DANMARKS OG GRØNLANDS GEOLOGISKE UNDERSØGELSE RAPPORT 2011/137

Maturity database for the Lower Palaeozoic in Scandinavia

ArcGis project version 1.0

Niels H. Schovsbo

GEOLOGICAL SURVEY OF DENMARK AND GREENLAND
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1. Introduction

The Cambro-Ordovician Alum Shale was deposited prior to the evolution of vascular land plants and the shale does not contain terrestrial vitrinite particles *sensu stricto*. The Alum Shale contains, nevertheless, vitrinite-like particles, probably of marine origin. According to Buchardt & Lewan (1990) these particles behave in a similar manner as true vitrinite particles with respect to thermal maturity and their reflectance has been widely used as a thermal maturity proxy for the shale (Kirsch 1980, Buchardt et al. 1986, 1997, Thomsen et al. 1987, Buchardt & Lewan 1990). For detailed discussion on the origin and geochemical similarities between Alum Shale 'vitrinite' and true vitrinite, see Buchardt & Lewan (1990). Apart from reflectance of vitrinite-like particles regional assessment of the maturity of the Lower Palaeozoic was made by Bergström (1980) based on conodont colour variation in limestones.

The maturity database presented here is a compilation of data collected during the 25 years of studies at the University of Copenhagen and at GEUS. The database includes reflectance of vitrinite particles, Rock Eval analyses and measurements of atomic H/C ratios on Lower Palaeozoic shales from Scandinavian. The majority of data derives from a database prepared during the project 'Pre-Westphalian Source Rocks' (PREWSOR, Warming et al. 1994). Additional data archived at GEUS including previously unpublished data for Ordovician and Silurian shales are also included. The combined PREWSOR and GEUS maturity databases thus represent the most detailed and comprehensive database on the maturity of the Lower Palaeozoic shales in Scandinavian compiled so far.

An ArcGis project containing the presented maturity data together with selected base-maps including the maturity map for the Lower Palaeozoic interval is provided on the CD attached to the printed version of this report. The ArcGis project enables a customisation of maturity maps and integration of the maturity data with other data types.

2. Outcrops and wells

Maturity data from 36 localities and 41 wells have been collected, representing a very wide geographic coverage of the Alum Shale occurrence (Figure 1).

Geographic coordinates were provided only for a few wells and for none of the outcrops. The subsequent geo-referencing was based on available field notes, locality maps and regional maps. The precision of the positions varies. In the ArcGis project the term 'position: fixed' is used for wells and localities where the coordinates were established from detailed locality maps or were provided from either a GEUS or a SGU database (Figure 10). The termed 'position: not fixed' indicate that the position is certain only within a radius of a few km. The term 'position: uncertain' indicates that no reliable location source could be found. The data location is thus certain within a radius of approximately 10 km.

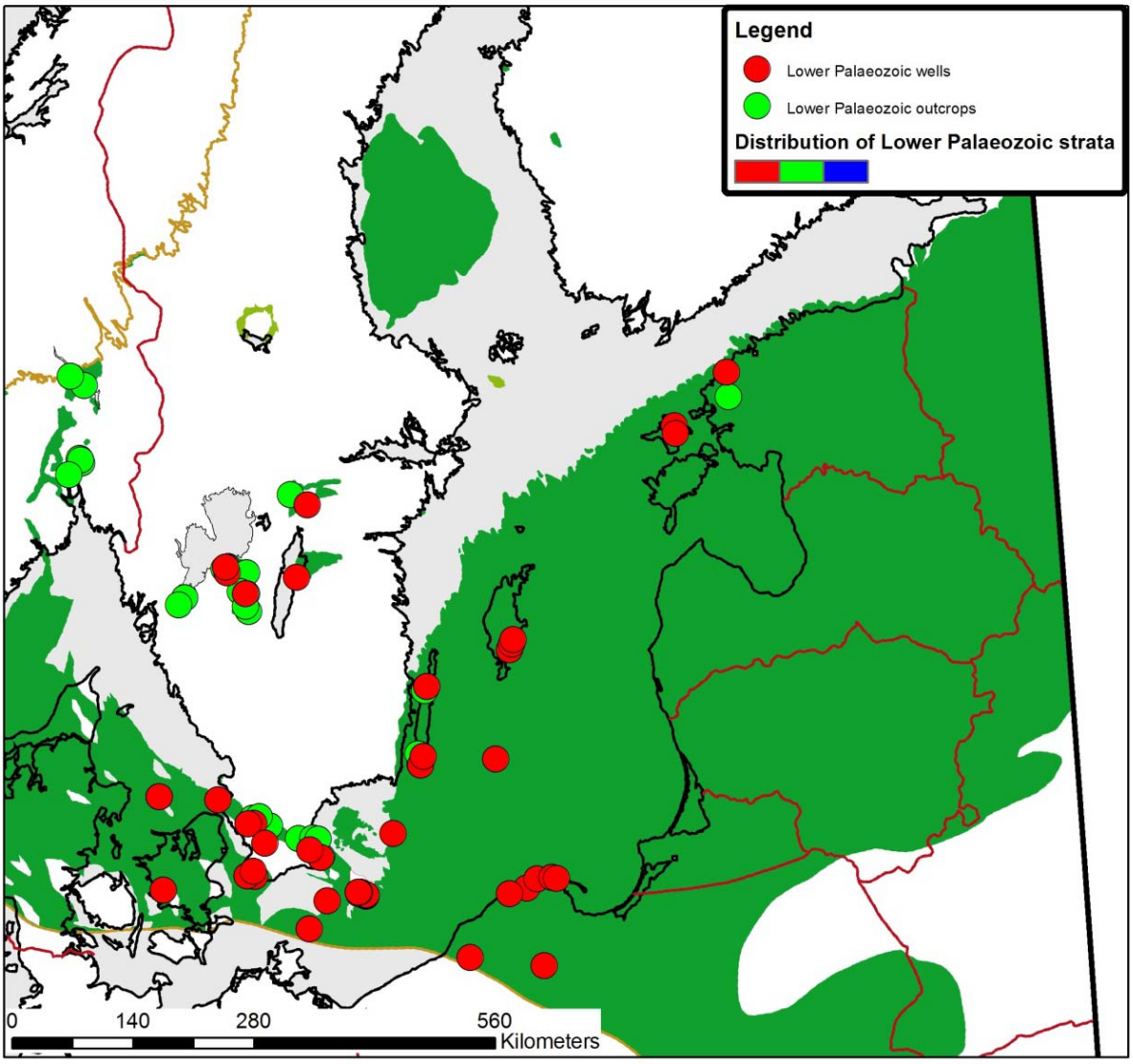

Figure 1. Wells and outcrops with maturity data. The base-map shows (in green) the distribution of Lower Palaeozoic strata in Baltica (Nielsen & Schovsbo 2011).

The stratigraphical nomenclature in the maturity database is presented in Table 1.

Table 1. Stratigraphical nomenclature used in the maturity database. The nomenclature is the standard for the area and follows that of Stouge & Nielsen (2003) and Nielsen & Schovsbo (2006).

Formation	**Stratigraphy**
Colonus Shale	Silurian
Cyrtograptus Shale	Silurian
Rastrites Shale	Silurian
Lindegård	U. Ordovician
Dicellograptus	U. Ordovician
Almelund Shale	M. Ordovician to U. Ordovician
Tøyen Shale	L. Ordovician
Alum Shale	L. Ordovician
Alum Shale	Furongian
Alum Shale	M. Cambrian

3. Reflectance of vitrinite-like particles

The majority of the vitrinite samples have been measured at the source rock laboratory at GEUS following the lab's standard procedure. For cuttings the investigated material was picked from washed samples and measurements were conducted on polished slides of powdered rock (1-2 mm). For whole rock samples measurements were conducted on crushed samples (1-2 mm).

Measuring was done with non-polarized light at a wavelength of 546 nm through an immersion oil (n=1.52). The average of different vitrinite-like macerales in each slide is referred to as the mean reflectance and the abbreviation %Ro is used.

The original histograms have been re-evaluated and included as background data together with statistical information on the measurements if these were available in the GEUS's maturity database. The individual samples are shown in Appendix A and the frequency histograms for the optical measurements on the samples are presented in Appendix C (on CD only).

