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Allocation of oil families in Williston Basin (North America) oil using chemometric algorithms

By,

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Abstract

Significant geochemical information is carried by the gasoline range, the saturate fraction and the biomarkers compositional data of oils. In this thesis the ability of chemometric methods is investigated in revealing of the oil families and the associated petroleum systems in Williston Basin. Multivariate statistical method of Principal Component Analysis (PCA) was applied to the gasoline range data, the saturate fraction data and to the biomarkers data for oil samples from the Williston Basin.

Master thesis is organized in six chapters. Chapter 1 is an introduction that describes the scope of the thesis. Chapter 2 focuses on the introduction of the geological setting of the studied oils. Chapter 3 covers the principles of the Principal Component Analysis. In chapter 4 an extensive description of the MATLAB code used in this study is presented. Chapter 5 covers the examination of three implemented models that are: the Saturated Gasoline Model, the Biomarkers Model and the combined Biomarkers Gasoline and Saturated range Model. The aim of these models is to separate the oils into families and examine the performance of each model in family affiliation. In Williston Basin six oil families have been well recognized namely A, B, C, D, E and F. Finally in chapter 6 the conclusions of the three models are presented. In model 1 the separation of families A and C is clear, while samples from B and D oil families are overlapping. Model 2 shows a clear separation of oil families E and F while oil samples from family C arising as two different subgroups. Model 3 enhances the separation of C family oils into two distinct subgroups.

1. Introduction.

In order to minimize investment risk in oil and gas exploration, it is important to concretely determine the presence, types and volumes of hydrocarbons in a proposed structure before drilling. Whilst seismic interpretation can define closed structures and identify potential subsurface traps, it does not accurately predict trap content. Drilling on a closed structure holds no certainty of finding similar liquids, even when close to a producing oil or gas field. Hence, viable exploration needs to be supported by a methodology that includes the prediction of the likelihood of success in consideration of data projections and relative uncertainty (Al-Hajeri et al. 2009).

In this study, multivariate statistical analysis is applied to explore the petroleum–petroleum correlations in Williston Basin. Compositional correlations between petroleum and source kerogen are used for petroleum system analysis and definition, including both petroleum–petroleum and petroleum-source rock correlation. Petroleum–petroleum correlations describe geochemically related groups or families derived from the same source rock, revailing processes such as thermal maturity, migration, water washing and biodegradation. The classification of petroleum families typically involve qualitative or semi-quantitative techniques that are based on compound existence or relative abundance. Petroleum-source rock correlation associates a petroleum family to a stratigraphic unit, facies or locality that is comprised of the source kerogen. The petroleum system is characterized by these two processes and leads to the identification of undiscovered recoverable oil accumulations. (Obermajer Osadetz & Pasadakis 2004).

The Williston Basin is a circular depression on the North American Craton spanning across vast areas of South and North Dakota, Montana, and the Canadian regions of Saskatchewan and Manitoba. A brief description of Williston Basin general geology setting and stratigraphic succession is presented in Chapter 2 of the current thesis.

Chapter 3 provides a short description of the theory of the PCA method. Specifically, the number of original variables used was reduced and are replaced by the principal components. These variables are chosen most likely to show the representation of notable data patterns, allow for variable loadings to be interpreted, and finally maximize the potential for PCA classification. PCA also permits identification of compositional characteristics associated with certain chemical and geological processes with the most important for petroleum system analysis being source rock composition.

In Chapter 4 a brief description of the MATLAB software that was implemented for the needs of the master thesis is presented. It is based on MATLAB code created in the Hydrocarbons Chemistry and Technology Research lab, TUC.

In total, 336 samples from the Williston Basin were examined and classified into six families. From Red River reservoir 57 oil samples were taken (the samples belong to family A). 78 oil samples that belong to Bakken reservoir were categorized in two families; family B with 27 oil samples and family E with 51 oil samples. In family C are included 157 oil samples from

Madison reservoir, thus family C is the largest examined family group. The 33 oil samples associated to Winnipegosis reservoir were belonging to family D. Finally family F includes 11 oil samples from Viking reservoir.

Chapter 5 presents three different models, based on MATLAB PCA code. The models try to separate the oil samples into families. In order to optimize the separation process the data are filtered and standardized. The mentioned models are the following: Saturated Gasoline Model (SGM), Biomarkers model (BM) and Biomarkers Gasoline Saturated Model (BGSM).

This work demonstrates that the developed models achieve to confirm the affiliation of oil families of previous studies. PCA is very helpful in identification of relations among petroleum components that may by other methods be overwhelmed by and concealed by the complexity of compositional diversity. The reduced variable sets assist in the identification of characteristics belonging to the same family and common processes, and provide better results compared to less abundant, more complicated compounds. Model 3 examines solely the oil samples of family C in order to evaluate the existence of two different trends in oil samples and the result of this model confirms the presence of these two different sub-groups.

In addition, the results of PCA indicate that the common interpretation of simple compounds have to be performed carefully. PCA also permits samples to be scored using factor loadings. Whilst BM and BGSM provide the best affiliation of oil samples they fail to classify two oil families. Oil samples from families A, C, E and F have compositions distinctive enough to allow for an unambiguous classification using only principal component compositional models. Families D and B oils have distinctive characteristics, but compositional overlap among families is sufficient to reduce confidence of definitive classification. The results of the classification models are presented in chapters 5 and 6.

2. General geological settings of Williston basin.

The Williston Basin is located at the central North American Craton as it is shown in Figure 1. Its large petroleum provinces represent an important petroleum resource predominately for Canada as it is presented in figure 2. Williston Basin has an intracratonic setting and low, episodic subsidence rate. Near the basin centre in North Dakota the sedimentary succession is near 5 km thick (Figure 1) and approaches 800 km diameter. It is a prevalent protected basin, mainly connected to bigger tectonic features. It's clearly characterized rock succession, simple deposition history and simple tectonics make this an manageable area to deal with oils. Much different settings occur in the American and Canadian parts of the Williston Basin. Great anticlinal fields, like those of Cedar Creek and Nesson anticlines, influence the American part (Figure 2). A lot of American oil production originates from Paleozoic, particularly Silurian, formations. Canadian accumulations exist mainly in stratigraphic traps. In south western Manitoba and southeastern Saskatchewan, oils exist around the Mississippian subcrop. In Ordovician, Middle Devonian, Mesozoic formations and Upper Devonian there are fewer oil resources. In southwestern and west-central Saskatchewan, oils exist in stratigraphic traps in latest Devonian to Mississippian, Jurassic, and Lower Cretaceous formations. These comparisons suggest possibilities for further petroleum discoveries in the Canadian Williston Basin, mainly in older Paleozoic strata and Middle Devonian that are mostly unexplored.

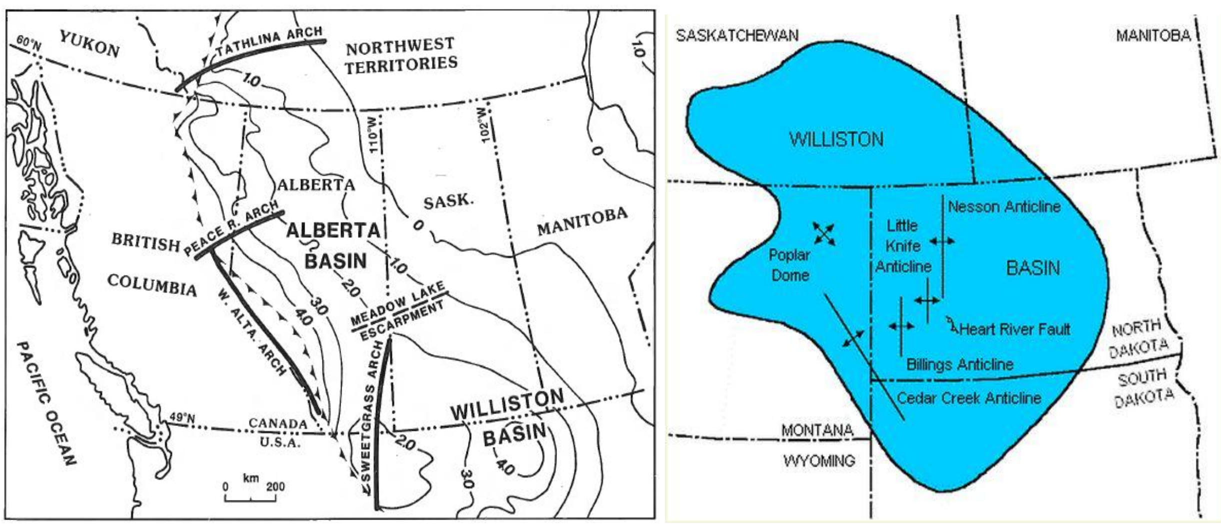


Figure 1: Sedimentary basins and major structural elements in the Western Interior Platform geological province south of 60°N. Sedimentary succession thickness is indicated by contours in kilometers. Extend of the Williston basin with major structures shown.

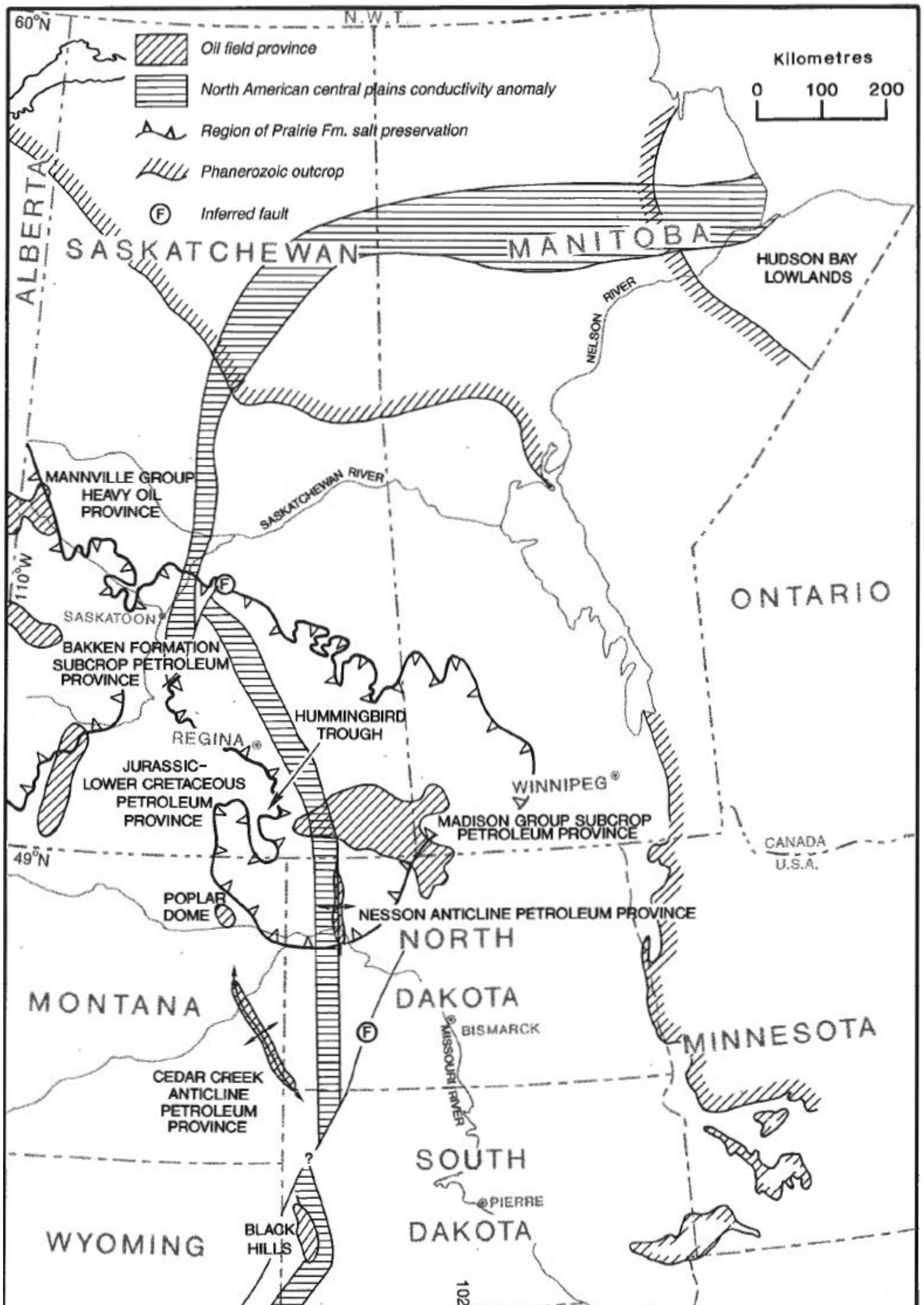


***Figure 2*:** Petroleum region and crucial tectonic elements in the Williston Basin and adjacent area. Only generalized outlines of the Mississippian Madison Group Subcrop Petroleum Province and other Williston Basin petroleum provinces are indicated.

2.1 Stratigraphic succession.

Six sequences are included at the succession bounded by unconformities (Figure 3, Figure 4).

On the lower Paleozoic of western North America Middle Cambrian to early Ordovician Sauk sequence was deposited.

The Tippecanoe sequence, Middle Ordovician clastic rocks and Upper Ordovician and Silurian carbonates and evaporates. Upper Ordovician rocks of this sequence contain important oil sources.

Kaskaskia, which is the third sequence, includes Middle Devonian, Late Devonian and Mississippian formations. A major transgressive event in the Upper Devonian (Bakken Formation) marks a change in Kaskaskia sequence depositional patterns and sedimentation style (Sandberg et al., 1983; Edie, 1958). The most significant interval in the Williston basin for petroleum source rocks is this sequence. There are present three important sources which are the Mississippian Madison Group, the latest Devonian to earliest Mississippian Three Forks Group and the Middle Devonian Elk Point Group.

The next sequence is the Pennsylvanian, Permian and Triassic Absaroka. This sequence is generally present only in American Williston Basin. This sequence contains effective oil source rocks, formations contain many unconformities and have small thickness.

The fifth sequence, the Zuni, can be locally subdivided into two sequences. The first of these sequences includes the Jurassic, when Williston Basin changed from a large reentrant on the craton margin into an orogenic foreland (Poulton, 1984; Carlson, 1968). The lower sequence contains a time equivalent succession to the last cratonically derived miogeoclinal succession.

Latest Jurassic and Cretaceous successions of the Columbian and Laramide orogenic forelands (Stott, 1984) form the final significant depositional episode. Thick shales of this final sequence include significant probable source rocks, but they are all immature in the Canadian Williston Basin. The first produced hydrocarbons in North Dakota were from the youngest strata in the state, glacial drift of the Tejas Sequence. However, there is no production from glacial drift today.

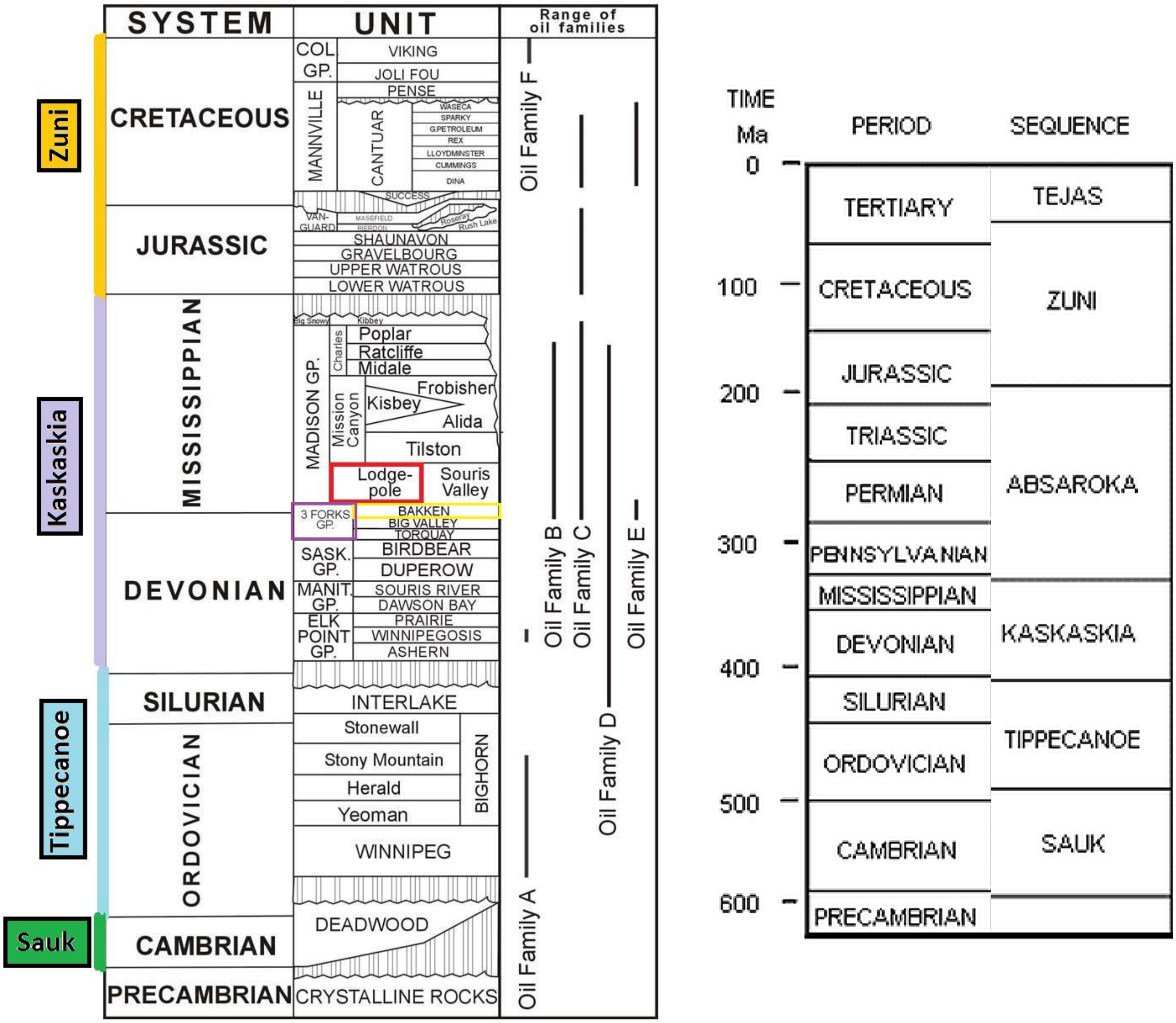


Figure 3: Generalized lithological succession in the Canadian Williston Basin at the left side of the figure. Time-stratigraphic column of Williston Basin at the right.

2.2 Tectonic setting.

The Williston Basin lies within the Interior Platform structural province. Basin monoclines are interrupted by important epeirogenic basement folds (Figure 2), such as the Nesson and Cedar Creek anticlines. These structures exert fundamental controls on hydrocarbon (HC) generation and petroleum occurrence in the Phanerozoic succession. An anomalous crustal region lies along longitude 103°W, south of latitude 51 °N (Figure 2). It coincides with the North American Central Plains conductivity anomaly and associated heat-flow anomalies. The North American Central Plains conductivity anomaly (Figure 2) is an intense, long (2000 km), wide (80 km) feature. It occurs between 10 and 20 km deep and is probably caused by crustal lithological variation. This region subsided anomalously throughout the Phanerozoic, the effects are recognizable in both sediment thickness and lithofacies patterns. The same region includes the Nesson Anticline, which shows enhanced hydrocarbon generation in Paleozoic rocks and elevated coal ranks in Tertiary strata.

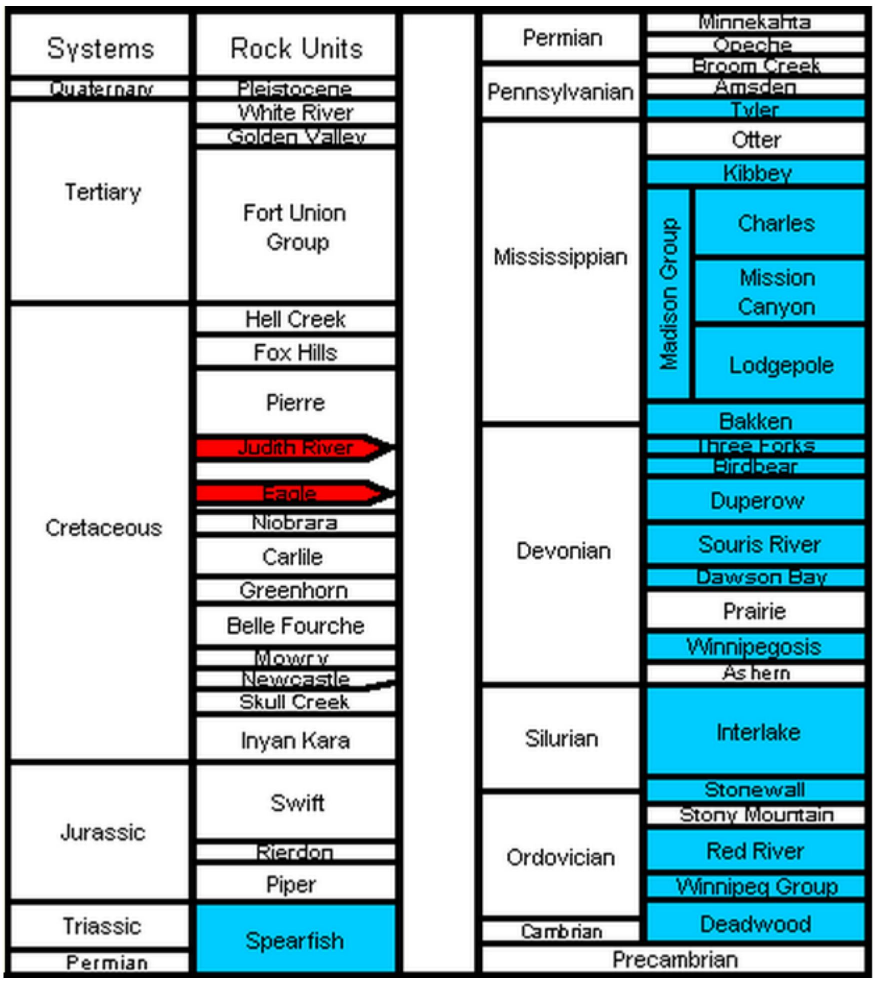


Figure 4: Generalized stratigraphic column for the Williston Basin with gas producing horizons shown in red and oil producing horizons shown in blue.

2.3 Oil Families and Their Sources in Williston Basin - Previous work.

In the Williston Basin, there are at least six oil families (Osadetz et al. (1994)). They have unique compositions, thus they are easily correlated with a unique source rock. The families with their corresponding main reservoir and source rock are presented in Table 1. The first attempt to categorize oils from the Williston Basin was made by Williams (1974) who identified three main oil types (Table 2). Based on a smaller sample set, Zumberge (1983) and Leenheer and Zumberge (1987) categorized crude oils from the American Williston Basin into five oil families (Table 2). By applying combinations of steroidal, terpane and normal alkane characteristics Osadetz et al. (1992) classified oils from the Canadian Williston Basin into four families (Table 2) (Obermajer et al. 2000).

Oil Family	Main Reservoir	Source Rocks	Reference
A	Red-River	Winnipeg-Bighorn	5
B	Bakken	Bakken	5
C	Madison	Lodgepole	1,2,3,4
D	Winnipegosis	Winnipegosis	1,2,3,4,5
E	Bakken	Bakken/Exshaw	2,3,4
F	Viking	Colorado	1,2,3,4

Table 1: Generalized Williston Basin oil family classification schemes based on the following studies: 1) Williams (1974); 2) Zumberge (1983); 3) Leenheer and Zumberge (1987); 4) Osadetz et al. (1992); and 5) Osadetz et al. (1994).

Family A

Oil is common to Late Ordovician reservoirs and has distinctive n-alkane compositions and low acyclic isoprenoid/ pentacyclic terpane ratios. These ratios and compositions match solvent extracts from kukersites of the Upper Ordovician Bighorn Group.

Family B

Oils are similar to Type II oils from Table 2 and they have high relative diasterane abundance without a prominence in the pentacyclic terpanes. They are found mainly in the Bakken Formation, but may occur in reservoirs as young as Early Cretaceous. The revised petroleum system model relates Family B oils to a source within the Bakken shale (Osadetz et al., 1992,1994; Osadetz and Snowdon, 1995).

Family C

Oils also are similar to Type II oils, but differ from Family B oils in that they have low relative diasterane abundance and a prominence of C35 pentacyclic terpane. They are found mainly in Mesozoic and Mississippian strata and are sourced from bituminous carbonates of the Mississippian (Tournaisian) Lodgepole Formation. Both Family B and C oils have been identified in the American Williston Basin (Price and LeFever, 1994; Obermajer et al., 2000).

Family D

Oils have low tricyclic/pentacyclic terpane ratios, but lack the GRH and n-alkane characteristics of Family A oils. Family D oil likely correlates to Groups 3, 4, and 5 of Leenheer and Zumberge (1987). Family D oils can be subdivided into D1 and D2 oils based on n-alkane/acyclic isoprenoid ratios and stratigraphic occurrence. Family D1 oil is found mainly in younger Devonian reservoirs and, as yet, has an undefined source. Thin organic-rich beds in Winnipegosis platform carbonates, the Birdbear Formation, and some Upper Devonian rocks have been recommended as possible source rocks. Family D2 oil occurs in pinnacle reefs of the Middle Devonian Winnipegosis Formation. It is sourced from the Brightholme Member that was deposited in a basinal setting between the pinnacle reefs of the Winnipegosis Formation. Oils having similar molecular compositions to D2 oils have been found in the Upper Cambrian Deadwood Formation, Silurian pools of the Nesson Anticline, and new discoveries in the Middle Ordovician Winnipeg Formation. They have, however, very different isotopic compositions of carbon and sulphur, suggesting that a still-undescribed petroleum system exists in Paleozoic strata (Osadetz et al., 2000).

Family E

Close in Mannville Formation in west-central Saskatchewan and within the middle Bakken sandstone subcrop play the oil pools in western Williston Basin exist. Stratigraphic occurrence and oil compositions of family E indicate that this family has Exshaw/Bakken sources in the Montana/Alberta Trough, outside the Williston Basin.

Family F

Oil, with pools in Early Cretaceous Viking Formation reservoirs of west-central Saskatchewan, have as sources the Cretaceous Colorado Group. Despite that now are trapped in the western part of the Williston Basin, Family F oils came out from segments of the Alberta/Montana Trough lying west of Calgary.

Williams, 1974	Zumberge, 1983; Leeheer and Zumberge, 1987	Osadetz et al., 1992, 1994	Source rocks
Type III (Pennsylvanian oils)	Not studied	Not studied	Tyler Fm. (Pennsyl.)
not studied		Family E (Bakken oils)	Exshaw/Bakken Fm. (U. Dev.-Miss.)
Type II (Devonian, Mississippian & Mesozoic oils)	Group 2 (Mission Canyon oils)	Family B (Bakken oils)	Bakken Fm. (U.Dev.-Miss.)
		Family C (Miss. & Jurassic oils)	Lodgepole Fm. (L. Miss.)
Not studied	Group 4 (Nisku oils) Group 3 (Duperow oils)	Family D (Winnipegosis oils)	Winnipegosis Fm. (M.Dev.)
Type 1 (Ordovician-Silurian oils)	Group 1 (Red River oils)	Family A (Red River oils)	Winnipeg Gr. (M. Ord.) and Bighorn Gr. (U.Ord.)
	Group 5 (Cambrian oil)	Not studied	unknown (?U.Cam.-Ord)

Table 2: Generalized Williston Basin oil family classification schemes (modified from Osadetz et al., 1994).

3. PCA: Description, use and interpretation of the results.

Principal Component Analysis (PCA) is the most frequently used among the multivariate analysis techniques because it is a starting point in the process of data mining. It targets at reducing the dimensionality of the data. In PCA, it is usual to deal with big data sets in which *n* objects are described by a number *p* of variables. The data are contained in a matrix ***X***, with rows n and columns p, with an element x_{ij} to an element of ***X*** at the i-th line and the j-th column. Usually, each line of ***X*** corresponds to an "observation". This observation can be a spectrum or a set of physicochemical measurements or, generally, an analytical curve derived from an analysis of a sample performed with an instrument producing analytical curves as output data. A column of ***X*** is mostly called a "variable". Regarding to the type of analysis, it is typical a deal with multidimensional data *n* x *p*, where *n* and *p* are of the order of several hundreds. In such situations, it is hard to identify in this set any relevant information without the help of a mathematical tool such as PCA.

3.1. Theoretical aspects.

The main idea of PCA is to represent the original data matrix X as a product of two smaller matrices T and P (the scores matrix and the loadings matrix respectively), such that:

$$ {}_nX^p = {}_nT^q \cdot {}_p\left[P^t\right]^q + {}_nE^P \qquad (1) $$

Or in the non-matrix version:

$$ x_{ij} = \sum_{k=1}^{K} t_{ik}\, p_{kj} + e_{ij} $$

With the condition $p_i^t p_j = 0$ and $t_i^j t_j = 0$ for $i \neq j$

Non-redundancy (at least at a minimum) of information "carried" by each estimated principal component is assured by this orthogonality. Equation 1 can be expressed in a graphical form, as follows:

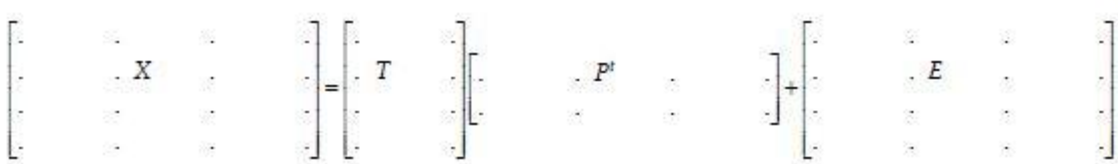


Figure 5: A matricized representation of the PCA decomposition principle.

This representation is translated in Figure 6 in a vectorized version which shows how the **X** matrix is composed by a sum of line-vectors (eigenvectors) and column-vectors (components). In a situation of chromatographic data or spectroscopic data, these eigenvectors and components have a chemical meaning. This is, the proportion of the constituent i for the i^{th} component and the "pure chromatogram" or "pure spectrum" for the i^{th} eigenvector.

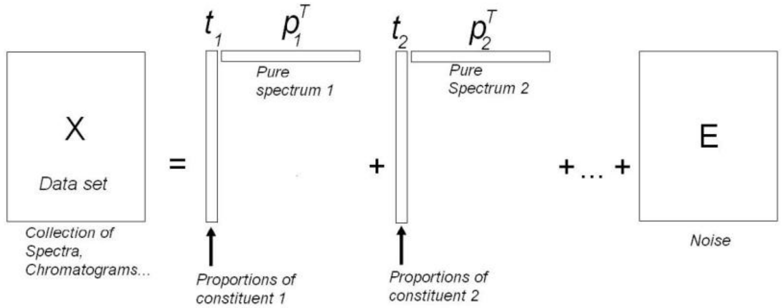


Figure 6: Schematic representation of the PCA decomposition as a sum of "components" and "eigenvectors" with their chemical significance.

The mathematical inquiry behind this expression of **X** is: If there exists one other basis, which is a linear combination of the original base, which re-expresses the initial data. The term "basis" indicates here a mathematical basis of unit vectors that support the other vectors of data. With respect to the linearity - which is one of the basic assumptions of the PCA – the general reply to this question can be written in the case where **X** is perfectly re-expressed by the matrix product $T.\mathrm{P}^T$, as follows:

$$PX=T \qquad (2)$$

A change of basis is represented in equation 2 and can be interpreted in different ways, such as the **X** into **T**, transformation by applying **P** or by geometrically saying that **P** (which is the rotation and a stretch) transforms **X** at **T** or the rows of **P**, where {p1,…,pm} represent a set of new basis vectors for expressing the columns of **X**. However, the solution offered by PCA consists of finding the **P** matrix, of which at least three ways are probable:

1. Eigenvectors calculation of the square, symmetric covariance matrix $X^T X$ (Eigenvector analysis implying a diagonalization of the $X^T X$);
2. Calculating eigenvectors of **X**, by the **X** direct decomposition using an iterative procedure (NIPALS);
3. Singular value decomposition of **X** (is a more generic algebraic solution of PCA).

The double nature of expressions **T = PX** and $X = TP^T$ leads to a comparable output when PCA is applied on **X** or applied on its transposed XT. The eigenvectors of the one are the other score vectors. This property is very significant and the principal components of a matrix are computed by using the method of covariance matrix.

3.2. Geometrical point of view.

3.2.1. Change basis vectors and reduction of dimensionality.

If it supposed that each dimension is associated with a variable in a p-dimensional space, so in this space, each observation is defined by its coordinates corresponding to the value of variables that express it. Since the data of the raw is generally too complicated to generate an interpretable representation in the space of the original variables, it is needed to reduce or compress the p-dimensional space into a lower space, while keeping the maximum information. Extend of information is statistically represented by the variances. PCA creates new variables as a linear combination of original variables. Geometrically, this switch of variables implies a change of axes, called principal components, chosen to be orthogonal. Each newly generated axis defines a direction that describes a part of the whole information.

The first component is computed in order to represent the main portion of information, following by the second component which represents a smaller amount of information, and so on. In other words, the original variables p are replaced by a set of new variables, the components; these components are linear combinations of original variables. The variances of components are categorized in decreasing order and by PCA construction, the whole set of components carry all of the original variance. The space dimensions are not reduced but the switch of axis allows a better representation of the data. Furthermore, by retaining the q first principal components (with q<p), after it is settled to retain the max of the variance enclosed in the original data for a q-dimensional space. This shrinkage of dimensions from p to q is the result of the projection of points in a p-dimensional space to another space of dimension q. An advantage of the technique is the ability to represent at the same time or separately the samples and variables in the space of initial components.

3.2.2. Correlation circle for discontinuous variables.

In the case of sensorial or physicochemical data, and generally in cases that the variables are not continuous like in chromatography or spectroscopy, a tool is necessary for interpreting the meaning that the axes include: the correlation circle. Each variable on this graph is associated with a point whose coordinate on an axe factor is a value of the correlation between the factor and the variable. In the space of dimension p, the max distance of the variables at the origin is 1. Thus, by projection on a factorial plan, a circle with radius 1 contains the variables (the correlation circle) and the closer they are closer to the edge of the circle, the more they are described by the plane of factors. Thus, the variables correlate well with the two factors composing the plan.

The angle between of the two variables, measured by its cosine, is the same with the two variables linear correlation coefficient between: $\cos(angle) = r(V1, V2)$

- In the case that the points are very close (angle approaches 0): $\cos(angle) = r(V1, V2)$ = 1 then V1 and V2 are highly (positively) correlated.
- In case that a is equal to 90 °, cos (angle) = r (V1, V2) = 0 then there isn't a linear correlation between X1 and X2
- In the case that the points are opposite, angle is 180 °, cos (angle) = r (V1, V2) = -1: V1 and V2 are strongly (negatively) correlated.

A picture that illustrate the above is given in Figure 7, which shows the correlation circle defined from a principal component analysis on data measured on palm oil samples. Obviously, correlation circle have to be interpreted jointly with another graph, named the score-plot, which is the result from calculation of samples coordinates in new principal components space that is referred below in this chapter.

3.2.3. Scores and loadings.

Scores contribution is to imply the coordinates of the observations on the PC components and the analogous graphs (objects projected in successive planes that are described by two principal components) are called score-plots. The contribution of original variables to the various components is defined with loadings. The corresponding graphs are the loadings-plot and can be seen as the projection of vectors of unity representing the variables in the successive planes of the main components. Thus scores are a representation of observations in the space formed by the principal components axes, symmetrically loadings are the variables in the space of principal components.

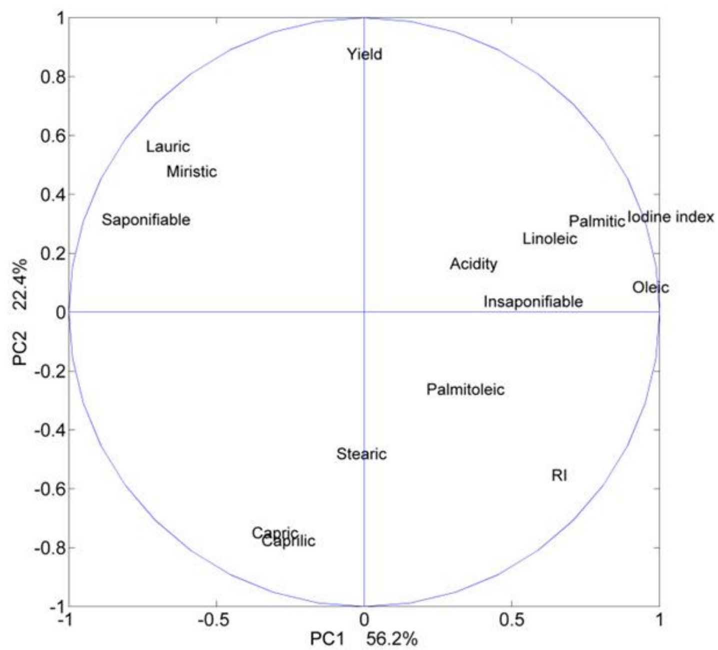


Figure 7: Example of score-plot and correlation circle obtained with PCA.

Observations with similar characteristics are necessarily close to each other in the space of principal components. This closeness in the initial space causes a close neighboring in the score-plots. Equivalently, the variables that their unit vectors are close to each other are considered to be positively correlated, that means that their influence on the positioning of objects is similar (these proximities are reflected in the projections of variables on loadings-plot). Although, variables that are away from each other will be characterized as being negatively correlated. When loadings are referred it is important to determine two different cases depending on the nature of the data. If the data include discontinuous variables, like the case of physicochemical data, the loadings are described as a factorial plan, i.e. PC1 vs. PC2, showing each variable in the PCs space. Nonetheless, if the data is continuous (in case of chromatographic data or spectroscopic) loadings are presented in different way. In a case like this, we usually represent values of loadings of each principal component in a graph with the scale corresponding to the experimental unit on the X-axis and the values of the loadings of component PCi on the Y-axis. Thus, the loadings are like a chromatogram or a spectrum. Figure 8 and Figure 9 provide, through the application of principal component analysis, an example of scores and loadings plots taken from a sensorial characterization and physicochemical study of Italian beef. The target of this work was clustering between the ethnic groups of animals (normal Piemontese, NP; hypertrophied Piemontese, HP; Friesian, F; Belgian Blue and White, BBW crossbred hypertrophied PiemontesexFriesian, HPxF;). These graphs are suitable for defining the likely reasons of clusters formation of objects that are visualized, i.e. the importance (or weight) of certain variables in the placing of objects on the plane formed by two main components. Certainly, the objects positioned, for example, right on the score's plot will have crucial values for the variables placed also right on the loadings plot, while the variables near the origin of the axes that will make a tiny contribution to the discrimination of objects. PC1 on the loadings plot is defined mainly by eating quality, one chemical parameter and two physical parameters (overall acceptability, Oa; ease of sinking, Te; initial juiciness, Ji; sustained juiciness, Js; residue, Tr friability, Tf;). These variables are positioned far from the origin of the first PC, at the right in the loadings plot, and close together, which means, therefore, that they are positive correlated. On the other hand, PC2 is mainly defined by two chemical (ether extract, E and hydroproline, Hy;) and two physical (lightness, L and hue, H;) parameters. These variables located on the left side of the loadings plot, and they are positively correlated. The interpretation of the scores' plot indicates a separation of the samples into two groups: the first one includes the meats of the normal Piemontese (NP) and the second one includes the meats of the Friesian (F) hypertrophied animals (HP). By avoiding to repeat all of the interpretation mentioned from the authors, the combined reading of scores and loadings indicates, for instance, that the meat samples HP and BBW have, in general, a higher protein content and also good eating qualities and lightness. At the other side, the meat samples F and NP are defined more by their hydroxyproline content, their ether extract or else their Warner-Bratzler shear value. This analysis may be made with the rest of the parameters studied and contributes to a better knowing of the "weight" that these parameters have, on the features of the product studied. This is a qualitative way to compare samples on the basis of a set of experimental measurements. (Christophe B.Y. Cordella 2012)

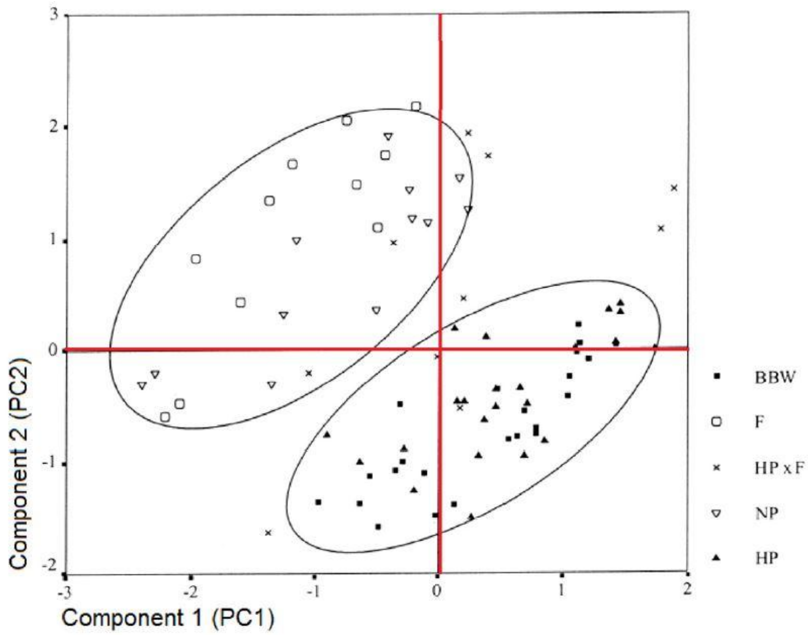


Figure 8: Score-plot obtained by PCA applied on meat samples.

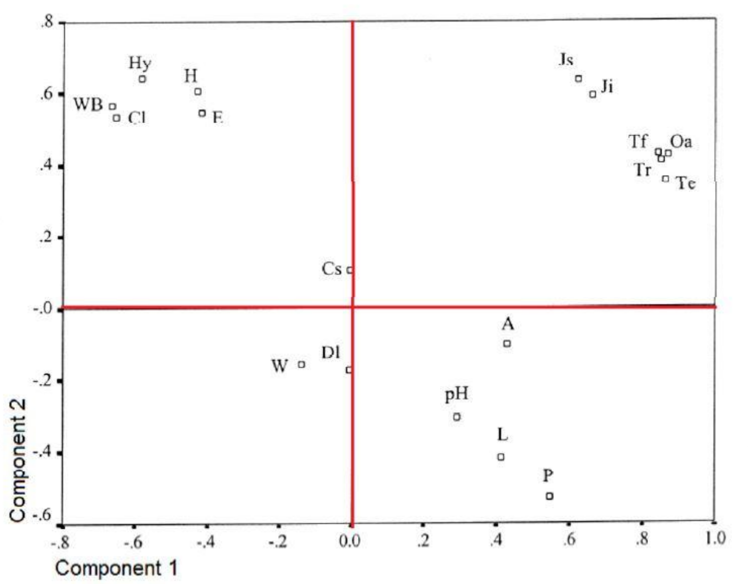


Figure 9: Loadings-plot obtained by PCA applied on meat samples. The first two PC loading vectors plot. Water (W); protein (P); ether extract (E); hydroxyproline (Hy); collagen solubility (Cs); lightness (L); hue (H); drip losses (Dl); cooking losses (Cl); Warner±Bratzler shear (WB); appearance (A); ease of sinking (Te); friability (Tf); residue (Tr); initial juiciness (Ji); sustained juiciness (Js); overall acceptability (Oa).

4. MATLAB code.

4.1 Overview.

In order to separate the oil samples into families for the three models a MATLAB code that is created in the Hydrocarbons Chemistry and Technology Research lab was used. The mentioned code was used with the necessary additions and adjustments in order to interpret data for analysis and clustering. Thus, some functions were needed to enrich the code in order to be customized on some specific requirements. The purpose of this chapter is a briefly description of a step by step analysis of how this code operates, from the data loading step until the plot of the results.

4.2 Data input.

The initial data exist in an excel file (.xlsx). Excel file is necessary to be structured with a specific form and the spreadsheet with the data in the 1st spreadsheet of the excel file (leftmost position). Table 3 illustrates a characteristic part of the data file from SGM model.

Sample's code

Lab.no	SA494	SA495	SA497	SA499	SA500	SA501	SA503	SA511
pr/ph	0.73	0.65	0.65	0.89	0.53	0.71	0.63	0.57
pr/nC17	0.55	0.32	0.40	0.32	0.33	0.47	0.39	0.36
Ph/nC18	0.76	0.50	0.65	0.38	0.61	0.71	0.65	0.57
CPI (14-20)	1.04	1.02	1.02	1.01	1.02	1.04	1.04	1.06
CPI (22-32)	0.93	0.93	0.94	0.96	0.93	0.92	0.93	0.92
Pr/Ph	0.73	0.65	0.65	0.89	0.53	0.71	0.63	0.57
Pr/nC17	0.55	0.32	0.40	0.32	0.33	0.47	0.39	0.36
Ph/nC18	0.76	0.50	0.65	0.38	0.61	0.71	0.65	0.57
CPI (14-20)	1.04	1.02	1.02	1.01	1.02	1.04	1.04	1.06
nC6	0.39	0.53	0.52	0.59	0.49	0.48	0.45	0.54
nC7	0.00	0.31	0.31	0.35	0.32	0.25	0.25	0.31
Benz	0.00	0.00	0.34	0.15	0.55	0.47	0.88	0.09
Tol	0.00	0.05	0.08	0.22	0.81	0.21	1.27	0.13

Model ratios

Sample's Data

Table 3: Excel sheet from SGM model which is a part of the input data for Saturate Gasoline Model (SGM).

A more detailed description of Table 3 follows:

<u>Sample number</u>

The first line represents the samples codes. For example the SGM model has 215 samples, however in Table 3 are shown only eight indicative samples. The sample code allows the user to click into an unknown sample in the score plot, and get the sample's code printed on the screen. This sample's recognition in plots is very important because help the user to spot the outliers.

<u>Model ratios</u>

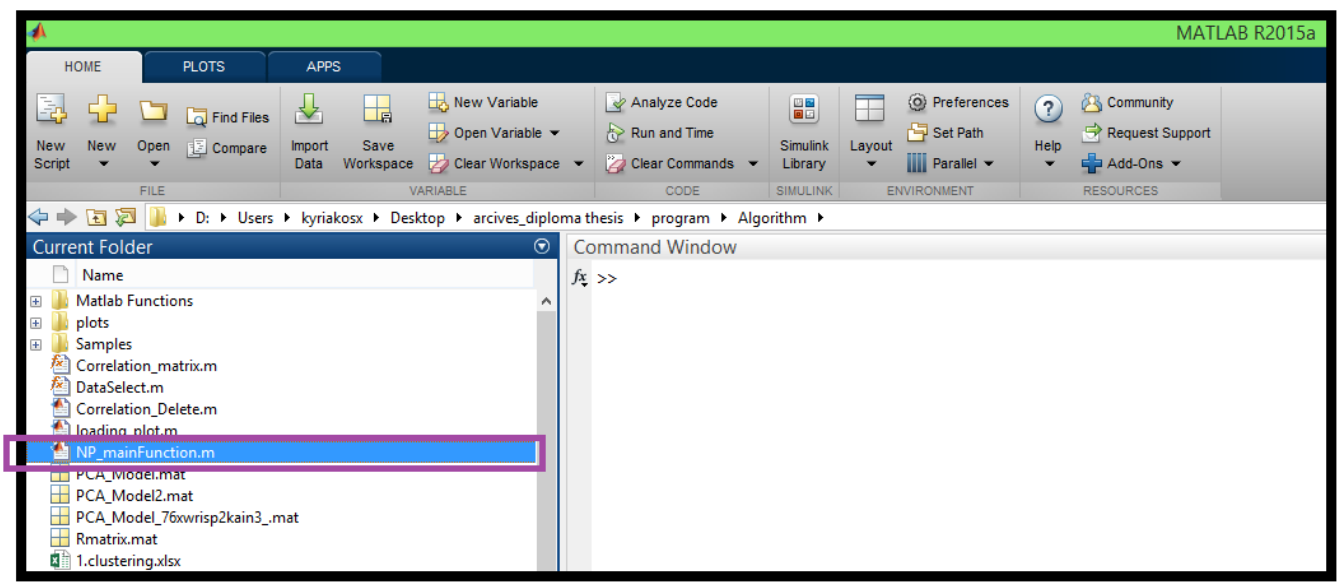
In the column model ratios, the selected components are placed or the selected ratios that were initially loaded in the model.

<u>Sample's data</u>

In this area the value of any sample for each ratio variable or pure variable are placed.

4.3 Loading the MATLAB code.

Main function option opens the MATLAB program (this option is in Figure 10 and is colored with a purple rectangular).



<u>Figure 10:</u> MATLAB environment, main function selection figure.

The main function code contains nine (9) sections. Most of these sections operate as pre-treatment methods that help the program to optimize the data separation. However, as far as the oil samples data concern, some of these methods have no physical meaning. Thus, Figure 11 sums up and numbers the sections of the code that can be potentially used for this project. In the next paragraph, is given a separate description of each section.

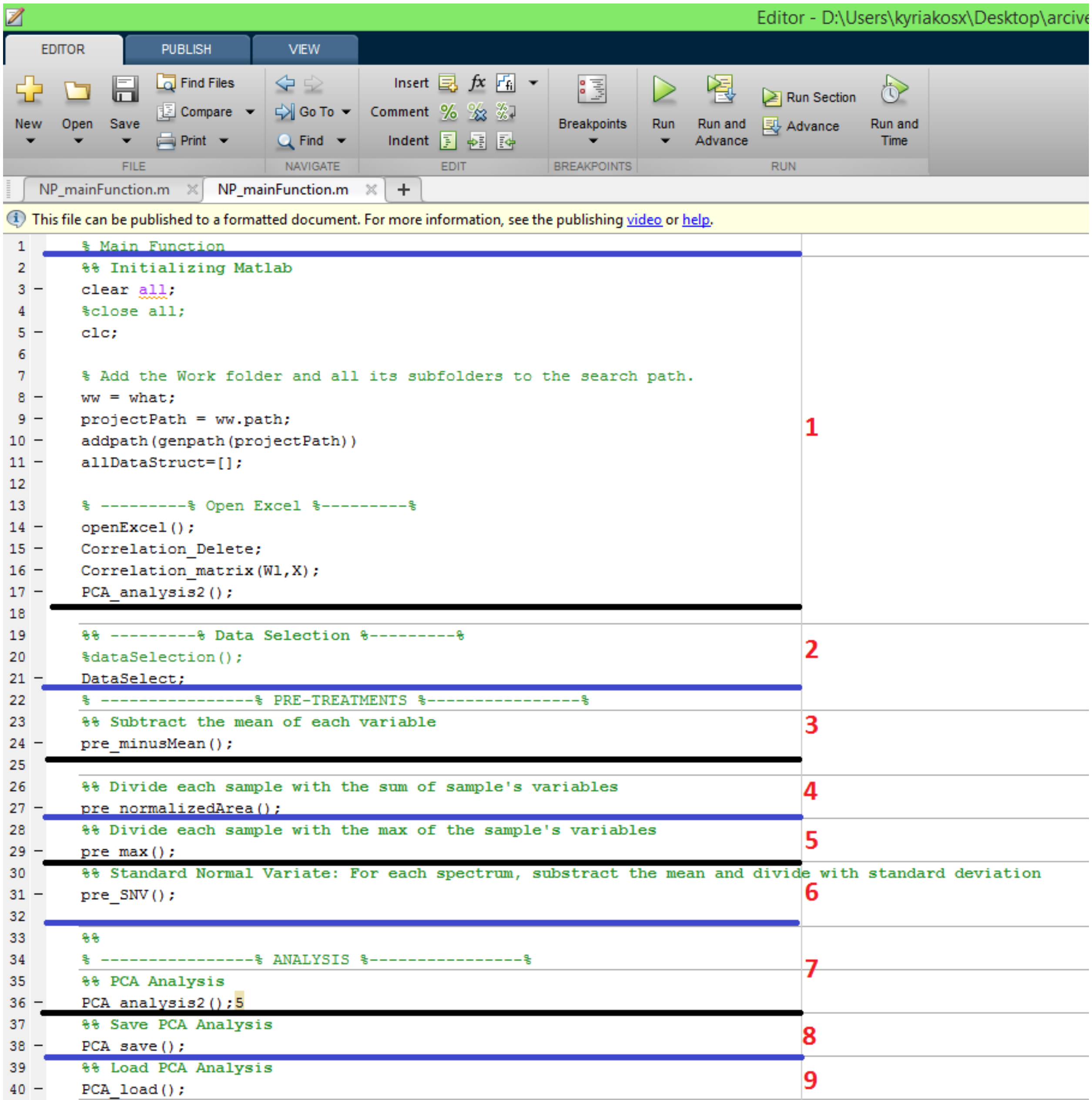


__Figure 11:__ Main function numbered sections that can be used in order to cluster the samples from different models into families.

4.4 Main function

The MATLAB code of the first section (Main function) is separated into three parts. In Figure 12 these parts have been numbered with different colors. Initially the code runs the command "openExcel ();". With this command the user has to choose the excel data that will be elaborated. As next step the code will automatically remove the compounds that are highly correlated (over 90%), these operations performed with the commands "Correlation_Delete;" and "Correlation_matrix (W1,X);". Finally the MATLAB runs the command "PCA_analysis2 ();" which prints the score plots. This print is used as a first view of the model output results.

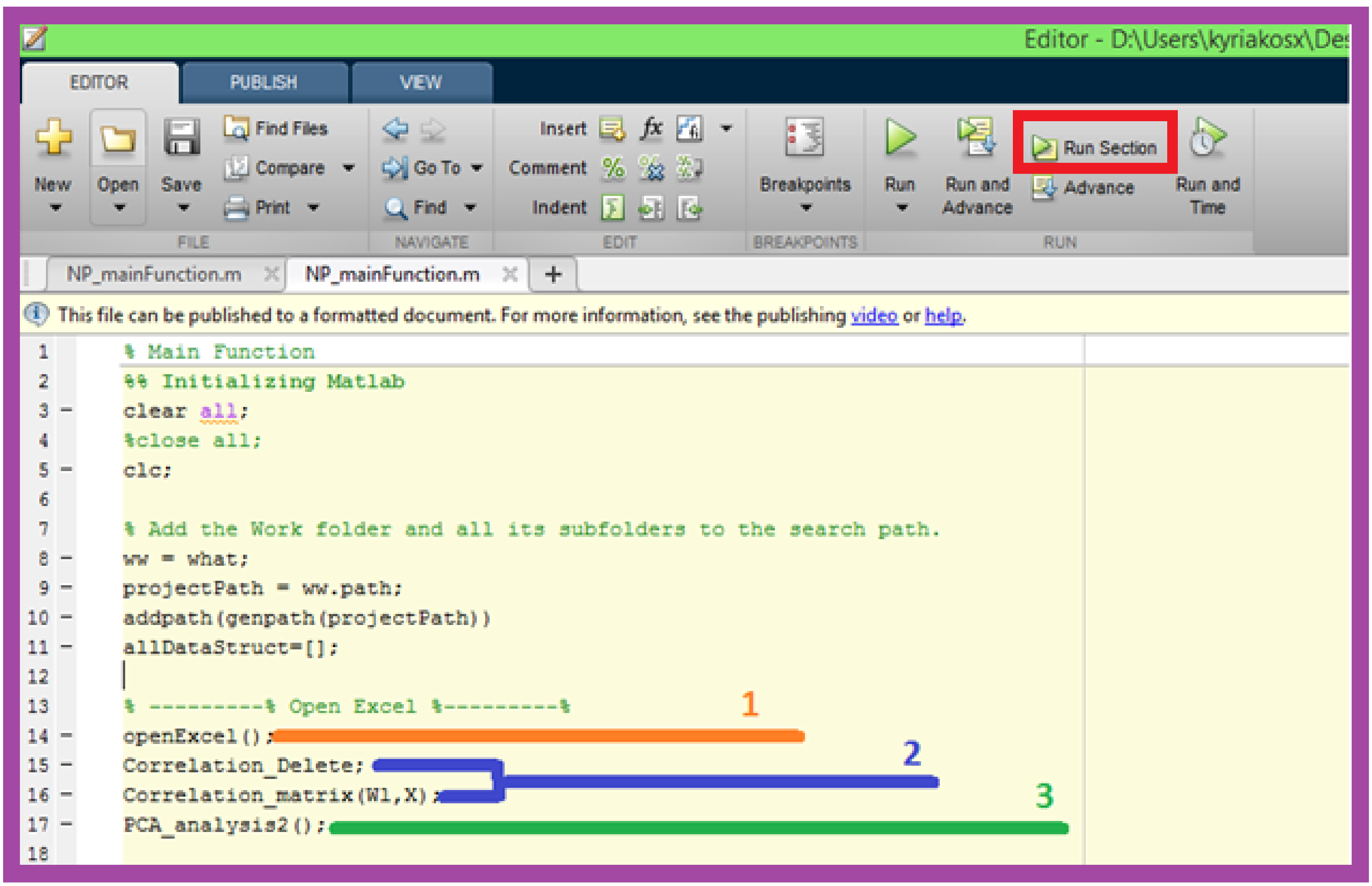


Figure 12: Main function section. Operation of this section is to open the excel data, identify the components relation with correlation matrix and print score and loading plot diagrams.

Step 1

- Choose Main function (first section).
- Press F5 or Click "Run section" (marked with a red colored rectangular at the top right side of Figure 12).

Subsequently a figure with three available choices appears as it is shown in Figure 13. The choice "Excel with other data" is selected.

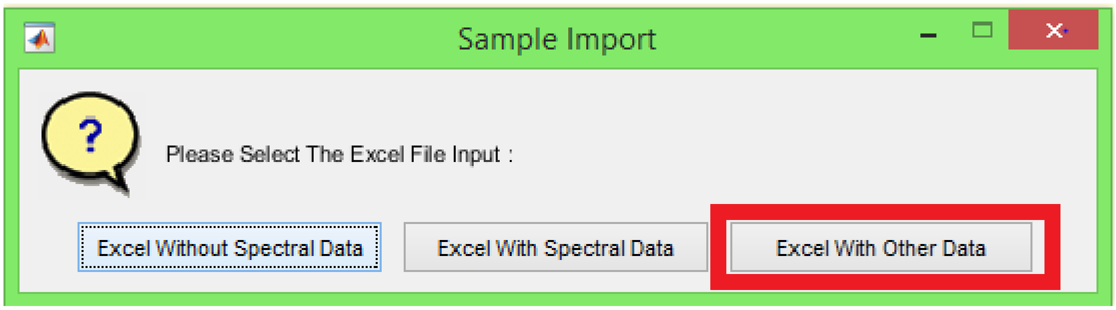


Figure 13: Sample import in order to select the data excel archive.

Step2

In this step the excel file that contains the data has to be selected as it is illustrated in Figure 14 When the correct excel spreadsheet is selected the "open" selection load the file into the MATLAB environment.

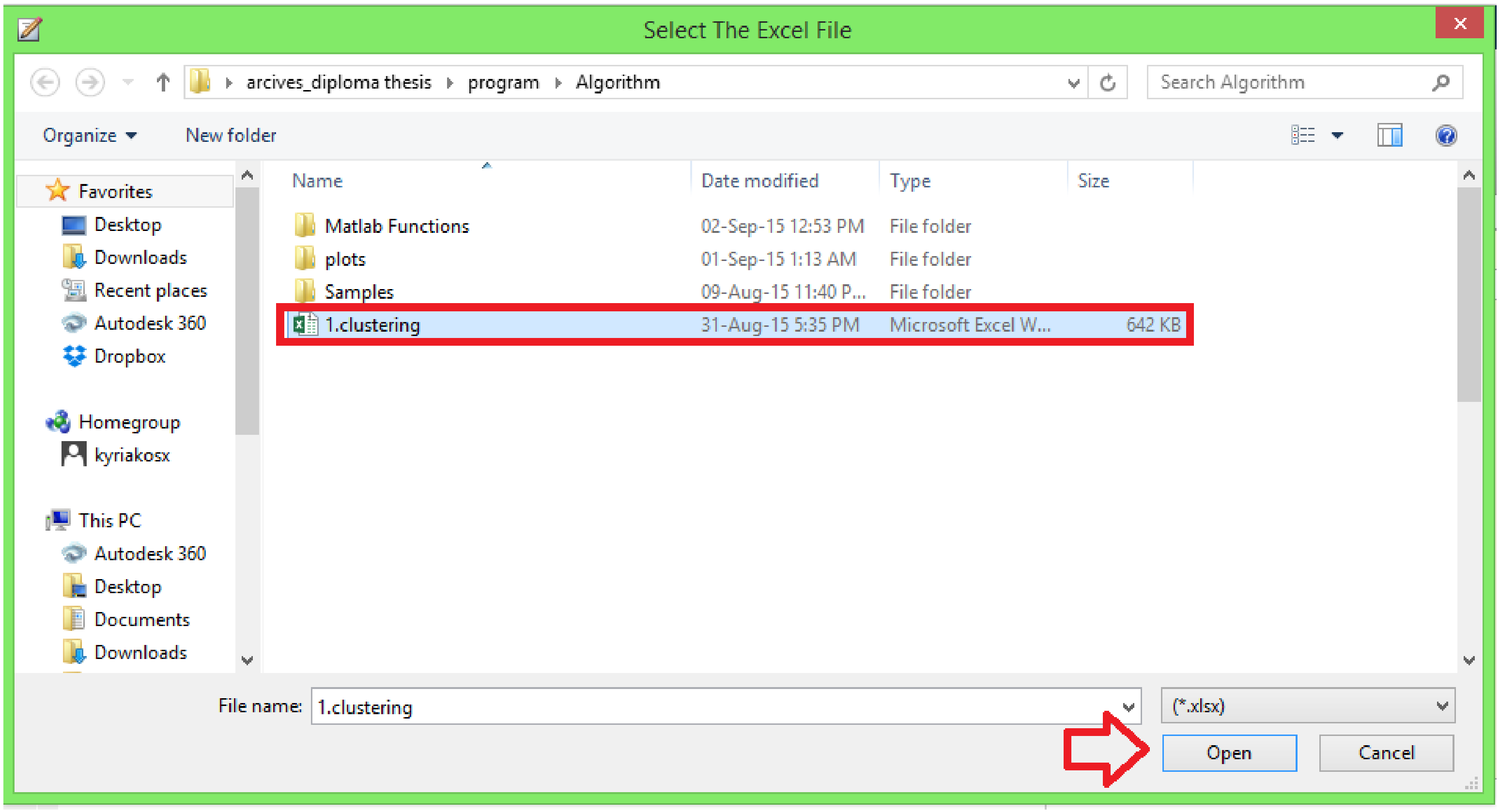


Figure 14: Excel file selection to insert the oil samples data into the MATLAB code.

Step 3

In this step the cross correlation matrix identify the variables (components) that have a correlation coefficient over 90%. The user has the ability either to let the MATLAB program automatically delete these values or manually delete them. The delete choice as well as the rest of the choices can be seen in Figure 15. The correlation matrix is an extra functionality that added for the needs of this thesis.

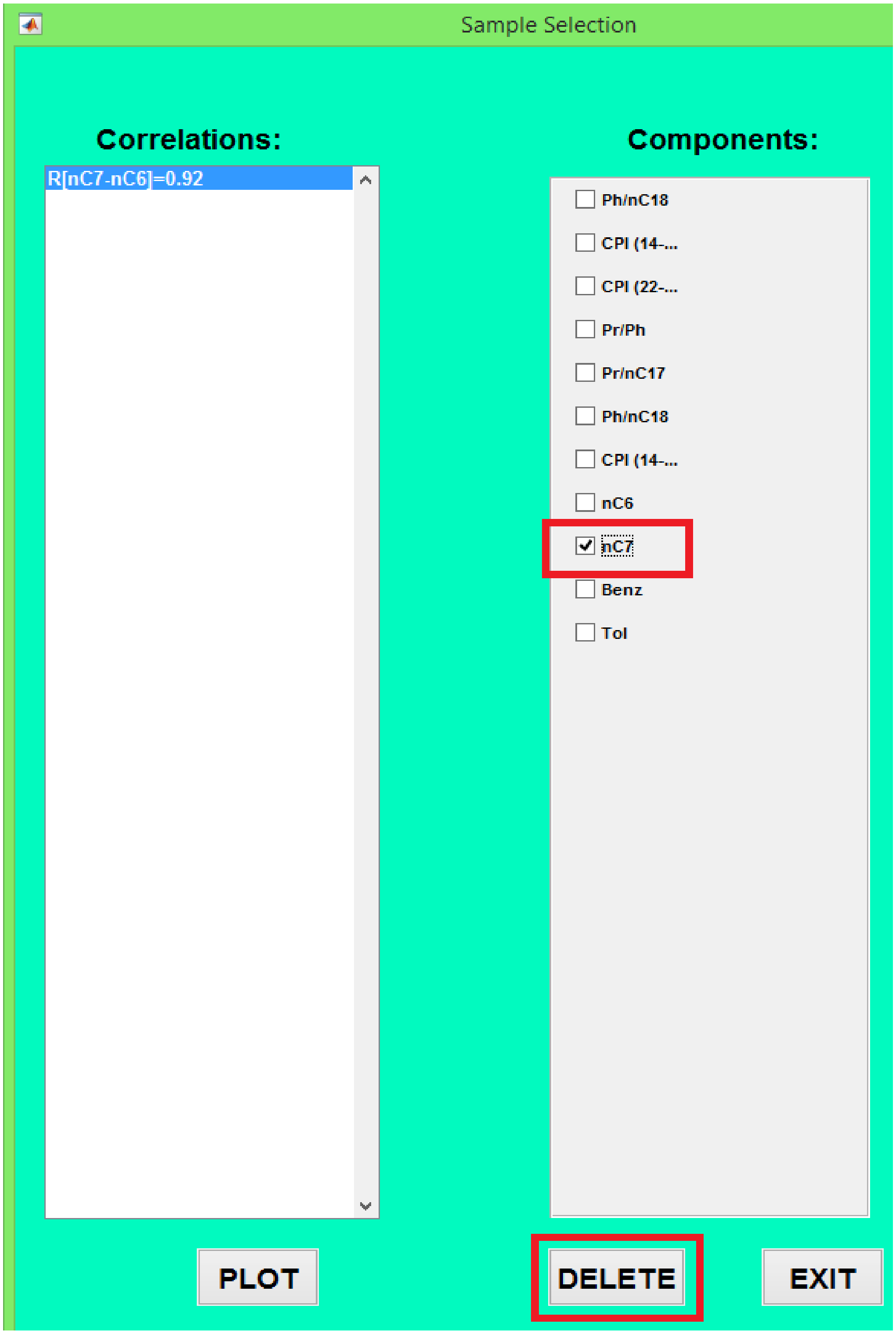


Figure 15: Correlation plot from MATLAB code.

Step 4

In this step, the number of how many principal components will be included in our analysis must be selected. The size of the selected number must be at least two and do not exceed the number of ten. The program prints four score plots with the horizontal axis being always the PC1, therefore values bigger than 5 as the number of principal components have no visualization effect.

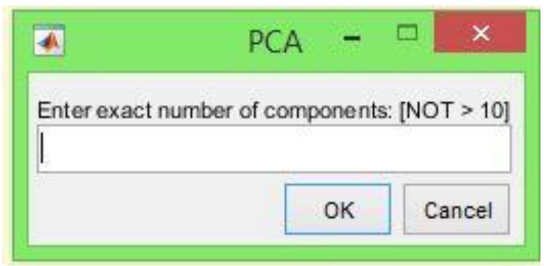


Figure 16: Number of components input.

Step 5

Finally the program prints the following plots. The first plot illustrates the percentage of variance that is explained from the principal components. The next plot depends on the value that the user selected in step 4. If for example the user selects the value of five then the output is four score subplots with the PC1 values in horizontal axis and PC2, PC3, PC4 and PC5 values at the vertical axis. The last plot that is obtained is the score plot with PC1 and PC2 values in axis without the other three score subplots. In most cases the score plot with the first two major components affiliates the samples in a better way, and this is the reason that it is plotted separately.

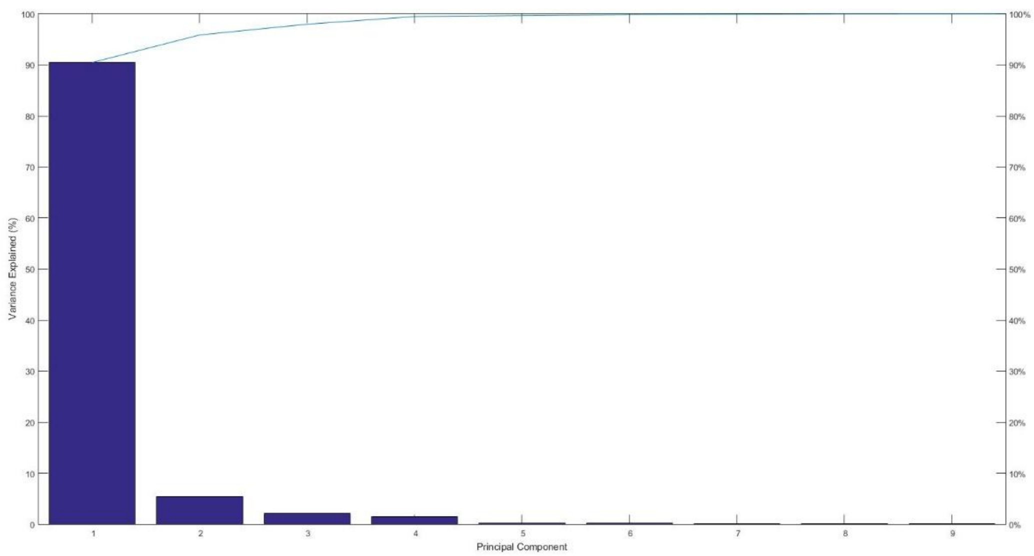


Figure 17: Variance explained.

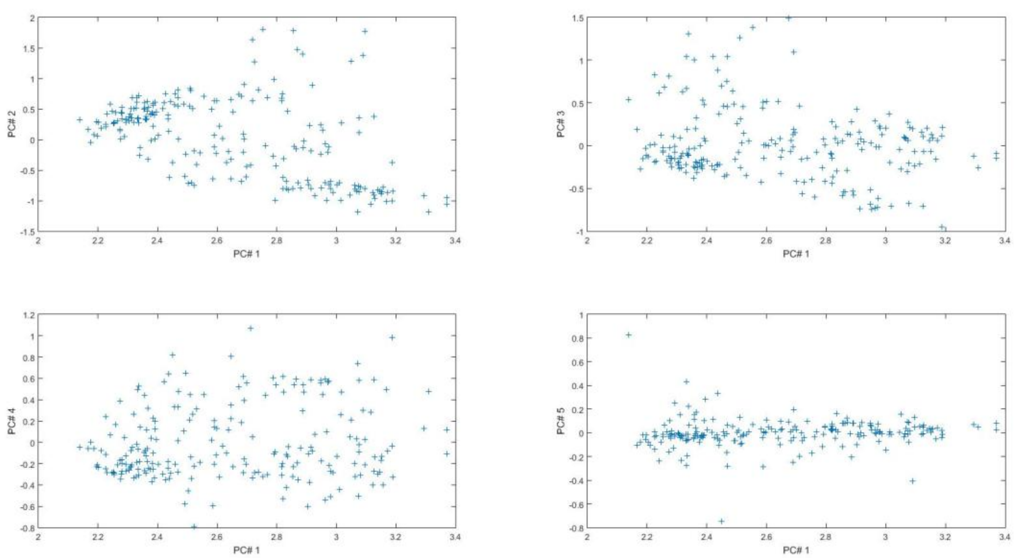


Figure 18: Score plots with the first five PC's.

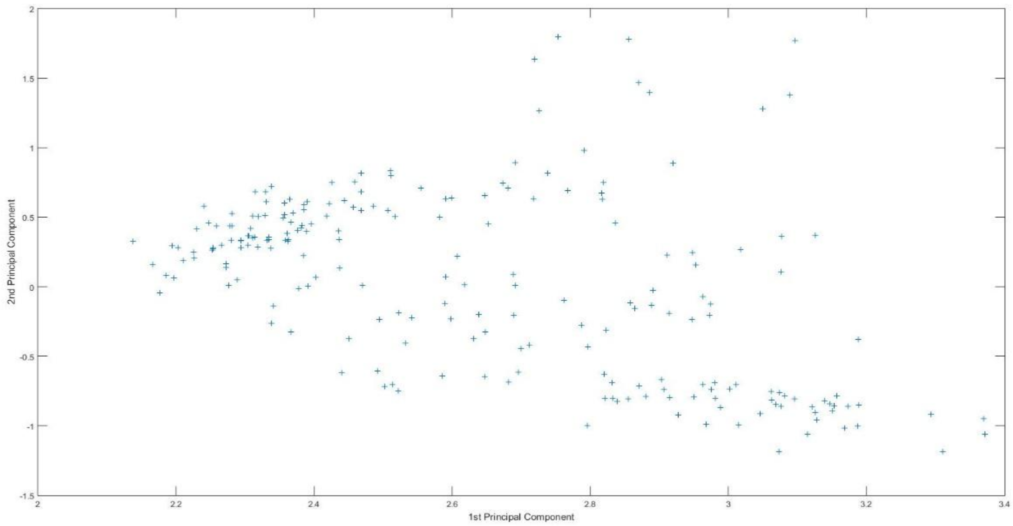


Figure 19: Score plot with PC1 and PC2 axes.

In order to make the separation more visible every sample takes a particular shape and color according to the family group that it belongs. In Figure 20 and Figure 21 the previous results are illustrated.

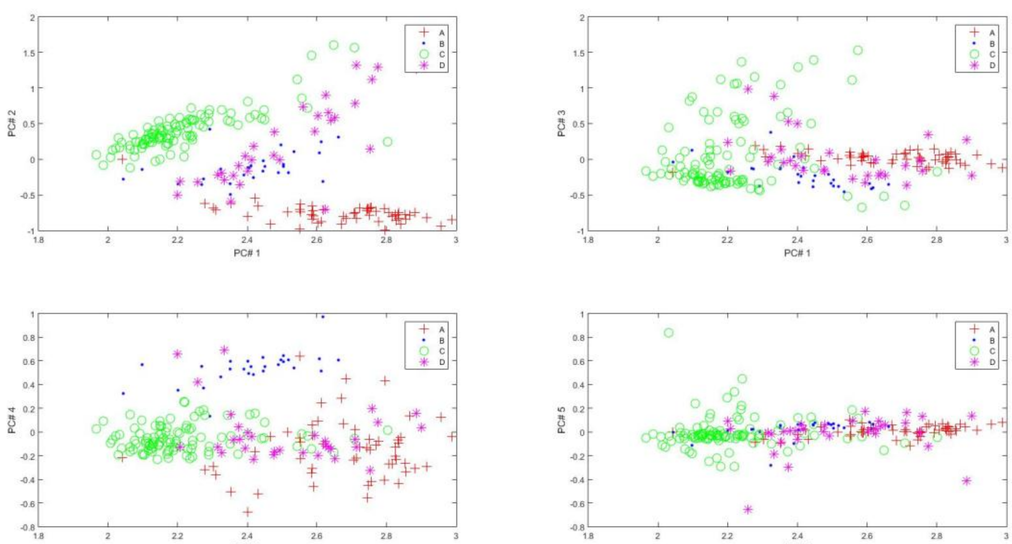


Figure 20: Score plots with the first 5 PC's. Every sample is colored depending on the family that it belongs.

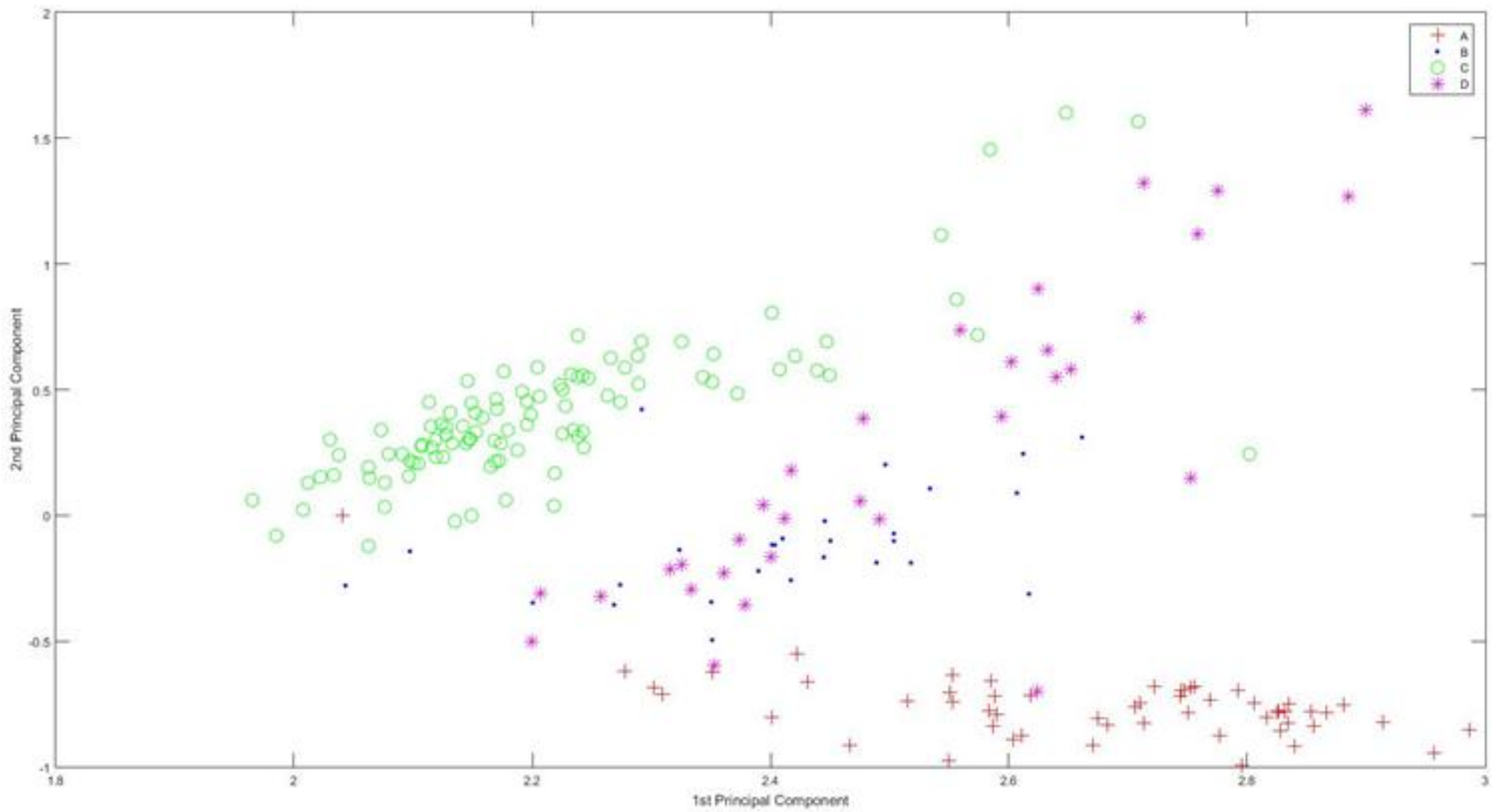


Figure 21: Score plot of the first two PC's. Samples from different families are plotted with different color.

An extra function has been implemented in MATLAB program in order to plot the loading scores. The MATLAB code for this function is illustrated in Figure 22. With the press of Run button a loading plot of Figure 23 is appeared. By selecting the points of the loading plot the corresponding component for each point is printed in the screen.

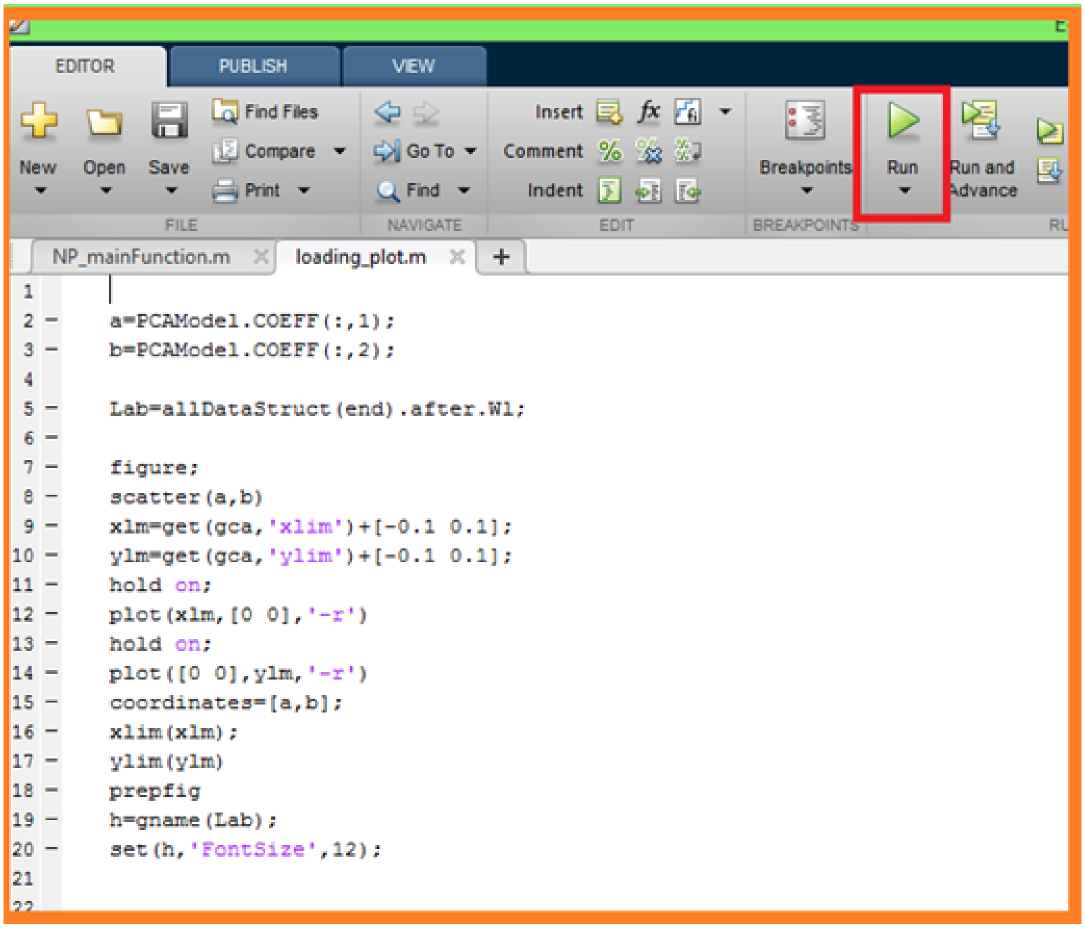


Figure 22: MATLAB code for loading score plot.

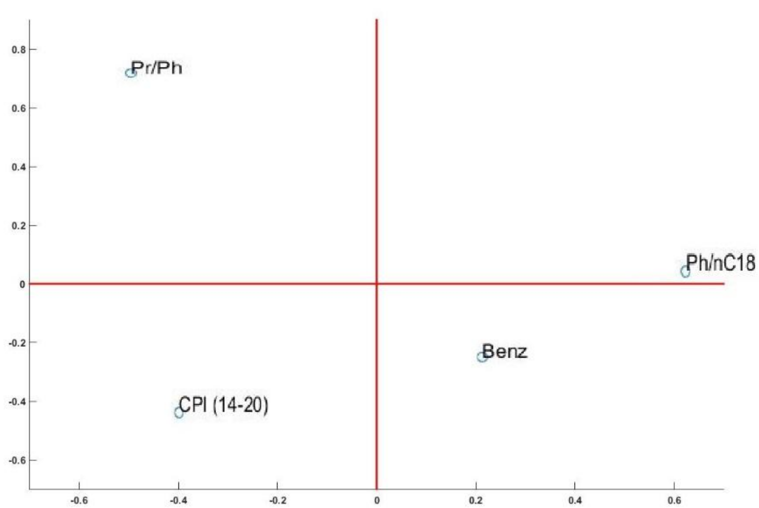


Figure 23: Output loading plot of the MATLAB code.

Step 6

For this step, the MATLAB code adjusted in order to provide the ability of variable selection. Thus the investigator can delete any variables that worsen the discrimination results for the oil samples. This section of the MATLAB code is marked with the number 2 in Figure 11.

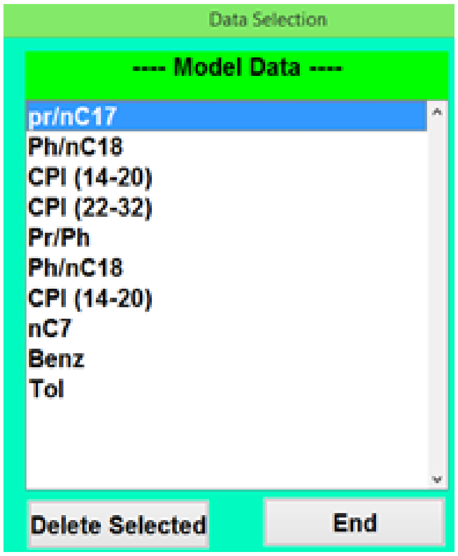


Figure 24: Table of components. From this table components can be removed from the model.

Step 7

In order to optimize the separation of the samples some pre-treatment methods are necessary. The pre-treatment methods are the following:

- Subtract the mean of each variable.
- Divide each sample with the sum of sample's variables.
- Divide each sample with the max of the sample's variables.
- Standard Normal Variable: For each variable, subtract the mean and divide with standard deviation.

Figure 25 shows the available pre-treatment methods. The methods that were used in this work have been marked with a colored rectangular.

```
% ----------------% PRE-TREATMENTS %----------------%
%% Substract the mean of each variable
pre_minusMean();
%% Substract sample min value
Subtract_sample_min();
%% Divide each sample with the sum of sample's variables
pre_normalizedArea();
%% Divide each sample with the max of the sample's variables
pre_max();
%% Standard Normal Variate: For each spectrum, substract the mean and divide with standard deviation
pre_SNV();
%% Scaling Spectra: For each variable , substract the standard deviation
pre_scalingSpectra();
%% First Derivative
pre_der1();
%% Second Derivative
pre_der2();
%% Orthogonal Signal Correction
pre_osc();
%%
%%Convert Transmitance to Absorbance
Convert_trans_to_abs();
```

Figure 25: Pretreatment methods of the MATLAB code. The methods that were used for this project are marked with a colored rectangular.

Step 8

The selection of the appropriate pre-treatment method is a more or less a trial and error process. After every pre-treatment method the score plot results are checked with the command PCA Analysis as it is shown in Figure 26. When the process is finished and the results are satisfactory, the output can be saved with the command "Save PCA Analysis". Finally if the user wants to load a previous saved model analysis, then the command "Load PCA Analysis" must be selected.

```
% ----------------% ANALYSIS %----------------%

%% PCA Analysis
PCA_analysis();

%% Save PCA Analysis
PCA_save();

%% Load PCA Analysis
PCA_load();
```

Figure 26: Part of the MATLAB code that indicates the run, save, and load commands for the model.

5 PCA Models.

5.1 Saturated fraction ratios model combined with gasoline range compositional model (SGM).

5.1.1 Samples.

The Saturated gasoline model (SGM) is composed from 215 samples as it is shown in Table 4.

The samples are separated into four independent families (A, B, C and D). The number of oil samples that each family contains is 55, 27, 101 and 32 respectively. Every oil family exhibits a different source rock origin. Oil samples from Red River reservoir are derived from Winnipeg-Bighorn source rock. Samples from Bakken reservoirs had also Bakken as source rock origination. The oils from family C and Madison reservoirs had Lodgepole as source rock. Finally the oil samples from Winnipegosis reservoirs, corresponding to Winnipegosis source rock.

In total SGM model developed with nine commonly used compositional ratios. These variables are the following: pr/ph, pr/nC17, Ph/nC18, CPI (14-20), CPI (22-32), nC6, nC7, Benz and Tol. These ratios are presented with their abbreviations and their normal name in Table 5. Furthermore, the values for these 9 ratios for each one of the 215 oil samples are presented in Appendix I.

Oil family	Source Rock	Main Reservoir	Samples
A	Winnipeg-Bighorn	Red River	55
B	Bakken	Bakken	27
C	Lodgepole	Madison	101
D	Winnipegosis	Winnipegosis	32
total			215

Table 4: Oil families discrimination in SGM model. Source rock, Main reservoir and samples number per corresponding oil family.

For the saturated range compositional data the most commonly used indices are:

The pristane/phytane ratio is one of the fundamentals geochemical parameters and used as an indicator of how oxic or anoxic is the depositional environment. The ratio pristane/nC17 differentiates organic matter from swamp environment from those that formed under marine environment. The phytane/nC18 index refers also to marine organic input. The CPI(14-20) and CPI(22-32) indices are Carbon Preference Indexes which is defined as the ratio of sum of concentration areas of odd to even carbon number of normal alkanes.

The ratios nC6 and nC7 are indicators for the paraffinicity of each oil sample and are calculated from the gasoline range compositional data. The benzene and toluene are two characteristic ratios of gasoline range and used as indicators of aromaticity of oil samples.

The histograms for the eight variables are presented in the following figures. Oil samples are colored according to the oil family that they belong. Thus red, blue, yellow and green colors are used for families A, B, C and D respectively:

No.	Compound	Abbreviation
1	pristane/C17 n- alkane ratio	Pr/nC17
2	1/2{[(C15+C17+C19)/(C14+C16+C18)] +[(C15+C17+C19)/(C16+C18+C20)}	CPI (14-20)
3	1/2{[(C23+C25+C27+C29+C31)/(C22+C24+C26+C28+C30)]+[(C23+C25+C27+C29+C31) / (C24+C26+C28+C30+C32)]}	CPI (22-32)
4	pristane/phytane ratio	Pr/Ph
5	phytane/C18 normal alkane ratio	Ph/nC18
6	n-hexane/ sum of compounds eluting between 2,2-dimethylbutane and n-hexane	nC6
7	n-heptane/sum of compounds eluting between 2,2-dimethylpentane and n-heptane	nC7
8	benzene/n-heptane	Benz
9	toluene/n-octane	Tol

Table 5: Definitions of original variables used in PCA in SGM model.