In a few cases the original raw data have been reprocessed and re-evaluated and in some of the samples the measurements were found to consist of several populations (Figure 2). This may either indicate that several different macerales are present in the sample or that the maceral is optically anisotrope. In a few cases re-evaluation of the sample population resulted in a slightly different vitrinite reflectance value than the one previously reported for the sample.

```
SAMPLE  : 1514A
STANDARD : 1.26%
COMMENT  : 3338 - 3341M
COMMENT  : SIDE TRACK 1
COMMENT  : CUTTINGS
COMMENT  :
SCALE   :   1.0000
 2.80- 2.99  *                       0.74
 3.00- 3.19  *********                6.62
 3.20- 3.39  *********+********      13.24
 3.40- 3.59  *********+******        11.76
 3.60- 3.79  *********                6.62
 3.80- 3.99  *********+*              8.09
 4.00- 4.19  *********+***            9.56
 4.20- 4.39  ******                   4.41
 4.40- 4.59  ****                     2.94
 4.60- 4.79  **                       1.47
 4.80- 4.99  *******                  5.15
 5.00- 5.19  *********+               7.35
 5.20- 5.39  ****                     2.94
 5.40- 5.59  *********+               7.35
 5.60- 5.79  *****                    3.68
 5.80- 5.99  ******                   4.41
 6.00- 6.19  ***                      2.21
 6.20- 6.39                           0.00
 6.40- 6.59  *                        0.74
 6.60- 6.79  *                        0.74
* = 0.74
TOTAL USED    MIN    MAX   MEAN  VARIAN  STD DEV
 136   136  2.9800 6.6000 4.2979  0.8973  0.9473
 136    53  2.9800 3.7700 3.3734  0.0399  0.1997
 136    87  2.9800 4.5300 3.6645  0.1719  0.4146
```

Figure 2. Example of a vitrinite histogram. Stars represent individual measurements. The interval to the left represent the interval range and the number to the right represents the proportion of measurements (%) within each interval. The total numbers of measurements, measurement in sub-population, minimum, maximum, mean, variance and standard deviation is tabulated below the histogram. The histograms are included in Appendix C (only on the CD) and in the folder 'GISproject\Appendix' on the attached CD.

3.1. Map of vitrinite-like reflectance in the Alum Shale Fm

Buchardt et al. (1997) presented an updated version of the maturity map based on vitrinite-like particles previously presented by Buchardt et al. (1986) and Buchardt & Lewan (1990) (Figure 3). The maturation map clearly depicts an increase in maturity towards the Caledonian Fronts to the south and west. High maturation was also observed locally in South Central Sweden caused by heating from Permo-Carboniferous dikes. High maturation caused by intrusions is also seen in Scania and in the Oslo area (Figure 3).

The maturity database allows for comparison between actual measurements and the interpreted map (Figure 3). The data points match the contouring with the exception of the Terne-1 well. Here the average maturity of 3.6% is significantly higher than expected based on the regional maturity map (Figure 3). Buchardt et al. (1997) assumed a reflectance of 2.65% for this well (Vejbæk et al. 1997) when the contouring was made. The validity of the maturity level reported by Vejbæk et al. (1994) has proven to be uncertain and high quality data indicate that the well has a maturity of 3.6% vitrinite-like reflectance (Schovsbo 2011).

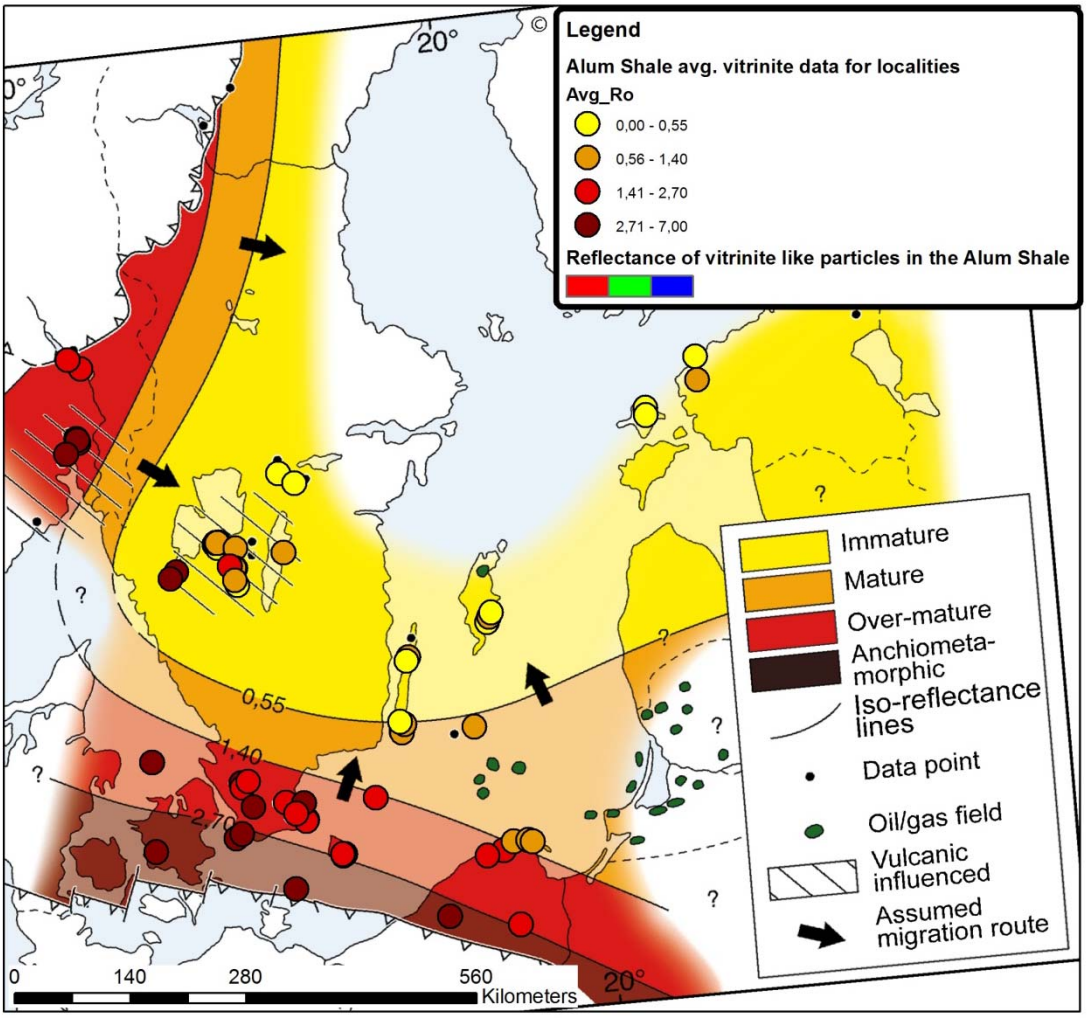

Figure 3. Reflectance of vitrinite-like particles in the Alum Shale. The colour intervals of the data points have been selected in order to match the colours used by Buchardt at al. (1997). Note that the large range in maturity in Central Sweden is caused by heating of the shale by sills and dikes. Average vitrinite-like reflectance values for all localities are presented in Table 2.

Table 2. Average reflectance values for vitrinite-like particles in the Alum Shale Formation. 'Diabase' indicates that the sample was picked near a diabase dike.

Location	Outcrop	Well	Avg Ro	Samples from locality (N_lok)	Note
Scania	Åkarpsmölla		4.8	5	diabase
Scania	Andrarum		2.0	3	
Scania		Albjära-1	2.1	5	
Scania	Gislövshammar		2.0	1	
Scania		Gislövshammar-2	2.0	7	
Scania	Kvasa		4.9	1	diabase
Scania	Röstunga		2.7	1	
Scania		Ljunghuse-1	3.2	1	
Scania		Håslöv-1	3.2	2	
Scania		Flagabro-1	2.1	2	
Scania		Fågelson-1	3.7	4	diabase
Bornholm	Limensgade		2.4	1	
Bornholm		Skelbro-1	2.4	5	
Bornholm	Læså		2.1	7	
Bornholm		Vasagård-1	2.3	6	
Bornholm		Gravgærde-1	1.8	2	
Sealand		Slagelse-1	3.0	2	
Nõrke	Lanna		0.5	4	
Nõrke		Hynneberg	0.5	4	
Kinnekulle	Trolmen		0.5	2	
Kinnekulle		Brattefors	0.5	1	
Kinnekulle	Brattefors		0.5	2	
Kinnekulle	Gössäter		0.5	2	
Kinnekulle		Hõllekis-1	0.5	3	
Billingen	Karlsfors		0.6	1	
Billingen	St. Stolan		1.1	4	
Billingen	Ranstad		1.1	5	
Billingen		Krosstation-1	0.8	12	
Billingen	Bjõllum		1.5	1	
Billingen	Stenbrottet (Orreholmen)		0.5	1	
Billingen	Djupadal		1.0	1	
Hunneberg	Mossebo		4.6	1	diabase
Hunneberg	Tunhem		6.3	2	diabase
Østergötland		Bärstad	0.6	4	
S. Öland	Ottenby		0.7	2	
S. Öland		Ottenby-2	0.7	3	
S. Öland		Kvinnsgröta-1	0.7	2	
N. Öland	Djupvik		0.4	2	

(Table 2 continued)