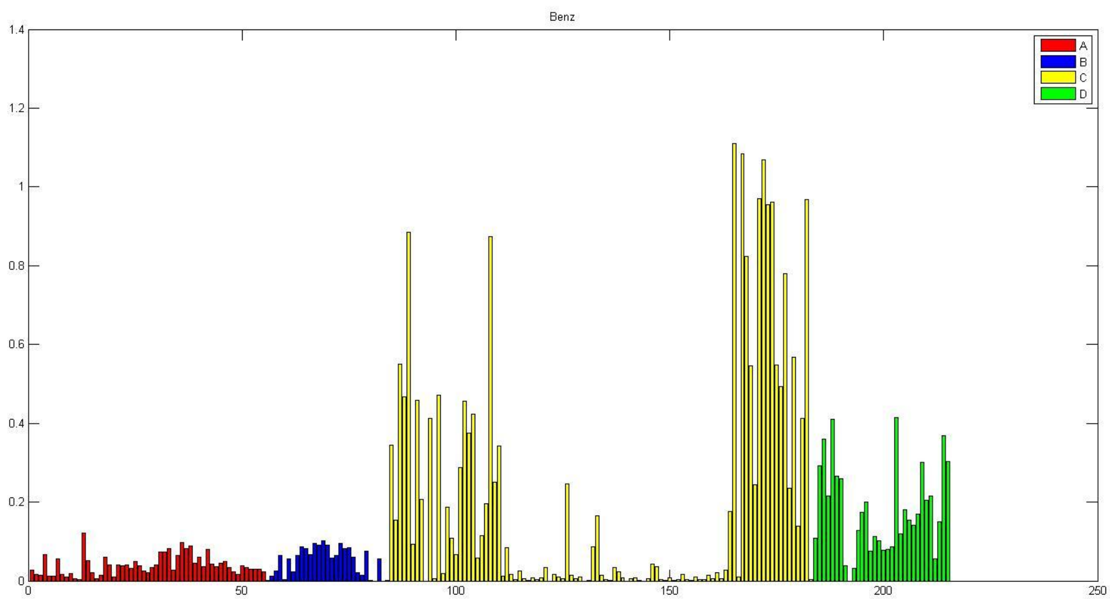
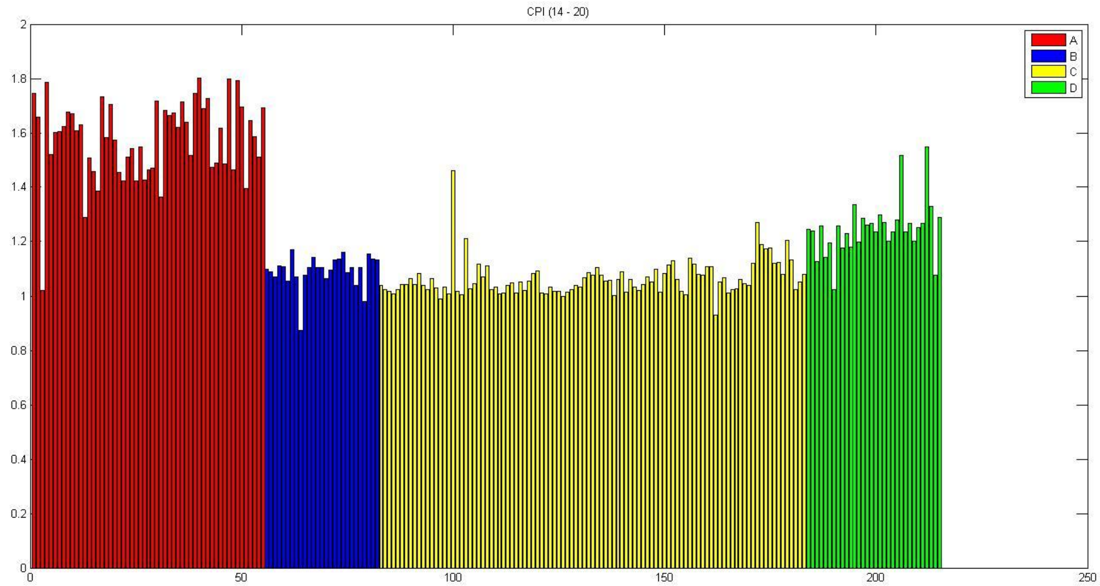
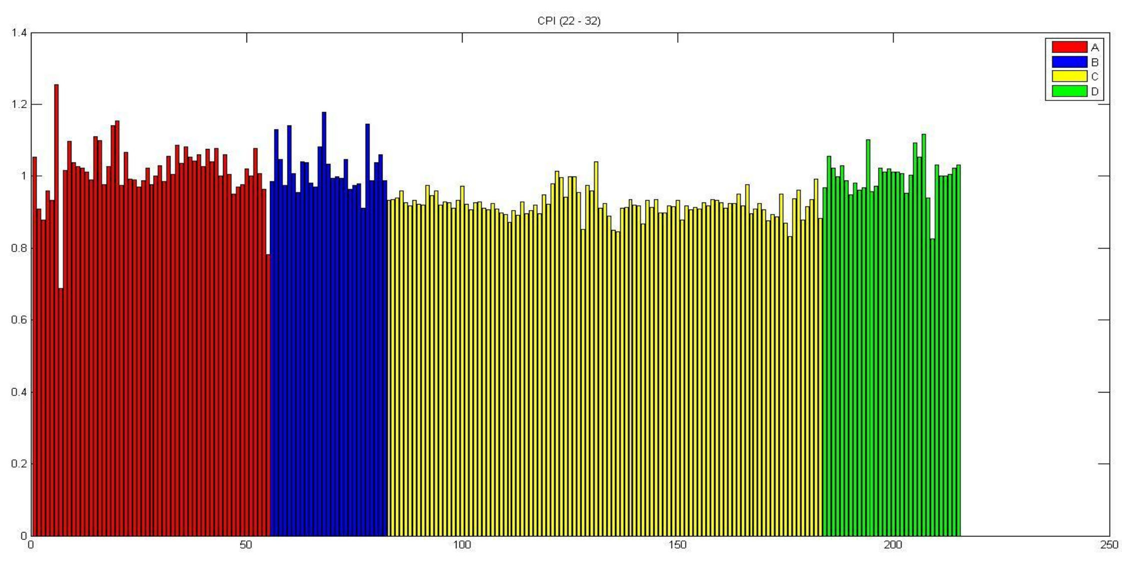


Figure 27: Benz histogram for oil samples of SGM model.



<u>Figure 28:</u> CPI(14-20) histogram for oil samples of SGM model.



<u>Figure 29:</u> CPI(22-32) histogram for oil samples of SGM model.

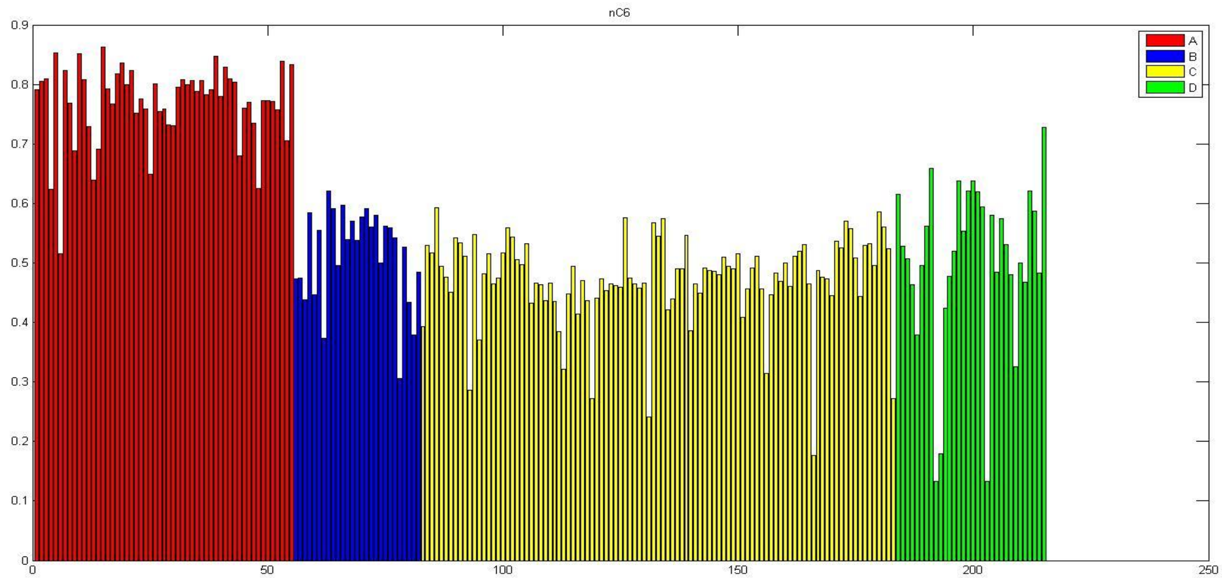


Figure 30: nC6 histogram for oil samples of SGM model.

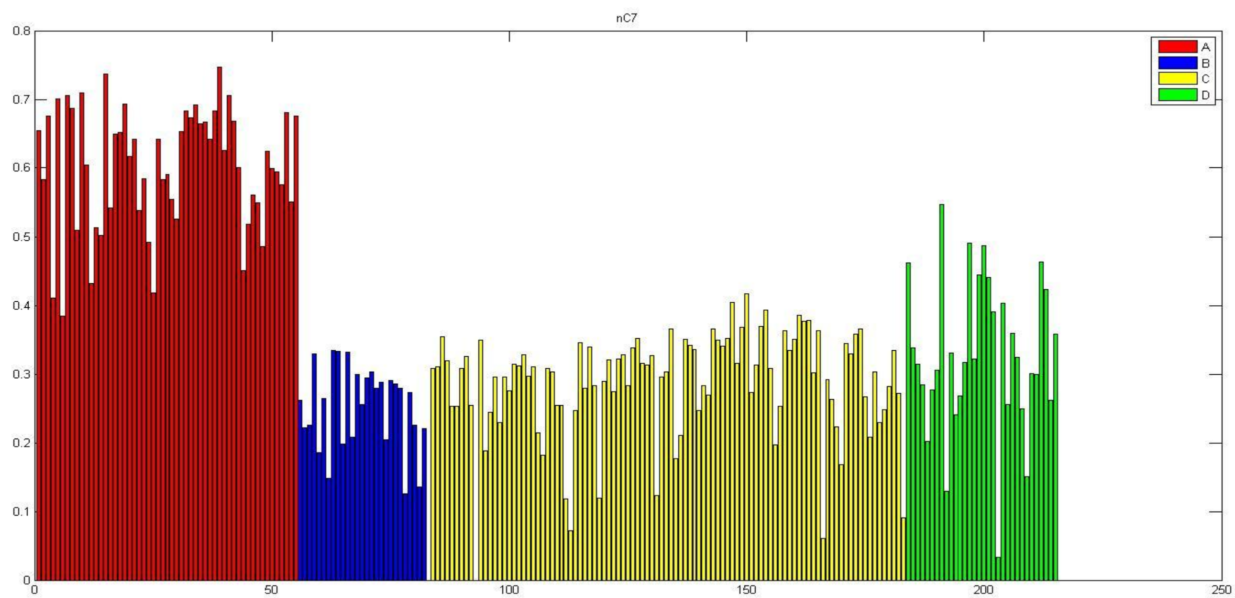


Figure 31: nC7 histogram for oil samples of SGM model.

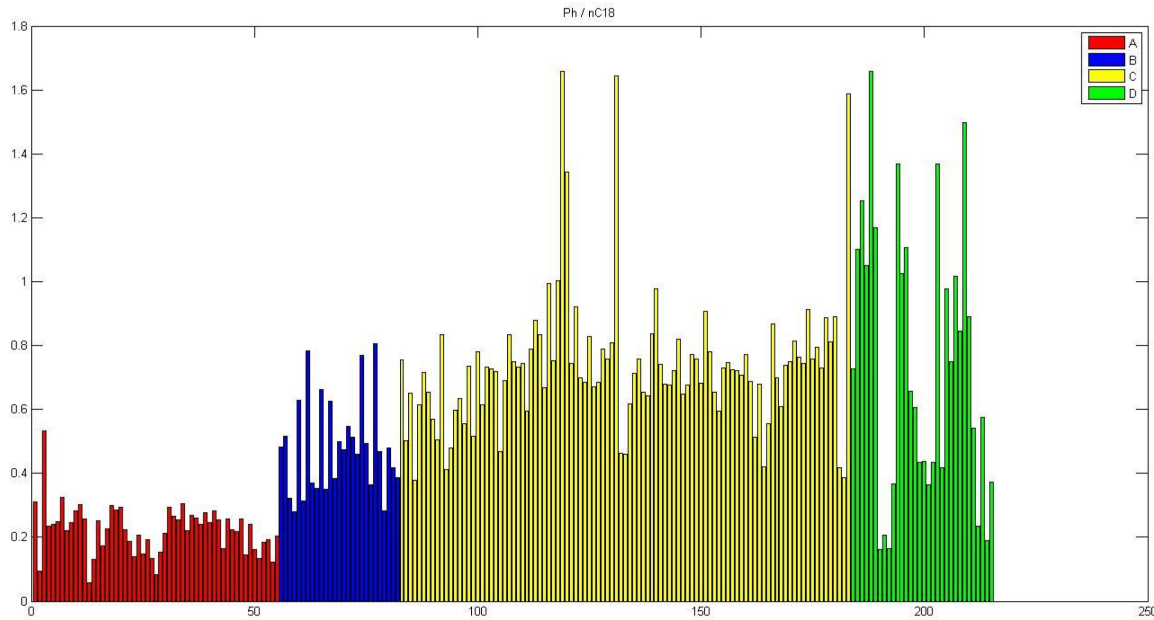


Figure 32: Ph/nC18 histogram for oil samples of SGM model.

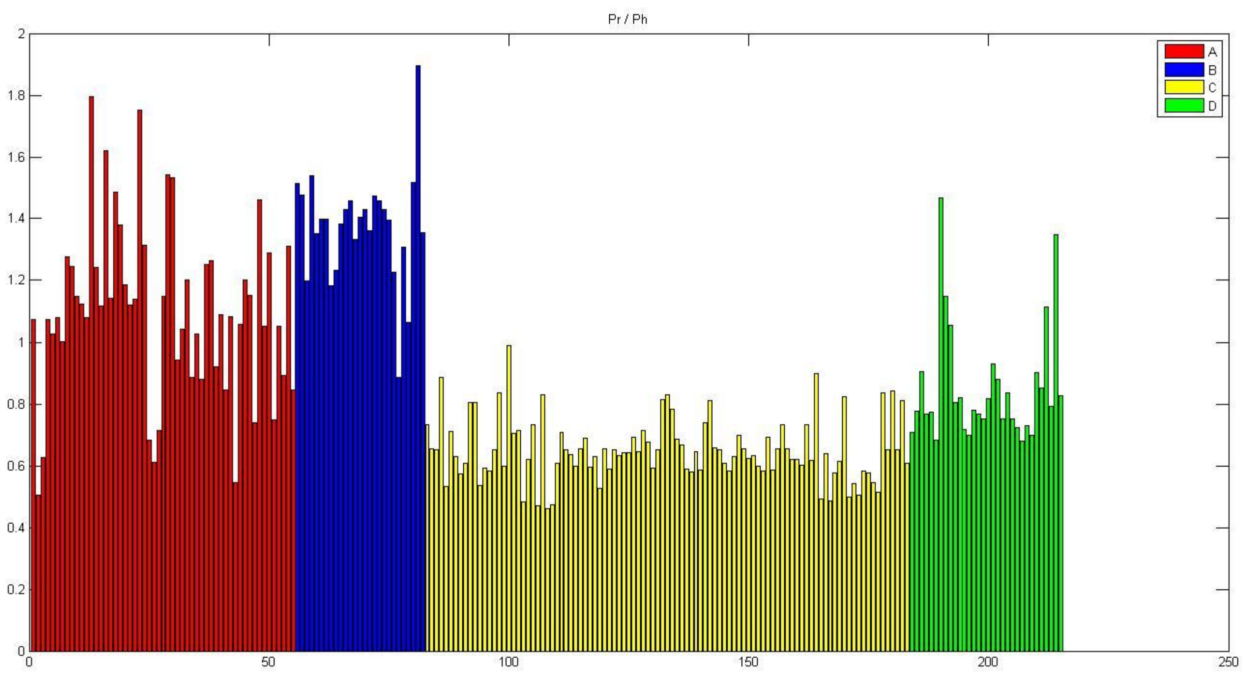


Figure 33: Pr/Ph histogram for oil samples of SGM model.

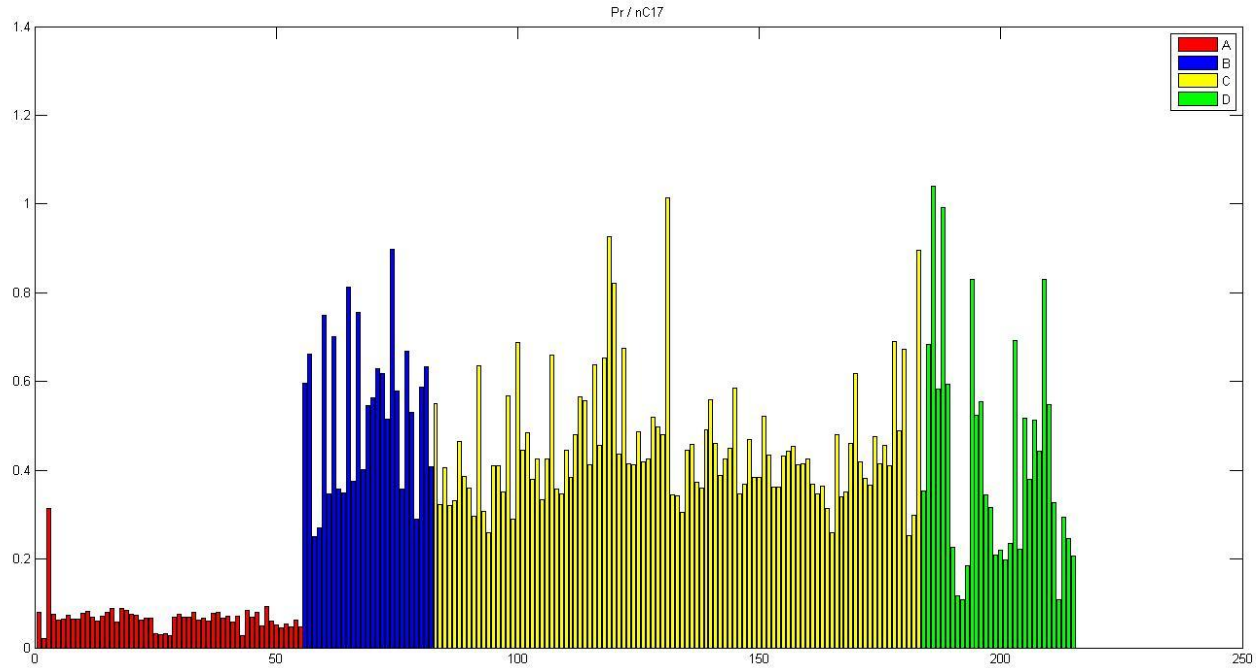


Figure 34: Pr/nC17 histogram for oil samples of SGM model.

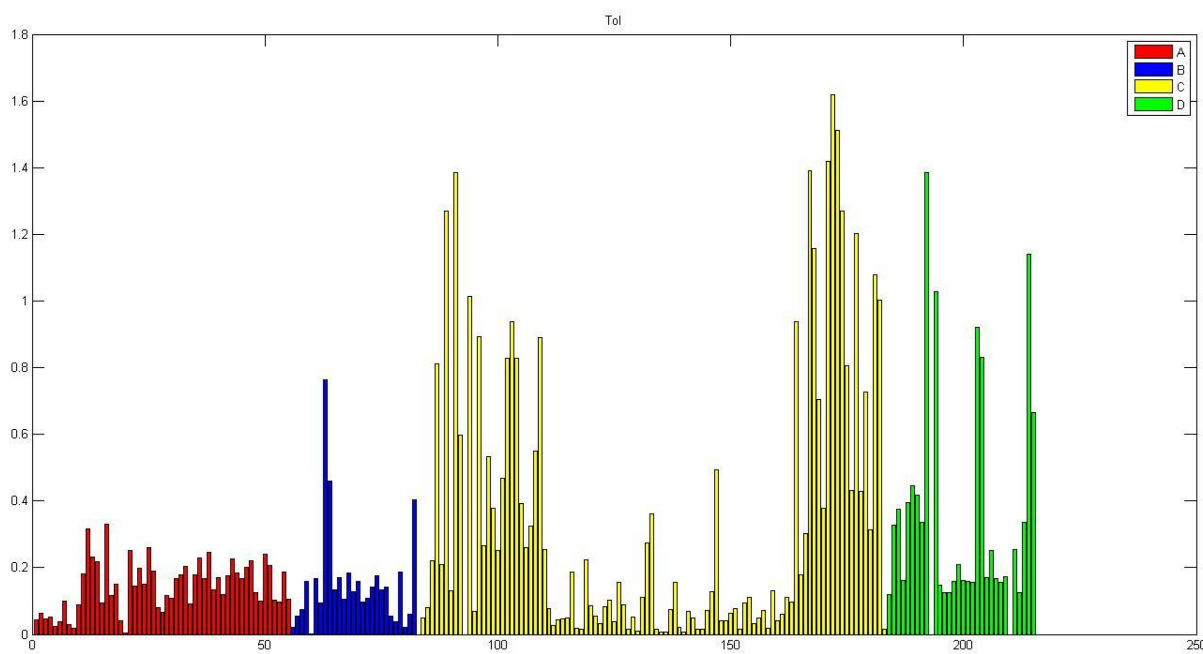


Figure 35: Tol histogram for oil samples of SGM model.

Table 6 shows the average value of each variable for every separate oil family.

No.	Variable	A	B	C	D
1	pr/ph	1,101	1,374	0,652	0,852
2	pr/nC17	0,069	0,535	0,452	0,426
3	Ph/nC18	0,225	0,483	0,735	0,749
4	CPI (14-20)	1,579	1,093	1,064	1,248
5	CPI (22-32)	1,015	1,024	0,923	1,004
6	nC7	0,602	0,252	0,284	0,327
7	Benz	0,040	0,055	0,208	0,181
8	Tol	0,145	0,157	0,348	0,357

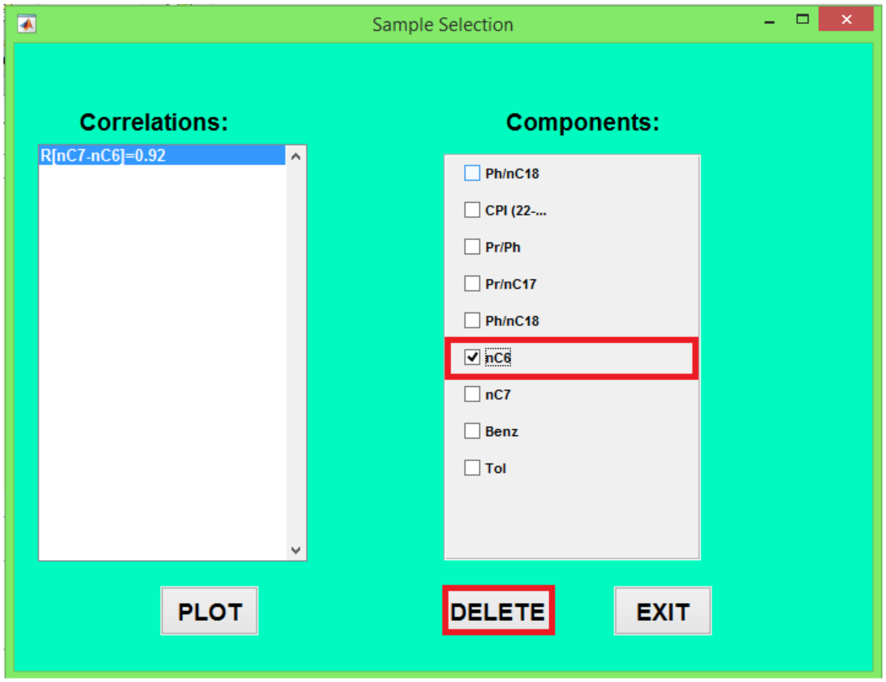
Table 6: Selected geochemical characteristics (of the Williston Basin oils) analysed in the SGM model.

From the previous eight histograms, the values for the eight variables overlap significantly the oil family (A, B, C and D). Thus this result is an indicator that needs to use multivariate analysis techniques like Principal Component Analysis in order to achieve family affiliation for the four oil families.

5.1.2 Data selection.

5.1.2.1 Correlation Matrix.

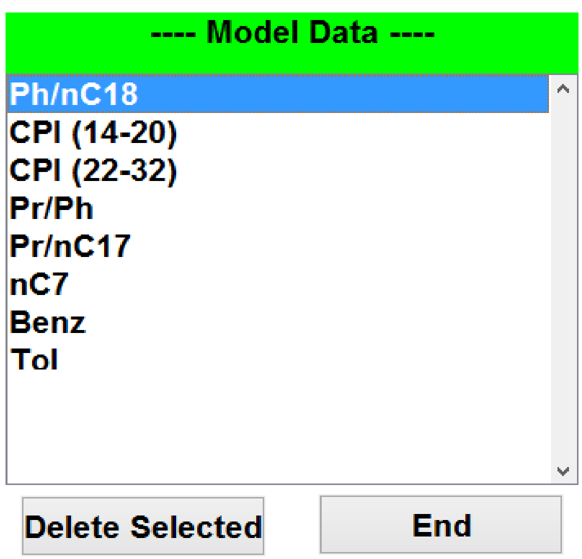
Figure 36 indicates relationships among the nine variables. Principal Component Analysis aims to produce a small set of independent principal components from a larger set of related original variables. The correlation matrix table shows that the correlation between variables nC6 and nC7 is 92% and the other variables are relative uncorrelated (the correlation between them is less than 90%) thus, nC6 variable is removed from the model.



<u>Figure 36:</u> Sample filter for correlation between components over 0.90.

5.1.2.2 Selection of variables.

The compositional ratios used for the SGM model are shown in Figure 37.



<u>Figure 37:</u> Initially selected ratios for SGM model separation

The results of PCA of SGM model is presented in Figure 39, Figure 38, Figure 40 and Figure 41.

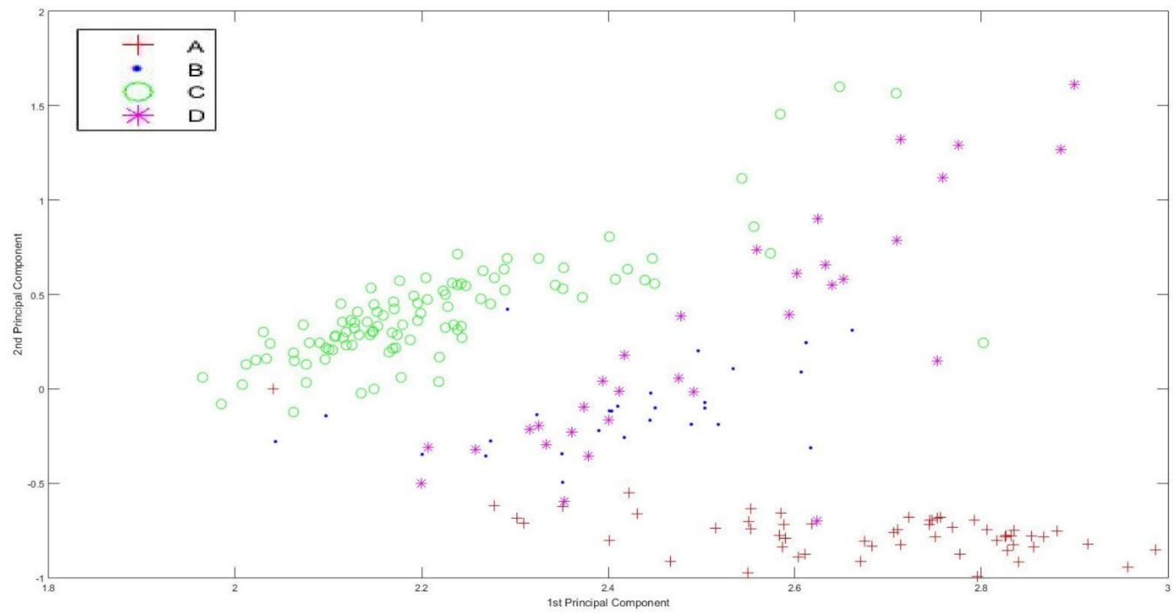


Figure 39: Sample scores for the first two PCs resulting from the SGM model after the removal of nC6 variable.

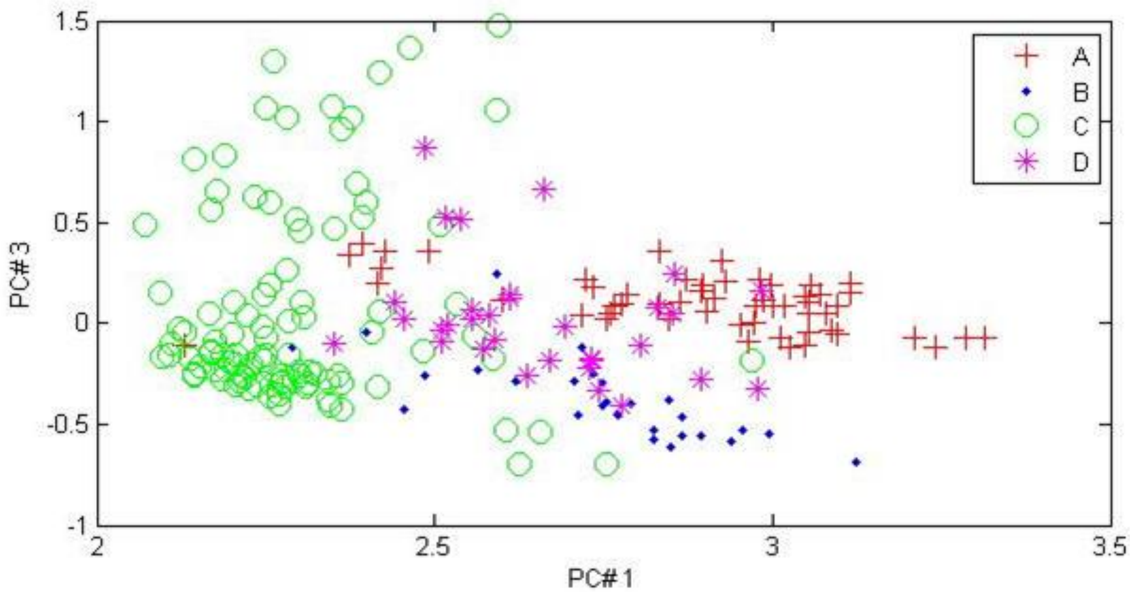


Figure 38: Output of Principal Component Analysis showing scores of the 215 oil Samples of SGM model. The x and y axes are the first and the third principal components PC1 and PC3 respectively.

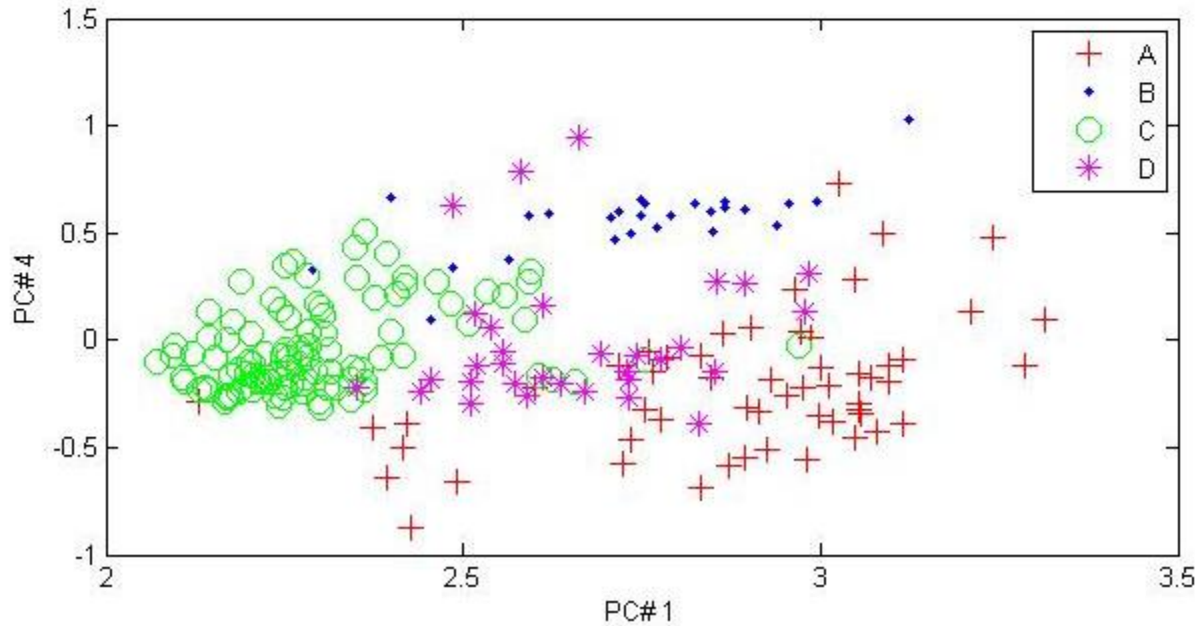


Figure 40: Output of Principal Component Analysis showing scores of the 215 oil Samples of SGM model. The x and y axes are the first and the fourth principal components PC1 and PC4 respectively.

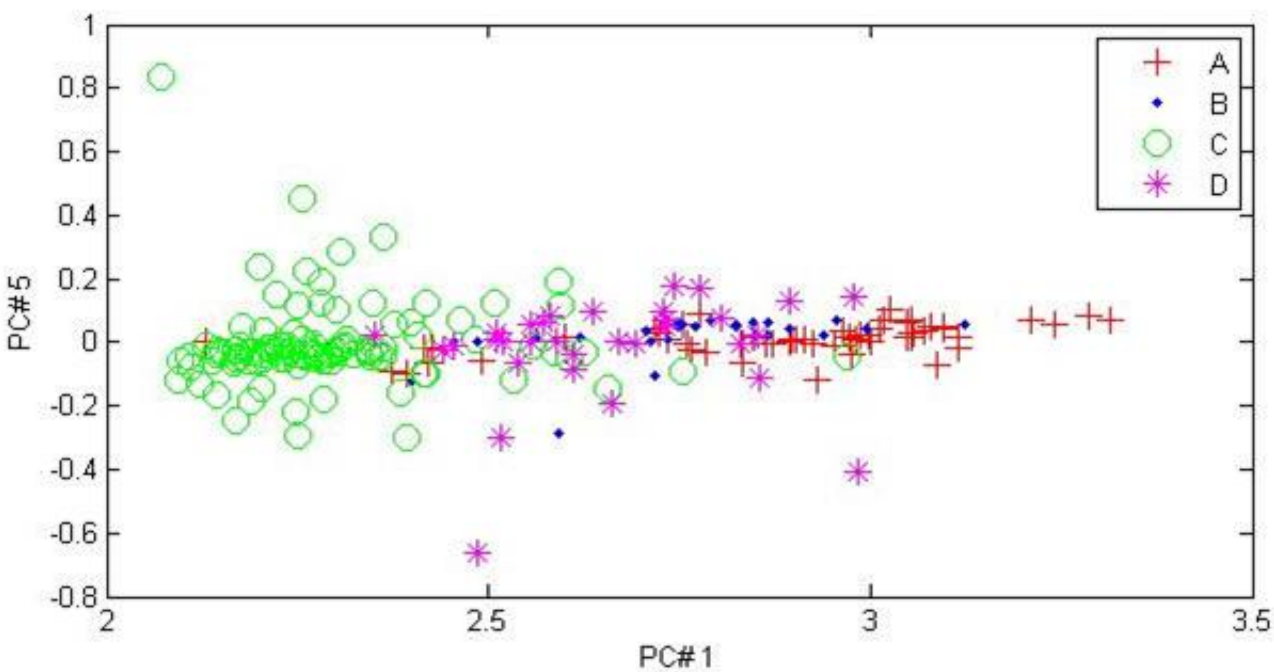


Figure 41: Output of Principal Component Analysis showing scores of the 215 oil Samples of SGM model. The x and y axes are the first and the fifth principal components PC1 and PC5 respectively.

The SGM model result is fairly clear in affiliation of the four oil families. Families A and C have a more prominent separation than B and D families which are overlapped in principal component space. This result is verified from plots of PC3 to PC1, PC4 to PC1 and PC5 to PC1 as it is shown in Figure 38, Figure 40 and Figure 41 respectively.

5.1.3 Score and loading plots.

The PCA loadings are illustrated in Figure 43. The contribution of each principal component in percentages of variance that is explained from the PCA model is shown in Figure 42 (Principal Component 1 and Principal Component 2 together explain 97% of the variance (91% and 6% respectively)).

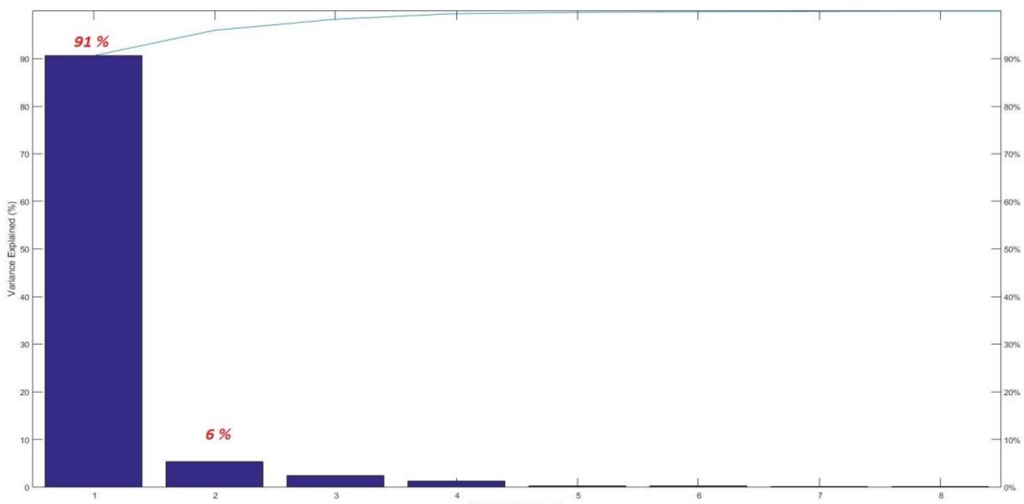


Figure 42: Total original variation, as a percentage, and as a PC function for the first four PCs in the PCA.

Score plot from Figure 44 and loading plot from Figure 43 are used together for interpretation of the PCA results and in order to find the ratio variables that influence more each oil family.

Variable loadings help to understand the role and the importance of the original variables. The lowest PC1 loading value is 0.07 on variable Benz. These values represent samples mainly from Lodgepole source rock (Family C). Likewise the most positive value of PC1 is 0.62 and belongs to the ratio CPI(14-20). Such values correspond to samples from family A (Winnipeg-Bighorn source rock) primarily, and samples from family D and B secondary.

PC2 loading gets its maximum positive value 0.63 in the Ph/nC18 ratio. High values of this ratio correspond to samples from Lodgepole source rock (family C). In contrary PC2 gets the maximum negative value of -0.35 in Pr/Ph ratio. As previous, with the maximum value of PC1, here Pr/Ph again is indicative for samples from Winnipeg-Bighorn source rock (family A).

The separation of oil families A and C is evident based on these ratios. Family D is not clearly distinguishable because it is mixed with oil samples of family B.

The samples of SGM model are plotted with positive values of PC1. Family A exhibits negative PC2 score values. Most of the samples of family B and D are plotted with negative PC2 values while some of them have positive values. The majority of family C oil samples have positive PC2 values. In general as it is observed from the loading plot of Figure 43 and from score plot of Figure 44 the ratios Ph/nC18, Pr/nC17, and the variables Tol and Benz influence the samples from family C and separate this family from the other three families. Furthermore variables nC7 and CPI(22-32) influence the samples of families D and B. In final the ratios Pr/Ph and CPI(14-20) separate the oil samples of family A to the bottom of the score plot.

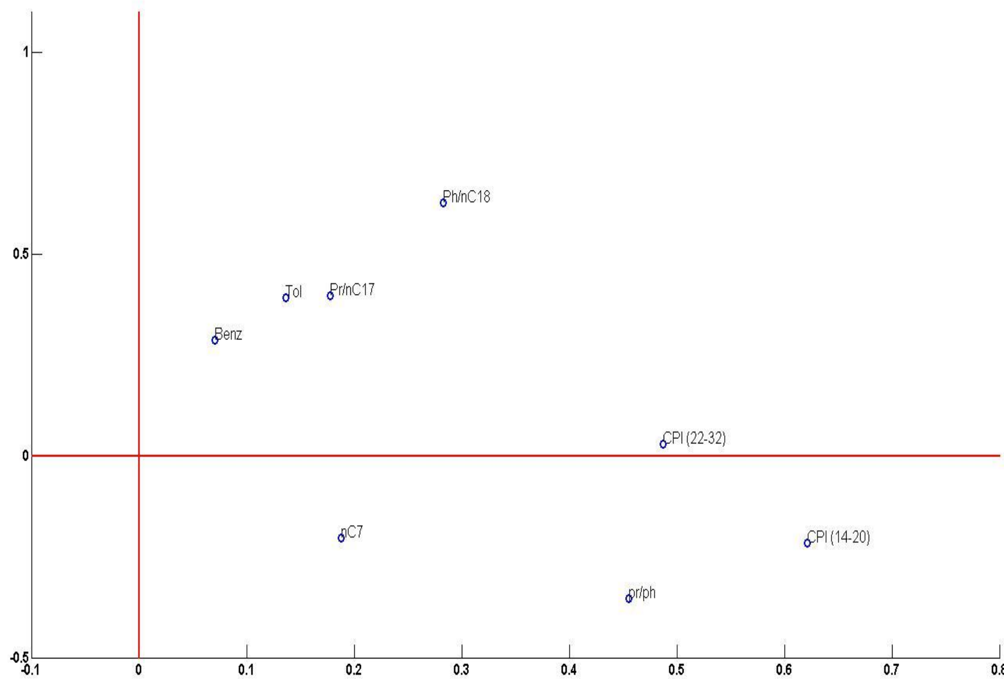


Figure 43: Original variable loadings for the first two PCs resulting from the SGM model.

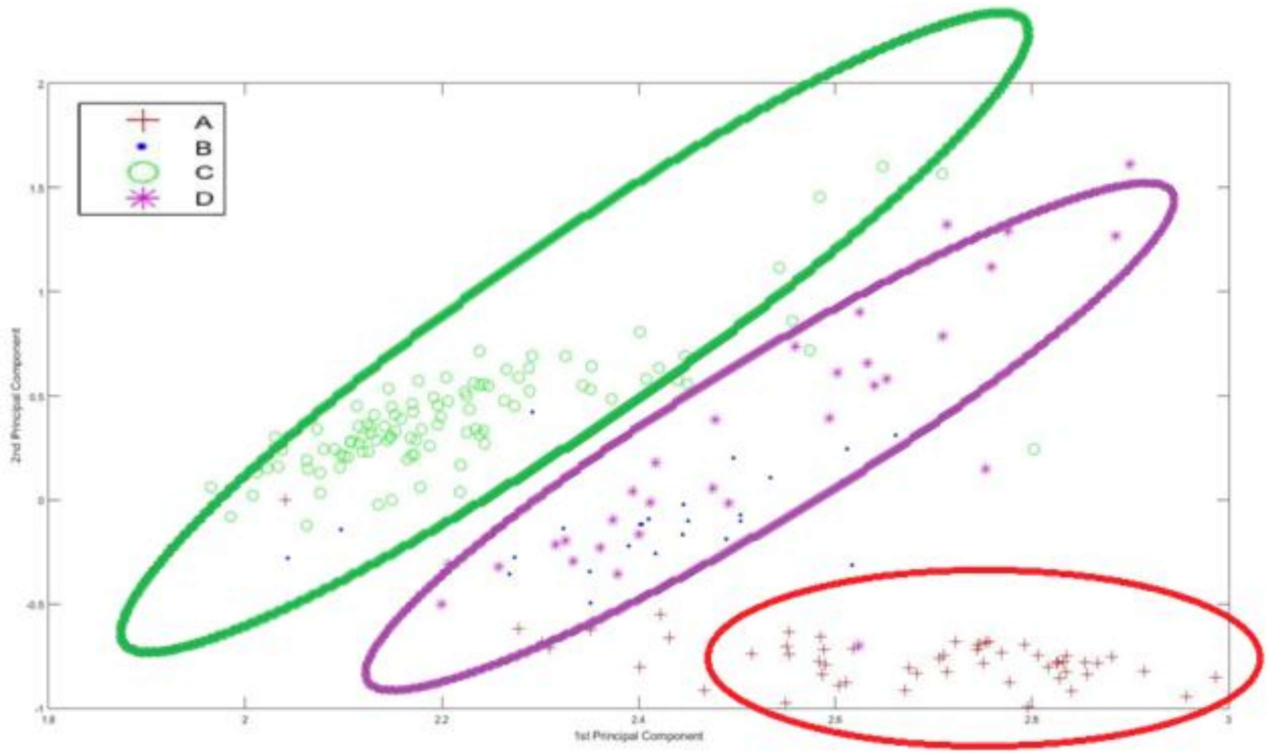


Figure 44: Output of Principal Component Analysis from SGM model x and y axes are PC1 and PC2 respectively. The different patterns of the 215 oil samples are circled with different colors.

The separation of the four families is well distinguished, as illustrated in Figure 44. Family A and C are clearly separated. Families D and B on the other hand, aren't so clearly separated in the score plot. Samples from Families B and D are overlapped.

Family A is fairly distinguished from the other three families; it contains 55 oil samples which are mainly from Red river reservoir, having Winnipeg-Bighorn as source rock. These samples are generally represented by big values of CPI(14-20) and Pr/Ph. Family A oil samples are also characterized by low Benz and Ph/nC18 values.

Family B includes 27 oil samples and they are placed at the middle of the score plot (Figure 44). The separation of the samples is not clear. The samples from family B are characterized by high values of the Pr/Ph and high values of CPI(22-32) as Figure 43 and Figure 44 indicate. The ratios Pr/Ph and CPI(22-32) are indicative for oil samples mainly from Bakken source rock.

Family C samples are spreading to the left side of the score plot. In total family C contains 101oil samples which are characterized mainly by high values of Benz, Pr/nC17, Tol and Ph/nC18 (Figure 43). Source rock with these characteristics could be probably Lodgepole, and the main reservoir that the samples were taken is Madison reservoir.

The most difficult family to be distinguished is family D. Family D contains 32 oil samples which differ from other samples due to high CPI(22-32) values. Family B also exhibit high values in ratio CPI(22-32) and this is probably one of the reasons that these two families are overlapped.

The majority of oil samples in family A have values greater than 1.2 in pristane to phytane ratio. This result is a strong indicator for oxidizing depositional environment and the isoprenoids to normal alkanes ratios (Pr/nC17 and Ph/nC18) have values lower than 0.32. Thus these values provide a rough indication of that the biodegradation process is in early steps for the oils in family A.

The values of Carbon Preference Indices for the oils samples in family B are related with no even or odd predominance because all values for these indices are near to one. The result of no even or odd carbon preference indicates mature oil samples. On the other hand the oil samples in family A have values in these two indices greater than 1.5 reveal a strong odd predominance in carbon atoms for A oil family.

The family C oil samples have values less than unity in the pristane to phytane ratio and this result reveals highly reducing depositional environments. The isoprenoids to normal alkanes ratios (Pr/nC17 and Ph/nC18) have values near to unity for these oil samples and this is an indicator of moderate biodegradation in these oils.

Finally the oil samples in family D have values in the range of 0.68 to 1.5 for the pristane to phytane ratio and the Carbon Preference indices have values very close to one. This result of no even or odd predominance is characteristic for mature oils. The similar behavior in ratio values between the oil samples of family B and D is mainly the reason that are overlapped in principal component space these oils samples.

5.2 Biomarkers Model (BM).

5.2.1 Samples.

Each crude oil has a unique biomarker fingerprint due to the variety of geological conditions and ages under which oil was formed. Often these differences in oils are small and a statistical approach is required to separate oils into different groups with the corresponding source rocks. Hence a multivariate statistical analysis is carried out of the biomarker values obtained from the sediment extracts, using Principal Component Analysis. Thus, biomarker values were used to correlate the oil samples and group them according to their probable sources. The biomarkers that were used initially were 54.

The list of the biomarkers that were used in this model and their abbreviations are given in Table 8. The number of samples that were used in Biomarker model was 176, thus a data table including a total of 54 biomarkers and 176 oil samples, with dimensions of 176 X 54, is presented in Appendix II. The oil samples are separated as Table 7 showing. Therefore, 114 oil samples are from Lodgepole source rock, 51 samples from Bakken/Exshaw and 11 from Colorado source rock.

Fifty four biomarker parameters were used in the statistical analysis of the model. One sample was excluded from the analysis due to the lack of values of these 54 parameters. This model was constructed to test the PCA results in family affiliation using the values of peak areas of compositional biomarkers.

Oil family	Source Rock	Main Reservoir	Samples
C	Madison	Lodgepole	114
E	Bakken	Bakken/Exshaw	51
F	Viking	Colorado	11
total			176

Table 7: Biomarkers model samples per corresponding source rock, reservoir and family.

No.	Compound	Abbreviation	No.	Compound	Abbreviation
1	C21-tricyclic terpane	C21tri	28	C33 homohopane S	C33S
2	C22-tricyclic terpane	C22tri	29	C33 homohopane R	C33R
3	C23-tricyclic terpane	C23tri	30	C34 homohopane S	C34S
4	C24-tricyclic terpane	C24tri	31	C34 homohopane R	C34R
5	C25-tricyclic terpane	C25tri	32	C35 homohopane S	C35S
6	C24-tetracyclic terpane	C24tet	33	C35 homohopane R	C35R
7	C26 tricyclic terpane S	C26tri1	34	C21 Sterane	C21S
8	C26 tricyclic terpane R	C26tri2	35	C27 diasterane	C27diaS
9	C28 tricyclic terpane S	C28tri1	36	C29 diasterane	C29diaS
10	C28 tricyclic terpane R	C28tri2	37	C27 aaa Rsterane	C27aaaR
11	C29 tricyclic terpane S	C29tri1	38	C28 aaa Rsterane	C28aaaR
12	C29 tricyclic terpane R	C29tri2	39	C29 aaa Rsterane	C29aaaS
13	18α-22,29,30-trisnorneohopane	Ts	40	C29 abb Rsterane	C29abbR
14	17α-22,29,30-trisnorhopane	Tm	41	C29 abb Ssterane	C29abbS
15	C30 tricyclic terpane S	C30tri1	42	C29 aaa Rsterane	C29aaaR
16	C30 tricyclic terpane S	C30tri2	43	C27 abb Rsterane	C27abbR
17	C28 hopane	C28H	44	C27 abb Ssterane	C27abbS
18	C29 hopane	C29H	45	C28 abb Ssterane	C28abb1
19	18α(H), 21β(H)-30-Norneohopane	C29t	46	C28 abb Rsterane	C28abb2
20	17α(H), 21β(H)-diahopane	C30Y	47	24-ethyl(S&R)-13β(H),17α(H)-20S-diaholestane	24-ethyl-13b, 17aDR
21	C30 hopane	C30H	48	C30 aaaRsterane	C30aaaR
22	C30 moretane	MOR	49	13β(H),17α(H),20S-cholestane (diasterane)	C27DbaS
23	C31 homohopane S	C31S	50	13β(H),17α(H),20R-cholestane (diasterane)	C27DbaR
24	C31 homohopane R	C31R	51	C22Ssterane	C22S
25	Gammacerane	GAM	52	C27 aaa Ssterane	C27aaaS
26	C32 homohopane S	C32S	53	C27abRcholestane	C27abR cholestane
27	C32 homohopane R	C32R	54	C30 diahopane	C30Diahopane

***Table 8*:** Biomarker parameter compounds and their corresponding abbreviation which were used in Biomarkers model (BM).

5.2.2 Data selection.

5.2.2.1 Cross-correlation plot.

The cross-correlation plots of various geochemical selection parameters were used to examine the correlation degree between two variables. If the correlation between the values of two variables X and Y is bigger than 0.90 one of the two components is dropped out in order to reduce the input space. Finally, 15 components are remaining out of the initially 54. The correlation matrix of the 54 components is shown in Figure 45 at its left side and the final matrix, after the elimination of the highly correlated components is shown at the right side of Figure 45. To sum up, the remaining components that were used to separate the samples of BM are presented in Table 9.

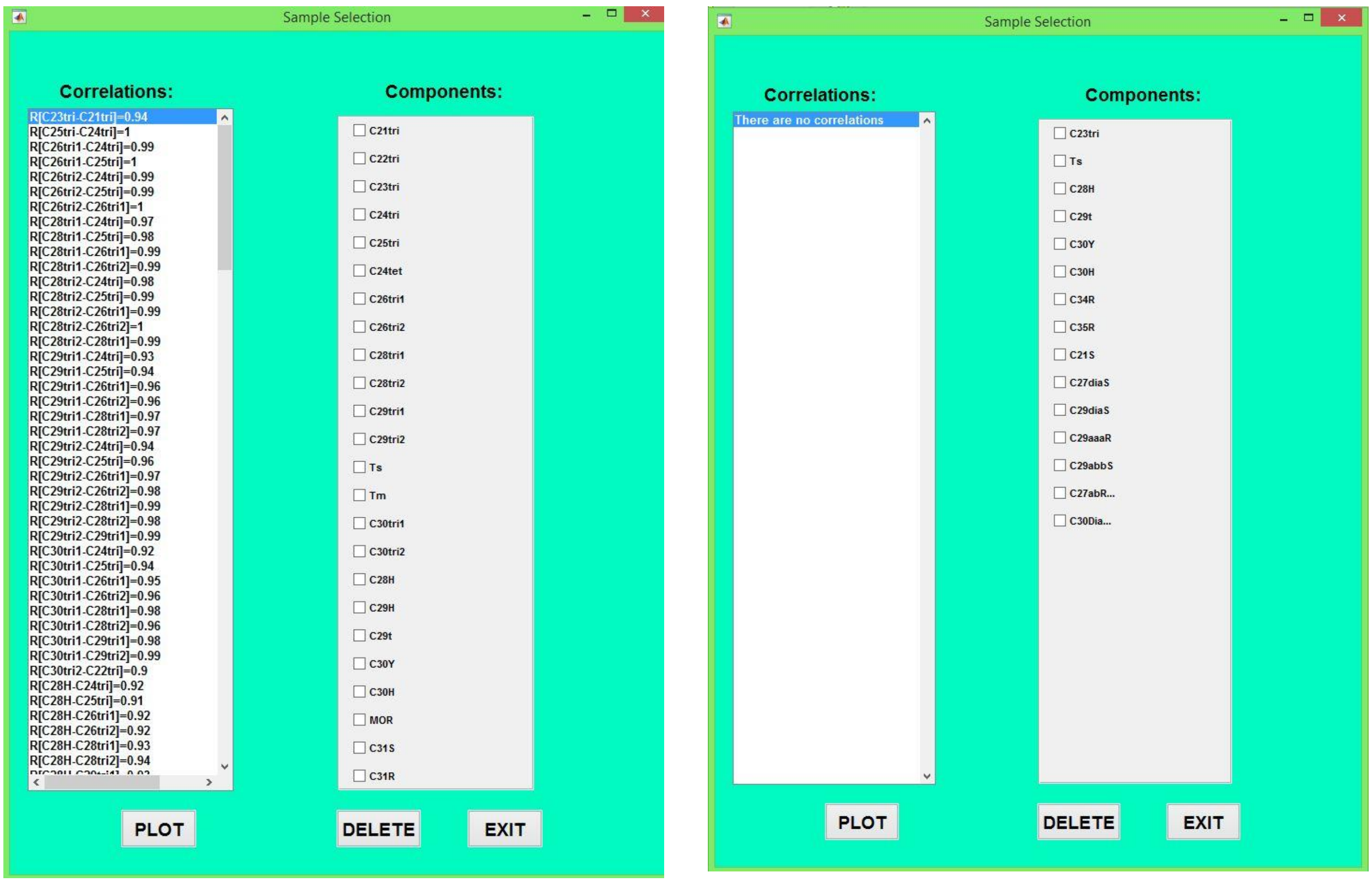


Figure 45: The initially used 54 Variables before the cross correlation delete. And the remaining 15 variables after the removal of higly correlated values (over 90% correlated).

Data selection					
1	C23tri	6	C30H	11	C29diaS
2	Ts	7	C34R	12	C29aaaR
3	C28H	8	C35R	13	C29abbS
4	C29t	9	C21S	14	C27abR cholestane
5	C30Y	10	C27diaS	15	C30Diahopane

Table 9: Variables which were finally inserted to Biomarkers model (BM) in order to separate the samples from the different oil families.

The histograms for the four variables C23tri, C28H, C34R and Ts are presented in the figures 46-49:

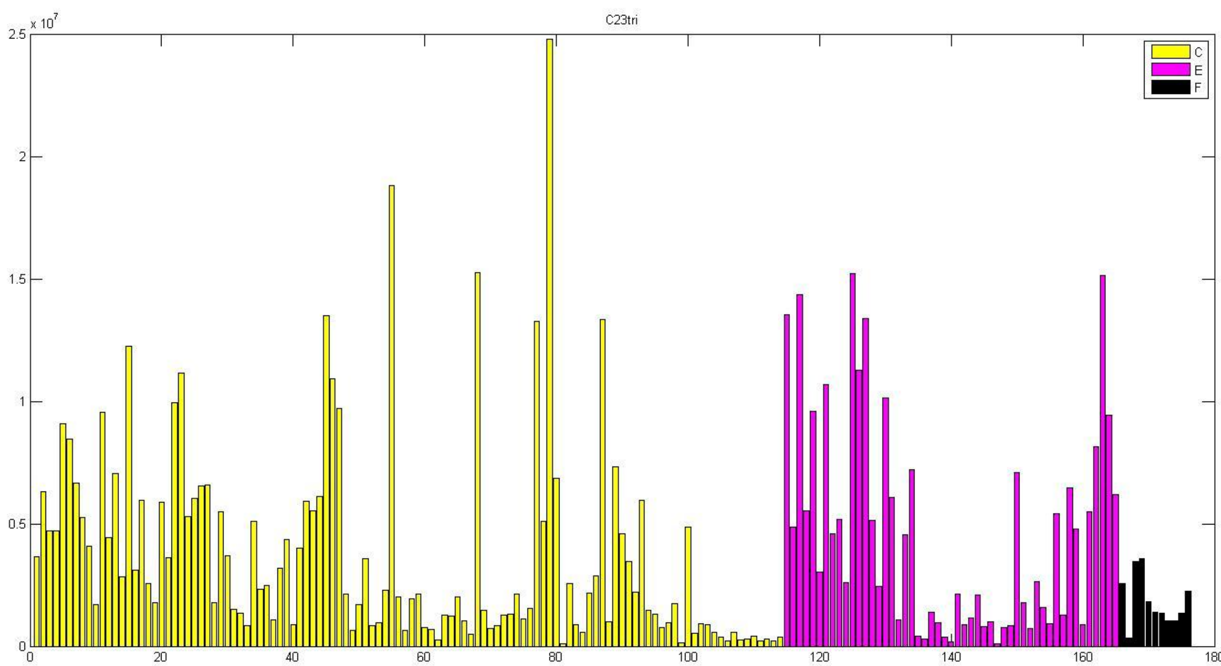


Figure 46: C23tri histogram for oil samples from BM model.

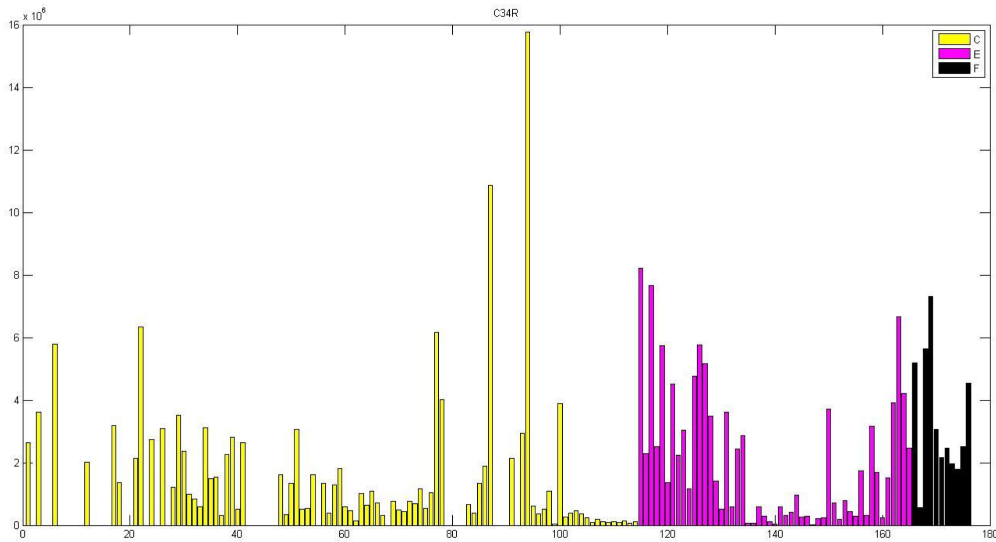


Figure 47: C34R histogram for oil samples from BM model.

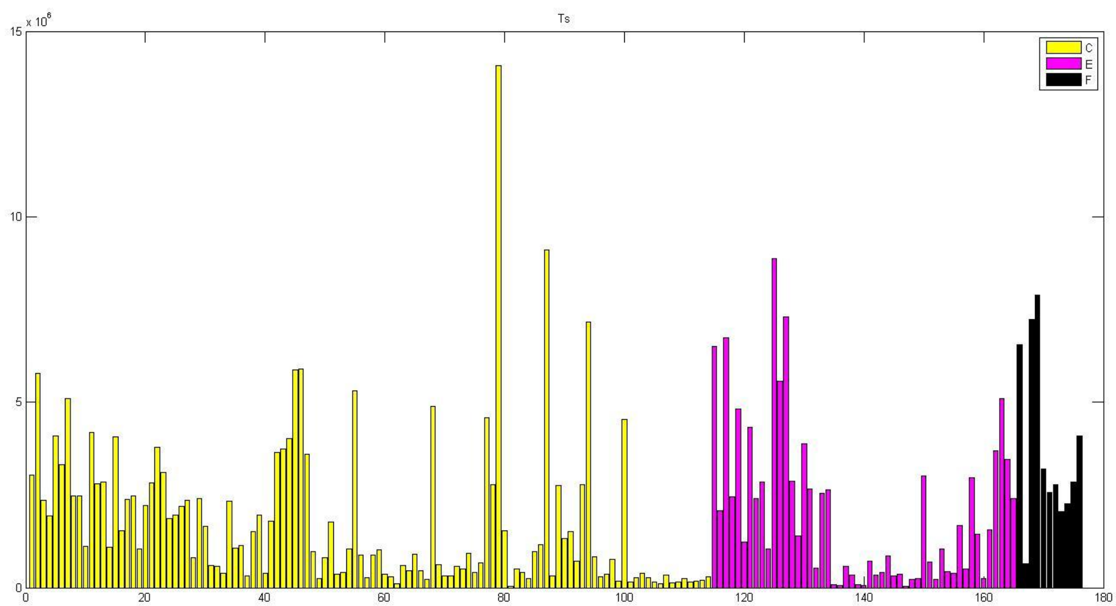


Figure 48: Ts histogram for oil samples from BM model.

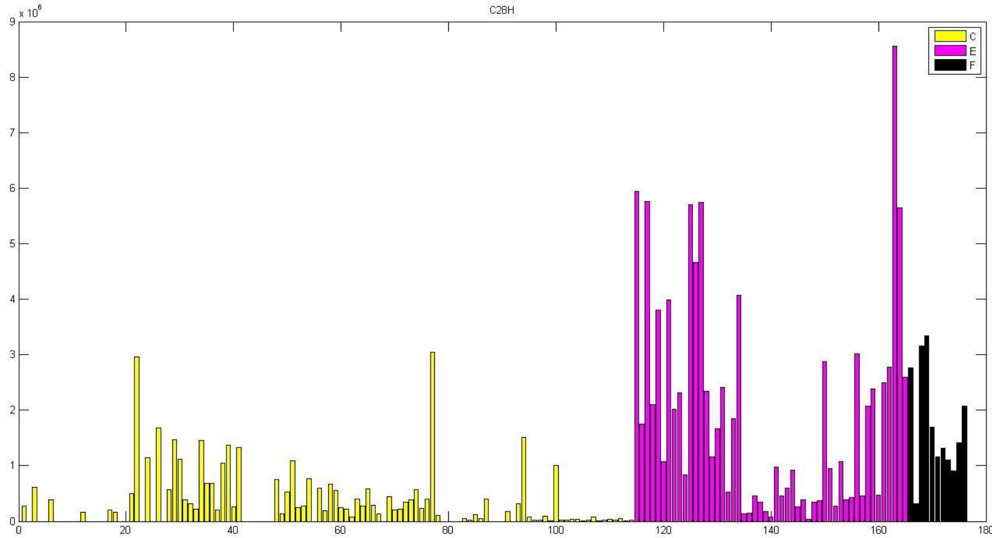


Figure 49: C28H histogram for oil samples from BM model.

No.	variable	C	E	F
1	C23tri	0,80	1,00	0,39
2	Ts	0,47	0,54	1,00
3	C28H	0,23	1,00	0,88
4	C29t	0,05	0,42	1,00
5	C30Y	1,00	non	non
6	C30H	1,00	non	non
7	C34R	0,50	0,61	1,00
8	C35R	0,83	1,00	0,93
9	C21S	0,55	1,00	0,84
10	C27diaS	1,00	non	non
11	C29diaS	0,35	0,37	1,00
12	C29aaaR	0,61	0,77	1,00
13	C29abbS	1,00	non	non
14	C27abR cholestane	0,67	0,82	1,00
15	C30Diahopane	0,06	0,19	1,00

Table 10: Biomarkers variables used in this model with their average values per oil family (the data have been normalized by max value).

From the previous four histograms, the values that have the four variables exist in the same range for each oil family (C, E, F). Thus this result is an indicator that a multivariate analysis technique like Principal Component Analysis is necessary in order to achieve family affiliation for the three oil families. A total of 15 individual biomarker variables were calculated for each sediment sample and Table 10 demonstrates the mean values of these 15 variables. The range of the values is from 0 to 1, due to normalization with maximum value that was made.

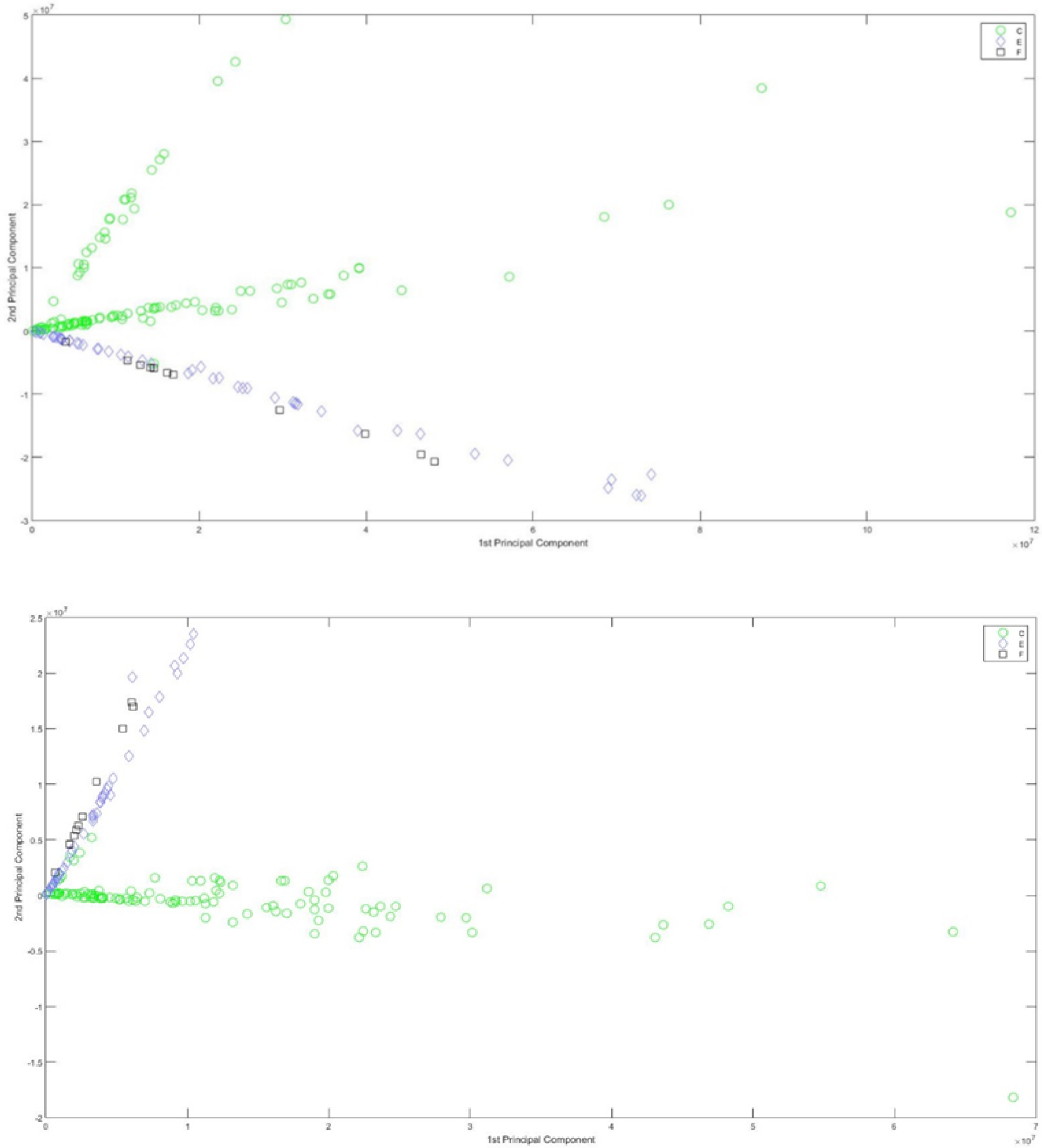


Figure 50: Sample scores for the first two principal components with the initial 54 variables.
Sample scores for the first two principal components after the variable elimination from cross correlation filter.

5.2.3 Data Pre-treatment.

5.2.3.1 Standard normal variable (SNV) transformation.

Standard normal variable (SNV) transformation removes the slope variation from compositional data caused by scatter and variation of component areas. The transformation is applied to each compositional data individually by subtracting the mean and scaling with the standard deviation.

$$x_{ij,SNV} = \frac{(x_{ij} - \overline{x_i})}{\sqrt{\frac{\sum_{i=1}^{P}(x_{ij} - \overline{x_i})^2}{P-1}}}$$

Where $x_{ij,SNV}$ is the transformed element for original element, x_{ij} and $\overline{x_i}$, is the mean of component *i* and *p* is the number of biomarkers variables.

The biomarkers model contains fifteen original compositional variables (see Table 9). The only pre-treatment applied in this model is that the values of the areas were standardized (SNV transformation). The sample scores of the first two principal components are presented in Figure 51.

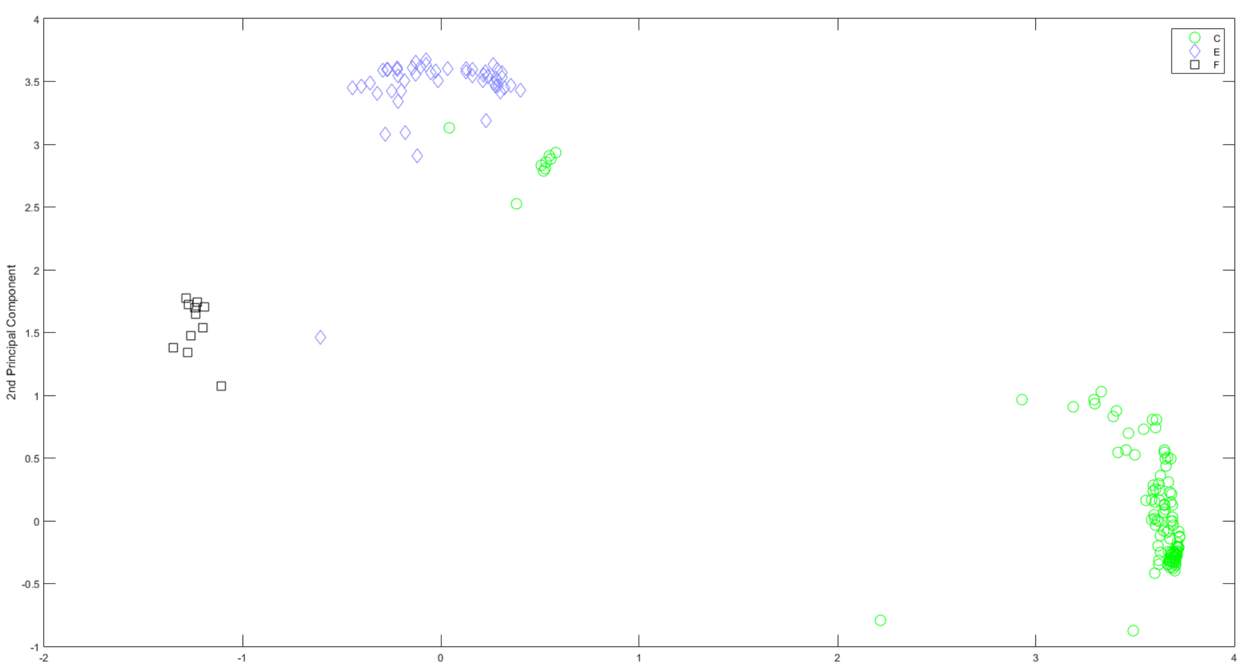


Figure 51: Sample scores for the first two principal components resulting from the Biomarkers Model (BM) after the SNV transformation.

5.2.4 Score and loading plots.

As previously referred Principal Component Analysis (PCA) is a method of statistics that is used to "discover" patterns and relations within a data set. Each principal component attempts to account for the largest possible portion of the original total variance of the data. Successive principal components explain progressively less of the original variance. In this model the contribution of PC1 and PC2 together in the total variance that is explained from the PCA model is 87% (57% and 30% respectively) as it is shown in Figure 52.

The loading plot is especially important, because it shows which original variables are responsible for the directions, changes and groupings observed in the corresponding score plot. The loading plot was used to interpret the changes observed in the corresponding score plot. Score and loading plots are presented in Figure 53 and Figure 54 respectively.

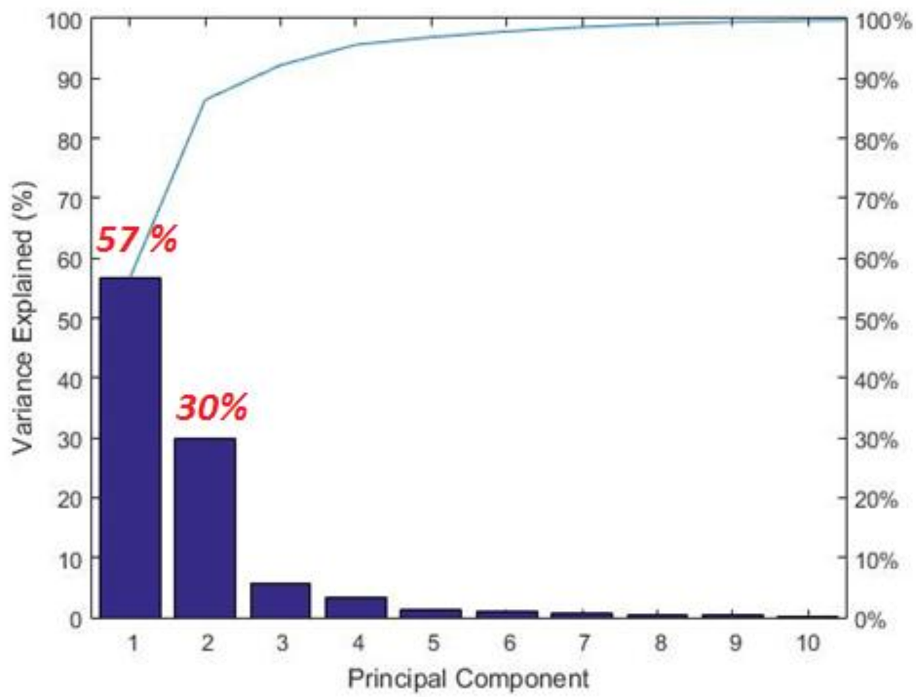


Figure 52: Explained variance for biomarkers model (BM).

Oil samples closely located in score plots have similar chemical composition based on the original variables. On the other hand, oil samples located far apart in the score plots have different chemical composition, and this dissimilarity increases as the distance increases.

In score plot the discrimination of Family C from Family E is fairly clear and the model has strong potential for classifying families C, E, and F (the oil samples are presented with specific colors, family C (green), family E (blue) and family F (black)).

Plotting scores of PC1 versus PC2 are used to confirm the relative influence of each component on the locations of samples (Figure 53). Oil samples from family F are clearly distinguished on the PC score plots. These oil samples exhibit negative scores on PC1 and positive loading scores on PC2. The samples of family E are mostly plotted on positive scores on both PC1 and PC2 while many samples were differentiated having negative scores on PC1. Family C separated into two subgroups; the group at the top appears positive values in PC1 and PC2. The other subgroup, which contains more samples, appears positive scores on PC1 and splits in both positive and negative scores on PC2. This separation of family C is indicative that the family C consists of two subcategories.

Score plot of variable loading of PC1 versus PC2 can be seen in Figure 54, reflecting the correlation between each variable and each Principal Component. The most negatively loaded with value of -0.183 on individual variance is C30Diahopane.

High negative values of these variables are attributed to the samples derived from Viking reservoir (F family). In contrast, the compound with the most positive loading on PC1 is C30H. Relatively, higher values of C30H are attributed to the samples derived from Madison reservoir from Lodgepole source rock.

PC2 loading is most positively loaded on the C23tri variable. The most negatively loaded variable for PC2 is C30Y variance. The lower values of the variance are evidence to the samples from Viking oil field.

These variables were the main factor to separate the oil samples from the rest. The Biomarkers model has strong potential to classify families C, E, and F.

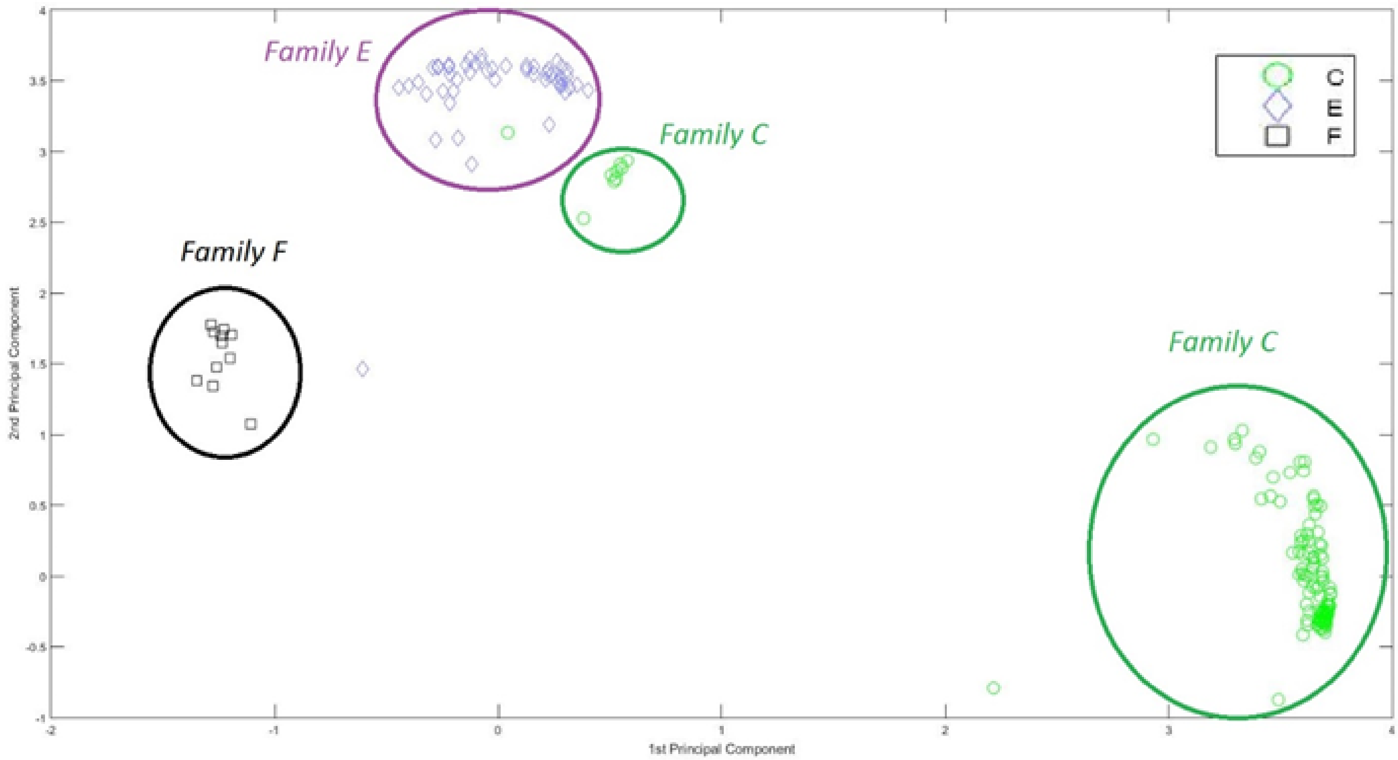


Figure 53: Output of Principal Component Analysis showing scores of the 176 oil samples.

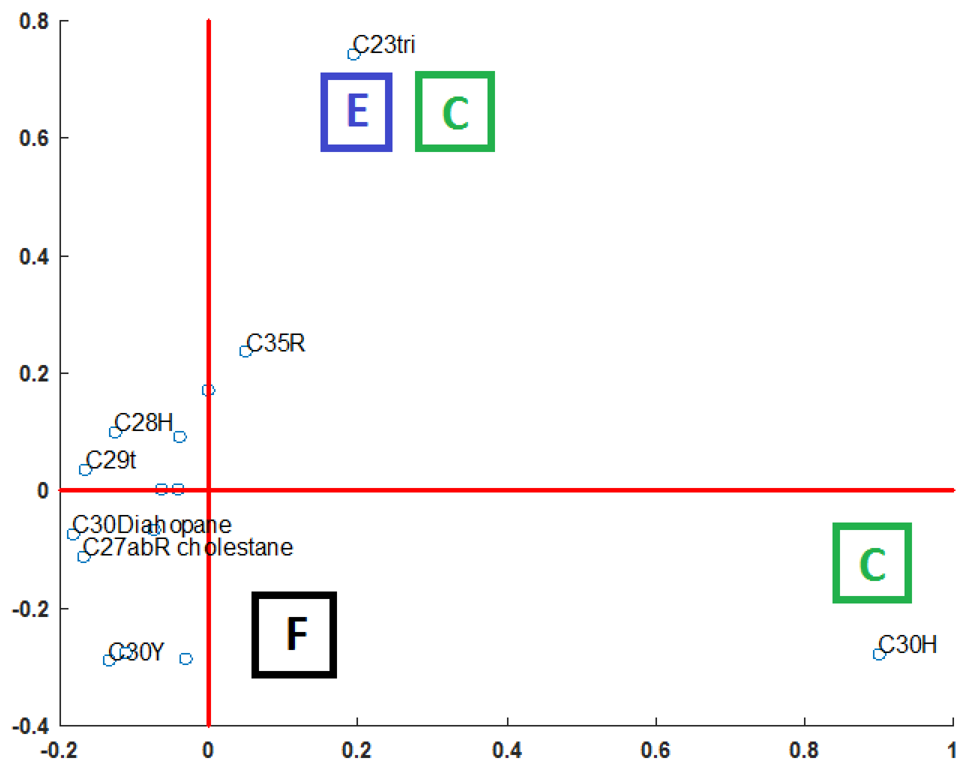


Figure 54: Output of Principal Component Analysis showing loadings of the variables.

Family C:

The groups of oils that belong in family C describe the origin of oil samples from Lodgepole source rock. The oil group has been separated into two sub-groups (Figure 53). The group C at the top in Figure 53 has similar biomarkers composition to the oils of the family E. The variable that separates the group C is C30H as it is depicted in Figure 53 and Figure 54. The other important variable with strong influence on this cluster is the high value of C23tri. However, the high C23tri and C30H values could be the variables to separate these oils from the others in the field.

Family E:

The classification of family E shows an origin mainly from Bakken source rock. The group is represented by fifty one oil samples. Family E is generally characterized by relatively high C23tri value. The C29diaS and Ts samples were apparently as low as the family C oils. Whilst C21S and C35R values are high for this family as it is and for the other two these values did not influence the family E oil group in terms of oil affiliation.

Family F:

The Family F contains 11 oil samples and is influenced by many loading values as it is observed in Figure 54. The classification of the family F oil samples is generally based on high values of Ts, C29t, C34R, C29dias, C29aaaR, C27abR cholestane and C30 diahopane variables. One important variable is C23tri which is the lowest among the three families and allows the separation to be clearly distinguished. These variables were mainly responsible to separate the samples of family F from the rest.

The oil samples of C group are separated in two different groups according to the results of PCA analysis of the Biomarker model. This result inspires us to implement the third model in order to examine more carefully the behavior of the oil samples of C family.

5.3 Combined biomarkers gasoline and saturated model (BGSM).

5.3.1 Samples.

In this model, a combination of gasoline range compositional ratios, saturated fraction ratios and biomarkers components used as variables. To be more specific, eight biomarkers ratios, five ratios that are calculated from saturated fraction and one ratio from gasoline range were used for the needs of this last model. The number of oil samples in C oil family is 86, thus the data contains a total size of 14 variables and 86 oil samples, the dimensions of the data are 86 X 14, and are presented in Appendix III. The full name and abbreviations of the 14 variables are presented in Table 11. The variables of BGSM model as they appear in the MATLAB code are presented in Figure 55.

Figure 55: Data selection table from MATLAB algorithm presenting the 14 variables of BGSM model.

No	Compound	Abbreviation
1	18cr(H)-trisnorhopane/17cr(H)-trisnorhopane.	Ts/Tm
2	17cr(H)-norhopane/17cr(H)-hopane.	29h/30h
3	C22 tricyclic terpane/C21 tricyclic terpane	22tri/21tri
4	C24 tricyclic terpane/C23 tricyclic terpane	24tri/23tri
5	C26 tricyclic terpane/C25 tricyclic terpane	26tri/25tri
6	CC28 tricyclic terpane/CC29 tricyclic terpane	C28tri/C29tri
7	17α,21β(H)-30-norhopane/17α,21β(H)-hopane	C29/C30
8	17α,21β(H)-29-pentakishomohopane (22S)/17α,21β(H)-29-tetrakishomohopane (22S)	35S/34S
9	Pristane/phytane ratio	Pr/Ph
10	Pristane/n-Cl7 ratio	Pr/nc17
11	Phytane/n-C18 ratio	Ph/nc18
12	1/2{(C15+C17+C19)/(C14+C16+C18)+(C15+C17+C12)/(C16+C18+C20)}	CPI(15-20)
13	(C15+C16+C17+C18+C19)/(C21+C22+C23+C24+C25)	mc/lc
14	(Mango parameter)=(2-methylhexane+2,3-dimethylpentane)/(3-methylhexane+2,4-dimethylpentane)	K1

Table 11: Full names and their abbreviations of the 14 ratios of the BGSM model.

For the biomarkers compositional data the most commonly used indices are:

The 30-Norhopane/hopane (also expressed as C29/C30) is typical of anoxic carbonate or marl source rocks and oils. If the value of this index is high indicates that oils generated from organic rich carbonates and evaporates. The ratio Ts/Tm (trisnorneohopane to trisnorhopane) increases with the portion of shale in calcareous facies and is quantitative estimation of oil maturity. The 26Tri/25Tri ratio is very useful in order to distinguish between marine versus lacustrine source rock depositional environments. The C30 member of the 17a (H) diahopane used as terrestrial marker due to their presence in coals and terrigenous oils. Diasteranes to steranes ratios are often used in order to distinguish petroleum from carbonate versus clastic source rocks. Low values of diasteranes / steranes is indicator for anoxic clay-poor or carbonate source rocks. Thus during the diagenesis phase of these carbonate sediments, bacterial activity provides bicarbonate and ammonium ions, resulting in increased water alkalinity.

The K1 index is calculated from compositional data of gasoline range and identifies if exist a common creation mechanism of light hydrocarbons from the heavier ones.

The 35S/34S ratio is an indication of carbonate/evaporate facies or anoxic depositional environment. The 22Tri/21Tri is as source parameter that helps in distinguish lithofacies.

5.3.2 Score and Loading plots.

The contribution of each principal component in percentages of variance that is explained from the PCA model is shown in Figure 57 (Principal Component 1 and Principal Component 2 together explain 92% of the variance (83% and 9% respectively)).

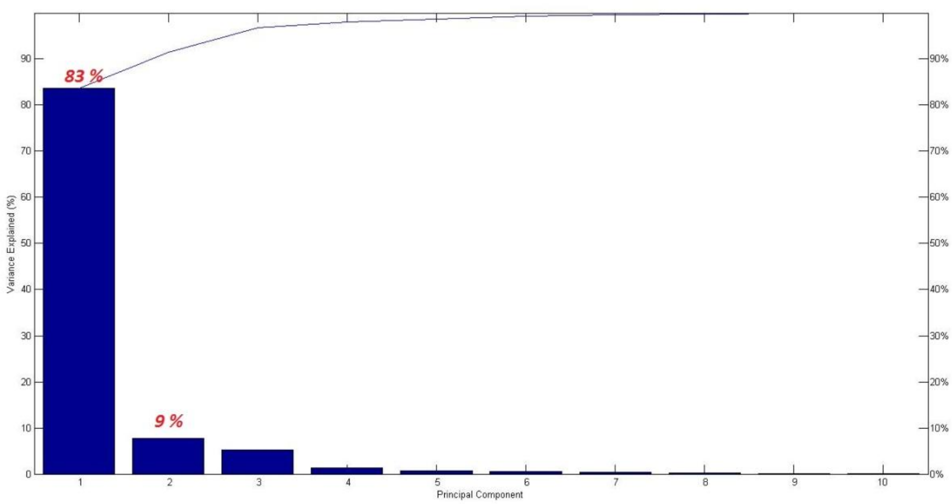


Figure 57: Variance Explained of the BGSM model. PC1 and PC2 explain the 92% of the information.