Location	Outcrop	Well	Avg Ro	Samples from locality (N_lok)	Note
N. Öland		Djupvik-1	0.6	2	
N. Öland	Äleklinta		0.5	1	
N. Öland	Degerhamn		0.5	4	
Baltic Sea		B-7	0.6	4	
Gotland		Lukse-1	0.3	1	
Gotland		Lajrhagen-1	0.3	1	
Gotland		Långvät-1	0.6	1	
Gotland		Lau-1	0.5	1	
Baltic Sea		Yoldia-1	1.8	1	
Baltic Sea		G-14	4.7	1	
Baltic Sea		B1.c	1.5	1	
Baltic Sea		L-a	1.8	1	
Poland		Z-2	1.2	1	
Poland		IG-1. Zarnowiec	1.1	3	
Poland		Koscierzyna IG-1	2.2	1	
Poland		Slupsk IG1	5.5	1	
Poland		Hel IG1	1.2	1	
Olso	Möllegaten		5.1	2	diabase
Olso	Ekeberg		3.9	4	diabase
Olso	Tøyenhagen		4.2	2	diabase
Olso	Slemmestad		5.3	9	diabase
Mjøsa	Steinsviken		2.5	3	
Norge	Lillehammar		2.3	1	
Estonia		F-342	0.5	1	
Estonia		K-16	0.5	1	
Estonia		K-14	0.5	1	
Estonia	Paldinski		0.6	1	
Kattegat		Terne-1	3.6	12	

3.2. Map of vitrinite-like reflectance in Ordovician and Silurian shales

A maturity map of the reflectance of vitrinite-like particles in Middle to Upper Ordovician and Silurian shales is presented in Figure 4. The map shows the same overall trends as the map based on Alum Shale data (Figure 3). The maturation at a few localities is, however, slightly lower than was measured for the Alum Shale (compare Figures 3 and 4).

In Scandinavia the thickness of the Ordovician shales is generally less than 100 m and thus no large thermal difference is expected to exist between the Alum Shale and the Ordovician shales. The preserved Silurian succession can, on the other hand, be up to 1.5 km in Scania and >3 km offshore Bornholm and in Kattegat (Michelsen & Nielsen 1991, Vejbæk et al. 1994). Hence, significantly lower maturities may characterize these sections.

One data point in the Colonus shale, in the Ringsö area (central Scania), indicates a reflectance of 1.2% of the vitrinite-like particles (Figure 4). The actual thickness of the Silurian in this area is, however, unknown and the maturity gradient thus cannot be calculated for this area based on this data point alone.

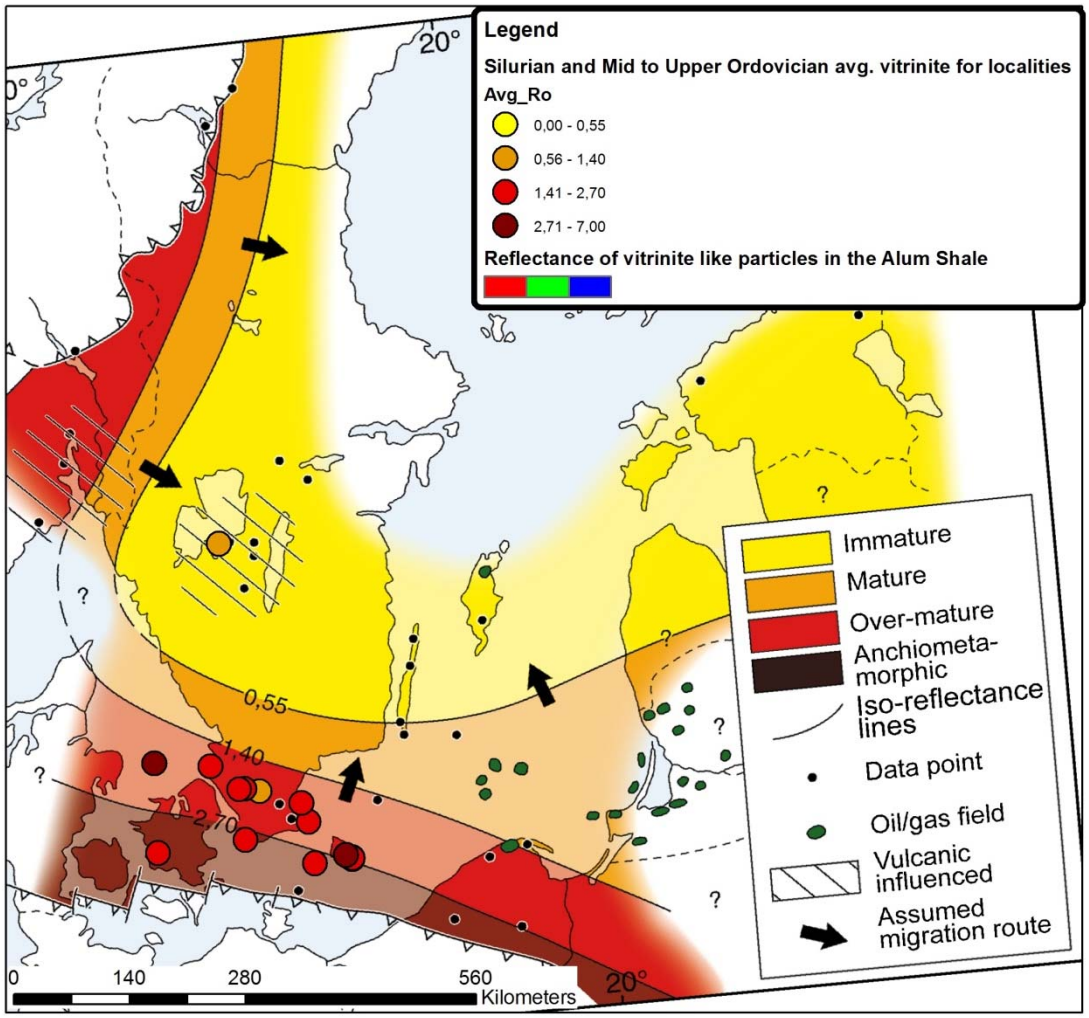

Figure 4. Reflectance of vitrinite-like particles in the Lower (Tøyen Shale), Middle and Upper Ordovician and Silurian shales. The colour interval of the data points is selected to match that used by Buchardt at al. (1997). Average vitrinite-like reflectance values for all localities are presented in Table 3.

Table 3. Average reflectance of vitrinite-like particles in Middle to Upper Ordovician and Silurian shales. 'Diabase' indicates that the sample was picked near a diabase dike.

Location	Outcrop	Well	Forma	Stratigraphy	Avg_Ro	N_lok	Note
Scania	Ringsjön		Colonus Shale	Upper Silurian	1.2	1	
Scania		Maglarp-1	Cyrtograptus Shale	Silurian	2.5	1	
Scania		Albjära-1	Almelund Shale	M. Ordovician	2.1	2	
Scania	Kivik		Almelund Shale	M. Ordovician	2.4	1	diabase
Scania		Lönstorp-1	Rastrites Shale	Silurian	1.9	2	
Scania		Lovisefred-1	Cyrtograptus Shale	Silurian	1.5	2	
Bornholm		Billegrav-1	Dicellograptus	U. Ordovician	2.5	2	
Bornholm	Øleå		Cyrtograptus Shale	Silurian	2.1	2	
Bornholm	Øleå		Rastrites Shale	Silurian	2.3	3	
Bornholm	Læså		Dicellograptus	Ordovician	2.0	1	
Bornholm	Hullegård		Dicellograptus	U. Ordovician	2.7	1	
Sealand		Slagelse-1	Silurian shale	Silurian	2.7	6	
Kinnekulle	Högkullen		Rastrites Shale	Silurian	0.8	2	
Baltic Sea		Pernille-1	Colonus Shale	Silurian	1.8	1	
Kattegat		Terne-1	Silurian shale	Silurian	2.5	4	
Kattegat		Terne-1	Rastrites Shale	Silurian	2.7	7	
Kattegat		Terne-1	Lindegård	U. Ordovician	2.9	5	
Kattegat		Terne-1	Dicellograptus	U. Ordovician	3.2	5	
Kattegat		Terne-1	Almelund Shale	M. Ordovician	3.5	2	

4. Rock Eval and atomic H/C ratio

In addition to reflectance of vitrinite like particles Rock Eval analyses and measurements of atomic ration were conducted on a part of the samples. Most of the Rock Eval data derives from the PREWSOR database (Warming at al. 1994) whereas the primary source of the H/C data is the publication by Buchardt & Lewan (1990). These are included in the maturity database in the file 'Maturity database.xlsx'.

Screening analyses of the Ottenby-2 and Hällkis-1 wells is provided to illustrate the variation within the Alum Shale. The data source is primarily the PREWSOR database (Warming at al. 1994). Data presented in Appendix B and in the file 'rock_eval_complication.xlsx'.

4.1. Map of Rock Eval HI for the Alum Shale Fm

The Rock Eval S2 yield when normalised to the TOC content is termed the hydrogen index (HI). This index is a proxy for the hydrogen content of the kerogen. The ratio depends on both kerogen type and maturation level. With increasing maturity the HI values decreases as a consequence of hydrocarbon generation.

The Alum Shale contains a marine type 2 kerogen (Buchardt & Lewan 1990) and immature Alum Shale is characterised by up to 600 mg HC / g TOC (Figure 5).

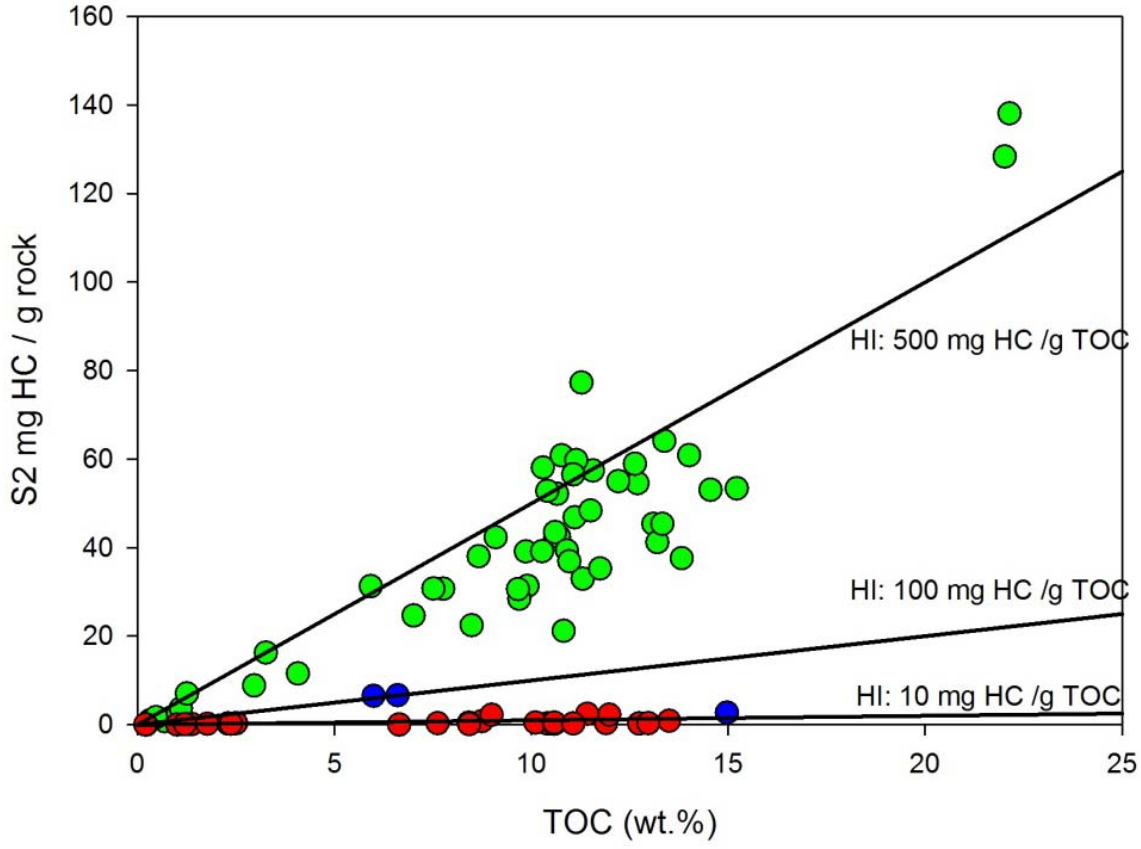

Figure 5. Rock Eval S2 yield versus TOC content of Alum Shale samples. Green colour: %Ro < 0.6%, blue colour 0.6 <%Ro< 1.8% and red colour Ro>1.8%. Data presented in Appendix B and in the file 'rock_eval_complication.xlsx' is available on the attached CD.

Rock Eval data from different regions in Balto-Scandia clearly reflect the maturity variation (Figure 6). Thermally immature Alum Shale (%Ro < 0.6) is characterised by relative high HI values of about 500-600 mg HC / g TOC. The southern part of Öland, Estonia, northern part of Poland and a few samples from central Sweden have HI less than 400 mg HC / g TOC which might indicate a slightly elevated maturity. Thermally matured Alum Shale (%Ro > 2%) have HI values below 10 mg HC / g TOC. This change reflects generation of hydrocarbons as a result of hydrogen and carbon loss due to expulsion.

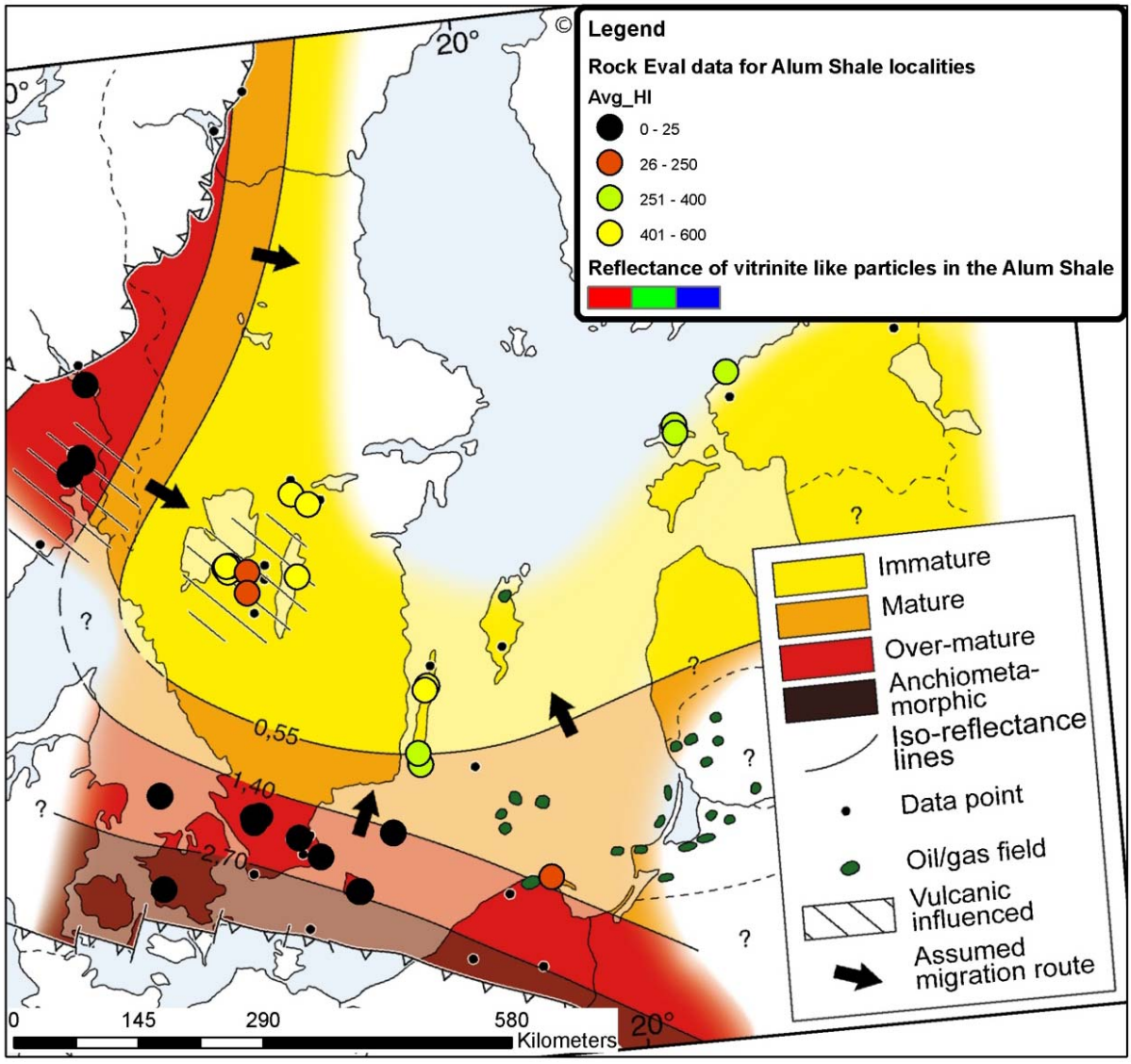

Figure 6. Rock Eval hydrogen index (HI) in the Alum Shale.

4.2. Map of atomic H/C ratios in the Alum Shale Fm

The H/C ratio is a powerful maturity indicator and is also an indicator of the type of organic carbon (Buchardt & Lewan 1990). The ratio is lowered when hydrocarbons have been expelled and in thermally immature sections the H/C ratio in the Alum Shale exceeds 1.0 (Figure 7). At vitrinite-like reflectances > 2% the atomic H/C ratio is less than 0.6, suggesting a very high aromatisation level of the kerogen. In samples picked near dikes H/C ratios approaching zero have been measured, indicating that the kerogen structure in those settings is completely broken down and the organic carbon is present as graphite.