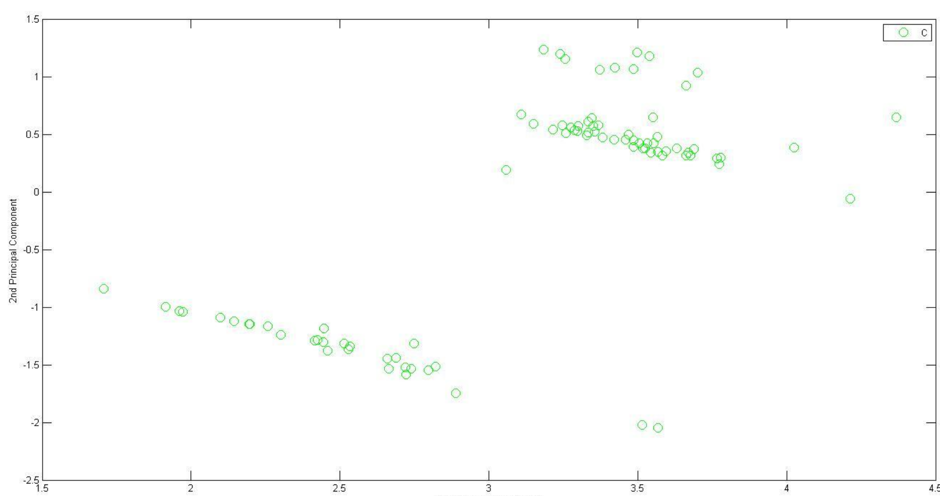


Figure 56: Output of Principal Component Analysis showing scores of the 86 oil Samples of BGSM model. The x and y axes are the first two principal components PC1 and PC2 respectively.

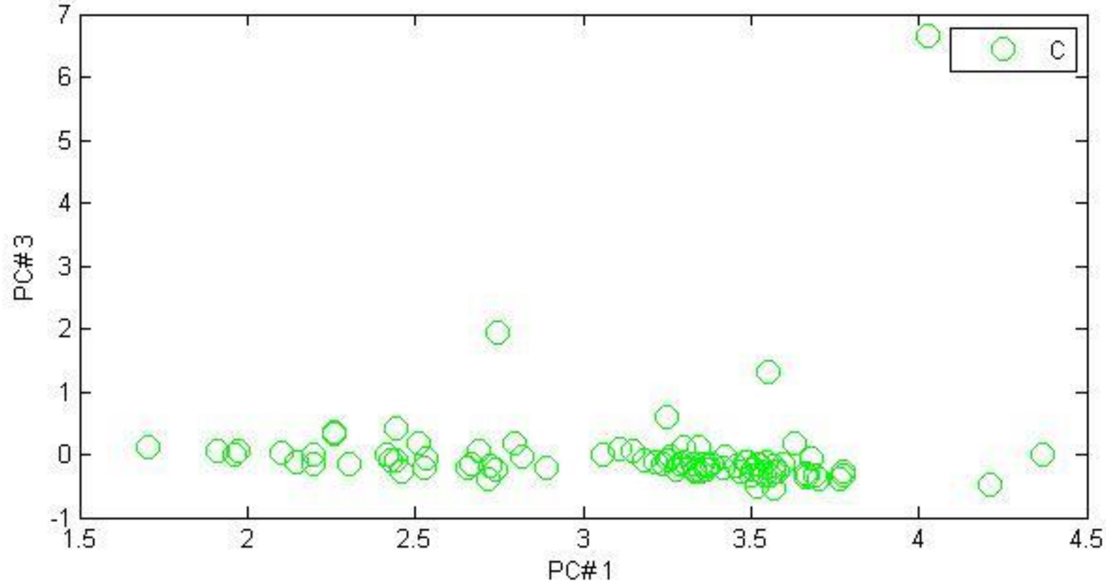


Figure 58: Output of Principal Component Analysis showing scores of the 86 oil Samples of BGSM model. The x and y axes are the first and the third principal components PC1 and PC3 respectively.

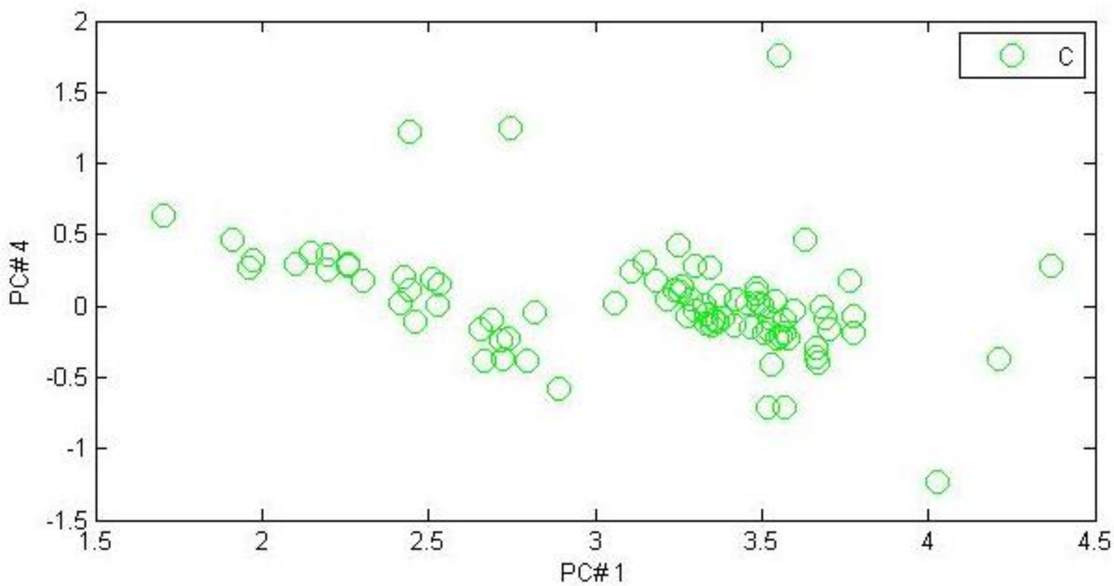


Figure 59: Output of Principal Component Analysis showing scores of the 86 oil Samples of BGSM model. The x and y axes are the first and the third principal components PC1 and PC4 respectively.

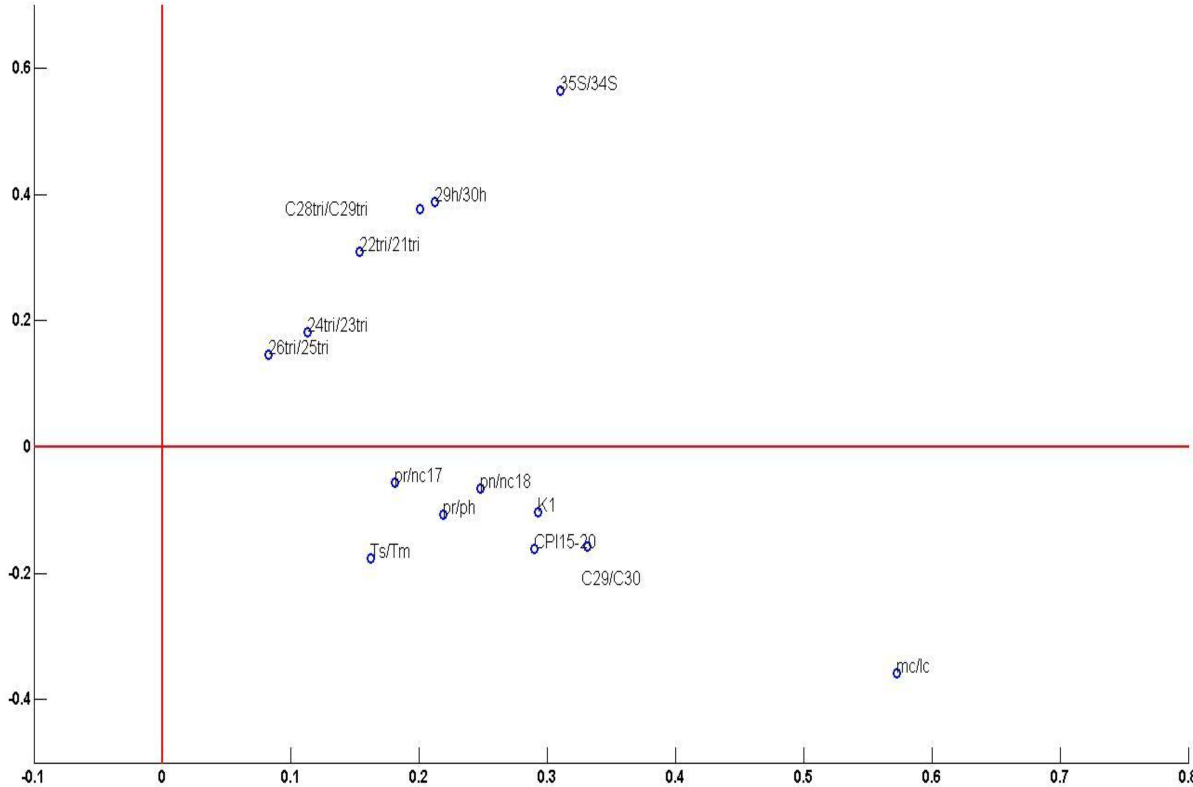


Figure 60: Output of Principal Component Analysis showing loadings of the variables based on 14 ratios of BGSM model.

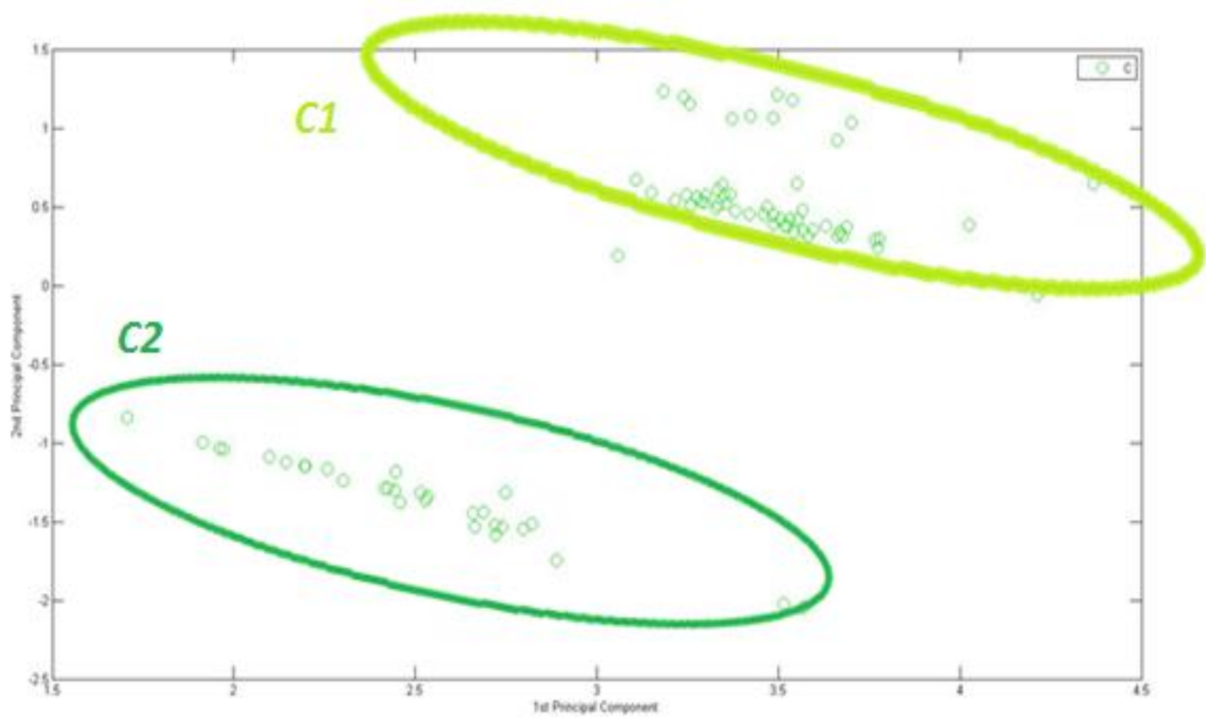


Figure 61: Output of Principal Component Analysis showing scores of the 86 oil Samples of BGSM model. The x and y axes are the first two principal components. The samples are separated and circled in two subgroups.

The result of PCA analysis at the oil samples of family C reveals clearly two distinguish clusters of oils which are named as C1 and C2, as it is depicted in Figure 61. At the score plots in Figure 58 and Figure 59 with PC3 and PC4 as vertical axes this separation of family C is also appeared but not as clear as that of the score plot of Figure 61.

The original variable loadings are presented in Figure 60. As it is shown the K1 index is very significant for the scores of first principal component (PC1) and the ratios 35S/34S and mc/Ic indexes for the scores of second principal component (PC2).

The loadings are presented as positively and negatively correlated selected features. Correlation between a specific observed variable and a specific factor can be observed from the loading plot in Figure 60 in combine with the score plot of Figure 61. Higher values mean a closer relationship. The most positive loaded ratio in PC1 is mc/lc with a value near to 0.6. It is clearly in Figure 61 that this ratio influence more the family C2. Hence, high values of this ratio are indicatively for C2 subgroup of family C. The lower value of PC1 belongs to the ratio C26tri/C25tri and it is close to 0.1. In PC2, the most positive value is near 0.6 and belongs to 35S/34S ratio. This range of values is indicative for oil samples from C1 subgroup. Finally the ratio that exhibits the most negative PC2 value is mc/lc (with a -0.4 value) low values of mc/lc ratio are characteristic for oil samples from family C2.

The majority of the oil samples in C1 subgroup have high values of 35S/34S ratio as the loading plot of figure 60 illustrates. This is an indicator of anoxic depositional environment. On the other hand the C2 subgroup of oils refers to a reducing depositional environment. In addition to the values of 26Tri / 25Tri ratio indicate lacustrine depositional environment for the C2 oil subgroup and marine source for C1 subgroup of oils.

6. Conclusions.

Analytical data from a set of 336 oil samples were used in this master thesis. The oil samples and their corresponding oil families are presented in Appendix IV. At least six distinct petroleum families namely A, B, C, D, E and F have been recognized in Williston Basin.

Findings suggest that oil families can be distinguished by unique biomarker signatures. Variables from PCA show distinctive compositions of their light fractions. The oil samples in Biomarkers model are well separated. In comparison with the other two models, the separation is clearly improved with the application of PCA of biomarkers. Saturated gasoline model (SGM) distinguish oil samples from families A and C in a satisfactory way but the oil samples from families B and D are overlapping with a not clear separation. The result of the three examined models indicates that the oil samples of families B and D are highly overlapped while oil samples from families A, C, E and F are well distinguished.

This work shows how the geochemical fingerprinting data from the Williston Basin oils when combined with multivariate statistical analysis can classify oils into six distinct groups reflecting their geographical locations. Geochemical fingerprinting, therefore, permits the classification of crude oils into Winnipeg-Bighorn, Bakken, Lodgepole, Winnipegosis, Bakken/Exshaw and Colorado source rocks.

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Appendix I

Geochemical Data of Analyzed Oils for SGM model.

		1	2	3	4	5	6	7	8	9
	Lab.no	**pr/nC17**	**CPI (14-20)**	**CPI (22-32)**	**Pr/Ph**	**Ph/nC18**	**nC6**	**nC7**	**Benz**	**Tol**
1	494	0.55	1.04	0.93	0.73	0.76	0.39	0.00	0.00	0.00
2	495	0.32	1.02	0.93	0.65	0.50	0.53	0.31	0.00	0.05
3	497	0.40	1.02	0.94	0.65	0.65	0.52	0.31	0.34	0.08
4	499	0.32	1.01	0.96	0.89	0.38	0.59	0.35	0.15	0.22
5	500	0.33	1.02	0.93	0.53	0.61	0.49	0.32	0.55	0.81
6	501	0.47	1.04	0.92	0.71	0.71	0.48	0.25	0.47	0.21
7	503	0.39	1.04	0.93	0.63	0.65	0.45	0.25	0.88	1.27
8	511	0.36	1.06	0.92	0.57	0.57	0.54	0.31	0.09	0.13
9	513	0.30	1.04	0.92	0.61	0.51	0.53	0.33	0.46	1.38
10	514	0.64	1.08	0.97	0.81	0.83	0.51	0.25	0.21	0.60
11	515	0.60	1.10	0.99	1.51	0.48	0.47	0.26	0.00	0.02
12	516	0.31	1.04	0.95	0.81	0.41	0.29	0.00	0.00	0.00
13	520	0.26	1.02	0.96	0.54	0.48	0.55	0.35	0.41	1.01
14	529	0.41	1.06	0.92	0.59	0.60	0.37	0.19	0.01	0.07
15	539	0.41	1.03	0.93	0.58	0.63	0.48	0.24	0.47	0.89
16	543	0.35	0.99	0.93	0.65	0.56	0.52	0.30	0.02	0.27
17	546	0.57	1.03	0.91	0.83	0.74	0.46	0.23	0.19	0.53
18	548	0.29	1.01	0.93	0.60	0.51	0.47	0.30	0.11	0.38
19	549	0.08	1.75	1.05	1.07	0.31	0.79	0.65	0.03	0.04
20	550	0.02	1.66	0.91	0.50	0.09	0.81	0.58	0.02	0.06
21	553	0.69	1.46	0.97	0.99	0.78	0.52	0.28	0.07	0.25
22	554	0.66	1.09	1.13	1.48	0.52	0.47	0.22	0.01	0.05
23	555	0.45	1.02	0.92	0.70	0.61	0.56	0.31	0.29	0.47
24	556	0.49	1.01	0.91	0.72	0.73	0.54	0.31	0.46	0.83
25	557	0.38	1.21	0.93	0.48	0.73	0.51	0.33	0.37	0.94
26	559	0.42	1.03	0.93	0.62	0.72	0.50	0.30	0.42	0.83
27	565	0.33	1.04	0.91	0.73	0.47	0.53	0.31	0.06	0.39
28	566	0.42	1.12	0.91	0.47	0.69	0.43	0.21	0.11	0.26
29	574	0.66	1.07	0.92	0.83	0.83	0.47	0.18	0.20	0.32
30	575	0.36	1.11	0.91	0.46	0.75	0.46	0.31	0.87	0.55
31	582	0.35	1.02	0.90	0.47	0.73	0.44	0.30	0.25	0.89
32	585	0.44	1.03	0.89	0.61	0.75	0.47	0.25	0.34	0.25
33	595	0.38	1.01	0.87	0.71	0.60	0.43	0.25	0.01	0.08
34	596	0.48	1.01	0.91	0.65	0.79	0.38	0.12	0.08	0.03
35	597	0.31	1.02	0.88	0.63	0.53	0.81	0.68	0.01	0.05
36	607	0.57	1.04	0.89	0.63	0.88	0.32	0.07	0.02	0.04
37	669	0.56	1.05	0.93	0.60	0.83	0.45	0.25	0.00	0.05
38	670	0.41	1.01	0.89	0.66	0.67	0.49	0.35	0.03	0.05
39	671	0.64	1.05	0.91	0.69	0.99	0.41	0.28	0.01	0.19
40	672	0.46	1.02	0.92	0.60	0.75	0.47	0.34	0.00	0.02
41	673	0.65	1.05	0.90	0.63	1.00	0.44	0.28	0.01	0.01
42	674	0.93	1.08	0.95	0.53	1.66	0.27	0.12	0.00	0.22
43	676	0.82	1.09	0.92	0.66	1.34	0.44	0.29	0.01	0.09
44	679	0.44	1.01	0.98	0.59	0.74	0.47	0.32	0.03	0.06
45	680	0.68	1.01	1.01	0.65	0.92	0.45	0.27	0.00	0.03
46	681	0.41	1.03	1.00	0.63	0.70	0.47	0.32	0.02	0.08
47	682	0.41	1.02	0.94	0.64	0.68	0.46	0.33	0.01	0.10
48	683	0.49	1.02	1.00	0.64	0.83	0.46	0.28	0.01	0.04
49	684	0.42	1.00	1.00	0.69	0.67	0.58	0.34	0.25	0.16
50	685	0.43	1.01	0.95	0.65	0.68	0.48	0.35	0.01	0.09
51	686	0.52	1.02	0.85	0.71	0.79	0.46	0.32	0.01	0.01
52	687	0.50	1.04	0.97	0.68	0.76	0.46	0.31	0.01	0.05
53	688	0.48	1.03	0.96	0.59	0.81	0.47	0.33	0.00	0.01
54	689	1.01	1.07	1.04	0.65	1.64	0.24	0.12	0.00	0.11
55	711	0.34	1.09	0.91	0.81	0.46	0.57	0.30	0.09	0.28
56	714	0.34	1.08	0.92	0.83	0.46	0.54	0.30	0.16	0.36
57	721	0.31	1.10	0.89	0.78	0.62	0.57	0.37	0.01	0.02
58	722	0.45	1.08	0.85	0.69	0.71	0.42	0.18	0.00	0.01
59	725	0.46	1.05	0.85	0.67	0.76	0.44	0.21	0.00	0.01
60	728	0.37	1.06	0.91	0.59	0.65	0.49	0.35	0.03	0.08

		1	2	3	4	5	6	7	8	9
	Lab.no	**pr/nC17**	**CPI (14-20)**	**CPI (22-32)**	**Pr/Ph**	**Ph/nC18**	**nC6**	**nC7**	**Benz**	**Tol**
61	729	0.36	1.00	0.91	0.58	0.64	0.49	0.34	0.02	0.16
62	730	0.49	1.06	0.94	0.64	0.84	0.55	0.34	0.01	0.02
63	731	0.56	1.09	0.92	0.58	0.98	0.39	0.25	0.00	0.01
64	732	0.46	1.01	0.92	0.74	0.74	0.46	0.28	0.01	0.07
65	733	0.39	1.06	0.87	0.81	0.68	0.45	0.27	0.01	0.05
66	734	0.43	1.03	0.93	0.66	0.68	0.49	0.37	0.00	0.02
67	735	0.45	1.02	0.91	0.65	0.72	0.49	0.35	0.00	0.02
68	736	0.59	1.04	0.94	0.61	0.82	0.49	0.34	0.00	0.07
69	737	0.35	1.07	0.90	0.58	0.65	0.48	0.35	0.04	0.13
70	738	0.37	1.05	0.90	0.63	0.68	0.51	0.40	0.04	0.49
71	739	0.47	1.10	0.92	0.70	0.77	0.49	0.32	0.00	0.04
72	740	0.38	1.01	0.92	0.66	0.76	0.49	0.37	0.00	0.04
73	741	0.38	1.08	0.93	0.62	0.68	0.51	0.42	0.01	0.06
74	742	0.52	1.12	0.88	0.63	0.91	0.41	0.27	0.00	0.08
75	743	0.43	1.13	0.92	0.60	0.78	0.46	0.31	0.00	0.02
76	744	0.36	1.06	0.91	0.58	0.65	0.49	0.37	0.02	0.09
77	745	0.36	1.02	0.91	0.69	0.59	0.51	0.39	0.00	0.11
78	746	0.43	1.00	0.91	0.58	0.73	0.46	0.31	0.00	0.03
79	747	0.44	1.14	0.93	0.66	0.75	0.31	0.20	0.01	0.05
80	748	0.45	1.12	0.92	0.73	0.72	0.45	0.25	0.00	0.07
81	749	0.41	1.08	0.94	0.66	0.72	0.48	0.36	0.00	0.02
82	750	0.41	1.08	0.93	0.62	0.71	0.47	0.33	0.01	0.13
83	751	0.43	1.11	0.93	0.62	0.77	0.50	0.35	0.01	0.04
84	752	0.37	1.11	0.91	0.60	0.69	0.46	0.39	0.02	0.06
85	753	0.35	0.93	0.93	0.73	0.51	0.51	0.38	0.01	0.11
86	754	0.36	1.05	0.92	0.62	0.68	0.52	0.38	0.03	0.10
87	756	0.35	1.25	0.97	0.71	0.73	0.62	0.46	0.11	0.12
88	800	0.68	1.24	1.06	0.78	1.10	0.53	0.34	0.29	0.33
89	801	1.04	1.13	1.02	0.90	1.25	0.51	0.31	0.36	0.37
90	802	0.58	1.26	1.00	0.77	1.05	0.46	0.28	0.22	0.16
91	841	0.99	1.14	1.03	0.77	1.66	0.38	0.20	0.41	0.40
92	920	0.08	1.79	0.96	1.07	0.23	0.62	0.41	0.07	0.05
93	924	0.59	1.20	0.99	0.68	1.17	0.50	0.28	0.27	0.45
94	1016	0.31	1.07	0.95	0.90	0.42	0.53	0.30	0.18	0.94
95	1018	0.06	1.52	0.93	1.03	0.24	0.85	0.70	0.01	0.02
96	1020	0.26	1.01	0.92	0.49	0.56	0.46	0.36	1.11	0.18
97	1093	0.23	1.02	0.95	1.47	0.16	0.56	0.31	0.26	0.42
98	1138	0.06	1.60	1.25	1.08	0.25	0.52	0.38	0.01	0.04
99	1140	0.07	1.60	0.69	1.00	0.33	0.82	0.71	0.06	0.10
100	1165	0.06	1.62	1.02	1.28	0.22	0.77	0.69	0.02	0.03
101	1166	0.25	1.07	1.05	1.20	0.32	0.44	0.23	0.03	0.07
102	1167	0.12	1.26	0.98	1.15	0.21	0.66	0.55	0.04	0.34
103	1170	0.27	1.11	0.97	1.54	0.28	0.58	0.33	0.07	0.16
104	1171	0.11	1.18	0.96	1.06	0.16	0.13	0.13	0.00	1.39
105	1172	0.18	1.23	0.97	0.81	0.37	0.18	0.33	0.03	0.00
106	1173	0.83	1.18	1.10	0.82	1.37	0.42	0.24	0.13	1.03
107	1273	0.52	1.34	0.96	0.72	1.03	0.48	0.27	0.17	0.15
108	1274	0.55	1.20	0.97	0.70	1.11	0.52	0.32	0.20	0.13
109	1275	0.35	1.28	1.02	0.78	0.66	0.64	0.49	0.08	0.12
110	1276	0.32	1.26	1.01	0.77	0.61	0.55	0.32	0.11	0.16
111	1279	0.75	1.11	1.14	1.35	0.63	0.45	0.19	0.00	0.00
112	1288	0.21	1.27	1.02	0.75	0.44	0.62	0.44	0.10	0.21
113	1289	0.22	1.24	1.01	0.82	0.44	0.64	0.49	0.08	0.16
114	1290	0.20	1.30	1.01	0.93	0.36	0.62	0.44	0.08	0.16
115	1291	0.24	1.27	1.01	0.88	0.43	0.59	0.39	0.09	0.16
116	1312	0.69	1.20	0.95	0.75	1.37	0.13	0.03	0.41	0.92
117	1313	0.22	1.23	1.00	0.84	0.42	0.58	0.40	0.12	0.83
118	1329	0.48	1.02	0.98	0.64	0.87	0.18	0.06	0.01	0.30
119	1335	0.52	1.28	1.09	0.75	0.98	0.48	0.26	0.18	0.17
120	1355	0.35	1.05	1.01	1.40	0.31	0.55	0.26	0.06	0.17

		1	2	3	4	5	6	7	8	9
	Lab.no	**pr/nC17**	**CPI (14-20)**	**CPI (22-32)**	**Pr/Ph**	**Ph/nC18**	**nC6**	**nC7**	**Benz**	**Tol**
121	1359	0.06	1.68	1.10	1.24	0.25	0.69	0.51	0.01	0.02
122	1364	0.38	1.52	1.05	0.72	0.75	0.57	0.36	0.16	0.25
123	1365	0.51	1.24	1.12	0.68	1.02	0.53	0.32	0.14	0.17
124	1384	0.70	1.17	0.96	1.40	0.78	0.37	0.15	0.02	0.09
125	1385	0.44	1.27	0.94	0.73	0.85	0.48	0.25	0.17	0.16
126	1386	0.34	1.03	0.90	0.49	0.70	0.49	0.29	1.08	1.39
127	1387	0.35	1.06	0.91	0.58	0.61	0.48	0.26	0.82	1.16
128	1388	0.46	1.04	0.92	0.61	0.74	0.47	0.22	0.55	0.71
129	1389	0.62	1.04	0.91	0.82	0.75	0.45	0.17	0.24	0.38
130	1391	0.36	1.07	1.04	1.18	0.37	0.62	0.33	0.07	0.76
131	1392	0.35	0.87	1.04	1.23	0.35	0.59	0.33	0.09	0.46
132	1393	0.81	1.08	0.98	1.38	0.66	0.50	0.20	0.08	0.13
133	1394	0.37	1.10	0.97	1.43	0.35	0.60	0.33	0.07	0.17
134	1395	0.75	1.14	1.08	1.46	0.63	0.54	0.21	0.09	0.10
135	1396	0.40	1.10	1.18	1.33	0.38	0.57	0.30	0.09	0.18
136	1397	0.54	1.11	1.03	1.41	0.50	0.54	0.26	0.10	0.13
137	1398	0.56	1.07	0.99	1.43	0.47	0.58	0.29	0.09	0.16
138	1399	0.63	1.10	1.00	1.36	0.55	0.59	0.30	0.06	0.10
139	1400	0.62	1.13	1.00	1.47	0.51	0.56	0.28	0.07	0.11
140	1401	0.51	1.14	1.05	1.46	0.46	0.58	0.29	0.09	0.14
141	1402	0.90	1.16	0.96	1.43	0.77	0.50	0.20	0.08	0.18
142	1403	0.58	1.09	0.97	1.39	0.49	0.56	0.29	0.08	0.13
143	1404	0.36	1.10	0.98	1.23	0.36	0.56	0.29	0.06	0.14
144	1443	0.67	1.04	0.91	0.89	0.80	0.54	0.28	0.02	0.06
145	1464	0.42	1.12	0.88	0.50	0.82	0.54	0.34	0.97	1.42
146	1465	0.38	1.27	0.89	0.54	0.76	0.52	0.33	1.07	1.62
147	1466	0.37	1.19	0.89	0.50	0.74	0.57	0.36	0.95	1.51
148	1467	0.48	1.17	0.95	0.58	0.91	0.56	0.37	0.96	1.27
149	1468	0.42	1.18	0.87	0.58	0.76	0.51	0.27	0.55	0.80
150	1469	0.46	1.12	0.83	0.54	0.79	0.44	0.21	0.49	0.43
151	1470	0.41	1.12	0.94	0.51	0.73	0.53	0.30	0.78	1.20
152	1471	0.69	1.08	0.96	0.84	0.89	0.53	0.23	0.23	0.43
153	1472	0.49	1.21	0.88	0.65	0.81	0.50	0.25	0.57	0.73
154	1473	0.67	1.13	0.92	0.84	0.89	0.59	0.28	0.14	0.31
155	1705	0.25	1.02	0.93	0.65	0.42	0.56	0.33	0.41	1.08
156	1707	0.08	1.67	1.04	1.15	0.28	0.85	0.71	0.02	0.09
157	1708	0.08	1.61	1.03	1.12	0.30	0.81	0.60	0.01	0.18
158	1710	0.07	1.63	1.02	1.08	0.26	0.73	0.43	0.00	0.32
159	1712	0.06	1.29	1.01	1.80	0.06	0.64	0.51	0.12	0.23
160	1713	0.53	1.10	1.15	1.31	0.47	0.31	0.13	0.01	0.04
161	1714	0.07	1.51	0.99	1.24	0.13	0.69	0.50	0.05	0.22
162	1715	0.30	1.05	0.99	0.81	0.39	0.52	0.27	0.97	1.00
163	1717	0.08	1.46	1.11	1.12	0.25	0.86	0.74	0.02	0.09
164	1719	0.09	1.38	1.10	1.62	0.17	0.79	0.54	0.01	0.33
165	1720	0.06	1.73	0.98	1.14	0.23	0.77	0.65	0.02	0.12
166	1723	0.09	1.58	1.03	1.49	0.30	0.82	0.65	0.06	0.15
167	1724	0.08	1.71	1.14	1.38	0.29	0.84	0.69	0.04	0.04
168	1725	0.08	1.57	1.15	1.18	0.29	0.80	0.62	0.01	0.00
169	1875	0.29	0.98	0.99	1.06	0.28	0.53	0.27	0.08	0.19
170	2121	0.59	1.15	1.04	1.52	0.48	0.43	0.23	0.00	0.02
171	2122	0.63	1.14	1.06	1.89	0.42	0.38	0.14	0.00	0.06
172	2125	0.90	1.08	0.88	0.61	1.59	0.27	0.09	0.00	0.01
173	2149	0.07	1.46	0.98	1.12	0.22	0.82	0.64	0.04	0.25
174	2268	0.06	1.42	1.07	1.14	0.19	0.75	0.54	0.04	0.14
175	2269	0.07	1.51	0.99	1.75	0.14	0.78	0.58	0.04	0.20
176	2270	0.07	1.54	0.99	1.32	0.21	0.76	0.49	0.03	0.15
177	2283	0.03	1.42	0.97	0.68	0.15	0.65	0.42	0.05	0.26
178	2284	0.03	1.55	0.99	0.61	0.19	0.80	0.64	0.04	0.19
179	2313	0.03	1.43	1.02	0.71	0.13	0.75	0.58	0.02	0.08
180	2362	0.03	1.46	0.98	1.15	0.08	0.76	0.59	0.02	0.07

		1	2	3	4	5	6	7	8	9
	Lab.no	**pr/nC17**	**CPI (14-20)**	**CPI (22-32)**	**Pr/Ph**	**Ph/nC18**	**nC6**	**nC7**	**Benz**	**Tol**
181	2363	0.07	1.47	1.00	1.54	0.15	0.73	0.55	0.03	0.12
182	2364	0.07	1.72	1.03	1.53	0.21	0.73	0.53	0.04	0.11
183	2424	0.07	1.37	0.98	0.94	0.29	0.80	0.65	0.07	0.17
184	2425	0.07	1.68	1.05	1.04	0.27	0.81	0.68	0.07	0.18
185	2426	0.08	1.66	1.01	1.20	0.25	0.80	0.67	0.08	0.20
186	2428	0.06	1.67	1.09	0.88	0.30	0.81	0.69	0.03	0.09
187	2429	0.07	1.62	1.04	1.03	0.22	0.79	0.66	0.06	0.18
188	2430	0.06	1.71	1.08	0.88	0.27	0.81	0.67	0.10	0.23
189	2431	0.08	1.64	1.05	1.25	0.26	0.78	0.64	0.08	0.17
190	2432	0.08	1.52	1.04	1.26	0.24	0.79	0.68	0.09	0.25
191	2433	0.07	1.75	1.06	0.92	0.28	0.85	0.75	0.05	0.13
192	2434	0.07	1.80	1.03	1.09	0.25	0.78	0.63	0.06	0.17
193	2435	0.06	1.69	1.08	0.84	0.28	0.83	0.71	0.04	0.12
194	2436	0.07	1.73	1.04	1.08	0.26	0.81	0.67	0.08	0.18
195	2467	0.03	1.47	1.08	0.55	0.16	0.80	0.60	0.04	0.23
196	2468	0.08	1.49	1.00	1.06	0.26	0.68	0.45	0.04	0.18
197	2469	0.07	1.62	1.06	1.20	0.22	0.76	0.52	0.05	0.17
198	2470	0.08	1.49	1.00	1.15	0.22	0.77	0.56	0.05	0.20
199	2471	0.83	1.20	0.83	0.70	1.50	0.33	0.15	0.30	0.17
200	2472	0.55	1.25	1.03	0.90	0.89	0.50	0.30	0.21	0.00
201	2595	0.33	1.27	1.00	0.85	0.54	0.47	0.30	0.22	0.26
202	2611	0.05	1.80	0.95	0.74	0.26	0.73	0.55	0.03	0.22
203	2626	0.11	1.55	1.00	1.11	0.23	0.62	0.46	0.05	0.13
204	2627	0.09	1.46	0.97	1.46	0.14	0.62	0.49	0.02	0.13
205	2706	0.06	1.79	0.98	1.05	0.24	0.77	0.62	0.02	0.10
206	2884	0.05	1.70	1.02	1.29	0.16	0.77	0.60	0.04	0.24
207	2885	0.29	1.33	1.00	0.79	0.58	0.59	0.42	0.15	0.34
208	2887	0.41	1.13	0.99	1.36	0.39	0.48	0.22	0.06	0.40
209	2889	0.25	1.08	1.02	1.35	0.19	0.48	0.26	0.37	1.14
210	2890	0.21	1.29	1.03	0.83	0.37	0.73	0.36	0.30	0.67
211	2892	0.04	1.40	1.00	0.75	0.13	0.77	0.59	0.03	0.21
212	2895	0.05	1.65	1.08	1.05	0.18	0.76	0.58	0.03	0.10
213	2896	0.05	1.59	1.01	0.89	0.19	0.84	0.68	0.03	0.10
214	2897	0.06	1.51	0.96	1.31	0.12	0.71	0.55	0.03	0.19
215	2898	0.05	1.69	0.78	0.85	0.21	0.83	0.68	0.02	0.10

Appendix II

Geochemical Data of Analyzed Oils for Biomarkers Model (BM).

		1	2	3	4	5	6	7	8	9	10
No	Lab.no	*C21tri*	*C22tri*	*C23tri*	*C24tri*	*C25tri*	*C24tet*	*C26tri1*	*C26tri2*	*C28tri1*	*C28tri2*
1	1055	44473,078	18120,184	102621,984	54138,48	51765,07	26469,254	18976,311	20516,967	23028,203	17710,359
2	1040	65428,5	28651,123	174864,109	79355,445	79215,672	38651,148	32263,922	38151,918	36151,367	36310,359
3	1033	151248,625	70951,977	408865	216467,563	199856,969	80696,266	65159,273	71039,734	72361,766	61005,07
4	1035	105768,57	48356,563	284383,031	144790,188	138231,875	62883,086	53442,422	60177,164	62877,234	55278,688
5	1039	137009,844	65720,742	374479,781	193686,938	181464,172	80287,648	59817,406	76094,891	74852,773	72908,961
6	1073	303588,594	132333,172	740217,813	399576,75	363256	192707,828	131948,297	166041,594	173133,625	158018,688
7	1065	294977,844	133708,063	838878,25	429173,75	398219,063	177521,25	154534,109	174084,75	181296,094	190830,156
8	1056	298855,281	128129,391	756825,188	400351,313	370407,344	186858,016	135853,641	162451,016	179063,031	165732,391
9	1053	318895,063	118235,281	783734,625	465477,844	436512,094	178909,469	167950,469	191108,594	187412,672	171144,563
10	1037	403998,969	148310,109	954910,688	533739,438	490385,156	206698,234	184223,656	205283,891	229565,266	226183,188
11	1114	334001,938	155135,547	877469,875	467942,938	430243,719	185623,969	160841,203	183853,781	213523,016	190149,625
12	1044	329752,906	138472,313	875146,688	479746,156	477097,688	222278,281	178347,656	217883,75	221095,109	214959,156
13	1054	417997	168116,219	1015562,5	577100,188	536486,5	255004,734	208714,391	246123,5	235106,328	210103,75
14	1076	349988,156	140597,484	924687,375	514400,969	492411,469	234054,156	188943,938	208324,859	218530,594	237432,828
15	1045	431220,438	200571,109	1150974	605885,875	647768,188	290702,906	234973,563	293123,75	279899,594	267670,969
16	1075	524336,625	233011,641	1564016,875	970821,125	953907,563	324539,594	364052,156	408231,625	394424,875	362077,969
17	1083	544420,125	202073,625	1274830,875	757434,563	728256,25	304444,906	275121,531	310178,688	351958,906	318521,344
18	839	428512,844	16924,266	1060979,875	653026,938	644441,25	276813,719	236300,703	287187,688	332352,156	318364,75
19	1036	577342,813	224827,563	1394420,125	842821,625	818590,75	320239,5	316598	353765,906	351792,594	365161,375
20	813	241393,969	66397,656	318380,906	275976,063	290912,719	140460,578	134382,094	160979,391	207937,938	178179,234
21	1043	838038,625	403232,594	2135728,25	1193477,875	1124626,375	475064,75	428066,5	482101,156	542528,125	505046,719
22	1069	645149,688	280558,719	1761735,25	979819	953935,813	449016,531	360370,344	436650,406	468729,656	425631,75
23	831	1098929,125	401676	2603801,75	1592159,375	1506345,375	581956,438	530778,25	600690,938	687968	640108,75
24	1052	785813,375	303826,469	2106710,5	1192115	1168968,875	467812,125	463472,969	525678,75	615904,563	585103,688
25	732	804362,313	467986,281	2282107,5	1319306,5	1428945,25	743093,688	542421,125	602453,25	682137,875	618912,063
26	1074	1045618,188	388829,844	2621418,25	1495101,375	1452216,625	656971,938	525417,438	646080,188	657742,438	551294,875
27	825	1271815,625	493161,156	3038331,75	1810107	1778826,25	692897,875	663895,688	750842,438	729673,688	710436,125
28	836	948274,438	383397,625	2435319,5	1534069,375	1539476	619604,625	600977,188	675666,75	822548,875	799702,688
29	1112	1606973,25	762352,125	4775203	2516564	2427762,5	1094161,625	896638,75	1102059,625	1246466,625	1145284,75
30	837	5471150,5	1754009	10139660	5263397	4734611	2927864	1437535,75	1716765,5	1508969,125	1668648,625
31	1739	2075538,75	835052,625	5494387	2672685,75	2648203,5	1283760,75	1053891	1201717,5	1194764,75	1171903
32	817	2047656,875	753787,063	4871614,5	2912477	2769909,75	1077346,5	1044106,375	1193853,25	1315725,625	1248313,625
33	1078	2074038,25	879710	5403157	2760335,75	2597809,25	1153895,25	909436,25	1128598,625	1336734,625	1274731,625
34	840	1728537,5	654497,875	4568065,5	2701514,75	2720973,25	1205515,375	1008010,625	1258627,875	1337395,25	1440399,5
35	3477	2297736	960035,125	6172911	3609915,25	3554395,5	1349778	1372047,75	1554872,625	1677609,75	1604794,625
36	829	1719438,25	669557,063	4605167,5	2787960,75	2846759	1267979,625	1065454	1319456,625	1561453	1478847,125
37	822	2336244,75	881187,5	5523027,5	3366420	3212208	1303458,375	1220250,75	1375325,125	1566883	1489634
38	821	856492,813	314091,531	1041844,813	783256,75	967404,938	485180,844	428340,594	517909,25	685505,563	530508,125
39	823	777420	536098,313	1028103	852494,25	937626,563	479805,906	428132,75	555405,313	700854,938	478695,5
40	838	2332524,5	910432,688	6075632	3840420,75	3889208,25	1447454,75	1387746	1718957,625	1828956,25	1780208,125
41	830	1910316,5	731366,75	5160001,5	3151675,25	3247258,5	1374888,625	1251543	1408781,75	1745205	1543416,25
42	1084	2503673	947629,063	6462069	3877413,25	4013031	1539504,625	1533762,125	1731990,375	1711755	1701047
43	818	972106,75	518547	1391697,25	1048528,063	1117500,875	559408,125	512909,531	649953,938	832475,688	709689,625
44	1032	2569906,5	1113012,375	7207890,5	4124955,75	3937315,75	1603233,125	1496507,75	1685610,375	1937540,375	1780176,5
45	835	1818700,625	732349,813	5124250,5	3195798,25	3229870,75	1330251	1288783	1461756,875	1579642,625	1447986,75