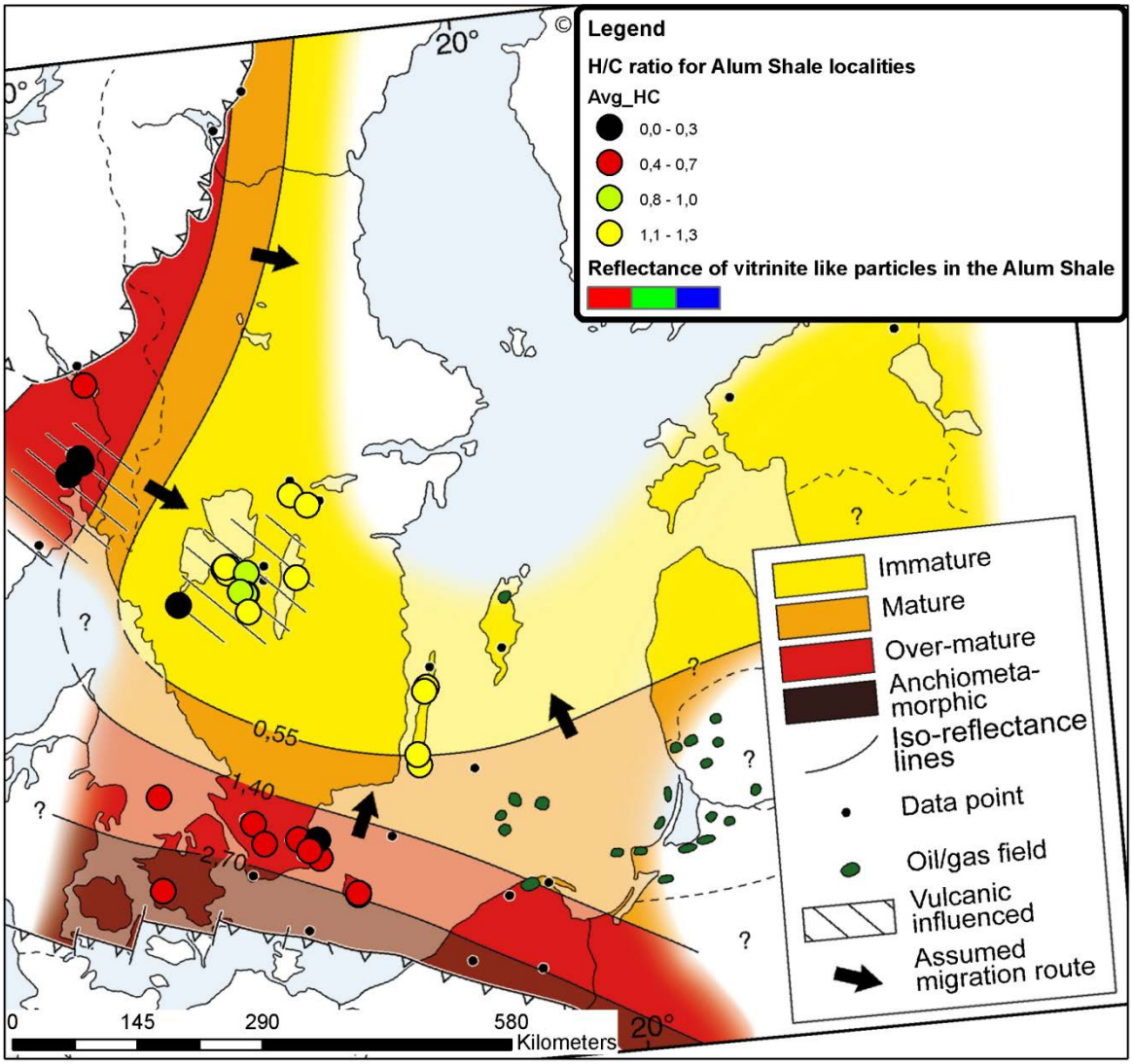

Figure 7. Map of the atomic H/C ratio in the Alum Shale.

4.3. Relationships between %Ro, HI and atomic H/C ratio

The reflectance of vitrinite-like particles is strongly correlated with other maturity indicators (Figure 8). The relationship between vitrinite reflectance and atomic H/C ratio (Figure 8a) was established by Buchardt & Lewan (1990) and also suggests that the Alum Shale 'vitrinite' is similar to true vitrinite present in younger rocks.

The relationship between hydrogen index and vitrinite-like particles indicates that immature Alum Shale contains up to 600 mg HC / g TOC (Figure 8b). At maturity levels of 1% Ro the HI index is reduced to about 300 mg HC / g TOC and at 2% the shale contains less than 50 mg HC / g TOC. At maturities of 3% Ro and higher the hydrogen index is near zero.

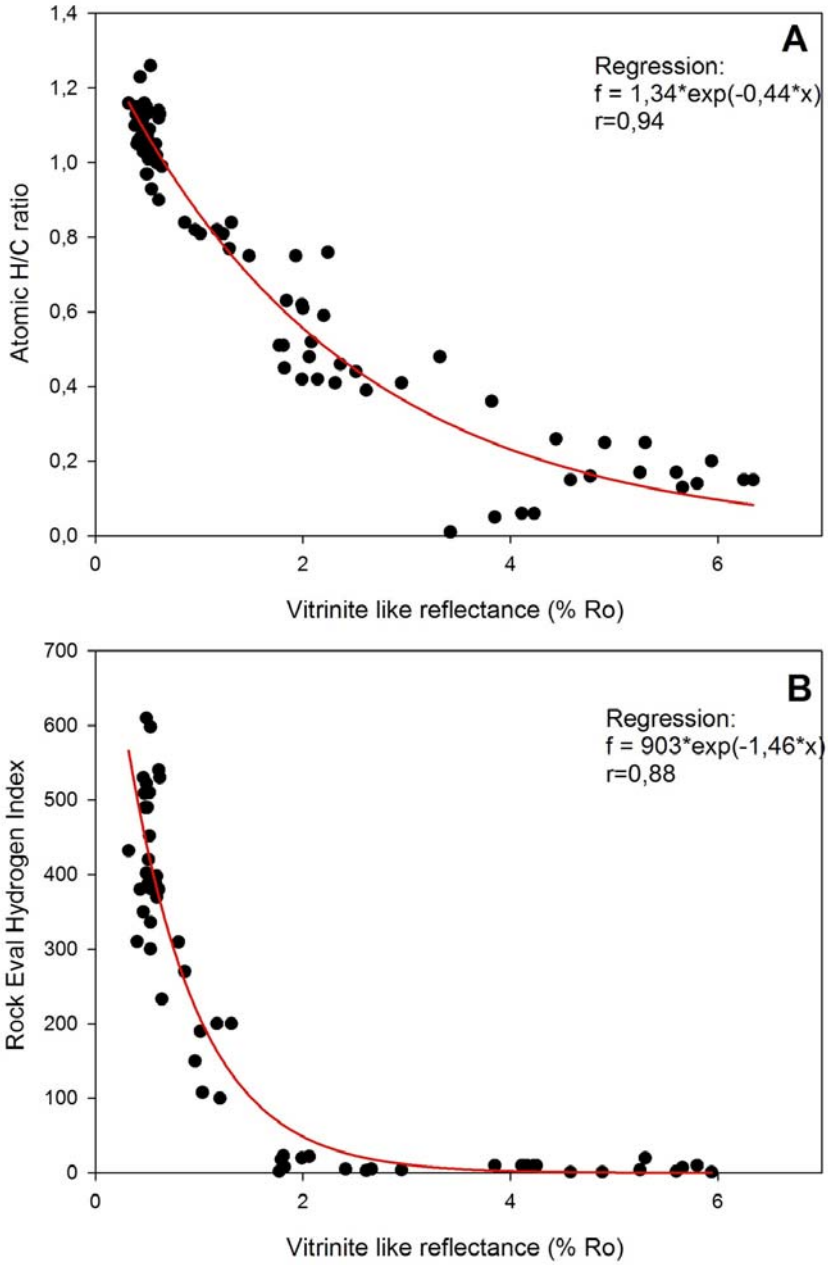

Figure 8. Reflectance of vitrinite-like particles in the Alum Shale versus atomic H/C ratio (A) and versus Rock Eval Hydrogen index (B). The red lines in A and B are the reference lines (exponential decay) for the relationships.

5. The ArcGis project

The maturity data and selected base-maps have been collected in an ArcGis project.The following base-maps are included (Figure 9):

Reflectance of vitrinite-like particles in the Alum Shale (Buchardt et al. 1997).
Distribution of Lower Palaeozoic strata (Nielsen & Schovsbo 2011).
Thickness of the Alum Shale Formation (Buchardt et al. 1997).
Distribution of facies types in the L. Ordovician part of the Alum Shale (Schovsbo 2002).
Distribution of facies types in the Furongian part of the Alum Shale (Schovsbo 2002).
Depth to the top crystalline basement or top Cambrian sandstone (Lassen & Thybo 2005).
Thickness of Palaeozoic strata (Lassen & Thybo 2005).
Structural elements in southern Scandinavian (Nielsen 2003).