		1	2	3	4	5	6	7	8	9	10
No	Lab.no	*C21tri*	*C22tri*	*C23tri*	*C24tri*	*C25tri*	*C24tet*	*C26tri1*	*C26tri2*	*C28tri1*	*C28tri2*
46	826	980477,813	394519,75	1360819,625	1058425,25	1170115,75	587832,688	529702,625	713396,25	900682,813	727672,813
47	1068	2682327	1013207,688	7097576,5	4282273	4166671,75	1569680,125	1607371,375	1815907,25	1923537,625	1952135,75
48	819	1048934,125	331878,094	1359772,75	989541,375	1195800,125	627076,688	503631,781	649759,5	884395,688	744983
49	816	1213777,75	261342,625	1802566,75	1137634,875	1340336,125	659134,063	567726,438	730990,75	936932,5	807555,25
50	3325	3176351,25	1218289,625	8159898,5	4991775	4984336,5	2061897,5	1914641,125	2150666,75	2230940,25	2134316,25
51	3431	3259251,75	1503098,625	9451683	4980463	4953503,5	2271976,25	1938658,75	2177018,5	2618211,25	2446936,75
52	827	4256683	1590813	10692221	6360907,5	6080726,5	2419583,25	2146658,25	2605189	2855019,5	2766184,5
53	824	3631161	1432843,25	9605552	6197213,5	6142981,5	2392256,5	2199640,75	2684025,5	2709850,5	2887455,25
54	833	4419738	1704547,625	11266961	6733892	6792378,5	2717282,5	2601926,75	2965907,25	3463902,75	3427291,5
55	828	1443558,375	663561	2263432,25	1545307,625	1791688,875	895087,125	854336,375	1051488,25	1436417,25	1138668,25
56	820	5665355,5	2109112	14342668	8838619	8513997	3311117,5	3206801	3678710,5	4134268	4041728,25
57	3327	5017965,5	2238826,75	15125597	8169509,5	8321025	3426255,25	3201160	3617074,75	4383277,5	4061924,75
58	811	5433619	1993542,875	13548024	8332768,5	8037986,5	3235800	3096433,75	3517244,75	4176709	4155292
59	812	1687497,375	648923,313	2563472,25	2218747,25	2468522	1347032,625	1234466,875	1576312,875	2183791,5	1643360,625
60	834	5033748	1867211,125	13386819	8254630,5	7871492,5	4648930,5	2815285,5	3486495,75	3906853,5	4057513,25
61	814	2045744,5	633596,75	3453767,25	2582311,75	2711979,5	1326929,25	1291266,375	1683159,25	2220864,25	1864019
62	815	2203857,25	435659,344	3587434,75	2401832,25	2952098,5	1543598	1344137,875	1814156,25	2569118	2253325,75
63	832	5330521	1881343,875	15202203	8869891	8456228	8508701	2900074,25	3723550,5	4679515	4044706,75
64	495	891519,063	905985,063	3667790,25	1309190,75	1410674	1747939,625	590715	693846,375	862032,813	598027,438
65	499	1,96E+06	0	6,31E+06	0	0	0	0	0	0	0
66	500	1038675,063	1287847,75	4719404,5	1522444,25	1800559,375	1633520,375	688162,125	778009,313	1004101,313	681157,813
67	503	1,06E+06	0	4,72E+06	0	0	0	0	0	0	0
68	511	2,12E+06	0	9,07E+06	0	0	0	0	0	0	0
69	512	1823844,125	2122951	8469651	2458864	2924662,25	2319512	1232976,625	1290140,75	1588766,25	1192806,625
70	513	1,80E+06	0	6,67E+06	0	0	0	0	0	0	0
71	529	1,18E+06	0	5,27E+06	0	0	0	0	0	0	0
72	540	0	0	4,08E+06	0	0	0	0	0	0	0
73	548	3,28E+05	0	1,71E+06	0	0	0	0	0	0	0
74	557	1,95E+06	0	9,56E+06	0	0	0	0	0	0	0
75	564	1180889,875	1205935,25	4444952	1576732,25	1657447,375	1834914,5	681867,25	805860,625	879764,875	644020,125
76	566	0	0	7,04E+06	0	0	0	0	0	0	0
77	574	6,34E+05	0	2,82E+06	0	0	0	0	0	0	0
78	575	2,34E+06	0	1,22E+07	0	0	0	0	0	0	0
79	579	0	0	3,10E+06	0	0	0	0	0	0	0
80	582	1174736,5	1607747,25	5940493	1544385,125	1823383,375	1678091,875	676095,813	793343,375	1043979,563	672307,563
81	587	740057,438	706371,438	2544472,5	992922,688	990871,375	1363802,5	451059,75	519346,844	638673,063	445118,375
82	589	0	0	1,78E+06	0	0	0	0	0	0	0
83	596	1,14E+06	0	5,86E+06	0	0	0	0	0	0	0
84	611	941273,438	914156,063	3619945,75	1299075,625	1323181,5	1731145,5	557144,063	638606,563	782485	536293,813
85	669	3752776	1981995,625	9945819	5534743	5608323	2874123,75	1944679,125	2396423,5	2627139,5	2444116,75
86	670	4,15E+06	0	1,12E+07	0	0	0	0	0	0	0
87	671	2059785,25	1154877,625	5309684,5	2921167	2874347,5	1546540,125	1005149,063	1203441,75	1233670,625	1158812,5
88	672	2,12E+06	0	6,02E+06	0	0	0	0	0	0	0
89	673	2517301,75	1315295,375	6549509	3736478,5	3706191,25	1846052,875	1359863,25	1513741,375	1717132,75	1593021,875
90	674	2,17E+06	0	6,58E+06	0	0	0	0	0	0	0

		1	2	3	4	5	6	7	8	9	10
No	Lab.no	C21tri	C22tri	C23tri	C24tri	C25tri	C24tet	C26tri1	C26tri2	C28tri1	C28tri2
91	675	643222,25	319543,125	1774018,75	1004499,563	1057201,25	547912,813	368072,656	453035,281	510859,938	467313,313
92	676	1957877,125	1022720,125	5484123	3087550,5	3324616	1825528,75	1180951,125	1439648,25	1626212,625	1532554,375
93	678	1302958,375	742472,688	3683370,25	1999770,75	2185422,25	1162351	814232,813	908709,688	977032,125	966748,688
94	679	561461,563	331463,906	1507686,625	854402,938	885833,25	494722,313	312235,656	377631,688	406390,156	381707,688
95	680	511816,438	290143,844	1337114	762651,938	788421,25	434755,063	301315,594	336768,594	384430,219	340833,406
96	681	302075,531	181080,5	844915	479116,594	499751,531	266742,781	189890,344	210471,531	253938,609	237718,234
97	682	1845296	1094506,5	5111537,5	2973216	3055927,75	1727301,25	1104702	1371285,625	1542686,625	1432850,625
98	683	847257,688	473894,375	2315509	1312594,5	1395428,75	757955,313	495567,438	611849,188	642671,563	635679,688
99	684	868705,875	511394,688	2463016,25	1373564,875	1488392,5	806507,313	531909,938	654417,563	761332,25	711662,75
100	685	443393,25	281231,688	1084531,125	577548,375	553889,938	279000,844	203481,25	225451,766	232885,703	207162,094
101	686	1108404,75	638569,063	3175095,75	1824907,75	1965726,375	1063436,125	700248,75	861180,625	1002293,063	868262,188
102	687	1572292,75	902935,938	4342370	2516650,5	2648196,25	1354489,75	1008427,25	1130633,375	1296301	1197639,25
103	688	338487,281	206607,719	897034,438	501039,563	514272,531	289442,656	182397,156	222772,219	252246,313	200321,906
104	689	1373632	767152,25	3986701	2354041,5	2459039,75	1294507,5	936013,813	1050728,25	1141171,5	989502,5
105	711	1,89E+06	0	5,90E+06	0	0	0	0	0	0	0
106	714	1,70E+06	0	5,54E+06	0	0	0	0	0	0	0
107	717	1,97E+06	0	6,10E+06	0	0	0	0	0	0	0
108	721	3,68E+06	0	1,35E+07	0	0	0	0	0	0	0
109	722	3,06E+06	0	1,09E+07	0	0	0	0	0	0	0
110	725	2,85E+06	0	9,69E+06	0	0	0	0	0	0	0
111	726	730011,125	384596,219	2147972,75	1164974,875	1239900,25	715133,313	443832,469	534502,625	634896,25	550998,813
112	727	233333,359	124169,094	641126,813	341232,156	358284,781	214412,078	128524,977	154646,578	153530,078	126537,414
113	728	573525,313	375033,125	1704218,25	922602,313	986773,313	558974,375	359106,313	433250,531	521774,25	439155,438
114	729	1134200,875	743006,75	3558836,5	1944226	2152021,75	1180308,5	771206,625	938420,375	1118366,875	948469,188
115	730	313018,094	174734,531	836970,688	488020,188	504180,031	253798,328	187423,844	207806,141	224232,625	214518,313
116	731	354705,969	198550,719	942400,5	535401,438	554231,125	290551,625	208835,344	231649,453	243431,547	214232,344
117	733	6,77E+06	0	1,88E+07	0	0	0	0	0	0	0
118	734	741842,313	429243	2029854,125	1186563,875	1247046,125	643903,188	439740,563	533029	624153,813	546085,063
119	735	248369,641	136892,531	641420,063	367320,031	378803,438	194870,125	142535,844	157075,172	181774,469	157692,875
120	736	693098,438	400615,375	1943817,5	1135773,75	1212475,75	624308,25	429599,563	518375,844	612641,563	548852,25
121	737	737568,125	488746,25	2146318,5	1180542,5	1274729,375	667162,813	502080,594	555625,938	678463,313	510406,938
122	738	266887	179446,594	764997,313	420958,313	447581,438	244081,094	170712,406	187746,281	210642,781	184916,469
123	739	241797,484	147819,703	669085,375	379612,938	399035,594	219467,594	140540,109	173650,828	182924,984	165999,906
124	740	103503,875	57826,48	257052,25	142436,531	148541,031	82320,883	51267,152	61603,98	60985,586	50443,234
125	741	420089,219	283454,344	1287975,75	699022,438	739765,438	409638,313	283307,344	310844,406	380898,344	325837,094
126	742	473712,25	268785,625	1230275,125	675450,625	684268,813	363885,781	238464,594	290563,938	311132,438	275784
127	743	755486,313	436528,656	2012236,375	1146461,875	1191493,125	618260,063	446415,438	498464,563	572567,625	493921,25
128	744	350071,188	230781,344	1020787,063	567122,438	595336,563	323431,906	216385,75	258455,125	287256,969	260263,281
129	745	189906,953	103534,719	488684,063	281689,375	287966,625	156296,969	111753,781	122204,008	133592,578	122523,695
130	746	5,63E+06	0	1,53E+07	0	0	0	0	0	0	0
131	747	526873,875	328495,938	1448395,625	813939,625	839084	448612,844	315797,313	350729,938	405217,094	361158,313
132	748	279871,438	149963,5	724477,875	419566,781	438920,063	220754,828	167379,672	186666,156	212883,219	172076,141
133	749	303406,719	176617,656	821205	459460,938	474372,625	234650,906	178892,734	199121,719	210598,344	200104,766
134	750	468662,25	272958,656	1267729,875	725853,5	758887,188	424672,063	293502,406	323508,375	387865,688	340316,094
135	751	492003,469	287067,656	1302149,125	740984	763389,375	386290,531	260650,328	318988,125	325558,031	294589,156

		1	2	3	4	5	6	7	8	9	10
No	Lab.no	*C21tri*	*C22tri*	*C23tri*	*C24tri*	*C25tri*	*C24tet*	*C26tri1*	*C26tri2*	*C28tri1*	*C28tri2*
136	752	754764,125	463939,781	2117328,75	1179224,75	1234998,75	691668,813	474775,781	524921,563	557304,875	482670,469
137	753	439666,375	242188,297	1098064,75	605877,625	618757,313	335397,063	231173,391	254482,141	262399,656	232590,672
138	754	536023,688	345767,938	1539891	809071	849084,375	477061,625	300969,25	368969,906	385525,188	345331
139	1329	4647663	2499734	13267570	7533292	7462014	3383271	2803772	3126295,5	3152258,5	2965714
140	1386	1145078,875	1512121,25	5110730	1557459,375	1890807,5	1781469,375	704211,625	801175,625	1111774	725158,75
141	1387	7,53E+06	0	2,48E+07	0	0	0	0	0	0	0
142	1388	1,88E+06	0	6,86E+06	0	0	0	0	0	0	0
143	1389	0	0	9,32E+04	0	0	0	0	0	0	0
144	1390	9,96E+05	0	2,57E+06	0	0	0	0	0	0	0
145	1464	199379,656	232020,469	886879,438	288836,656	336687,906	280021,375	126759,938	144541,922	177028,063	133333,234
146	1465	135638,328	138163,266	547076,375	181691,625	212296,203	175753,234	91755,094	92277,484	103023,102	77722,117
147	1466	550265,813	573641,375	2185035,5	780004,25	880925,438	764060,688	355432,375	392620,313	439981,156	328818,125
148	1467	630981,25	794912	2862480,75	878478,125	1020615,5	827390	389095,406	450719,031	560871,313	413434,188
149	1468	2943914,25	3395107,75	13326534	4278206	5145261	5041979,5	2060721,125	2392848,25	3115821	2190886,75
150	1469	2,00E+05	0	1,01E+06	0	0	0	0	0	0	0
151	1470	1,55E+06	0	7,32E+06	0	0	0	0	0	0	0
152	1471	1,01E+06	0	4,61E+06	0	0	0	0	0	0	0
153	1472	861560,563	891844	3439985,75	1193333,25	1334005,5	1103438,875	595878,25	596267,875	708726,875	530368
154	1473	4,41E+05	0	2,19E+06	0	0	0	0	0	0	0
155	2125	1429825,125	1439945,625	5970701,5	1903448	2126995	2043355,625	837271,313	971999,375	1070485,375	826478,313
156	2453	796794,125	392900,313	1456098,375	885026,438	784508,25	4829938,5	314158,531	388387,844	1568878,25	506298,938
157	3576	322818	347801,938	1315636,875	481313,188	489911	554969	195718,047	231299,688	258296,781	192785,469
158	3577	169874	211834,031	752924,188	219108,422	255837,016	209761,641	106583,938	110934,172	134834,688	99234,133
159	3578	214697,797	276048,594	940086,875	285340,844	340066,875	281088,844	131511,531	151062,125	180118,281	126585,375
160	3579	424617,5	454909	1744958,25	632444,313	727749,813	594466,188	284328,531	334009,438	378840,469	268905,563
161	3580	54113,113	46625,578	140982,672	62826,805	65654,414	100016,898	28708,373	37533,355	30126,105	26892,93
162	3581	1213887,5	1110368,25	4864285,5	1818639,5	2001290,125	2563571	857512,813	1023397	1305974	891127,938
163	3582	134847,313	148559,234	539381,813	169995,516	193530,766	116181,086	70374,594	88156,633	99143,25	82484,68
164	3583	228480,453	243251,5	932264,313	278415,313	306361,5	172626,625	125462,172	134247,906	153419,078	129080,445
165	3588	215470,094	227057,75	860998,938	303517,563	336916,156	311713,531	160267,438	159942,828	183561,156	130276,852
166	3589	134058,797	148254,047	562600,375	210246,031	245515,219	198782,594	96950,023	110096,859	126186,156	88139,359
167	3590	82930,328	96736,305	368949,219	116863,875	137841,484	112561,547	54796,605	64654,645	72619,477	54188,246
168	3591	49602,523	60055,332	220587,453	70996,375	79049,469	77081,156	31900,432	35713,406	41243,25	33037,441
169	3592	144952,219	172068,547	560836,563	203129,063	219192,828	229802,781	85704,086	100409,43	114491,953	89235,734
170	3593	65547,047	68948,617	257527,766	84584,602	94661,734	100021,617	38163,445	46314,633	46419,133	32532,074
171	3594	73720,852	78472,602	286607,219	101824,602	108308,906	98468,383	46212,77	47304,703	56526,887	44022
172	3595	120735,852	112079,836	410312,656	157705,938	160690,5	177334,984	65144,781	75043,523	74240,648	60567,168
173	3596	62337,582	59094,305	221841,391	82324,156	86076,883	98743,055	37007,73	45426,98	43261,207	37452,129
174	3597	80406,844	89720,172	310142,031	109614,836	117303,164	131562,547	47111,457	55760,457	63713,559	50745,469
175	3598	71000,469	64638,219	197867,828	82379,914	88063,789	119882,742	33246,715	49717,93	46992,508	36234,727
176	3599	111613,297	107089,742	360432,063	151674,844	153121,391	184854,359	66270,43	82045,039	90380,961	76628,18

		11	12	13	14	15	16	17	18	19	20	21	22
No	**Lab.no**	***C29tri1***	***C29tri2***	***Ts***	***Tm***	***C30tri1***	***C30tri2***	***C28H***	***C29H***	***C29t***	***C30Y***	***C30H***	***MOR***
1	1055	25645,006	27792,709	29820,324	66846,359	22240,723	16509,51	38740,105	213246,891	1767,808	0	0	23001,424
2	1040	47233,164	53295,449	52032,352	124501,398	37709,148	33191,691	75472,227	372053,813	46998,016	0	0	41229,367
3	1033	80974,563	92671,609	87105,172	208925,5	71856,828	47507,766	140374,953	727535,25	102306,922	0	0	62887,539
4	1035	79057,867	85767,031	70184,672	199116,766	74017,273	51475,918	143278	690556,688	2924,83	0	0	72868,469
5	1039	103848,195	110531,813	84038,07	261591,969	98435,664	59411,969	174514,422	912603,5	91451	0	0	108538,063
6	1073	201434,594	220012,531	223304,516	536388,375	193445,063	124615,063	270683,188	1882623	171508,313	0	0	192284,047
7	1065	231015,547	260410,094	240262,672	557711,625	193518,594	135119,016	370076,031	1917829	23302,463	0	0	211344,859
8	1056	201369,141	223778,938	227342,938	482457,844	164349,266	116381,82	348558,031	1763912,875	103297,211	0	0	215785,016
9	1053	253052,563	274269,625	317071,188	585873,625	240927,563	129271,961	264179,375	2103911	19858,766	0	0	222410,844
10	1037	275093,75	292925,906	338829,5	723960,813	279212,063	161797,438	349264,656	2459892,75	349326,906	0	0	260938,922
11	1114	255872,75	301491,688	252570,578	633843,438	220204,656	139175,828	471978,563	2294549,25	53276,734	0	0	261390,172
12	1044	279438,563	300255,688	337144,25	731145,813	273043,625	167347	463972,375	2550460,5	202901,406	0	0	302817
13	1054	257909,141	287171,375	374741,188	715831,438	251696,297	150532,938	386243,063	2435154	68669,148	0	0	305994,25
14	1076	253530,625	273845,75	377851,781	681259,625	224982,609	152674,031	431845,656	2512219	15749,369	0	0	320406,063
15	1045	326272,5	366237,031	410887,313	912598,563	309765	203719,375	592240	3150851,5	36054,824	0	0	378986,625
16	1075	544600,563	574068,438	424258,281	748866,563	448355	192098,094	382101,438	3390462,75	193558,313	0	0	389462,938
17	1083	353250,281	375708,781	512051,594	885814,5	327961	172811,391	450729,844	3165503	14184,765	0	0	407608,875
18	839	395707,938	417615,188	537243,875	949648	381776,813	209724,016	520594,625	3676590,75	194666	0	0	463532,969
19	1036	443006,5	486173,594	570650,625	1024616,25	429955,188	210257,047	454581,719	4109599,25	791281	0	0	503155,313
20	813	380431,5	415320,063	654225,188	382978,188	410639,156	68578,602	322298,656	2090228,5	2090228,5	0	0	589044,875
21	1043	605476	620730,75	704263,688	1588787,25	591254	369433,781	978327,5	5556947	214873,875	0	0	669366,063
22	1069	575439,563	626038,625	682673,938	1496535,875	516652,969	337744,375	947726,25	5454722,5	131679,875	0	0	747660,188
23	831	834598,375	893472,938	1036122,5	1809181,125	762772,125	369581,625	833199,875	6808143,5	1334807	0	0	788239,313
24	1052	715817,313	777469,625	849072,25	1615503	668371,813	355871,875	927560,063	6278101,5	104414,883	0	0	835223,438
25	732	835437,75	1087304,125	1045435,625	2375285,25	956654	758388,25	761027,063	9720659	130200,813	0	0	975881,375
26	1074	769498,438	831528,25	1040463,688	2035885,625	711963,063	428746,344	1074470,375	7598529	50173,254	0	0	1007526,25
27	825	978898,625	997588,688	1220581,75	2002367,75	940776,125	475820	1072007,5	8249035	1339036,75	0	0	1031922,688
28	836	986322,188	1102534,25	1396610,375	2282891	987797,188	474863,031	1162773,125	9143256	925382,25	0	0	1135260,125
29	1112	1418338,25	1558133,375	1445346,25	3475525,5	1328195,625	915700	2379590,5	12719611	1008729,375	0	0	1438567,125
30	837	1468887,875	1797892,5	3873585,75	6475043	1579589,625	946753,563	1672333,25	16340174	2935992,25	0	0	1448202,75
31	1739	1402819,125	1497781,625	1557743,25	3718181	1309397	900459,938	2496147,5	12320111	20849,945	0	0	1448394,125
32	817	1609856,5	1751607	2074313,625	3423744	1508724,25	699176,875	1753265,75	13198318	1548819,375	0	0	1632503,25
33	1078	1598677,375	1742822,5	1685456,125	4272471	1570109,125	1045718,25	3017499,25	14207180	484756,531	0	0	1689606,5
34	840	1616464,375	1813546,25	2548201,25	4088683,25	1634937,25	855118,188	1842628	16223635	1994145,25	0	0	1840696,625
35	3477	2050363,75	2084014,625	2390630	4137542	1728284,25	947949,063	2596614,25	16762973	2794371,75	0	0	1902926,625
36	829	1859294,375	1963035,125	2401279,5	4382469	1772273,75	915250,563	2016283,25	16427631	2058737,125	0	0	1948792
37	822	1864201	2034683,875	2439695,25	4186127,25	1776325,25	894052,938	2098355,5	16702527	2604283,25	0	0	1955488,125
38	821	1197951,875	1421689,125	2053912,375	1167307,875	1082685	1082685	1101031,25	6753409	3064945	0	0	2022892,375
39	823	1260226,125	1325499,875	2253371,25	1141211,875	1435765,125	239640,547	911561,813	3990142,25	2533191,75	0	0	2147802
40	838	2418574,25	2555888,25	2655746,5	4417638,5	1978883,375	1052878,75	2414818,75	19014632	3643561,5	0	0	2310384,5
41	830	2027727,25	2283444,25	2852776,75	5233326	1773216,875	1135944,125	2310527,75	19546078	2794411,75	0	0	2348888,5
42	1084	2160963,5	2339723,75	2971132,75	4681017,5	2182176,75	1033223,75	2075161	19020068	3629748,25	0	0	2354490
43	818	1407782	1556023,25	2573201,5	1353343,75	1723959,625	264597,969	1163702,625	5406796,5	3030492,25	0	0	2365842,5
44	1032	2259239,75	2535678,75	2636490,25	5843018	2104440,5	1385890,75	4073731,5	21978716	3132648,5	0	0	2437159,75
45	835	2089249,875	2234488,25	2863145,75	5137564,5	2160695,75	1087408,5	2334543	19736904	2259186,75	0	0	2533346,5

		11	12	13	14	15	16	17	18	19	20	21	22
No	**Lab.no**	***C29tri1***	***C29tri2***	***Ts***	***Tm***	***C30tri1***	***C30tri2***	***C28H***	***C29H***	***C29t***	***C30Y***	***C30H***	***MOR***
46	826	1502371,5	1506219,125	2852648,75	1464655,5	1574728,125	234348,297	1415855,125	5774668,5	3135256,75	0	0	2566274
47	1068	2559155	2641468,75	3009168	5037245	2084253	1120261	2871375,5	22626618	3858852,5	0	0	2651499
48	819	1545025,375	1784689,625	2784405,5	1588578	1854614	289907,281	1309019,625	6262933	3701445,5	0	0	2838794,75
49	816	1884087	1712565,625	3204769	1784931,375	1495479	257023,438	1697661,75	6587351	4179932	0	0	2930147,75
50	3325	2877919	2898682	3693043	6410294,5	2624909,25	1338493,5	2771967	24649874	24649874	0	0	3018415
51	3431	3065784	3466309,75	3457052	8210223	3191699,5	2074750,25	5649222,5	30867078	2862261,25	0	0	3271450
52	827	3410599	3658661,25	4319713	7550246	3320679,25	1518869	3983331,75	29851144	3825663,75	0	0	3622197,5
53	824	3692365,75	3986717,5	4828008,5	7927766	3681490	1734060	3802136,75	32432732	6520426,5	0	0	4233938
54	833	4093355,25	4396904	5556217	9037066	3495772,75	1861758	4668743,5	37327928	6120952,5	0	0	4521938,5
55	828	2785326	2819031,5	4082689,75	2777580,75	3097957,25	500750,656	2070090,875	16443114	7070983	0	0	4637440
56	820	5236528,5	5551460	6742325,5	10745230	4393932	2360130,5	5752709,5	45076168	8064233	0	0	5414882
57	3327	5067857	5555777,5	5095763,5	12829021	5052828	3078994,75	8558388	46995472	4913637	0	0	5495049,5
58	811	4982778	5262803	6510539,5	10773921	4305098,5	2205886,75	5947832,5	44970448	7214492,5	0	0	5736078
59	812	3873260,5	3823482,25	6551703	3745416,25	3638632,75	664961,563	2758153	20768782	8729670	0	0	6364590
60	834	4094065,5	4971584,5	7304352,5	24380972	5308517,5	2847788,25	5744557	51147036	7269816	0	0	6373281
61	814	4230231,5	3848225,5	7226173,5	4245257	3776228,75	3776228,75	3150602,75	25058964	10793118	0	0	6920299
62	815	3796074,25	4092840,25	7891597	4242326	4363079,5	709965,813	3338989,5	25554652	12154763	0	0	7995627,5
63	832	4492730	5563681	8878576	41219332	4946482,5	3682178,75	5704087,5	58435076	5877089,5	0	0	9415310
64	495	724138,938	1150629,75	3025908	2786392	1054529,375	769633,75	273330,188	13371431	51072,738	243798,625	11373378	1074186,125
65	499	0	0	5,78E+06	2,51E+06	0	0	0	0	0	0	9,61E+06	0
66	500	834115,25	1455615,75	2359792,5	4385527,5	1160215,375	1290593,375	611576,313	18299520	23979,004	18299520	16087451	1180541,5
67	503	0	0	1,94E+06	4,28E+06	0	0	0	0	0	0	1,34E+07	0
68	511	0	0	4,09E+06	7,29E+06	0	0	0	0	0	0	2,11E+07	0
69	512	1444840,5	2171803,75	3307482,25	7263912,5	1831558,25	2163087,75	388406,656	31202370	14317,407	562714,875	27525316	2327416,75
70	513	0	0	5,09E+06	5,31E+06	0	0	0	0	0	0	0	0
71	529	0	0	2,47E+06	3,82E+06	0	0	0	0	0	0	0	0
72	540	0	0	2,48E+06	5,10E+06	0	0	0	0	0	0	1,86E+07	0
73	548	0	0	1,12E+06	1,47E+06	0	0	0	0	0	0	0	0
74	557	0	0	4,17E+06	1,09E+07	0	0	0	0	0	0	2,83E+07	0
75	564	706858,75	1328340,625	2806068	2772392,75	1094885	752847,375	166486,75	12766920	68763,281	209991,5	10423853	887355,25
76	566	0	0	2,85E+06	9,18E+06	0	0	0	0	0	0	2,23E+07	0
77	574	0	0	1,10E+06	3,19E+06	0	0	0	0	0	0	1,10E+07	0
78	575	0	0	4,07E+06	9,87E+06	0	0	0	0	0	0	2,72E+07	0
79	579	0	0	1,54E+06	3,86E+06	0	0	0	0	0	0	1,29E+07	0
80	582	848317,313	1384861,5	2374536,25	4961181	1208522,875	1394826,875	202426,438	19651074	26578,309	296315,531	17498298	1531908,125
81	587	449295,375	892296,938	2463917,25	1486191,25	688514,375	421838,625	157584,406	8348720,5	2081756	363655,094	6412452	476488,438
82	589	0	0	1,05E+06	1,17E+06	0	0	0	0	0	0	4,82E+06	0
83	596	0	0	2,22E+06	6,10E+06	0	0	0	0	0	0	2,15E+07	0
84	611	621087,625	1039493	2824896	2586770	922281,125	727289,438	497212,906	12229748	1325110,75	252770,172	10488999	936556,375
85	669	3274819,25	4229222	3793384,25	9193063	3550751,5	2891072,75	2958336,5	36669688	160499,359	1103283,625	40230796	3686515,5
86	670	0	0	3,12E+06	7,23E+06	0	0	0	0	0	0	2,56E+07	0
87	671	1494283,75	1992204,125	1870607,25	4263226	1663143,125	1403653,5	1144275,5	16613080	12412,401	478692,531	17090954	1619246
88	672	0	0	1,95E+06	4,29E+06	0	0	0	0	0	0	1,58E+07	0
89	673	2040741,875	2529277	2193131,75	5297209	2178366	1615618	1683808	20761724	33170,891	580431,313	22484820	2055316,25
90	674	0	0	2,36E+06	5,57E+06	0	0	0	0	0	0	2,14E+07	0

		11	12	13	14	15	16	17	18	19	20	21	22
No	Lab.no	*C29tri1*	*C29tri2*	*Ts*	*Tm*	*C30tri1*	*C30tri2*	*C28H*	*C29H*	*C29t*	*C30Y*	*C30H*	*MOR*
91	675	632037,938	731289,875	800621,063	1757785,75	587747	521598,375	572963,25	7022942	527863	178012,047	7456893	707955,75
92	676	1930094,375	2414200,75	2399830,75	5497710	2011837,875	1715073,5	1468168,75	21235072	483451,688	533237,938	22694654	2130253,25
93	678	1269539,125	1650537,5	1645566,875	3648544,5	1291522,375	1189749,5	1124054,75	14453492	467499,906	381233,188	14865096	1374459,5
94	679	496301,781	659305,688	589701,75	1473530,5	507950,844	475141,938	387981,125	5916985	340612,25	150818,75	5845442,5	561073,25
95	680	432528,531	592329,313	564623,438	1302181,5	473756,688	421877,625	311180,938	5323941	296403,719	141333,406	5222666	490203,688
96	681	294170,719	407305,125	377147,688	878003,5	328144,719	273657,219	224031,125	3623888	268275,719	98160,273	3687759,25	348732,063
97	682	1797406,75	2222710,25	2334816	5290449	1874476,5	1638176,625	1449589,125	21088906	711794,875	447388,281	20837812	1544683
98	683	815921,438	1056414	1061026,125	2313213,5	935201,875	745425,313	677920	9110047	427387,938	235184,313	9713731	912761,25
99	684	865002,5	1129032	1147686,875	2648316	930750,688	849485,688	688034,438	10697200	760061,125	249024,391	10987343	1043758,125
100	685	253174,125	327740,688	327176,031	760614,063	255485,813	227192,188	197879,172	2816963,5	183807,109	68920,648	2818211,25	254170,766
101	686	1211266,25	1498066,375	1502197,625	3364266,5	1194423,875	1025973,938	1045896,938	13049452	357825,656	366804,656	14532078	1332271,625
102	687	1592536	2010849,625	1948778,5	4357073	1700425	1309238,875	1366485,375	17268724	1149497,5	534324,938	18614350	1744979
103	688	287813,906	458903,188	376191,563	853248,688	315720,813	272691,688	255804,109	3243320,75	13084,891	86882,547	3485602,75	324541,531
104	689	1440022,75	1772768,5	1795261,125	4089496	1491708	1320516	1328973,875	15480448	1438577,5	487555,344	16724027	1538503,625
105	711	0	0	3,65E+06	2,35E+06	0	0	0	0	0	0	8,37E+06	0
106	714	0	0	3,74E+06	2,84E+06	0	0	0	0	0	0	1,03E+07	0
107	717	0	0	4,01E+06	2,38E+06	0	0	0	0	0	0	8,88E+06	0
108	721	0	0	5,88E+06	6,87E+06	0	0	0	0	0	0	1,82E+07	0
109	722	0	0	5,89E+06	5,59E+06	0	0	0	0	0	0	1,69E+07	0
110	725	0	0	3,60E+06	3,73E+06	0	0	0	0	0	0	1,41E+07	0
111	726	727817,625	867470,75	969175,125	2315437,25	692473,188	733283,375	759158,438	9055338	830015,813	227156,469	9533252	903383,25
112	727	181609,656	261255,172	256843,969	655118,75	220151,094	213435,297	136526,563	2488241	29785,115	52484,926	2415725,75	224578,438
113	728	592720,75	812645,375	803849,188	1987186,375	671103,25	633717,5	527826,313	7952943,5	352960,156	182647,406	8423846	760694,625
114	729	1276835,25	1671605,875	1760788,125	4293166	1441896,75	1459632,875	1091000,625	16749409	1179858,75	356854,188	17814462	1617451,5
115	730	293316,625	367697,469	356303,063	779792,125	309830,813	238862,891	244712,25	3026918,75	350197,813	101801,438	3394865,5	305134,281
116	731	315204,25	405928,219	398672,094	879654,25	321594,938	274508,688	274090,219	3380728	35630,73	94212,594	3719258,25	343871,281
117	733	0	0	5,30E+06	1,15E+07	0	0	0	0	0	0	4,25E+07	0
118	734	738640,063	920373,75	870625,188	1924178,875	796870,188	591135,125	600952,063	7550932	351305,125	216314,563	8439053	780613,188
119	735	207659,531	277443,219	273654,063	594838,75	259497,781	175161,906	188266,469	2323382,75	12219,471	73186,758	2561870,75	235643,328
120	736	705764	916739,5	870504,75	2003492,125	780488,063	591197,313	667288,5	7835316	801677,375	223666,734	8988269	846568,563
121	737	755118,25	1021934,313	1024713,188	2565885	880237	793854,563	556212	9876615	586293,5	237719,703	10555297	965668,563
122	738	257939,547	367266,938	357241,906	850501,25	335145,719	279112,781	240762,688	3430633,5	254658,969	86890,102	3655123,5	330690,125
123	739	222884,016	298787,063	298185,406	678877,188	248438,141	217565,031	222103,188	2645829	181244,469	82139,117	2929075,25	263606
124	740	72077,914	108252,234	106373,43	247360,234	100327,883	64149,977	73588,555	912976,5	2515,057	24283,936	1022160,563	96024,219
125	741	439287,469	605775,938	597361,813	1413636,75	487965,563	466127,5	397462,406	5671358,5	153147,203	135211,484	5961957	534615,5
126	742	361378,406	482559,094	451001,125	1042124,375	386172,219	326088,969	272197,281	3908027,75	98714,313	106261,695	4123557,5	400475,906
127	743	679139,625	867265,563	896667,188	1977581,75	746673,625	602898,25	581849,063	7394128	76177,023	181684,938	8117454	768837,063
128	744	351933,094	456542	453312,625	1128488,375	429109,313	351796,875	294274,063	4266178	385274,656	109105,5	4590651	408783,5
129	745	158966,891	225583,266	213384,016	472458,438	191247,234	156551,469	134732,281	1943724,375	4760,736	54922,824	2036446	198385,031
130	746	0	0	4,88E+06	1,15E+07	0	0	0	0	0	0	3,98E+07	0
131	747	482853,281	633936,188	619278	1347357,25	521738,875	436353,938	437744,406	5177462,5	107448,633	152407,844	5702396	516349
132	748	252142,641	322882,625	310379,688	727194,75	292064,594	216026,422	205153,281	2709753	30688,697	86373,789	3098838,75	285269
133	749	269100,594	355182,188	323983,5	728392,25	279902,719	218088,438	222754,922	2747015,25	16053,185	79191,219	3096636,25	282110,844
134	750	433878,25	598073,125	576634	1334914,875	509198,188	416582,469	346565,063	5313803,5	34323,703	366406,094	5485243	516056,531
135	751	397607,219	523610,094	502291,938	1129348	433599,656	324994,25	380687,938	4249969	16917,924	126776,148	4775516,5	438100,469

		11	12	13	14	15	16	17	18	19	20	21	22
No	Lab.no	*C29tri1*	*C29tri2*	*Ts*	*Tm*	*C30tri1*	*C30tri2*	*C28H*	*C29H*	*C29t*	*C30Y*	*C30H*	*MOR*
91	675	632037,938	731289,875	800621,063	1757785,75	587747	521598,375	572963,25	7022942	527863	178012,047	7456893	707955,75
92	676	1930094,375	2414200,75	2399830,75	5497710	2011837,875	1715073,5	1468168,75	21235072	483451,688	533237,938	22694654	2130253,25
93	678	1269539,125	1650537,5	1645566,875	3648544,5	1291522,375	1189749,5	1124054,75	14453492	467499,906	381233,188	14865096	1374459,5
94	679	496301,781	659305,688	589701,75	1473530,5	507950,844	475141,938	387981,125	5916985	340612,25	150818,75	5845442,5	561073,25
95	680	432528,531	592329,313	564623,438	1302181,5	473756,688	421877,625	311180,938	5323941	296403,719	141333,406	5222666	490203,688
96	681	294170,719	407305,125	377147,688	878003,5	328144,719	273657,219	224031,125	3623888	268275,719	98160,273	3687759,25	348732,063
97	682	1797406,75	2222710,25	2334816	5290449	1874476,5	1638176,625	1449589,125	21088906	711794,875	447388,281	20837812	1544683
98	683	815921,438	1056414	1061026,125	2313213,5	935201,875	745425,313	677920	9110047	427387,938	235184,313	9713731	912761,25
99	684	865002,5	1129032	1147686,875	2648316	930750,688	849485,688	688034,438	10697200	760061,125	249024,391	10987343	1043758,125
100	685	253174,125	327740,688	327176,031	760614,063	255485,813	227192,188	197879,172	2816963,5	183807,109	68920,648	2818211,25	254170,766
101	686	1211266,25	1498066,375	1502197,625	3364266,5	1194423,875	1025973,938	1045896,938	13049452	357825,656	366804,656	14532078	1332271,625
102	687	1592536	2010849,625	1948778,5	4357073	1700425	1309238,875	1366485,375	17268724	1149497,5	534324,938	18614350	1744979
103	688	287813,906	458903,188	376191,563	853248,688	315720,813	272691,688	255804,109	3243320,75	13084,891	86882,547	3485602,75	324541,531
104	689	1440022,75	1772768,5	1795261,125	4089496	1491708	1320516	1328973,875	15480448	1438577,5	487555,344	16724027	1538503,625
105	711	0	0	3,65E+06	2,35E+06	0	0	0	0	0	0	8,37E+06	0
106	714	0	0	3,74E+06	2,84E+06	0	0	0	0	0	0	1,03E+07	0
107	717	0	0	4,01E+06	2,38E+06	0	0	0	0	0	0	8,88E+06	0
108	721	0	0	5,88E+06	6,87E+06	0	0	0	0	0	0	1,82E+07	0
109	722	0	0	5,89E+06	5,59E+06	0	0	0	0	0	0	1,69E+07	0
110	725	0	0	3,60E+06	3,73E+06	0	0	0	0	0	0	1,41E+07	0
111	726	727817,625	867470,75	969175,125	2315437,25	692473,188	733283,375	759158,438	9055338	830015,813	227156,469	9533252	903383,25
112	727	181609,656	261255,172	256843,969	655118,75	220151,094	213435,297	136526,563	2488241	29785,115	52484,926	2415725,75	224578,438
113	728	592720,75	812645,375	803849,188	1987186,375	671103,25	633717,5	527826,313	7952943,5	352960,156	182647,406	8423846	760694,625
114	729	1276835,25	1671605,875	1760788,125	4293166	1441896,75	1459632,875	1091000,625	16749409	1179858,75	356854,188	17814462	1617451,5
115	730	293316,625	367697,469	356303,063	779792,125	309830,813	238862,891	244712,25	3026918,75	350197,813	101801,438	3394865,5	305134,281
116	731	315204,25	405928,219	398672,094	879654,25	321594,938	274508,688	274090,219	3380728	35630,73	94212,594	3719258,25	343871,281
117	733	0	0	5,30E+06	1,15E+07	0	0	0	0	0	0	4,25E+07	0
118	734	738640,063	920373,75	870625,188	1924178,875	796870,188	591135,125	600952,063	7550932	351305,125	216314,563	8439053	780613,188
119	735	207659,531	277443,219	273654,063	594838,75	259497,781	175161,906	188266,469	2323382,75	12219,471	73186,758	2561870,75	235643,328
120	736	705764	916739,5	870504,75	2003492,125	780488,063	591197,313	667288,5	7835316	801677,375	223666,734	8988269	846568,563
121	737	755118,25	1021934,313	1024713,188	2565885	880237	793854,563	556212	9876615	586293,5	237719,703	10555297	965668,563
122	738	257939,547	367266,938	357241,906	850501,25	335145,719	279112,781	240762,688	3430633,5	254658,969	86890,102	3655123,5	330690,125
123	739	222884,016	298787,063	298185,406	678877,188	248438,141	217565,031	222103,188	2645829	181244,469	82139,117	2929075,25	263606
124	740	72077,914	108252,234	106373,43	247360,234	100327,883	64149,977	73588,555	912976,5	2515,057	24283,936	1022160,563	96024,219
125	741	439287,469	605775,938	597361,813	1413636,75	487965,563	466127,5	397462,406	5671358,5	153147,203	135211,484	5961957	534615,5
126	742	361378,406	482559,094	451001,125	1042124,375	386172,219	326088,969	272197,281	3908027,75	98714,313	106261,695	4123557,5	400475,906
127	743	679139,625	867265,563	896667,188	1977581,75	746673,625	602898,25	581849,063	7394128	76177,023	181684,938	8117454	768837,063
128	744	351933,094	456542	453312,625	1128488,375	429109,313	351796,875	294274,063	4266178	385274,656	109105,5	4590651	408783,5
129	745	158966,891	225583,266	213384,016	472458,438	191247,234	156551,469	134732,281	1943724,375	4760,736	54922,824	2036446	198385,031
130	746	0	0	4,88E+06	1,15E+07	0	0	0	0	0	0	3,98E+07	0
131	747	482853,281	633936,188	619278	1347357,25	521738,875	436353,938	437744,406	5177462,5	107448,633	152407,844	5702396	516349
132	748	252142,641	322882,625	310379,688	727194,75	292064,594	216026,422	205153,281	2709753	30688,697	86373,789	3098838,75	285269
133	749	269100,594	355182,188	323983,5	728392,25	279902,719	218088,438	222754,922	2747015,25	16053,185	79191,219	3096636,25	282110,844
134	750	433878,25	598073,125	576634	1334914,875	509198,188	416582,469	346565,063	5313803,5	34323,703	366406,094	5485243	516056,531
135	751	397607,219	523610,094	502291,938	1129348	433599,656	324994,25	380687,938	4249969	16917,924	126776,148	4775516,5	438100,469

		11	12	13	14	15	16	17	18	19	20	21	22
No	**Lab.no**	***C29tri1***	***C29tri2***	***Ts***	***Tm***	***C30tri1***	***C30tri2***	***C28H***	***C29H***	***C29t***	***C30Y***	***C30H***	***MOR***
136	752	679547,688	911150,313	928992,875	2194246,75	781193,688	656844,188	562963	8246279,5	241278,797	188485,531	8549446	786058,125
137	753	307923,313	427460,656	418912,438	943510,813	384413,063	304603	236839,219	3635099,25	8029,152	96655,172	3663226,75	344114,875
138	754	455761,031	621425,75	657561,25	1622294,75	566866,563	545781,75	406424,813	6242875,5	12811,864	154620,406	6515898	571766
139	1329	4109751,25	4575039	4576327,5	10565051	3925190	3079866	3045630,5	39520808	2899308,75	931576,375	43719208	4091111
140	1386	832542,375	1617088	2772268,25	5970648	1202619	1780861,625	100981,375	24602774	764,674	374954,344	21642320	1753204,25
141	1387	0	0	1,41E+07	2,15E+07	0	0	0	0	0	0	4,76E+07	0
142	1388	0	0	1,53E+06	4,39E+06	0	0	0	0	0	0	1,50E+07	0
143	1389	0	0	2,88E+04	9,46E+04	0	0	0	0	0	0	0	0
144	1390	0	0	5,09E+05	1,58E+06	0	0	0	0	0	0	0	0
145	1464	149794,859	267250,031	410350,719	851169,813	219436,828	241720,516	43102,129	3402682,5	845,57	37108,609	3057232,75	287045,25
146	1465	94122,891	151233,578	239933,75	463305,781	120877,68	122695,109	27142,52	1835365,75	3701,128	40940,828	1660444,875	151448,969
147	1466	372599,563	637952,938	972786,688	1818350,375	543842,938	489755,719	120490,359	7152751	4856,481	86047,297	6412433,5	472755,094
148	1467	470834,125	813239,875	1168334,75	2901255,5	700631,25	865413,625	48776,938	11018143	16799,766	93366,016	10078948	809213,125
149	1468	2609634,75	4635674,5	9096227	15661351	3981806	4583442,5	393938,781	65615796	12108,157	986285,063	58924312	5304610
150	1469	0	0	3,25E+05	1,02E+06	0	0	0	0	0	0	0	0
151	1470	0	0	2,75E+06	4,81E+06	0	0	0	0	0	0	1,81E+07	0
152	1471	0	0	1,32E+06	3,93E+06	0	0	0	0	0	0	0	0
153	1472	607213,75	1029228,75	1516406,25	2901264,75	840432,375	835723,188	171956,953	11567490	1515,946	79718,164	10852677	799623,625
154	1473	0	0	7,14E+05	2,20E+06	0	0	0	0	0	0	0	0
155	2125	936982,063	1461724,5	2785432,5	3892214	1202599,125	1064475,625	312847,906	17007636	15848,102	12247,758	14149403	1101216,5
156	2453	1497927,75	1242114,625	7169836	11035378	1419920,375	1672042,375	1514929,375	45434492	195986,094	1752043,375	70587760	7043319,5
157	3576	223464,063	336479,031	830269,938	782001,75	317210,313	231962,266	77320,266	3582862	3119,626	50485,078	3097106,75	225734
158	3577	96329,594	140945,703	286169,75	554917,188	157072,469	172268,563	18404,203	2359574,5	1445,631	18631,6	2066173,875	169243,547
159	3578	141440,641	216871,141	363905,875	744217,375	217078,391	233907,328	22786,924	3272246,75	23291,531	44614,43	2838603	239605,25
160	3579	317185,375	471360,469	757676,688	1367791,625	432725,563	374017,344	94822,406	5470595,5	8002,378	96626,82	5128708	349566,188
161	3580	28786,246	46294,969	175435,516	51897,293	42609,891	16939,047	3645,324	335515,563	122907,883	10368,977	239513,938	17663,555
162	3581	1029570	1572435,25	4545687,5	4114429	1390013,125	1057774	1005281,313	19880766	243648,406	312340,531	17175654	1315811,375
163	3582	110703,141	143602,609	160408,516	464202,125	144116,125	141251,969	22717,436	1666457,5	6972,224	38426,531	1552284,625	126945,188
164	3583	166464,781	252117,891	263233,75	770598,125	196711,766	237295,625	14362,055	2619691,25	39706,406	49106,289	2555011	171712,938
165	3588	157026,109	244638,688	388708,5	636485,875	217121,063	179453,984	41123,672	2615209,75	9975,854	43039,789	2214584,75	151469,875
166	3589	120823,672	176567,141	273717,563	524169	154642,609	147482,859	29221,359	1979749,5	19822,281	14811,696	1800573,25	156799,984
167	3590	63836,805	94113,641	153159,813	317748,531	89505,406	99325,234	7361,106	1269247,5	14242,863	11115,899	1159334,25	86964,672
168	3591	38011,582	57085,855	109612,453	152218,969	48777,027	45245,625	27450,117	634548,938	1620,057	7413,106	540743,313	44508,563
169	3592	95537,195	172628,219	347868,375	292509	132878,734	92471,43	74117,602	1369079,125	9691,719	23050,641	1144974,375	104602,664
170	3593	34099,641	52029,445	121917,742	142153,188	62692,441	40324,094	11793,558	658835	6716,219	9122,16	545762,375	34966,461
171	3594	43706,25	70102,102	143032,031	130008,219	71870,805	41799,527	21713,365	623132,688	3991,441	7322,443	491261,469	44501,59
172	3595	64126,344	97600,039	253706,219	186922,047	91036,094	52321,57	33829,477	889074,688	33313,176	17149,416	713508,813	63819,73
173	3596	34895,805	75734,07	142135,094	111639,641	57344,387	30170,775	20521,959	505075,281	21449,072	6756,945	411163,625	37691,621
174	3597	47906,832	63716,98	182944,469	186531,969	73749,219	55831,102	56103,781	844201,063	2932,789	10801	680652,75	61487,945
175	3598	40674,984	61705,203	208066,109	93184,953	62738,004	27344,818	3478,548	527753	10031,946	18354,561	388487,531	27580,01
176	3599	66772,68	94714,898	304297,625	180990,281	101528,352	49393,469	21027,377	909545,25	7378,483	14721,234	694628,25	48799,41