Pdf's of the original papers containing the geo-referenced base-maps above mentioned papers are included in the folder 'Literature'.

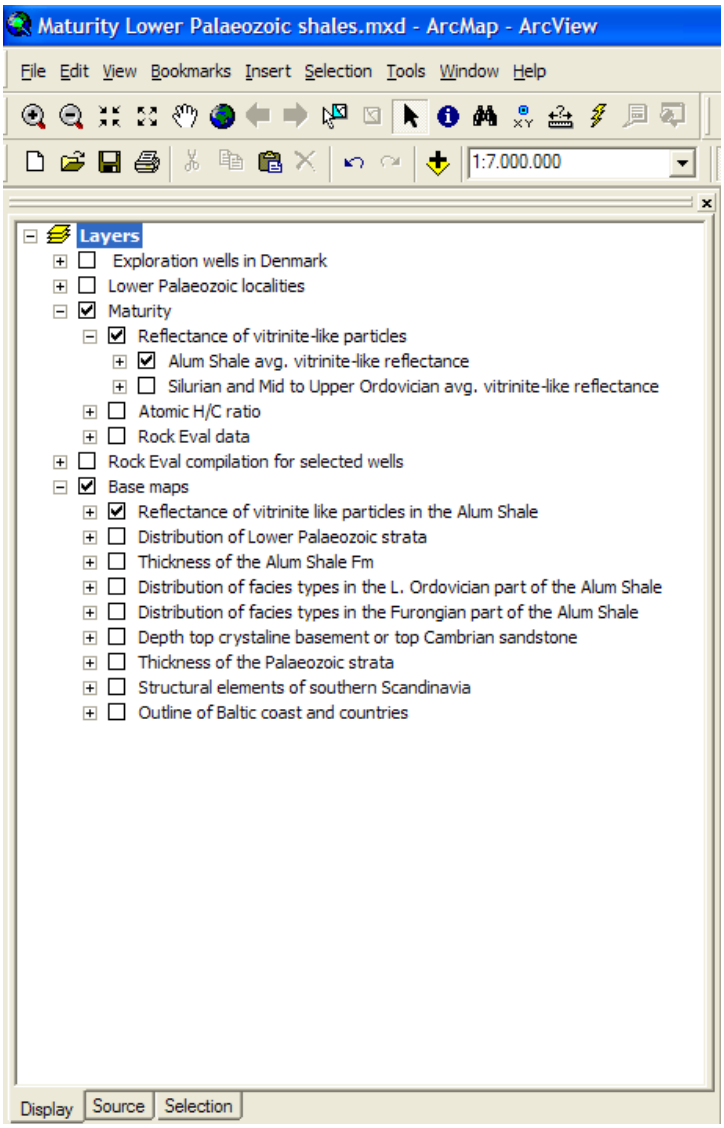

Figure 9. Table of content in the ArcGis Project. The project is launched from the mxd file: 'Maturity Lower Palaeozoic Shales.mxd' located in the GISproject folder on the CD.

The ArcGis project allows for a detailed evaluation of the spatial variation of the maturity data. The project contains predefined maps for the %Ro, atomic H/C ratio and Rock Eval HI (Figures 3, 4, 6, 7).

For each well and outcrop a direct link to frequency data for the vitrinite measurements is provided (Figure 10).

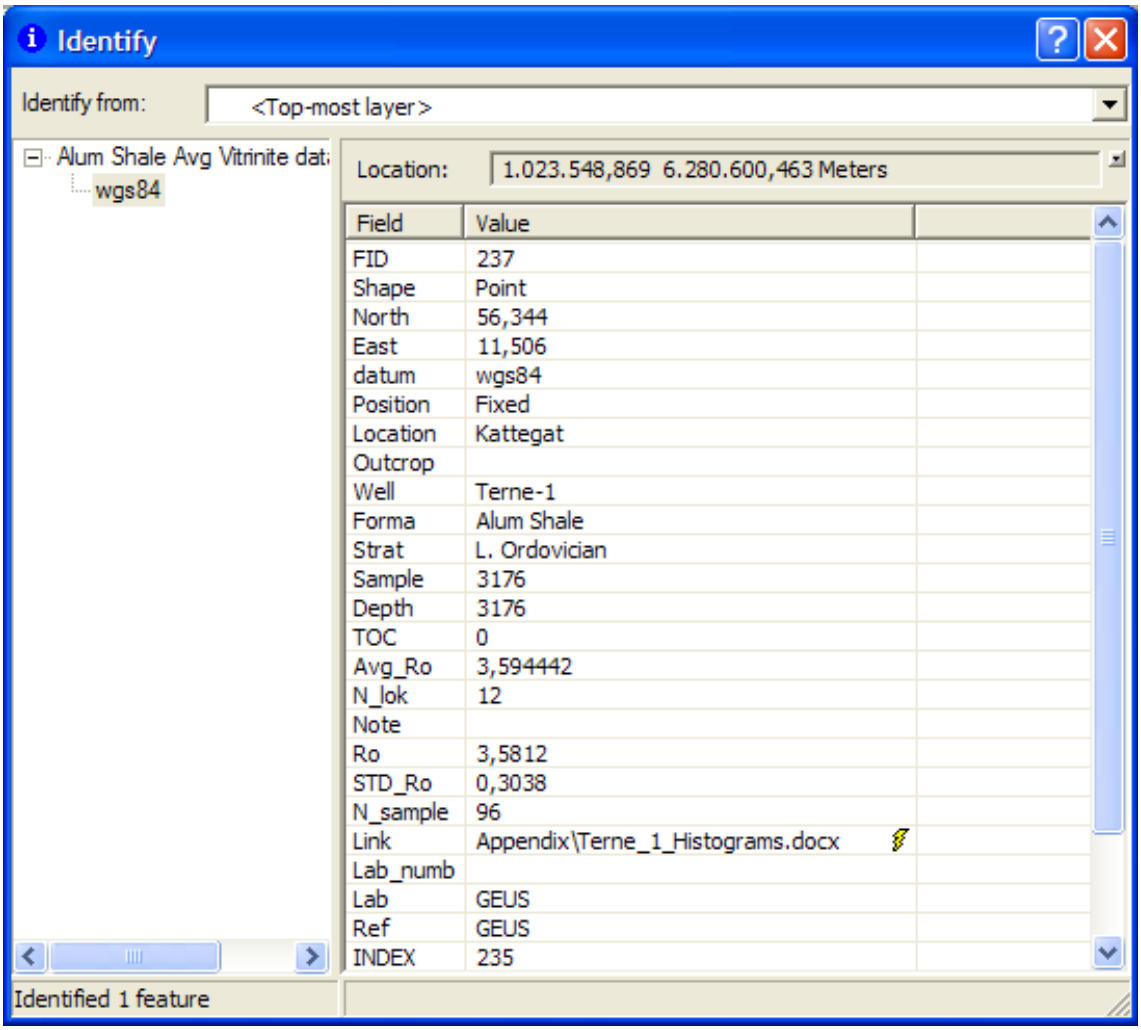

Figure 10. Example of the information accompanying each well and outcrop. A direct link to the histograms is included.

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7. Data included on CD

Attached to this report is a CD that contains the following documentation:

The files:

a. Maturity_Database.xlsx
b. Rock Eval Complication.xlsx
c. Pdf of this report termed: 'Maturity database for the Lower Palaeozoic.pdf'

The folders:

1. 'Tables and Appendix'; data presented in Tables 1-3 and in Appendix A,B and C.
2. 'Literature'; pdf of cited literature if public available
3. 'GISproject'; the AchGis project. The folder contains:
    a. the file: 'Maturity Lower Palaeozoic Shales.mxd' where from the ArcGis program is launched from
    b. Subfolders includes: 'Appendix', 'png_files' and 'Shapefiles'

8. Appendix A: Vitrinite-like reflectance

Location	Outcrop	Well	Formation	Stratigraphy	Sample	Depth	Ro	STD_Ro	N	Lab
Scania	Ringsjön		Colonus Shale	Silurian	2121W		1.21	0.1	70	GEUS
Scania		Maglarp-1	Cyrtograptus Shale	Silurian	1938W	1951.0	2.53	0.26	47	GEUS
Scania	Åkarpsmölla		Alum Shale	Furongian	5m		4.40			GEUS
Scania	Åkarpsmölla		Alum Shale	Furongian	6m		4.60			GEUS
Scania	Åkarpsmölla		Alum Shale	Furongian	10m		5.30			GEUS
Scania	Åkarpsmölla		Alum Shale	Furongian	20m		5.80			GEUS
Scania	Åkarpsmölla		Alum Shale	Furongian	50m		3.90			GEUS
Scania	Andrarum		Alum Shale	Furongian	AS-42		1.77	0.2	75	Amaco
Scania	Andrarum		Alum Shale	Furongian	AS-43		1.82	0.2	75	Amaco
Scania	Andrarum		Alum Shale	Furongian	SKK 21		2.50	0.08	100	GEUS
Scania		Albjära-1	Almelund Shale	U. Ordovician	alb 1/01 (79-009)	8.3	1.94	0.23	45	GEUS
Scania		Albjära-1	Almelund Shale	M. Ordovician	alb 1/07 (79-015)	80.0	2.20	0.37	60	GEUS
Scania		Albjära-1	Alum Shale	L. Ordovician	alb 1/14 (79-022)	140.7	2.03	0.3	57	GEUS
Scania		Albjära-1	Alum Shale	L. Ordovician	alb 1/15 (79-023)	150.5	2.30	0.27	99	GEUS
Scania		Albjära-1	Alum Shale	L. Ordovician	ALB 97.153	58.0	2.09			BGR
Scania		Albjära-1	Alum Shale	Furongian	letgas 6	145.2	2.26	0.16	97	GEUS
Scania		Albjära-1	Alum Shale	Furongian	letgas 9	157.0	1.88	0.17	93	GEUS
Scania	Gislövshammar		Alum Shale	Furongian	SKK 20		2.00	0.09	100	GEUS
Scania		Gislövshammar-2	Tøyen Shale	L. Ordovician	GIS2 89.944	15.0	2.09	0.17	28	GEUS
Scania		Gislövshammar-2	Alum Shale	Furongian	GIS2 89.907	53.0	1.84	0.08	86	GEUS
Scania		Gislövshammar-2	Alum Shale	Furongian	GIS2 89.917	42.0	1.91	0.12	92	GEUS
Scania		Gislövshammar-2	Alum Shale	L. Ordovician	GIS2 89.925	33.9	2.00	0.12	78	GEUS
Scania		Gislövshammar-2	Alum Shale	L. Ordovician	GIS2 89.931	28.0	1.93	0.15	100	GEUS
Scania		Gislövshammar-2	Alum Shale	M. Cambrian	GIS2 93.260	99.0	2.01	0.17	40	GEUS
Scania		Gislövshammar-2	Alum Shale	Furongian	GIS2 93.283	75.9	1.99	0.12	94	GEUS
Scania		Gislövshammar-2	Alum Shale	Furongian	Gisstd	60.4	2.00			BGR
Scania	Kivik		Almelund Shale	M. Ordovician	kivik-1		2.42	0.29	48	GEUS
Scania	Kvasa		Alum Shale	L. Ordovician	kvasa-1		4.91	0.47	100	GEUS
Scania		Lönstorp-1	Rastrites Shale	Silurian	lon1 97-151	64.9	1.90	0.27	18	GEUS
Scania		Lönstorp-1	Rastrites Shale	Silurian	lon1 97-152	75.7	1.85	0.28	60	GEUS
Scania		Lovisefred-1	Cyrtograptus Shale	Silurian	1932W	242.5	1.48	0.16	37	GEUS
Scania		Lovisefred-1	Cyrtograptus Shale	Silurian	1933W	264.5	1.43	0.16	30	GEUS
Scania	Röstunga		Alum Shale	Furongian			2.66			GEUS
Scania		Ljunghuse-1	Alum Shale	Furongian	1937W	2254.3	3.20	0.53	36	GEUS
Scania		Håslöv-1	Alum Shale	Furongian	1934W	2518.1	3.02	0.16	120	GEUS
Scania		Håslöv-1	Alum Shale	Furongian	1935W	2525.8	3.30	0.14	120	GEUS
Scania		Flagabro-1	Alum Shale	L. Ordovician	FLAGA-1	50.0	2.20	0.38	100	GEUS
Scania		Flagabro-1	Alum Shale	L. Ordovician	FLAGA-2	42.0	2.08	0.19	85	GEUS
Scania		Fågelson-1	Alum Shale	Furongian	Fågel 2	43.9	3.32			GEUS
Scania		Fågelson-1	Alum Shale	Furongian	Fågelson	46.6	3.31	0.45	140	GEUS
Scania		Fågelson-1	Alum Shale	Furongian	Fågel 3	48.5	3.82	0.31	60	GEUS

Location	Outcrop	Well	Formation	Stratigraphy	Sample	Depth	Ro	STD_Ro	N	Lab
Scania		Fågelson-1	Alum Shale	Furongian	Fågel 4	54.8	4.44	0.6	103	GEUS
Bornholm	Limensgade		Alum Shale	L. Ordovician	AS-47		2.41			Amaco
Bornholm		Skelbro-1	Alum Shale	Furongian	SKK 34	27.1	2.31	0.41	70	GEUS
Bornholm		Skelbro-1	Alum Shale	Furongian	SKK 44	17.9	2.14	0.42	70	GEUS
Bornholm		Skelbro-1	Alum Shale	L. Ordovician	SKK 55	6.9	2.51	0.44	70	GEUS
Bornholm		Skelbro-1	Alum Shale	M. Cambrian	SKK 25	35.7	2.36	0.27		GEUS
Bornholm		Skelbro-1	Alum Shale	L. Ordovician	SKK 54	7.9	2.37			GEUS
Bornholm		Billegrav-1	Dicellograptus	U. Ordovician	SKS 07	46.9	2.41	0.38	82	GEUS
Bornholm		Billegrav-1	Rastrites Shale	Silurian	SKS 27	28.5	2.50	0.38	145	GEUS
Bornholm	Øleå		Cyrtograptus Shale	Silurian	225A		2.13	0.31	34	GEUS
Bornholm	Øleå		Cyrtograptus Shale	Silurian	227A		2.05	0.29	11	GEUS
Bornholm	Øleå		Rastrites Shale	Silurian	Mer-1		2.31			GEUS
Bornholm	Øleå		Rastrites Shale	Silurian	Mer-2		2.27			GEUS
Bornholm	Øleå		Rastrites Shale	Silurian	Mer-3		2.31			GEUS
Bornholm-Læså	Læså		Dicellograptus	Ordovician	221A		1.96	0.26	31	GEUS
Bornholm-Læså	Læså		Alum Shale	Ordovician	219A		2.37	0.32	35	GEUS
Bornholm-Læså	Læså		Alum Shale	Furongian	218A		1.99	0.33	40	GEUS
Bornholm-Læså	Læså		Alum Shale	M. Cambrian	212A		2.09	0.23	41	GEUS
Bornholm-Læså	Læså		Alum Shale	Furongian	AS-45		1.81	0.19	85	Amaco
Bornholm-Læså	Læså		Alum Shale	Furongian	AS-46		2.06	0.11	35	Amaco
Bornholm-Læså	Læså		Alum Shale	Furongian	Læså. outcrop		1.99	0.33	41	GEUS
Bornholm-Læså	Læså		Alum Shale	Furongian	Læså. outcrop		2.09	0.23	40	GEUS
Bornholm	Hullegård		Dicellograptus	U. Ordovician	404w		2.74	0.16	23	GEUS
Bornholm		Vasagård-1	Alum Shale	Furongian	405a	10.3	2.02	0.27	115	GEUS
Bornholm		Vasagård-1	Alum Shale	Furongian	406a	11.6	2.46	0.18	116	GEUS
Bornholm		Vasagård-1	Alum Shale	Furongian	407a		2.20	0.3	122	GEUS
Bornholm		Vasagård-1	Alum Shale	Furongian	408a	17.0	2.55	0.12	86	GEUS
Bornholm		Vasagård-1	Alum Shale	Furongian	409a	19.6	2.28	0.3	100	GEUS
Bornholm		Vasagård-1	Alum Shale	Furongian	410w		2.04	0.36	55	GEUS
Bornholm		Gravgærde-1	Alum Shale	M. Cambrian	411w		1.87	0.16	55	GEUS
Bornholm		Gravgærde-1	Alum Shale	M. Cambrian	412a		1.76	0.14	50	GEUS
Sealand		Slagelse-1	Silurian shale	Silurian	258A	2641.6	2.50	0.35	25	GEUS
Sealand		Slagelse-1	Silurian shale	Silurian	259A	2773.1	2.58	0.23	34	GEUS
Sealand		Slagelse-1	Silurian shale	Silurian	260A	2775.3	2.72	0.17	26	GEUS
Sealand		Slagelse-1	Silurian shale	Silurian	261A	2812.6	2.72	0.17	42	GEUS
Sealand		Slagelse-1	Silurian shale	Silurian	262A	2855.8	2.85	0.22	69	GEUS
Sealand		Slagelse-1	Lindegård	U. Ordovician	263A	2905.0	3.01	0.26	75	GEUS
Sealand		Slagelse-1	Alum Shale	Alum Shale	264A	2932.7	3.07	0.23	140	GEUS
Sealand		Slagelse-1	Alum Shale	Alum Shale	265A	2933.2	2.91	0.35	49	GEUS
Närke	Lanna		Alum Shale	Furongian	689w		0.47	0.06	59	GEUS
Närke	Lanna		Alum Shale	Furongian	1130w		0.45	0.03	16	GEUS
Närke	Lanna		Alum Shale	Furongian	1135w		0.41	0.03	60	GEUS
Närke	Lanna		Alum Shale	Furongian	AS 34		0.49	0.04	45	Amaco
Närke	Lanna		Alum Shale	Furongian	NARK-4		0.45			GEUS
Närke		Hynneberg	Alum Shale	L. Ordovician	1916W	7.1	0.44	0.03	67	GEUS
Närke		Hynneberg	Alum Shale	L. Ordovician	BB 87-5	9.3	0.54	0.08	105	GEUS