		23	24	25	26	27	28	29	30	31	32	33	34
No	**Lab.no**	***C31S***	***C31R***	***GAM***	***C32S***	***C32R***	***C33S***	***C33R***	***C34S***	***C34R***	***C35S***	***C35R***	***C21S***
1	1055	88564,328	73597,219	44903,344	60655,824	42672,426	49396,836	34245,254	32920,945	20188,328	44042,477	26357,754	12367,148
2	1040	180950	149946,125	83167,977	119297,266	87709,625	92757,609	71413,859	70118,063	40286,898	82898,859	64567,586	15167,83
3	1033	311091,563	272814,438	163003,891	204231,766	149886,703	169391,625	111173,375	101335,477	63127,898	136530,031	99196,078	40128,445
4	1035	314045,563	274969,625	138787,375	202836,891	151649,281	170748,594	107346,82	129548,414	68944,172	148497,156	107907,797	22054,93
5	1039	430207,094	357205,188	227417,531	290870,781	215667,25	242698,109	158784,313	209585,719	102321,414	222230	169143,891	46801,18
6	1073	771692,063	699374,688	462280,813	566094,25	404952,875	481798,063	300762,719	290834,125	182022,938	420986,781	320819,719	89999,797
7	1065	913817,938	811530,938	535369,563	625509,688	415550,719	496304,875	335579,969	321464	226259,984	410352,75	288961,813	87379,445
8	1056	814770,625	737928,938	474611,75	566070,188	405850,688	458827,438	290190,75	294835,406	201603,125	406211,344	268746,875	81392,102
9	1053	960194,438	820849,813	475502,563	703166,938	507949,938	590911,75	397196,25	405990,125	251454,484	512331,625	342869,219	104006,422
10	1037	1254208,375	1054624,25	684971,75	838723,25	623290	718840,625	469982,281	560628,5	295752,125	597394,5	509240,563	87267,148
11	1114	1176228	1009905,563	595600,938	781142,875	545756,625	624750,125	414914,563	380036,156	247632,172	540739,563	401547,156	99555,672
12	1044	1164799	977974,313	563835,313	858038	616588,063	714221,563	458965,219	457300,031	313788,719	581253,625	436934,656	84903,984
13	1054	1083540,25	950963,625	553182,438	789221,75	555199,063	671621,438	430422,438	414955,094	283441,75	488340,031	350359,813	87605,664
14	1076	1181385,5	1074441,5	651408,938	825827,375	603603,438	697603,563	452221,719	460583	288217,938	577934,313	408924,875	82017
15	1045	1534960,375	1373680,5	941324,125	1111835,125	752790,438	962581,25	601655,5	545487,125	408453,281	739736,875	502454,813	123315,539
16	1075	1761424,375	1365786,875	1365786,875	1425502,5	894443,313	1276243,75	683498,5	839866	442890,219	1108989,25	690614,5	208410,313
17	1083	1409562,625	1239491,5	737728,625	1015851,188	717467,625	849356,188	556923,813	538407,625	323661,313	646945,125	385549,031	150295,781
18	839	1945704,125	1640867,875	810280,125	1478915,25	1049373,875	1333031,75	836646,375	879518,25	586373,938	1125657,875	792370,375	205925,141
19	1036	1999631	1736452,625	992699,813	1509481	1092698,125	1425253,125	906444,313	970096,625	584929,125	1281906,75	1040412,313	184968,484
20	813	1410832,75	1113054,75	281434,031	1274728,25	888878,25	1144429	818101,625	798737,25	572488,625	583609,563	683384,125	224089,969
21	1043	2649901,75	2340195,5	1440559,25	1844771,875	1328642,5	1645964	1061488,375	985771,375	598148,25	1271468,625	931112,313	317401,156
22	1069	2726385,75	2445665,25	1496497	1942759,125	1381001,875	1591795,25	1064823,875	1012264,188	703148,938	1371953	836076,438	156297,375
23	831	4028278,75	3428697,25	1793392,75	3024274	2116959,5	2782468,25	1665119,375	1818866	1169526,875	2663861,75	1644103,875	957060,375
24	1052	3112641	2632485	1200378,25	2365153	1697529,75	2078484,75	1335331	1434384,375	953878,188	1834541,5	1353085,125	298655,906
25	732	5242044	4504994	1284211	3919670	2826414,25	3400922	2082575	2466628	1611234,875	3291355,75	2321726,75	669360
26	1074	3440807	2958926	1668495,875	2470585,5	1799448,375	2127661,5	1392906,5	1304276	796871,188	1553036,25	1220102,125	500664,125
27	825	4454684	3830942,25	2087853,5	3119332,75	2348153,5	2995197,5	1870758,5	1971712,125	1368353	2632550,25	1832738,75	1210537
28	836	5123742	4234934,5	1942304,625	3769877	2748039	3363751,5	2118268,75	2356716,5	1405244,125	3096304,5	2240081,75	703679,938
29	1112	6420102	5679087,5	3414774,75	4405254	3031679,5	3825828,75	2465087,75	2626267	1692474	3647916	2540476,25	1049709,75
30	837	4485648,5	3543505,5	2425608,25	2479503,5	1522449,25	1715658,625	979691,438	817786,188	522303,813	795562,75	459314,75	2717313
31	1739	5977773	5080104	3498384	4066688,75	2851368,25	3648521,5	2298752,5	2208735,75	1506630,375	3080962	2418924,75	12909,916
32	817	7453128,5	6389755,5	3318129,25	5583167	3970076	4814237	3019953,25	3259302	2277198,25	4489509	3276546	1391918,5
33	1078	7436804	6369767	3955766,25	4857794	3651263	4554028	2860562,25	2797914,75	1729976,75	3685696,25	2619826	3506573,75
34	840	8204676,5	7402721,5	4266718	6258602,5	4499537	5602247	3449820,5	3439444,25	2431458,25	4467770,5	3237102,5	1139831,375
35	3477	8496027	7155198	3291712,25	6419391,5	4181619	5282567	3373233,75	3617569	2455556	4729872,5	3791317,75	1172929,5
36	829	8266447,5	7089341,5	2824445,25	6249696	4546691	5696312	3476523	3631614	2249082,75	4725226	3413176,25	1138772,875
37	822	8609710	6915577,5	2947599,5	6558532,5	4625356	6065079	3779967,75	3697714,75	2500439,25	5105093	4081314,75	1576374,375
38	821	5049818	4395221,5	948594,188	4299071,5	3023716,5	4222882	2788420,75	2507545,75	1970681,125	2084355,75	1418984,125	752046,313
39	823	4906782	4297922,5	3673061,25	4121954	3231139	3618289,5	2660169,75	2373863,5	1794624,25	1849601,875	1567233,625	707968,875
40	838	11278456	9637531	4108458,5	8645316	6120460	8004016	4957972,5	5283125	3610199,75	7639412	5556264,5	1265814,75
41	830	11146612	9720994	5066494,5	8548982	6123776,5	7279895,5	4510292,5	4967222	3046221	6791633,5	4836636	1737502,875
42	1084	9852066	8647061	4715353	7633634,5	4969244,5	6318332,5	4159682	4249524	3165520,75	5982445,5	3871991,5	1114440,25
43	818	5731964	5068562,5	4917634	4967181	3548812	5003894,5	3281870,5	3064404,25	2155421,25	2077045,25	1526650,625	852782,875
44	1032	10706650	9356635	5632930	7258428,5	5287831,5	6504564,5	4122878	4071891,75	2863347,25	5388886	3788097,25	1736827,5
45	835	11671136	10202113	5345886,5	8678292	6230728,5	7732120,5	4766156,5	5270937,5	3498907,25	6813368,5	4923069	1510540,5

		23	24	25	26	27	28	29	30	31	32	33	34
No	Lab.no	C31S	C31R	GAM	C32S	C32R	C33S	C33R	C34S	C34R	C35S	C35R	C21S
46	826	5868992,5	4556335,5	2575774,75	5281263	3998413,5	5168501,5	3582668,5	3176448,25	2510475	2597593	1922852,75	862820,875
47	1068	11708896	10294366	5595571	9066920	6428345,5	8469079	5271717	5541432	3705462,75	7422066	5418828,5	1168915,125
48	819	6965509	6161206,5	2336358,75	5843730	4473825	5970980	3887472,25	3481056	2454162	2681979,75	2541961,25	1008178,313
49	816	6975618,5	6626341,5	2258602,75	5911399	4130801,5	5539452,5	3878694,5	3641722	3072234,25	2764999,75	1957096,875	1028516,875
50	3325	12622896	11012826	5188536	9615667	6873195,5	8740172	5242880,5	5589749	3909433,75	7071098,5	4769509,5	1811356,125
51	3431	14904524	12562681	6521826	10520820	7185372	9205246	5793550	6163622	4205554,5	8474187	6125344	2389513,25
52	827	15798014	13059381	5823433	11479276	8409500	10716242	6490592,5	6615084	4504381	9140047	6482099,5	3001034,25
53	824	19154364	16663628	7271674	14441974	10591352	12913614	8116809	8838971	5746888,5	12141106	9925585	1775982,625
54	833	19416614	16841994	7034256,5	14071992	10565213	13143078	7914057	8187563	5755049,5	10763816	8189242	3011621,75
55	828	10922447	8669215	8669215	9307824	7229472	8415918	6165961	5485452	4534724	4090886,5	2859799,5	1358717,125
56	820	25122862	21550168	11090732	19041612	12987799	16765587	10423760	10561393	7651367	14716433	11396082	4198704
57	3327	24385312	20297398	9662042	16990374	12377416	14635857	9259665	9973346	6650510,5	13052495	8487208	3951810,5
58	811	26575388	22900862	8714365	18680012	13850061	16874626	10855065	11487294	8204553	15048386	9862205	4192261,75
59	812	14156845	13393032	3002756	12299342	9014059	13338291	8165837	7876498	5195036	5431187	5210344,5	2108710
60	834	20650102	16945636	9351030	13310223	9381330	12491321	7741682,5	7543126,5	5150713	9064994	6899200	7598441
61	814	16642968	12745682	14325347	14431957	10686306	14453179	9471108	8368608	5641447,5	5936500,5	4491020	2347584,5
62	815	17548876	16720620	14975909	14814136	10215150	14740978	9562601	9462718	7306703,5	7095582,5	5934594	1896499,375
63	832	19101994	14896749	9182152	11457397	7918374	9358327	6092876,5	6984557	4751041	7220768	6343148,5	12416279
64	495	6321133,5	4650116,5	4650116,5	5438494,5	4069530,5	4516471	2902311,5	4002848,5	2641164,75	6710006,5	4613125	829300,813
65	499	0	0	0	0	0	0	0	0	0	0	0	9,52E+05
66	500	9763623	7673194,5	4565922	7949952,5	5869455	6377839,5	4117766,75	5527294,5	3611147,25	9414960	6517582	861785,375
67	503	0	0	0	0	0	0	0	0	0	0	0	5,12E+05
68	511	0	0	0	0	0	0	0	0	0	0	0	9,52E+05
69	512	16792232	13728758	8645378	13713525	9731018	10574803	6771297,5	8769418	5779076,5	15560255	10724232	1843486,125
70	513	0	0	0	0	0	0	0	0	0	0	0	7,31E+05
71	529	0	0	0	0	0	0	0	0	0	0	0	5,68E+05
72	540	0	0	0	0	0	0	0	0	0	0	0	7,02E+05
73	548	0	0	0	0	0	0	0	0	0	0	0	2,35E+05
74	557	0	0	0	0	0	0	0	0	0	0	0	9,94E+05
75	564	5688681	4303328,5	4303328,5	5002535,5	3403035,25	3990093	2533833	3364726,5	2024139,625	5618393,5	3948292,25	966930,125
76	566	0	0	0	0	0	0	0	0	0	0	0	9,68E+05
77	574	0	0	0	0	0	0	0	0	0	0	0	4,29E+05
78	575	0	0	0	0	0	0	0	0	0	0	0	9,18E+05
79	579	0	0	0	0	0	0	0	0	0	0	0	4,07E+05
80	582	10305755	8266953	5387366	8298287	6018345,5	6225704	4070671,5	5278469,5	3179542,5	8951097	6101363	961345,938
81	587	3517923	2636952,75	2636952,75	3029986,25	2349623,5	2493715,75	1652502,75	2154233,75	1367156,75	3409557,25	2356379,5	632669,438
82	589	0	0	0	0	0	0	0	0	0	0	0	3,24E+05
83	596	0	0	0	0	0	0	0	0	0	0	0	7,18E+05
84	611	5896105,5	4880601	2766902,75	5047287	3741644	3963823,25	2563287,5	3563190,75	2134437,75	5735083,5	3977244,5	891887,063
85	669	18841994	15873477	7314673,5	14505036	10434755	12109529	7545419,5	8770848	6328124,5	11610045	7522484	3165838,75
86	670	0	0	0	0	0	0	0	0	0	0	0	1,96E+06
87	671	8210500	7173328	3010345,5	6204982,5	4550624	5356130	3330157	4034965,5	2727781,25	5328968,5	3441376,5	1717391,5
88	672	0	0	0	0	0	0	0	0	0	0	0	1,16E+06
89	673	10696584	9292577	2710707,5	8096071,5	5914842,5	7335002,5	4483921,5	5067085,5	3095220,75	6965833,5	4297236,5	2136750,5
90	674	0	0	0	0	0	0	0	0	0	0	0	1,29E+06

		23	24	25	26	27	28	29	30	31	32	33	34
No	Lab.no	C31S	C31R	GAM	C32S	C32R	C33S	C33R	C34S	C34R	C35S	C35R	C21S
91	675	3553576,5	2914292,75	1257060,125	2720875,25	1956015,75	2365740,5	1431586,875	1753345,875	1205540,375	2289641,75	1665175,5	569924,5
92	676	10714389	8922337	3923618,25	8185128,5	6037454,5	7168618	4393928,5	5112286,5	3507551,5	6765493	4196517	1760103,875
93	678	7012342	6008550	2732112,25	5265235,5	3832773	4782820,5	2907082,75	3363083,25	2356449,5	4340664	3042406,75	1207897,5
94	679	2878407	2523814,25	1339075	2216288	1598119,25	1877845	1179500,25	1494672,625	999691,563	1930422,625	1471350,5	513487,813
95	680	2574062,5	2261001,5	938609,313	1899866	1371803,25	1690282,25	1005334,563	1165801,25	835009,375	1608016,875	1152952,25	474680,625
96	681	1792258,25	1475479,5	646365,625	1360655,875	930902,938	1197565,625	731390,75	874497,875	595832,625	1232369,625	897485,25	281954,063
97	682	9739818	8467412	3953838,25	7510411,5	5461079,5	6195164	3915127,25	4708767,5	3105594,5	6350060,5	4515802	1801111,25
98	683	4743550,5	4228528	1639108,625	3572001	2430845,75	3308143,75	2030450	2282899,25	1491566,125	3094835,25	2367048,25	830358,688
99	684	5320615,5	4414315	1105951,25	4161937	3010027,5	3607139,5	2253436,25	2635397,75	1538237	3555579	2613075,75	874638,5
100	685	1231813,625	1003072,813	431732,031	891102	660145,875	702248,563	429338,125	463083,969	308202,469	562819,313	407722,563	451742,094
101	686	7071704,5	5782991	2522546,75	5376666,5	3892693,75	4674876,5	2940414	3461425	2263037	4546787	3228578	1055046,375
102	687	9018138	7673374	4106749,25	6781158,5	4950744	5900564	3602485,25	4211139	2817193,75	5765867	4206090	1145116,125
103	688	1665180,25	1334211,75	599492,438	1230653,125	909255,188	1118289	700794,5	791948	520920,813	1042786,625	757097,813	284376,563
104	689	8272854,5	7164623	3763491	6333743	4506008	5531726,5	3368657,5	4053974,5	2639250,25	5318920	3883929,75	986037,125
105	711	0	0	0	0	0	0	0	0	0	0	0	1,01E+06
106	714	0	0	0	0	0	0	0	0	0	0	0	9,53E+05
107	717	0	0	0	0	0	0	0	0	0	0	0	1,05E+06
108	721	0	0	0	0	0	0	0	0	0	0	0	1,75E+06
109	722	0	0	0	0	0	0	0	0	0	0	0	1,77E+06
110	725	0	0	0	0	0	0	0	0	0	0	0	1,31E+06
111	726	4734608	4010312	1679459,625	3619534	2483699,25	3113648,5	1934010,125	2319972,25	1609879,125	3096522,25	2202527,25	483796,594
112	727	1195229,125	947785,188	230544,281	863449,75	644460,938	745836,563	494848,313	583740,875	347016,063	786725,625	558321,875	175077,359
113	728	4187275,75	3366547,25	1448908,125	3021173,75	2314876	2652509,5	1683426,25	2016260,625	1344275,625	2827887,75	1994712,625	491471,313
114	729	8993552	7630475,5	1726529	6528156,5	4885288	5891405,5	3732228,5	4435521,5	3071684,25	6173964,5	4338798,5	1022633,75
115	730	1663685,625	1416270	721561,25	1258353,125	904603,5	1056247,5	676790,813	780509,938	522457,625	1082766,5	782362,563	269328,875
116	731	1753309,375	1399454	610337,375	1293675	962060,875	1121136,5	702491,5	828228,438	541760,188	1097596,375	796236,5	302327,844
117	733	0	0	0	0	0	0	0	0	0	0	0	3,71E+06
118	734	4036671,75	3279076,25	1385764,625	3087127	2301402,75	2895000	1753522,875	2001303,625	1346064,875	2788444,75	2003349,75	632375,625
119	735	1237535,375	985380,25	296727,594	906604,25	695427,563	780076,188	519190,188	591045,375	387891,563	788068,688	573366,5	213525,891
120	736	4457542,5	3837554,25	1496189,375	3357663	2495068,5	2898592	1797934,875	2095467,75	1276259,125	2857930,75	2058934	549505,063
121	737	5305918	4322574,5	990015,375	4090844,5	2966707	3443155	2193716,5	2740887,5	1821642	3838003,25	2689683,5	619750,313
122	738	1815443,25	1483012,5	669012,875	1316826,875	994039,125	1216079,75	759904,313	891869,625	588640,813	1175761,5	868035,625	209600,875
123	739	1457516,75	1217688,125	634718,688	1062956,25	793591,688	987310,375	623338,188	712862,563	452987,813	945843,063	681442,313	188179,172
124	740	495347,313	375821,75	167922,781	331223,125	258208,281	284604,625	196008,156	204268,922	133218,453	270258,313	199593,875	85324,289
125	741	2877102,5	2330015	549598,438	2164323,75	1614043,125	1895162,75	1208477,5	1460997,5	1002749,063	1986559,75	1410101,625	315450,906
126	742	2002579,875	1722552,5	433231,25	1479811	1087815,5	1299232,375	827874,188	956735,125	639775,938	1254407,25	911662,813	356683,531
127	743	3817779,25	3177268,5	1458465,75	2801179,5	2111463,5	2481969,75	1554734,25	1665294,875	1093339,375	2226434,75	1509467,875	768621,188
128	744	2261888,25	1868517,5	430364,781	1697833,5	1223578,875	1647084,625	963447,125	1164215,625	717452	1568597,5	1094360,75	282913,813
129	745	983607,938	796704,5	351491,844	738067,75	541106,688	660199,063	422213,875	492815,844	301472,375	693002,5	519548,625	156287,844
130	746	0	0	0	0	0	0	0	0	0	0	0	3,15E+06
131	747	2750212,25	2347097,5	915372,688	1970860,875	1477236,875	1751756,125	1097553,625	1259348,875	752628,375	1679779,625	1225309,125	442625,875
132	748	1536430,375	1305362,25	588690,75	1127561,5	841021,75	994460,438	625043,938	727580,75	476670,125	986500,813	727480,313	224687,641
133	749	1499699,875	1282792,5	419654,594	1083362,5	819834,938	1014164	637195,938	705468,25	425646,531	955462,125	705101,438	242853,266
134	750	2689087	2311576	1245689,375	1971620	1461609,75	1704919,25	1072651,875	1280383,125	764612,188	1661438,125	1075258,875	397232,969
135	751	2262211,25	1812612,75	771251,5	1684529,75	1252915,875	1479441,25	929620,938	1074126,375	694395,313	1450079,75	1052596,625	399909,563

		23	24	25	26	27	28	29	30	31	32	33	34
No	Lab.no	*C31S*	*C31R*	*GAM*	*C32S*	*C32R*	*C33S*	*C33R*	*C34S*	*C34R*	*C35S*	*C35R*	*C21S*
136	752	4069614,5	3311918	1407884,125	3061314,25	2254225,25	2580847,5	1650973,75	1913500,875	1170598,375	2531959,25	1876826,875	642101,625
137	753	1758853	1511669,25	402794,719	1268442,5	950582,875	1150835,875	728099,375	799976,313	540834,063	1103016,5	797070,25	367424,094
138	754	3224849,5	2703234,75	1101098,25	2253477,25	1730558,25	2062813,875	1316112,625	1575885	1042214,688	2154022,5	1558708,75	452521,438
139	1329	20897492	16990546	6602037	15526078	11671503	13644425	8477598	9480282	6150501,5	12833148	8776322	4228832,5
140	1386	14045543	11004090	6981914	11070115	7982656,5	8194280,5	5336838,5	6735313,5	4001953,75	11016443	7413820	947833,688
141	1387	0	0	0	0	0	0	0	0	0	0	0	2,65E+06
142	1388	0	0	0	0	0	0	0	0	0	0	0	1,14E+06
143	1389	0	0	0	0	0	0	0	0	0	0	0	9,19E+03
144	1390	0	0	0	0	0	0	0	0	0	0	0	3,39E+05
145	1464	1929246,5	1430129,25	823483,313	1603681	1132997	1306529,5	1155809,25	1085718,25	655571,5	1747043,875	1158567,125	175047,641
146	1465	1021674,25	812638,938	516075,875	809836,063	619344,063	662757,125	449091,188	601184,375	379727,188	994802,5	698035	111811,453
147	1466	3874786,75	2920469,5	1604575,875	3050200	2378967	2469749,75	1666434,375	2191750	1335895,875	3641940,25	2300326	450867,406
148	1467	6382616,5	4986797,5	3080827,5	4918870,5	3613825,25	3680624,25	2448543,25	3155353,75	1891036,75	4938366,5	3201791,5	562173,438
149	1468	35971128	28552194	18218560	27742246	21501810	21010456	14165240	18146298	10865838	28280026	17893642	2701630,5
150	1469	0	0	0	0	0	0	0	0	0	0	0	7,95E+04
151	1470	0	0	0	0	0	0	0	0	0	0	0	5,51E+05
152	1471	0	0	0	0	0	0	0	0	0	0	0	4,90E+05
153	1472	6640117	5326691	3249048,75	5072824,5	4016689,75	4023642,5	2727602,5	3481568,75	2140558,5	5812590,5	3624851	754847,25
154	1473	0	0	0	0	0	0	0	0	0	0	0	2,17E+05
155	2125	7996163,5	6272909	3693987,75	6590331,5	4822915	5424072,5	3431354,25	4546758	2941420,25	7879200,5	5245049,5	1201326,125
156	2453	27711898	21220422	5221222	18227720	13731461	12117119	9345218	23957464	15765018	9046380	5944502	764922,063
157	3576	1730912,5	1269214,5	705180,75	1419388,875	1072553,25	1155882	740972,375	1065053	618198,125	1759225,5	1187425,125	405247,5
158	3577	1164431,25	926533,813	557687,063	954703,375	677177,875	723273,75	453691,844	604155,438	355101,25	1037173,875	707310,625	242400,063
159	3578	1738496,625	1340999,125	793706,375	1373916	1016090,813	1038162,625	691588,125	869464,938	522671,063	1491008,75	903799,5	308939,344
160	3579	3116885,25	2440237	1211400,375	2569275	1883203,875	2162639,75	1340629,5	1886369,875	1091015,25	2894712,75	1993747,375	519368,219
161	3580	119719,258	104799,414	32684,037	108184,25	83101,32	88422,977	54113,309	81903,305	49939,66	119786,242	83066,18	74498,383
162	3581	9531927	7057646	2510614,5	8752858	6203797,5	6847582	4366623,5	6307424,5	3889767,5	9492360	6372256	1681994,875
163	3582	907386,5	691232,688	329290,625	707939,813	478280,438	491793,469	330494,875	448715,281	253137,109	693426,125	441258,438	218143
164	3583	1499300,125	1198262,5	658237,688	1062504,875	807107,188	800982,375	527604	669125,25	396774,344	1030222,063	721175,688	338251,281
165	3588	1213530,75	931215,438	455851,094	959641,063	731633,813	830096,063	540142,313	646520,875	458883,563	1178989,125	877747,938	372153,344
166	3589	1029518,875	791135,875	425748,719	780107,875	605420,5	619553,438	416442,344	540865,125	354143,875	831511,625	577183,813	220989,672
167	3590	677878,25	527107,688	290250,344	535446,5	409323,5	426135,094	265325,469	432447,688	230219,141	576645,188	468209,406	144887,453
168	3591	313230,188	234232,688	139790,094	244064,797	186888,094	191573,906	128237,797	187631,438	95938,891	256656,766	193666,391	75922,641
169	3592	644658,063	515731,75	330357,125	509148,313	386648,344	432436,094	279784,156	332183,188	196165,531	568715,313	384259,406	199811,906
170	3593	308666,688	218103,141	70967,969	242074,688	184891,766	190756,391	127895,289	165109,063	101024,258	272705,531	200081,266	87762,461
171	3594	274911,344	226271,359	143203	207234,969	161778,344	179439,266	114335,531	140105,219	80328,344	242312,406	161434,625	90193,273
172	3595	373939,656	271740,094	169662,25	300033	230169,234	242101,969	158820,891	200543,719	120223,563	332434,969	232297,969	153339,375
173	3596	241468,797	196043,234	101211,938	186636,547	142378,906	155795,375	99997,969	127969,203	81325,828	215816,906	135603,641	75451,484
174	3597	366790,688	264418,938	71997,602	293168,156	232886,688	233682,109	154099,516	198071,547	128765,32	311997,219	216062,156	106016,547
175	3598	207168,531	172292,922	67678,102	166970,438	128423,656	142605,141	91654,391	115810,164	70775,539	188042,281	131857,359	90219,039
176	3599	395952,938	323255,844	69486,141	307773,563	226523,828	264006,938	168180,953	210548,125	120879,109	348562,563	242037,438	141841,859

		35	36	37	38	39	40	41	42	43	44	45	46
No	Lab.no	*C27diaS*	*C29diaS*	*C27aaaR*	*C28aaaR*	*C29aaaS*	*C29abbR*	*C29abbS*	*C29aaaR*	*C27abbR*	*C27abbS*	*C28abb1*	*C28abb2*
1	1055	0	6048,846	3069,544	1769,059	6922,948	8154,471	5952,734	5561,703	0	0	0	0
2	1040	0	11487,868	5568,652	8710,676	12357,067	19734,609	7922,691	11964,422	0	0	0	0
3	1033	0	19128,949	13808,315	6141,514	21346,205	25278,439	22817,559	20262,895	0	0	0	0
4	1035	0	29877,248	9922,899	10231,521	19890,146	27546,707	16801,268	19154,941	0	0	0	0
5	1039	0	44360,148	12332,021	13672,711	38148,285	52555,398	25251,059	22218,371	0	0	0	0
6	1073	0	53594,723	37187,125	28234,008	53061,105	67044,992	43018,199	52690,16	0	0	0	0
7	1065	0	56658,633	35248,574	28296,219	55674,234	70570,734	51582,09	57925,238	0	0	0	0
8	1056	0	38585,387	32293,586	24609,365	50106,797	67739,758	44016,523	53834,875	0	0	0	0
9	1053	0	99916,25	78209,672	50919,094	99879,695	139829,094	102362,258	101020,859	0	0	0	0
10	1037	0	89355,883	43169,41	22234,051	95721,719	127585,57	87349,727	91059,203	0	0	0	0
11	1114	0	63755,695	63217,809	21294,637	79547,617	97341,164	81385,031	74558,875	0	0	0	0
12	1044	0	141293,844	45021,406	38610,121	105764,086	133842,031	104267,695	109804,609	0	0	0	0
13	1054	0	82598,641	42209,973	20696,57	80289,438	106869,219	78559,219	86538,617	0	0	0	0
14	1076	0	91286,344	48509,008	41771,09	95483,734	118928,469	84062,406	93146,43	0	0	0	0
15	1045	0	91737,813	55358,609	33191,16	97814,961	123632,047	104032,344	95994,906	0	0	0	0
16	1075	0	408524,906	138639,531	79971,563	413665,094	518752,875	346819,688	353362,031	0	0	0	0
17	1083	0	240088,766	94948,586	61207,133	215604,203	299343,031	222868,656	221708,484	0	0	0	0
18	839	0	314197,688	294126,344	198107,516	411771,219	523218,844	414939,125	411203,438	0	0	0	0
19	1036	0	234935,391	186820,5	64355,086	263555,781	343907,875	236261,484	268173,719	0	0	0	0
20	813	0	748360	311857,313	320599,344	444072,031	591347,625	476254	375781,344	0	0	0	0
21	1043	0	283227,406	154006,734	111861,492	239297,469	313333,438	238212,672	269793,813	0	0	0	0
22	1069	0	221702,344	102087,906	49481,07	198553,219	257449,172	180090,938	169999,25	0	0	0	0
23	831	0	757627,75	652523,75	424955,125	1211789,875	1568172,375	1290625,375	1182371,375	0	0	0	0
24	1052	0	325871,25	198040,641	175509,234	371228,188	504038,969	388459,656	409991,281	0	0	0	0
25	732	0	473494,031	904950	520332	1222061,375	1682061,125	1329357,75	1202596,5	0	0	0	0
26	1074	0	719712,75	444231,313	261346,094	672379,438	853767,625	685753,313	675920,375	0	0	0	0
27	825	0	1041651,125	888768,875	598120	1249023	1642117,125	1336454,875	1243413,75	0	0	0	0
28	836	0	814292,938	573070,5	572283,938	1186252	1523249,75	1120499,125	1203772,375	0	0	0	0
29	1112	0	722551,375	464278,438	332739,906	920367,188	1085729,625	824332,25	674538,75	0	0	0	0
30	837	0	1438789,75	857578,063	597534	1543163	1539529,875	1135135,375	1101939	0	0	0	0
31	1739	0	3330379	1450359,375	1002072,063	2952706,25	3336688,25	2364870,5	2595159,5	0	0	0	0
32	817	0	1863143,375	1711077,125	896966,125	2256537,25	2948045,25	2046062,875	2206312,75	0	0	0	0
33	1078	0	2613239,75	1628847,25	1196210,875	3463233,5	4073434,5	3014438,25	3101672	0	0	0	0
34	840	0	2191975	1666344,25	1019857,438	2353855,75	2836146,25	2411716	2240551,75	0	0	0	0
35	3477	0	1512725,5	908932,875	423170,906	1701813,5	2111924,25	1756113,125	1704464,875	0	0	0	0
36	829	0	1682158,875	1172016,625	851897,938	2275830,5	2882842,25	2054356,375	2237731	0	0	0	0
37	822	0	1987342,625	1896009,25	865346,813	2460890,25	3184911	2756997,75	2445910	0	0	0	0
38	821	0	1717219,75	638831,625	1034517,5	1204909,375	1466506,625	974179,938	1086628,375	0	0	0	0
39	823	0	1895470,375	767844	871345,875	1175476,625	1433715,625	1142312,625	1012916,813	0	0	0	0
40	838	0	1679474,625	1855290,25	976529,375	2660038,5	3528068	2805650,5	2645120,75	0	0	0	0
41	830	0	1548543,75	2086141,125	1370069,125	2955828,25	3829067,25	3110237,5	2980168,5	0	0	0	0
42	1084	0	1663460,625	948986,125	679444,5	2025367,375	2392527,75	2059476,75	1887349,5	0	0	0	0
43	818	0	2385637,5	973441,375	1139385,625	1477527,625	1997158,125	1543417,75	1226666,75	0	0	0	0
44	1032	0	1514399	823881,875	630234,625	1813728,75	2287127	1950863,75	1705054,125	0	0	0	0
45	835	0	1624519,125	1398631,875	1367574,25	2791276,75	3694654,5	2953316,75	2741154	0	0	0	0

		35	36	37	38	39	40	41	42	43	44	45	46
No	**Lab.no**	***C27diaS***	***C29diaS***	***C27aaaR***	***C28aaaR***	***C29aaaS***	***C29abbR***	***C29abbS***	***C29aaaR***	***C27abbR***	***C27abbS***	***C28abb1***	***C28abb2***
46	826	0	2273277,25	1080888,875	1285038	1630380	2093285	1652758	1390483,875	0	0	0	0
47	1068	0	1771122	1098757	990795,313	2287494,75	2957585	2308185,5	2308583	0	0	0	0
48	819	0	2322117,25	1047774,063	1130409,625	1713743,875	2245203	1759019,875	1491017,375	0	0	0	0
49	816	0	2588519	1269730,75	1633129,875	1936378,125	2598079,75	2041633,5	1704026,5	0	0	0	0
50	3325	0	2771813	1524892,75	1237844,25	2996013	3796048,25	2692367,75	3069888,5	0	0	0	0
51	3431	0	2150757	1747185,5	1126246,125	2203203,5	2888987,5	2175673	1762716	0	0	0	0
52	827	0	3048640,75	2504366	1970926,375	4648077	6008722,5	4993365,5	4681178,5	0	0	0	0
53	824	0	3373735	2839275	1821154,5	3865416,5	5338180	4650163	3971623,25	0	0	0	0
54	833	0	4296663	3497172,5	1743389,25	5696483,5	6749920	5607769	5161793,5	0	0	0	0
55	828	0	3957526,75	1857345,125	2427910	2716183,5	3406525	2682275	2310026,25	0	0	0	0
56	820	0	4972848,5	5440929,5	3546284,75	7479925	9786041	7928384,5	7423618,5	0	0	0	0
57	3327	0	3705939,25	2171609,5	2031199,25	4111533,75	5087291	3520957	4481764,5	0	0	0	0
58	811	0	5980169	4264493,5	3108709,75	8258158,5	10713108	8569653	8218301,5	0	0	0	0
59	812	0	7987285,5	3778525	4718752	5234976	6889608,5	5593137	4935142,5	0	0	0	0
60	834	0	3859510,25	3744914	2703228	6463093	7521740	5701608	5622042	0	0	0	0
61	814	0	10153489	2666004,75	4241697	5673433,5	7000710,5	4569088	5001845	0	0	0	0
62	815	0	5400908	2272259,5	3266545	4290304,5	5296987	3527072,75	3994332,75	0	0	0	0
63	832	0	2760593,5	4299153,5	1897906,25	4865571,5	5480839	3814645	3796343	0	0	0	0
64	495	297392,906	1087450,25	815306,625	778086,625	977614,125	1435053,5	1129241,125	1058599	965832,063	805836,313	470868,188	355840,875
65	499	9,07E+05	1,87E+06	7,89E+05	2,74E+05	1,09E+06	1,33E+06	1,40E+06	1,10E+06	0	0	0	0
66	500	190441,125	1469013,875	928069,813	353925,219	1438605	2180985,25	1807398,625	1507341,875	1515864,5	1478715,5	757323,625	630810,188
67	503	3,50E+05	1,96E+06	1,22E+06	4,54E+05	1,41E+06	1,65E+06	1,94E+06	1,48E+06	0	0	0	0
68	511	6,11E+05	3,13E+06	2,15E+06	8,28E+05	2,36E+06	2,33E+06	2,87E+06	2,59E+06	0	0	0	0
69	512	619092,938	3340906	2304779,75	1066049,125	2698861,75	3940512,25	3344340,25	2734975	3122666	2899764,25	1504030,125	1261440,625
70	513	3,02E+05	1,50E+06	7,89E+05	2,87E+05	9,75E+05	1,65E+06	1,58E+06	1,05E+06	0	0	0	0
71	529	3,01E+05	1,63E+06	1,00E+06	3,51E+05	1,04E+06	1,41E+06	1,51E+06	1,14E+06	0	0	0	0
72	540	8,89E+05	2,84E+06	1,79E+06	6,65E+05	2,05E+06	2,92E+06	2,56E+06	2,43E+06	0	0	0	0
73	548	6,86E+04	4,58E+05	3,26E+05	8,19E+04	3,13E+05	6,29E+05	5,46E+05	4,60E+05	0	0	0	0
74	557	5,80E+05	4,85E+06	3,78E+06	1,28E+06	3,83E+06	3,85E+06	4,76E+06	4,39E+06	0	0	0	0
75	564	253045,125	1102906,125	818418,688	214682,016	873909,75	1347244,125	1092322	911683,938	919011,313	927275,313	373162,875	364042,25
76	566	6,04E+05	3,02E+06	2,08E+06	7,86E+05	2,16E+06	2,28E+06	2,64E+06	2,29E+06	0	0	0	0
77	574	3,78E+05	1,61E+06	9,83E+05	3,68E+05	1,04E+06	1,44E+06	1,56E+06	1,16E+06	0	0	0	0
78	575	4,43E+05	3,87E+06	2,90E+06	9,85E+05	3,01E+06	3,00E+06	3,75E+06	3,50E+06	0	0	0	0
79	579	4,32E+05	1,77E+06	1,14E+06	4,47E+05	1,30E+06	1,64E+06	1,90E+06	1,41E+06	0	0	0	0
80	582	220359,219	1735930,5	1457439,625	409943,594	1528021,25	2328350,5	1849402,625	1600088,875	1691786,375	1738405,875	827916,813	703517,75
81	587	202398,953	275098,375	441116,313	102022,805	485153,75	704358,375	531256,125	496160,344	457577	382317,875	181866,094	213505,484
82	589	3,21E+05	7,51E+05	4,50E+05	1,64E+05	4,89E+05	7,11E+05	6,40E+05	5,25E+05	0	0	0	0
83	596	4,96E+05	2,85E+06	2,08E+06	7,26E+05	2,21E+06	3,19E+06	3,03E+06	2,50E+06	0	0	0	0
84	611	261601,359	981750,813	552196,688	290575,5	898985,375	1314771,125	992191,625	919354,125	872224,938	771459,438	434320,469	389251,281
85	669	1568376,625	5868756	3763446,5	2050376,5	4876879,5	6537293	5499647	4793672,5	4336640	3654381,5	3010030	2758620,5
86	670	1,70E+06	4,51E+06	2,66E+06	1,08E+06	2,93E+06	4,53E+06	4,03E+06	3,00E+06	0	0	0	0
87	671	848198,875	2695480	1279675,875	696258,813	2142025,5	2890932,75	2396347,5	2045193,875	2198275,5	1688641	1341926,5	1065689,375
88	672	1,05E+06	2,75E+06	1,70E+06	6,87E+05	1,80E+06	2,97E+06	2,51E+06	1,89E+06	0	0	0	0
89	673	1246446,875	3385992,75	1592948,75	1251350,125	2926350,5	3880502,5	2843567	2811761,25	2722154,25	2013866,875	1813312	1621541,5
90	674	1,39E+06	3,27E+06	1,98E+06	8,54E+05	2,33E+06	3,61E+06	3,04E+06	2,51E+06	0	0	0	0

		35	36	37	38	39	40	41	42	43	44	45	46
No	**Lab.no**	***C27diaS***	***C29diaS***	***C27aaaR***	***C28aaaR***	***C29aaaS***	***C29abbR***	***C29abbS***	***C29aaaR***	***C27abbR***	***C27abbS***	***C28abb1***	***C28abb2***
91	675	392757,781	374541,469	545561,688	421092,469	1014337,563	1355472,75	1122046,5	985590,188	937439,438	814727,813	611108,938	519748,938
92	676	1010693,438	1010454,188	2255123,5	1332197,125	2930870,25	3977165	3430483,25	2741946	2499965,25	2428609	1691440,25	1460913
93	678	736868	599371,875	1083701,375	630025,688	1928739,375	2613544	2159572,5	1864457,625	1692670,25	1431929,375	1163641	1028814,063
94	679	294040,281	341385,375	637953,375	282121,063	854491,938	1145004,875	955635,938	795371,563	740686,188	623979	500969,969	426535,844
95	680	253864,188	261072,656	578960,375	260855,594	709045,438	973412,438	779409,5	679108,25	662192,25	562281,563	446120,594	401122,719
96	681	143322,844	174593,031	383636,063	317379,531	493278,594	684732,625	544340,313	476038,219	465935,906	437077,156	301629,469	246095,016
97	682	1106671,375	1132691,625	2272579	1385362,75	2954388,25	4099269,5	3384012,25	2849441,25	2937877,5	2739382,25	1858137,875	1463970,375
98	683	543763,813	543901,188	1100926,375	639762,25	1385055,125	1916364,75	1542195,375	1329873,5	1310736,875	1108267,75	900517,813	811678,625
99	684	543129,563	524945,438	1173139,5	693605,75	1513936	2052352,25	1735112,75	1477401	1487079,625	1401679	953834,625	872973,938
100	685	156493,938	169877,844	255893,328	150128,906	443122,969	612353,875	500246,688	398025,281	481371,438	466331,875	311693,125	270871,063
101	686	720172,625	874655,313	1409641,25	784528,5	1895864,375	2540657,5	2127843,75	1827309,25	1700992,625	1557387,625	1111534,625	1023643,813
102	687	798469,688	789209,688	1543426,875	843405,125	2016400,625	2674511,5	2019886,5	1958294,25	1748135,625	1727866,125	1218993,625	1078295,375
103	688	163107,563	152438,656	291346	150530,594	446835,344	585438	487994,844	408840,469	365785,969	332285,281	249731,813	201000,313
104	689	723082,063	609433,25	997694,563	792433	1827628,25	2549921,5	2105960	1807132,75	1544687,375	1277319,75	1058068,25	805884,125
105	711	6,41E+05	1,79E+06	8,56E+05	2,76E+05	9,39E+05	1,53E+06	1,40E+06	1,16E+06	0	0	0	0
106	714	7,06E+05	1,95E+06	9,85E+05	3,10E+05	1,14E+06	1,80E+06	1,70E+06	1,41E+06	0	0	0	0
107	717	6,85E+05	1,80E+06	8,79E+05	2,75E+05	1,05E+06	1,71E+06	1,51E+06	1,28E+06	0	0	0	0
108	721	7,28E+05	3,67E+06	2,56E+06	7,49E+05	2,45E+06	4,19E+06	3,72E+06	3,26E+06	0	0	0	0
109	722	7,92E+05	3,20E+06	2,07E+06	6,07E+05	2,18E+06	3,36E+06	3,31E+06	2,92E+06	0	0	0	0
110	725	6,55E+05	2,31E+06	1,42E+06	4,89E+05	1,64E+06	2,30E+06	2,16E+06	2,57E+06	0	0	0	0
111	726	295130,125	293887,906	616364,5	414733,313	964487,125	1257295	1092408,75	899965,563	787648,625	687706,563	506831,594	436941,531
112	727	79746,148	81470,961	175003,938	102155,109	243971,688	337790,938	251023,078	242193,172	225128,891	196991,266	130807,109	125393,781
113	728	299687,281	301850,781	691679,438	355261,469	1006730,563	1384460,875	1183538	986185	873927,188	834246,375	576063,875	510415,531
114	729	600195,813	520316,594	1109869,875	960872	2024391,25	2785764,5	2344179,25	2000487,25	1681993,875	1735831,5	1157398,25	950888,563
115	730	168018,078	183257,797	345457,313	166262,813	480261,781	623795,188	487991,25	446903,156	384099,094	319816,063	263988,531	240669,828
116	731	156592,391	164014,813	363071,656	153859,094	467279,5	628935,813	507878,938	442095,938	399226,75	338491,594	281508,313	245688,094
117	733	3,81E+06	9,09E+06	5,57E+06	2,27E+06	5,74E+06	8,98E+06	7,84E+06	5,85E+06	0	0	0	0
118	734	455655,969	526554,688	874742,813	390821,25	1195295,625	1572060,25	1304678,75	1108100,25	1034990,875	814052,188	663736,188	517138,375
119	735	129370,977	130024,93	255030,969	136255,781	327415,031	446151,469	346295,656	316250,156	279103,75	238015,891	164698,344	159845
120	736	338093,156	459205,313	759833,25	339012,313	1022821,5	1353507,75	1024880,125	1003419,375	856940,75	776167,813	557681,75	448075,406
121	737	363278,125	315460,813	991848,313	408931,219	1292238,875	1793387	1448898	1242373,125	1155751,375	929889,125	754382,438	592089,688
122	738	107813,945	129698,813	269185,219	84126,555	395286,875	551346,75	441446,906	395081,438	320428,844	282070,063	191238,656	182158,172
123	739	109907,586	104259,75	226137,469	130914,578	293592,406	396466,375	298741,5	294809,188	246898,578	229560,688	140543,203	136244,234
124	740	48686,52	43197,535	93507,633	54090,906	117455,586	160463,859	129937,641	113535,602	102056,203	89636,586	68163,875	62486,898
125	741	188201,969	179164,5	329215,375	213325,797	606804,375	821529,063	609854,875	595151,813	476739,656	421274,188	335471,188	314268,906
126	742	180555,625	172549,594	359689,656	217141,438	450605,25	609042,5	442643,094	442599,5	378092,219	323640,25	249382,875	201711,5
127	743	388191,281	401773	767575,063	527556,438	1149611,375	1568336,875	1273283	1271175,375	1159648,75	1066280,875	743209,313	658345,375
128	744	147759,625	166599,672	418447,375	260226,25	545621,188	752391,25	614079,563	552281,25	452054,75	392939,688	308677,625	272654,75
129	745	88852,93	90965,719	187423,141	153999,234	242524,406	327738,938	242791,063	237996,672	204918,828	172581,375	137785,188	128894,547
130	746	3,04E+06	7,67E+06	4,75E+06	1,92E+06	5,13E+06	7,88E+06	6,69E+06	5,55E+06	0	0	0	0
131	747	263522,563	290131,438	530693,188	320534	690686,5	932864,813	741651,438	666398	581661,438	499630,281	390781,313	361526,031
132	748	148030,078	147293,797	277621,313	139599,422	380839,438	499169,563	421946,219	366366,719	313805,125	265451,688	213631,469	180312,813
133	749	152303,844	169270,906	304379,656	130896,016	386774,719	505920,438	376431,125	373990,875	345720,969	274387,875	221935,453	197406,719
134	750	230846,531	231814,281	446074,25	294119,656	664260,063	899456	664711,938	652872,688	602674,375	558960,75	385970,281	318003,281
135	751	261104,453	243834	478719,531	255891,859	632751	829975,438	674462,25	606392,813	531200,875	449695,563	360810,188	340943,688

		35	36	37	38	39	40	41	42	43	44	45	46
No	Lab.no	*C27diaS*	*C29diaS*	*C27aaaR*	*C28aaaR*	*C29aaaS*	*C29abbR*	*C29abbS*	*C29aaaR*	*C27abbR*	*C27abbS*	*C28abb1*	*C28abb2*
136	752	362975,531	370808,438	829032,313	432357,469	1024322,375	1419679,125	1135220,375	1011600,375	964585,313	886333,688	598351	552040,25
137	753	180131,313	161822,188	259389,828	291502,844	460641,281	619219,75	457385,344	441178,219	440415,75	395861,594	274616,969	225415,359
138	754	220916,063	228623,328	527083,438	322639,688	749433,375	1011546,688	836735,438	731802,438	689251,5	645238,375	437365,313	359862,313
139	1329	2735962,5	2634420,75	3705254	3091836	6967010	9458489	7888059	6433733	7313448,5	6548731	4499427,5	3876319
140	1386	274889,313	1763386,75	1138316,375	473208,344	1790247,375	2668636,5	2228459,25	1908136,75	1798563	1852539,75	895440,25	759714,25
141	1387	1,84E+06	9,03E+06	6,39E+06	2,30E+06	7,33E+06	1,10E+07	9,60E+06	7,83E+06	0	0	0	0
142	1388	3,07E+05	1,52E+06	1,09E+06	7,55E+05	1,11E+06	1,97E+06	1,65E+06	1,34E+06	0	0	0	0
143	1389	9,68E+03	6,05E+04	3,93E+04	9,62E+03	3,66E+04	6,42E+04	5,73E+04	4,06E+04	0	0	0	0
144	1390	2,50E+05	9,45E+05	4,46E+05	1,30E+05	4,22E+05	7,17E+05	7,06E+05	6,16E+05	0	0	0	0
145	1464	49585,27	326157,281	271033,156	85972,102	303482,281	442976,031	359256,531	325898,188	312971	307227,094	153931,125	130841,5
146	1465	24408,58	160330,953	135378,563	34053,563	153214,953	223285,344	180524,828	159226,844	167123,5	161901,531	80885,953	69123,531
147	1466	120180,781	725379,5	568740,063	156562,656	611055,375	906578,188	710304,063	633810,375	679927,75	675362,375	322255,813	285208,875
148	1467	177810,672	1043675,25	842563,25	342225,313	959832,438	1430659,125	1207681,625	1032914,813	1077687	1061708,75	520837,5	483848,25
149	1468	878748,75	5120170	4334242,5	1223550,875	4886063,5	7325960,5	6046576,5	5240512	5078017	4429926,5	2568663,75	1958086,75
150	1469	4,96E+04	3,01E+05	1,83E+05	5,81E+04	1,95E+05	3,64E+05	3,10E+05	2,22E+05	0	0	0	0
151	1470	2,81E+05	1,45E+06	9,05E+05	2,56E+05	9,05E+05	1,57E+06	1,41E+06	1,07E+06	0	0	0	0
152	1471	4,11E+05	1,50E+06	8,40E+05	0	8,29E+05	1,43E+06	1,24E+06	9,55E+05	0	0	0	0
153	1472	270403,375	1294576,5	774592,5	273455,75	1068805,25	1574705,875	1299862,75	1130392	1168063	1032487,875	555258,438	459778,281
154	1473	1,94E+05	8,07E+05	4,43E+05	1,35E+05	4,38E+05	7,90E+05	7,14E+05	5,09E+05	0	0	0	0
155	2125	248827,563	1394266,125	1217096,875	185517,609	1289005,75	1934115,125	1602686,375	1336322,625	1433727,375	1366235	714043,375	598549,5
156	2453	760612,438	1190058,375	1150149,875	400694,5	3153846	2968693,5	2240056,75	2502039,25	1456307,125	1072429,375	690529,063	806522,438
157	3576	139568,516	486775,438	378727,625	108817,844	431929,219	638331,563	477897,219	440986,531	454928,063	447306,5	228114,438	215060,484
158	3577	67984,086	387527,594	270903,813	89229,953	317349,719	451767,5	371176,875	312481,656	365147,438	361313,344	185048,063	161904,625
159	3578	102794,969	501724,031	333099,625	117240,195	408677,063	602943,938	465986,688	424327,563	502776,031	478145,469	209608,813	219531,297
160	3579	191713,438	964087,438	625690,188	257371,125	749973,875	1149320,625	872841,625	758013,188	872136,813	821482,25	421117,656	363061,469
161	3580	30969,91	69200,734	26870,223	28046,023	35717,195	51845,832	39862,172	34043,832	43665,047	31985,041	16790,279	16158,91
162	3581	636909,75	2389804,75	1722287,75	639448,875	2169797	3345727,25	2808410	2296047,5	2284511,75	2020504,375	1130309,5	865307,813
163	3582	108818,539	366521,438	237619,188	88079,406	266026,813	381957,188	295722,094	271264,875	330493,813	314464,188	138744,563	153023,688
164	3583	174045,109	566485,188	301576,344	119491,648	413351,594	594037,563	501763,031	423624,875	512533,469	451701,969	253158,156	243317,188
165	3588	115278,016	542899,063	315467,781	103975,469	447635,063	667515,813	561686,313	444823,938	579994,688	545490,75	281702,25	250280,563
166	3589	80518,273	435058,531	309977,75	74975,148	312659,563	469990,469	399781,313	316869,125	433634,469	427687,125	194642,156	172395,797
167	3590	56726,621	255385,141	140397,578	55899,715	198937,344	297173,813	235734,563	203987,141	270995,063	252132,297	120964,148	100497,133
168	3591	20973,391	114055,539	61809,309	20553,174	89474,523	129237,289	97479,992	84622,438	114580,531	111111,258	53282,484	47447,895
169	3592	56278,34	234492,5	170828,766	31101,68	169311,75	255886,734	196029,266	169190,891	216306,938	209089,938	101202,133	90525,586
170	3593	25457,857	111396,82	77955,289	15907,016	83011,133	126808,773	96146,586	81411,125	97169,219	97343,633	47797,125	40601,957
171	3594	23711,979	96122,672	74666,43	21470,65	69956,078	107035,578	80680,164	71087,039	91111,219	90803,836	45117,563	42734,039
172	3595	47350,637	147272,313	100469,781	19836,613	98410,383	148966,594	117290,594	95035,617	122536,883	105259,82	56371,258	45660,16
173	3596	24754,053	27663,947	55920,16	13286,053	53291,906	83721,938	62466,59	54690,637	65823,867	65627,813	26001,777	25550,674
174	3597	31806,811	127003,906	88131,719	21561,43	92712,508	140071,25	106333,664	100666,766	103421,359	93089,375	45143,496	42593,66
175	3598	35482,094	53301,539	48524,324	10835,243	47273,688	76744,188	58953,918	50390,789	60135,375	42419,984	24512,41	22080,66
176	3599	48045,73	50599,684	63509,254	17548,85	85736,891	131783,438	97133,563	84805,094	107378,367	84762,383	46711,969	43865,531

		47	48	49	50	51	52	53	54
No	**Lab.no**	**24-ethyl-13b, 17aDR**	**C30aaaR**	**C27DbaS**	**C27DbaR**	**C22S**	**C27aaaS**	**C27abR cholestane**	**C30Diahopane**
1	1055	4940,649	1825,346	4896,982	4069,439	5313,526	3811,348	3835,084	12486,07
2	1040	11047,37	1362,228	10155,285	8007,762	15804,383	7991,15	10266,509	22585,322
3	1033	19223,598	7649,012	15113,232	7350,158	19885,322	15501,896	11010,04	35841,688
4	1035	18455,059	7411,02	16106,932	9258,103	21488,631	11613,427	29877,248	36616,004
5	1039	34474,293	2508,017	32221,816	16007,666	55945,715	14174,665	44360,148	48738,211
6	1073	46499,066	16683,645	37457,465	27905,701	37926,441	41081,945	26793,391	94031,922
7	1065	50206,414	21971,467	34886,316	30286,18	42311,523	41890,023	41281,953	105279,43
8	1056	49907,168	13488,482	37250,211	25416,223	39000,121	35952,145	23190,305	100393,773
9	1053	97294,984	18333,574	76803,07	58918,156	51001,055	83673,578	72918,844	147725,594
10	1037	82665,242	5876,94	70191,336	44789,852	73650,195	58528,117	40619,191	173272,953
11	1114	68360,945	21026,98	50448,676	35310,664	48231,156	52150,906	36135,004	126103,305
12	1044	95627,938	34371,363	73833,883	57408,629	53854,836	69021,781	141293,844	184482,375
13	1054	90956,438	23861,146	74488,68	56609,383	57563,469	61739,184	45136,68	203704,984
14	1076	89015,531	17549,914	74800,992	55068,117	56038,012	61880,199	41193,027	212306,531
15	1045	92575,539	31112,537	61916,977	41004,379	60061,305	62744,242	48155,684	165149,359
16	1075	428502,875	90451,867	320115,781	255100,313	156648,531	269287,469	196318,469	249302,719
17	1083	215321,563	57959,898	188079,797	137175,047	118459,695	155484,047	105707,188	264628,438
18	839	322561,688	105811,789	244773,328	174255,078	143592,719	277560,906	270804,781	222569,406
19	1036	293670,406	62909,82	190676,625	135192,391	123302,625	204988,609	179927,781	248907,359
20	813	976956,563	164955,359	678414,813	536787,375	149891,094	311934,25	293429,406	764078,375
21	1043	247487,25	79448,289	185050,781	128201,211	155378,438	179839,938	149915,703	397941,531
22	1069	213852,359	66693,391	145308,422	98011,75	103571,211	148167,203	95251,484	316490,969
23	831	733453,313	279871	731384	505285,844	476668,75	842217,063	789207,813	369540,625
24	1052	331563,719	95657,164	243679,5	161021,297	146711,406	251408,703	174443,813	385241,094
25	732	725091,375	238183,531	470685,781	327063,156	316047,406	771781,313	958342,938	267725,813
26	1074	832220,063	179431,672	534593,75	387938,688	367624,563	456555,469	481253,781	608533,75
27	825	1265678,25	276639,688	841027,063	582919,5	574645,625	980732,938	868751,25	506709,969
28	836	937713,625	282226,188	657910,688	459214,344	365182,188	803569,313	695332,313	523639,406
29	1112	753914,938	300662,5	545698,625	372171,031	476310,844	575049,5	411198,719	698301,125
30	837	1265690,875	225693,25	1433559,875	1088539,5	1532569	1293127,75	893984,063	988183,125
31	1739	2270265	924676,313	1397584,75	1100456,875	1542272,875	1765983,5	3330379	674799,938
32	817	2118886,75	496083,219	1453789,625	1027859,875	953205,563	1849045,125	1575203,625	823934,375
33	1078	2629321,5	911460,063	1803016,125	1292605,125	1685298,75	1697896,75	1296878,875	880732,5
34	840	2319446,75	610126,25	1485935	1198087	866626,5	1625281,5	1306695,75	1133669
35	3477	1599991,5	460411,75	1261854,125	890279,625	822481,625	1225907,625	829071,375	1220637,5
36	829	1966120,25	608830	1455053,875	1030614,563	787442,063	1639492,25	1579541,375	977539,313
37	822	1890364,875	644078,75	1569175,375	1098721,625	1082974,25	1861222,25	1702755,875	1016787,25
38	821	2512235,75	451903,719	1925744,375	1482737,375	514757,156	778276,313	603992,938	2150878,75
39	823	2416888,5	430375,813	1848802,25	1452828	502436	705705,625	724180,938	2669687,5
40	838	2263858,75	659796,875	1429743,25	1110744,625	823640,938	1760239,375	1684690,875	1037410,938
41	830	2305140	774710,375	1583128,75	1160321,5	838789,438	1934459,5	2097781	1021272,5
42	1084	1746112,75	412437,969	1423181	1033731	778978,438	1304513,5	1098193,75	1429975,5
43	818	2992431,25	539785,125	2271450	1754031,25	601495,875	1011255,063	775609,125	2993591
44	1032	1489621,75	564758,125	1126514,625	801248,063	895742,188	1076845,125	667154,5	1245287
45	835	2054831,25	662710,75	1474922,5	1186776,625	789032,813	1823644,25	1806390,875	1126686,375

		47	48	49	50	51	52	53	54
No	Lab.no	24-ethyl-13b, 17aDR	C30aaaR	C27DbaS	C27DbaR	C22S	C27aaaS	C27abR cholestane	C30Diahopane
46	826	3403586,5	632057,375	2359288,75	1862142,25	558426,188	1369555,375	1012127,125	3337203,5
47	1068	1975956	614255,5	1520744,625	1073725,75	831954,375	1559638,75	1325443	1325417,375
48	819	3280296,5	638630,688	2602212,5	1983985,375	633112,063	1082100,5	664852,625	3492371,25
49	816	3953370	785678,25	2784309,5	2259049,25	718341,313	2895630	1272048,375	3695297
50	3325	2545966	758826,813	2170287,75	1760594,875	1229061,5	2311161	1550890,5	1352236,5
51	3431	2169594	801120,688	1348007	882516,25	1118735,5	1129043	1121087,25	1493221
52	827	3764286,5	1045796,813	2943077,5	2011921,75	1899033,625	3122008,5	3049965,5	1708019
53	824	3494970,5	920937,625	2413441,25	1648609,5	1214091,625	2788685	2320662,25	1998686,75
54	833	4218801,5	1329631,5	3122825,5	2246505,25	1997818,875	3863395,25	3287098,5	2401902,5
55	828	5564604	1096160,25	3824462	2802813,25	854218,063	1915347,5	1387927,375	5844045,5
56	820	6161298,5	1758288,25	4430118	3221940,75	2668051,25	5471336	5729229	3227447,25
57	3327	3729961,75	1423258,375	2595723,25	1826249,125	2057585,625	2696548,75	1676693,875	2751664,5
58	811	6064663	1901863,125	4586450	3370640	2868934,5	5863329	5434867,5	2793368,5
59	812	10783894	2236618	7301174,5	5942811	1570059,875	3397589,75	3722178	7556896,5
60	834	5655294	1428053,125	4519143,5	3222268,5	4085885,25	5567072,5	4824702,5	3274688
61	814	11369189	2290038,5	7788916,5	6156894,5	1760520,625	6276677	2983159,75	8990165
62	815	8953763	1783706,75	6259403,5	5051519,5	1359296,25	5642671,5	2277329	9486269
63	832	3936836,75	754331,063	4084139,5	2739251	6007520	5072758,5	4832453,5	3064126,75
64	495	0	0	0	0	0	0	0	0
65	499	0	0	0	0	0	0	0	0
66	500	0	0	0	0	0	0	0	0
67	503	0	0	0	0	0	0	0	0
68	511	0	0	0	0	0	0	0	0
69	512	0	0	0	0	0	0	0	0
70	513	0	0	0	0	0	0	0	0
71	529	0	0	0	0	0	0	0	0
72	540	0	0	0	0	0	0	0	0
73	548	0	0	0	0	0	0	0	0
74	557	0	0	0	0	0	0	0	0
75	564	0	0	0	0	0	0	0	0
76	566	0	0	0	0	0	0	0	0
77	574	0	0	0	0	0	0	0	0
78	575	0	0	0	0	0	0	0	0
79	579	0	0	0	0	0	0	0	0
80	582	0	0	0	0	0	0	0	0
81	587	0	0	0	0	0	0	0	0
82	589	0	0	0	0	0	0	0	0
83	596	0	0	0	0	0	0	0	0
84	611	0	0	0	0	0	0	0	0
85	669	0	0	0	0	0	0	0	0
86	670	0	0	0	0	0	0	0	0
87	671	0	0	0	0	0	0	0	0
88	672	0	0	0	0	0	0	0	0
89	673	0	0	0	0	0	0	0	0
90	674	0	0	0	0	0	0	0	0

Appendix III

Geochemical Data of Analyzed Oils for Biomarkers Gasoline and Saturated Model(BGSM).

		1	2	3	4	5	6	7
No	**Lab. No**	**Ts/Tm**	**29h/30h**	**22tri/21tri**	**24tri/23tri**	**26tri/25tri**	**C28tri/C29tri**	**C29/C30**
1	495	1,08595919	1,175678062	1,016226237	0,356942644	0,418746642	1,19042461	1,115839243
2	499	2,305267358	0	0	0	0	0	1,170909091
3	500	0,538086353	1,137502765	1,239894743	0,322592448	0,38219352	1,203792058	1,256918474
4	503	0,453971963	0	0	0	0	0	1,236296296
5	511	0,56087195	0	0	0	0	0	1,120478536
6	513	0,958568738	0	0	0	0	0	1,169578623
7	529	0,647182176	0	0	0	0	0	1,107040913
8	540	0,485109718	0	0	0	0	0	0
9	548	0,763586957	0	0	0	0	0	1,179424372
10	557	0,381352834	0	0	0	0	0	1,158432304
11	566	0,310457516	0	0	0	0	0	1,128699002
12	574	0,344514107	0	0	0	0	0	1,246254072
13	575	0,412325157	0	0	0	0	0	1,148317631
14	579	0,398963731	0	0	0	0	0	1,114630468
15	582	0,478623185	1,123027737	1,368602448	0,259975919	0,370791915	1,230647479	1,18225134
16	589	0,897435897	0	0	0	0	0	1,07357212
17	596	0,364725185	0	0	0	0	0	1,124871001
18	669	0,412635511	0,911483034	0,528141201	0,556489415	0,346748774	0,802224275	1,085465711
19	670	0,431299294	0	0	0	0	0	1,01023587
20	671	0,438777407	0,972039361	0,560678656	0,5501583	0,349696431	0,825593282	1,022825416
21	672	0,454375729	0	0	0	0	0	1,192841163
22	673	0,414016466	0,923366253	0,52250207	0,570497498	0,366916643	0,841425744	1,029936672
23	674	0,423981332	0	0	0	0	0	1,332374101
24	676	0,436514612	0,935686087	0,522361752	0,56299804	0,355214294	0,842556015	1,162762022
25	678	0,451020092	0,972310707	0,569836076	0,542918744	0,372574597	0,769595915	1,455952381
26	679	0,400196501	1,012239022	0,590359034	0,566697962	0,352476785	0,818836788	2,013623978
27	680	0,433598111	1,019391437	0,566890437	0,570371665	0,382175891	0,888797366	1,215189873
28	681	0,429551463	0,982680201	0,59945438	0,567058928	0,379969509	0,863235504	1,290448343
29	682	0,441326625	1,012049922	0,593133297	0,581667649	0,361494803	0,858284651	1,54020979
30	683	0,458680587	0,93785251	0,559327324	0,566870826	0,355136325	0,787663534	1,368852459
31	684	0,433364778	0,973592979	0,588685656	0,557675929	0,35737209	0,880150346	1,421225383
32	685	0,430147228	0,999557255	0,634271469	0,53253278	0,367367659	0,919863762	1,091342335
33	686	0,446515645	0,897975637	0,576115415	0,574756761	0,356229005	0,827475432	0,854731231
34	687	0,44726781	0,927710288	0,574279782	0,579556901	0,380797779	0,813985367	1,288723668
35	688	0,440893222	0,930490645	0,610385473	0,55855109	0,354670228	0,876421562	1,162703379
36	689	0,438993246	0,925641175	0,55848455	0,590473552	0,380642002	0,792467688	0
37	711	1,554468085	0	0	0	0	0	1,161706349
38	714	1,314104819	0	0	0	0	0	1,080124224
39	721	0,856269113	0	0	0	0	0	1,145960832
40	722	1,053149606	0	0	0	0	0	1,069789675
41	725	0,965665236	0	0	0	0	0	1,061813187
42	726	0,418571104	0,949868733	0,526836107	0,542360174	0,357958206	0,872328765	0
43	727	0,392057118	1,030017998	0,532153201	0,532238161	0,35872296	0,845384994	0,995997713

		1	2	3	4	5	6	7
No	Lab. Num	Ts/Tm	29h/30h	22tri/21tri	24tri/23tri	26tri/25tri	C28tri/C29tri	C29/C30
44	728	0,404516254	0,944098871	0,653908583	0,541363944	0,363919766	0,880303667	1,041289593
45	729	0,410137443	0,940214136	0,655092732	0,546309447	0,358363769	0,875889724	1,039454277
46	730	0,456920571	0,891616693	0,558225017	0,583079187	0,371739919	0,764472948	1,003500583
47	731	0,453214537	0,908979095	0,559761426	0,568125163	0,376801906	0,772297794	0,947718631
48	732	0,440130559	0	0,581810303	0,578108831	0,379595457	0,816503534	1,018412863
49	733	0,459895833	0	0	0	0	0	1,011235955
50	734	0,452465828	0,894760585	0,578617575	0,58455623	0,35262574	0,845004007	1,052296498
51	735	0,460047472	0,906908653	0,551164508	0,572666887	0,376279172	0,875348548	1,06
52	736	0,434493722	0,871726914	0,578006461	0,584300609	0,354316004	0,868054425	1,053278689
53	737	0,399360528	0,935702236	0,662645569	0,550031368	0,393872303	0,898486181	1,008738394
54	738	0,420036897	0,938582103	0,672369182	0,550274237	0,381410826	0,816636237	1,012135922
55	739	0,439233209	0,903298405	0,611336812	0,567360986	0,352199431	0,82071827	0,996710526
56	740	0,430034482	0,893183061	0,558689035	0,554115091	0,345137984	0,846106423	1,026989619
57	741	0,422570942	0,951257867	0,674747961	0,542729502	0,382969154	0,867082198	1,056254136
58	742	0,43277092	0,947732086	0,567402732	0,549024045	0,348495488	0,860960237	1,050561798
59	743	0,453415991	0,910892504	0,577811469	0,56974513	0,374668916	0,843077924	1,026440678
60	744	0,401698976	0,929318739	0,659241183	0,555573693	0,363467933	0,816226078	1,056807052
61	745	0,451646111	0,954468901	0,545186563	0,576424312	0,388078934	0,840379888	1,017632242
62	746	0,422983521	0	0	0	0	0	1,017073171
63	747	0,459624201	0,907945099	0,623481166	0,561959461	0,376359593	0,839213711	1,010241405
64	748	0,426817834	0,874441434	0,535829955	0,579129875	0,381344318	0,844296776	1,056042032
65	749	0,444792624	0,887096523	0,582115177	0,559496031	0,377114371	0,782600814	1,037671233
66	750	0,431963124	0,968745323	0,582420829	0,572561643	0,386753671	0,893950522	1,027390438
67	751	0,444762764	0,8899496	0,583466732	0,569046959	0,341438244	0,818793059	1,021648045
68	752	0,423376667	0,964539632	0,614681813	0,556939847	0,38443422	0,820111502	1,068416866
69	753	0,443993256	0,99232166	0,55084562	0,551768577	0,373609146	0,852159109	1,062634989
70	754	0,405327854	0,958099022	0,645060929	0,525407967	0,354463301	0,845893268	1,029032258
71	1329	0,433157161	0,903968983	0,537847516	0,567797419	0,375739311	0,767019293	1,283924843
72	1386	0,464316143	1,136790048	1,320538945	0,304743036	0,372439619	1,335396291	1,147342995
73	1387	0,655798789	0	0	0	0	0	1,316875461
74	1388	0,349043716	0	0	0	0	0	1,125840538
75	1389	0,304081201	0	0	0	0	0	1,111557789
76	1464	0,482102059	1,112994259	1,163711853	0,325677475	0,376490916	1,181803329	0,890096618
77	1465	0,517873421	1,105345789	1,018615225	0,33211382	0,43220318	1,094559473	0,972295515
78	1466	0,534983082	1,11545032	1,042480491	0,35697555	0,403476117	1,180841847	0,954474097
79	1467	0,402699711	1,093183832	1,259802886	0,306893985	0,381236035	1,191229104	0,993220339
80	1468	0,580807301	1,113560664	1,153263126	0,321029159	0,40050857	1,193968236	0,932727273
81	1469	0,319174041	0	0	0	0	0	0,92732421
82	1470	0,570627337	0	0	0	0	0	1,102137767
83	1471	0,335285132	0	0	0	0	0	1,030985915
84	1472	0,522670759	1,065865132	1,035149516	0,346900638	0,446683503	1,167178568	0,936902486
85	1473	0,324658781	0	0	0	0	0	0,974637681
86	2125	0,715642177	1,202003788	1,007078138	0,318798051	0,393640471	1,142482249	1,086956522

		8	9	10	11	12	13	14
No	Lab. Num	35S/34S	pr/ph	pr/nc17	pn/nc18	CPI15-20	mc/lc	K1
1	495	1,676307884	0,654409261	0,323133826	0,500767263	0,885378265	1,784802432	0,935024913
2	499	0	0,886123998	0,320518688	0,378572569	0,958008124	2,150168219	0,929005288
3	500	1,703357764	0,53261815	0,330767499	0,613591888	0,902580865	1,874824421	0,906412488
4	503	0	0,630337265	0,386629981	0,653741718	0,951292901	2,008415036	0,850905571
5	511	0	0,57208022	0,360045538	0,568420582	0,871124829	1,144799503	0,884415071
6	513	0	0,607445443	0,296212833	0,505975578	0,923928035	1,850822644	0,942367451
7	529	0	0,591090721	0,41046195	0,598547258	0,872925502	1,071896257	0,96409098
8	540	0	0,946170921	0,631539957	0,746556189	2,199594008	2,319789957	0,841397647
9	548	0	0,599821269	0,290613093	0,514956282	1,078403448	2,276843949	0,950201605
10	557	0	0,483372706	0,378593794	0,727717535	1,008833921	1,38579411	0,880616924
11	566	0	0,470427774	0,424527246	0,689257328	0,894040515	0,699553507	0,928138624
12	574	0	0,82887574	0,6592	0,832676389	0,9157907	1,814879665	0,795458891
13	575	0	0,462482066	0,356739708	0,749220682	0,95115553	1,461291603	0,969933293
14	579	0	0,799822459	0,562597565	0,830650117	1,09587506	2,328420951	0,865585027
15	582	1,695775073	0,472551286	0,347793727	0,732874537	0,881303737	1,620558462	0,882704037
16	589	0	0,922512527	2,522015656	1,826740765	0,837791177	1,131208919	0,838359035
17	596	0	0,652395515	0,480751174	0,788902292	0,978396035	1,912783241	1,014713015
18	669	1,32370838	0,599410898	0,557381539	0,833026623	0,872317861	1,593473323	0,993055022
19	670	0	0,655329444	0,413004484	0,668728588	0,960795485	2,294661639	0,949718083
20	671	1,320697414	0,68901195	0,636853448	0,993197279	0,946259018	2,149067599	0,999364208
21	672	0	0,596096838	0,45718075	0,751020408	0,890631994	1,753634017	1,003126745
22	673	1,374721919	0,630181347	0,653020134	1,00390117	0,886359044	1,523287671	0,997696809
23	674	0	0,52684673	0,925671812	1,658391797	0,909340187	1,214580265	0,96714974
24	676	1,323379079	0,655431717	0,822270889	1,341801802	0,94250587	1,802275867	1,00237313
25	678	1,290679914	0,698034644	0,520233366	0,862272009	0,583525553	1,865874152	1,001066568
26	679	1,291535412	0,588444066	0,435765349	0,743665541	0,889876939	1,973378469	0,993008304
27	680	1,379323341	0,652122642	0,675626145	0,921405288	0,844029463	1,46898154	0,985035461
28	681	1,409231126	0,631834751	0,41445271	0,697753285	0,881856029	1,980818206	0,981028457
29	682	1,348561062	0,643320363	0,413057961	0,684360021	0,867213838	2,091369131	0,964811675
30	683	1,355660023	0,643493761	0,486522911	0,827085088	0,978257192	2,23738898	0,994251348
31	684	1,34916219	0,691616766	0,41923775	0,672136223	1,062735546	2,22404405	0,948164803
32	685	1,215372051	0,645856726	0,426263525	0,684445128	0,890845805	1,908617999	0,984278936
33	686	1,3135593	0,714846416	0,518825861	0,790289953	0,964496218	2,137693351	1,0004612
34	687	1,369194178	0,677435144	0,497483825	0,758915305	0,906423442	1,801150101	1,017296061
35	688	1,316736231	0,591847976	0,479794597	0,807606762	0,872267856	1,874935534	0,99514859
36	689	1,312026013	0,650054171	1,014247766	1,644020356	0,943108426	1,656449446	0,938642909
37	711	0	0,812601626	0,34477406	0,461538462	0,95748309	2,074492422	0,904477089
38	714	0	0,830405815	0,341937897	0,458929812	0,959718821	2,087762145	0,896906607
39	721	0	0,782860999	0,305911512	0,616472546	1,047206052	2,225468185	0,898040658
40	722	0	0,68592148	0,445509177	0,713088445	0,997180651	3,541314031	0,912736228
41	725	0	0,666472303	0,457840977	0,758178603	0,963146283	3,655598002	0,928994754
42	726	1,334723831	4,86013986	5,743801653	0,371428571	0,349555771	0,852765957	0,72484124
43	727	1,347730917	0,601787955	1,901387512	2,568896052	0,727492749	1,030689271	0,908294649

		8	9	10	11	12	13	14
No	**Lab. No**	**35S/34S**	**pr/ph**	**pr/nc17**	**pn/nc18**	**CPI15-20**	**mc/lc**	**K1**
44	728	1,40254078	0,589434276	0,373435235	0,652551574	0,911101196	1,80987921	1,009418635
45	729	1,391936551	0,579738464	0,360500981	0,641376651	0,891229889	1,824429352	0,978412737
46	730	1,387255238	0,644759016	0,491016427	0,837662338	0,971079402	2,027762597	0,968368876
47	731	1,325233866	0,584502104	0,559395973	0,97838765	0,909120946	1,369307609	1,034964826
48	732	1,334354329	0,738199029	0,461316936	0,741846069	0,884806144	1,596511561	0,979056151
49	733	0	0,809653606	0,388247468	0,680448223	0,952358973	1,780949785	1,00591576
50	734	1,393314195	0,658673469	0,4263071	0,675318709	0,903081624	1,76676397	1,016251022
51	735	1,333347187	0,653033859	0,448744529	0,720183486	0,873084304	1,822159978	1,011088857
52	736	1,363862913	0,608829569	0,58548626	0,818946188	0,857046803	1,278537713	1,028555316
53	737	1,400277556	0,583833	0,347108529	0,647354802	0,925415715	1,785756735	0,972686986
54	738	1,318310958	0,630010718	0,368757842	0,675010852	1,07978693	2,284578045	1,016456363
55	739	1,326823868	0,697805139	0,469138024	0,772060343	0,979623333	2,111049196	0,992984411
56	740	1,323051546	0,655394168	0,384530315	0,758026559	0,883487325	1,576554056	1,026616861
57	741	1,359728371	0,624675886	0,384697272	0,681289563	0,944973321	1,942966194	1,007459829
58	742	1,311133267	0,63428236	0,521476834	0,906840564	0,984430278	2,085672848	0,962962963
59	743	1,336961269	0,598802395	0,434419382	0,780654441	0,941755504	1,642462845	1,0104367
60	744	1,347342766	0,584353059	0,362358502	0,654371226	0,900689363	1,715542925	0,991091387
61	745	1,406209862	0,691031498	0,363016294	0,593549308	1,030358733	2,292006714	1,017393224
62	746	0	0,584719986	0,431533078	0,729920334	0,850649275	1,49753293	1,02485558
63	747	1,33384772	0,6556495	0,442810175	0,745701185	0,957656115	1,687061781	0,93020419
64	748	1,355864367	0,732443258	0,453688389	0,724091261	1,000687463	1,994907511	0,993432722
65	749	1,354365877	0,655781585	0,412596834	0,721235521	0,954269479	2,178675011	1,012418524
66	750	1,297610139	0,619559178	0,414087645	0,708158447	0,926731274	2,055304983	0,991561295
67	751	1,350008513	0,619863014	0,4256153	0,77139838	0,949931194	1,720542293	1,022245205
68	752	1,323207783	0,601197263	0,368255631	0,686631435	0,946900032	1,754967329	1,006859428
69	753	1,37881145	0,734192756	0,346867749	0,511888551	0,883131351	2,131444112	1,003814204
70	754	1,366865285	0,617631439	0,363892365	0,677947795	1,020206979	2,103259435	1,00699187
71	1329	1,353667328	0,639425587	0,48076168	0,868283836	0,98349745	3,017617548	1,096661076
72	1386	1,635624385	0,486019242	0,340566733	0,699768567	0,883519573	1,575985866	0,886802135
73	1387	0	0,575063923	0,351701541	0,609047089	0,888394551	1,564684068	0,909368235
74	1388	0	0,613063315	0,459696297	0,739668443	0,965073668	1,902566457	0,836705566
75	1389	0	0,823717949	0,618179516	0,750189825	0,927247635	2,24824916	0,807912503
76	1464	1,609113483	0,499488753	0,418415418	0,815	0,922224293	1,210786739	0,838934344
77	1465	1,654737783	0,54180444	0,381697171	0,764535934	1,079457357	1,441970162	0,865319144
78	1466	1,661658606	0,504553734	0,365435356	0,742560866	0,987941152	1,26239614	0,834639582
79	1467	1,56507539	0,581640942	0,47606383	0,913204748	0,985766402	1,590919895	0,820712967
80	1468	1,558446026	0,575928918	0,415017462	0,756723716	0,969546131	1,262626263	0,868922846
81	1469	0	0,544067456	0,455156198	0,79391138	0,925068974	1,450602658	0,831533663
82	1470	0	0,512779553	0,41074856	0,7291788	0,891073192	1,013131313	0,856260015
83	1471	0	0,836074872	0,690398126	0,887267237	0,913735811	1,477474403	0,766179326
84	1472	1,669532018	0,651087832	0,487922705	0,811641596	1,008007858	1,473055105	0,843825481
85	1473	0	0,84122807	0,671568627	0,889235569	0,960458982	1,491421255	0,767600424
86	2125	1,732927176	0,606676343	0,895074946	1,587557604	0,959663476	2,470211718	0,908749577

Appendix IV

Lab number of oil samples with their corresponding family.

No	F.No	Fam.	Lab.no	No	F.No	Fam.	Lab.no	No	F.No	Fam.	Lab.no
1	1	A	549	30	30	A	2363	58	1	B	515
2	2	A	550	31	31	A	2364	59	2	B	554
3	3	A	597	32	32	A	2424	60	3	B	1166
4	4	A	920	33	33	A	2425	61	4	B	1170
5	5	A	1018	34	34	A	2426	62	5	B	1279
6	6	A	1138	35	35	A	2427	63	6	B	1355
7	7	A	1140	36	36	A	2428	64	7	B	1384
8	8	A	1165	37	37	A	2429	65	8	B	1391
9	9	A	1359	38	38	A	2430	66	9	B	1392
10	10	A	1707	39	39	A	2431	67	10	B	1393
11	11	A	1708	40	40	A	2432	68	11	B	1394
12	12	A	1710	41	41	A	2433	69	12	B	1395
13	13	A	1711	42	42	A	2434	70	13	B	1396
14	14	A	1712	43	43	A	2435	71	14	B	1397
15	15	A	1714	44	44	A	2436	72	15	B	1398
16	16	A	1717	45	45	A	2467	73	16	B	1399
17	17	A	1719	46	46	A	2468	74	17	B	1400
18	18	A	1720	47	47	A	2469	75	18	B	1401
19	19	A	1723	48	48	A	2470	76	19	B	1402
20	20	A	1724	49	49	A	2611	77	20	B	1403
21	21	A	1725	50	50	A	2627	78	21	B	1404
22	22	A	2149	51	51	A	2706	79	22	B	1443
23	23	A	2268	52	52	A	2884	80	23	B	1713
24	24	A	2269	53	53	A	2892	81	24	B	1875
25	25	A	2270	54	54	A	2895	82	25	B	2121
26	26	A	2283	55	55	A	2896	83	26	B	2122
27	27	A	2284	56	56	A	2897	84	27	B	2887
28	28	A	2313	57	57	A	2898				
29	29	A	2362								

No	F.No	Fam.	Lab.no	No	F.No	Fam.	Lab.no	No	F.No	Fam.	Lab.no	No	F.No	Fam.	Lab.no
85	1	C	494	127	43	C	1386	169	85	C	3573	211	127	C	726
86	2	C	495	128	44	C	1387	170	86	C	3574	212	128	C	727
87	3	C	497	129	45	C	1388	171	87	C	3576	213	129	C	728
88	4	C	499	130	46	C	1389	172	88	C	3577	214	130	C	729
89	5	C	500	131	47	C	1464	173	89	C	3578	215	131	C	730
90	6	C	501	132	48	C	1465	174	90	C	3579	216	132	C	731
91	7	C	503	133	49	C	1466	175	91	C	3580	217	133	C	732
92	8	C	511	134	50	C	1467	176	92	C	3581	218	134	C	733
93	9	C	513	135	51	C	1468	177	93	C	3582	219	135	C	734
94	10	C	514	136	52	C	1469	178	94	C	3583	220	136	C	735
95	11	C	516	137	53	C	1470	179	95	C	3588	221	137	C	736
96	12	C	520	138	54	C	1471	180	96	C	3589	222	138	C	737
97	13	C	529	139	55	C	1472	181	97	C	3590	223	139	C	738
98	14	C	539	140	56	C	1473	182	98	C	3591	224	140	C	739
99	15	C	540	141	57	C	1705	183	99	C	3592	225	141	C	740
100	16	C	543	142	58	C	1715	184	100	C	3593	226	142	C	741
101	17	C	546	143	59	C	2125	185	101	C	3594	227	143	C	742
102	18	C	547	144	60	C	512	186	102	C	3595	228	144	C	743
103	19	C	548	145	61	C	523	187	103	C	3596	229	145	C	744
104	20	C	553	146	62	C	533	188	104	C	3597	230	146	C	745
105	21	C	555	147	63	C	560	189	105	C	3598	231	147	C	746
106	22	C	556	148	64	C	564	190	106	C	3599	232	148	C	747
107	23	C	557	149	65	C	587	191	107	C	669	233	149	C	748
108	24	C	559	150	66	C	598	192	108	C	670	234	150	C	749
109	25	C	565	151	67	C	611	193	109	C	671	235	151	C	750
110	26	C	566	152	68	C	717	194	110	C	672	236	152	C	751
111	27	C	574	153	69	C	1390	195	111	C	673	237	153	C	752
112	28	C	575	154	70	C	1455	196	112	C	674	238	154	C	753
113	29	C	579	155	71	C	2453	197	113	C	675	239	155	C	754
114	30	C	582	156	72	C	3135	198	114	C	676	240	156	C	1329
115	31	C	585	157	73	C	3136	199	115	C	678	241	157	C	3307
116	32	C	589	158	74	C	3137	200	116	C	679				
117	33	C	595	159	75	C	3241	201	117	C	680				
118	34	C	596	160	76	C	3271	202	118	C	681				
119	35	C	607	161	77	C	3386	203	119	C	682				
120	36	C	711	162	78	C	3408	204	120	C	683				
121	37	C	714	163	79	C	3415	205	121	C	684				
122	38	C	721	164	80	C	3522	206	122	C	685				
123	39	C	722	165	81	C	3550	207	123	C	686				
124	40	C	725	166	82	C	3551	208	124	C	687				
125	41	C	1016	167	83	C	3554	209	125	C	688				
126	42	C	1020	168	84	C	3563	210	126	C	689				

No	F.No	Fam.	Lab.no	No	F.No	Fam.	Lab.no	No	F.No	Fam.	Lab.no
242	1	D	756	275	1	E	811	308	34	E	1056
243	2	D	800	276	2	E	817	309	35	E	1065
244	3	D	801	277	3	E	820	310	36	E	1068
245	4	D	802	278	4	E	822	311	37	E	1069
246	5	D	841	279	5	E	824	312	38	E	1073
247	6	D	924	280	6	E	825	313	39	E	1074
248	7	D	1093	281	7	E	827	314	40	E	1075
249	8	D	1167	282	8	E	829	315	41	E	1076
250	9	D	1171	283	9	E	830	316	42	E	1078
251	10	D	1172	284	10	E	831	317	43	E	1083
252	11	D	1173	285	11	E	832	318	44	E	1084
253	12	D	1273	286	12	E	833	319	45	E	1112
254	13	D	1274	287	13	E	834	320	46	E	1114
255	14	D	1275	288	14	E	835	321	47	E	1739
256	15	D	1276	289	15	E	836	322	48	E	3325
257	16	D	1288	290	16	E	837	323	49	E	3327
258	17	D	1289	291	17	E	838	324	50	E	3431
259	18	D	1290	292	18	E	839	325	51	E	3477
260	19	D	1291	293	19	E	840	326	1	F	812
261	20	D	1312	294	20	E	1032	327	2	F	813
262	21	D	1313	295	21	E	1033	328	3	F	814
263	22	D	1335	296	22	E	1035	329	4	F	815
264	23	D	1364	297	23	E	1036	330	5	F	816
265	24	D	1365	298	24	E	1037	331	6	F	818
266	25	D	1385	299	25	E	1039	332	7	F	819
267	26	D	2076	300	26	E	1040	333	8	F	821
268	27	D	2471	301	27	E	1043	334	9	F	823
269	28	D	2472	302	28	E	1044	335	10	F	826
270	29	D	2595	303	29	E	1045	336	11	F	828
271	30	D	2626	304	30	E	1052				
272	31	D	2885	305	31	E	1053				
273	32	D	2889	306	32	E	1054				
274	33	D	2890	307	33	E	1055				