Location	Outcrop	Well	Formation	Stratigraphy	Sample	Depth	Ro	STD_Ro	N	Lab
Närke		Hynneberg	Alum Shale	Furongian	BB 87-6	14.4	0.48	0.09	115	GEUS
Närke		Hynneberg	Alum Shale	Furongian	BB 87-7	22.2	0.46	0.03	95	GEUS
Västergötland	Falköping		Alum Shale	Furongian	1133w		1.04	0.05	60	GEUS
Västergötland (Kinnekulle)	Trolmen		Alum Shale	Furongian	AS 08		0.50	0.08	52	Amaco
Västergötland (Kinnekulle)	Trolmen		Alum Shale	Furongian	AS 09b		0.43	0.04	25	Amaco
Västergötland (Kinnekulle)		Brattefors	Alum Shale	Furongian	BB 87-8		0.46			GEUS
Västergötland (Kinnekulle)	Brattefors		Alum Shale	Furongian	AS 33		0.52	0.05	72	Amaco
Västergötland (Kinnekulle)	Brattefors		Alum Shale	Furongian	BB 86-28		0.51			GEUS
Västergötland (Kinnekulle)	Gössäter		Alum Shale	Furongian	AS 31		0.49	0.04	52	Amaco
Västergötland (Kinnekulle)	Gössäter		Alum Shale	Furongian	AS 32		0.52	0.04	70	Amaco
Västergötland (Kinnekulle)		Hällekis-1	Alum Shale	Furongian	HAL1 93-151	24.5	0.45	0.07	110	GEUS
Västergötland (Kinnekulle)		Hällekis-1	Alum Shale	Furongian	HAL1 93-152	32.5	0.48	0.02	100	GEUS
Västergötland (Kinnekulle)		Hällekis-1	Alum Shale	Furongian	HAL1 93-153	39.7	0.53	0.04	100	GEUS
Västergötland (Kinnekulle)		Hällekis-1	Alum Shale	Furongian	Hälstd		0.49			BGR
Västergötland (Kinnekulle)	Högkullen		Rastrites Shale	Silurian	1329W		0.86	0.04	199	GEUS
Västergötland (Kinnekulle)	Högkullen		Rastrites Shale	Silurian	1330W		0.80	0.04	44	GEUS
Västergötland (Billingen)	Karlsfors		Alum Shale	Furongian	BB 92-02		0.63			GEUS
Västergötland (Billingen)	St. Stolan		Alum Shale	Furongian	AS 35		0.96	0.25	18	GEUS
Västergötland (Billingen)	St. Stolan		Alum Shale	Furongian	BB 86-39		0.64	0.23	45	GEUS
Västergötland (Billingen)	St. Stolan		Alum Shale	Furongian	BB 92-01		1.65			GEUS
Västergötland (Billingen)	Stolan		Alum Shale	Furongian	1134w		1.30	0.05	40	GEUS
Västergötland (Billingen)	Ranstad		Alum Shale	Furongian	1132w		0.90	0.04	61	GEUS
Västergötland (Billingen)	Ranstad		Alum Shale	Furongian	AS 27		1.17	0.24	35	Amaco
Västergötland (Billingen)	Ranstad		Alum Shale	Furongian	AS 28		0.86	0.3	44	Amaco
Västergötland (Billingen)	Ranstad		Alum Shale	Furongian	AS 29		1.31	0.24	22	GEUS
Västergötland (Billingen)	Ranstad		Alum Shale	Furongian	AS 30		1.01	0.18	11	GEUS
Västergötland (Billingen)		Krosstation-1 Häggum	Alum Shale	Furongian	Häggum 02	49.3	1.23			GEUS
Västergötland (Billingen)		Krosstation-1 Häggum	Alum Shale	Furongian	Häggum 03	51.3	1.48			GEUS
Västergötland (Billingen)		Krosstation-1 Häggum	Alum Shale	Furongian	Häggum 05	47.4	2.24			GEUS
Västergötland (Billingen)		Krosstation-1 Häggum	Alum Shale	Furongian	Häggum 07	53.4	1.29			GEUS
Västergötland (Billingen)		Krosstation-1 Häggum	Alum Shale	Furongian	Häggum 09	54.9	0.61			GEUS
Västergötland (Billingen)		Krosstation-1 Häggum	Alum Shale	Furongian	Häggum 11	57.4	0.54			GEUS
Västergötland (Billingen)		Krosstation-1 Häggum	Alum Shale	Furongian	Häggum 13	59.4	0.50			GEUS
Västergötland (Billingen)		Krosstation-1 Häggum	Alum Shale	Furongian	Häggum 15	61.5	0.41			GEUS
Västergötland (Billingen)		Krosstation-1 Häggum	Alum Shale	M. Cambrian	Häggum 17	63.6	0.44			GEUS

Location	Outcrop	Well	Formation	Stratigraphy	Sample	Depth	Ro	STD_Ro	N	Lab
Västergötland (Billingen)		Krosstation-1 Häggum	Alum Shale	M. Cambrian	Häggum 19	65.6	0.38			GEUS
Västergötland (Billingen)		Krosstation-1 Häggum	Alum Shale	M. Cambrian	Häggum 21	67.6	0.39			GEUS
Västergötland (Billingen)		Krosstation-1 Häggum	Alum Shale	M. Cambrian	Häggum 23	69.6	0.39			GEUS
Västergötland (Billingen)	Bjällum		Alum Shale	Furongian	K-68744		1.48	0.41	10	GEUS
Västergötland (Billingen)	Stenbrottet (Orreholmen)		Alum Shale	Furongian	K-68756		0.49	0.07	75	GEUS
Västergötland (Billingen)	Djupadal		Alum Shale	Furongian	BILL-4		1.04			GEUS
Västergötland (Hunneberg)	Mossebo		Alum Shale	Furongian	BB 92-03		4.57			GEUS
Västergötland (Hunneberg)	Tunhem		Alum Shale	Furongian	K-68766		6.25	0.4	5	Amaco
Västergötland (Hunneberg)	Tunhem		Alum Shale	Furongian	K-68767		6.34	0.59	3	Amaco
Östergötland		Bårstad	Alum Shale	L. Ordovician	BB 87-1	20.6	0.62	0.1	150	GEUS
Östergötland		Bårstad	Alum Shale	Furongian	BB 87-2	23.2	0.51	0.05	70	GEUS
Östergötland		Bårstad	Alum Shale	Furongian	BB 87-3	30.5	0.61	0.09	79	GEUS
Östergötland		Bårstad	Alum Shale	Furongian	BB 87-4	38.2	0.61	0.08	18	GEUS
S. Öland	Ottenby		Alum Shale	Furongian	AS 36		0.59	0.06	75	Amaco
S. Öland	Ottenby		Alum Shale	L. Ordovician	91-10		0.80	0.05	50	RWTH Aachen
S. Öland		Ottenby-2	Alum Shale	L. Ordovician	Ott 9003	6.2	0.77			GEUS
S. Öland		Ottenby-2	Alum Shale	Furongian	Ott 9009	13.5	0.66			GEUS
S. Öland		Ottenby-2	Alum Shale	M. Cambrian	Ott 9018	25.0	0.73			GEUS
S. Öland		Kvinnsgröta-1	Alum Shale	Furongian	690w	33-35	0.69	0.05	100	GEUS
S. Öland		Kvinnsgröta-1	Alum Shale	Furongian	691w	42-44	0.71	0.06	143	GEUS
N Öland	Djupvik		Alum Shale	L. Ordovician	NS 91-701		0.53	0.04	50	RWTH Aachen
N Öland	Djupvik		Alum Shale	L. Ordovician	BB 86-81		0.32	0.05	70	GEUS
N Öland		Djupvik-1	Alum Shale	L. Ordovician	DJU1 91-722	4.4	0.55	0.1	150	GEUS
N Öland		Djupvik-1	Alum Shale	Furongian	DJU1 91-723	2.0	0.58	0.05	100	GEUS
N Öland	Äleklinta		Alum Shale	Furongian	AS 40		0.47	0.05	70	Amaco
N Öland	Degerhamn		Alum Shale	Furongian	AS 10		0.50	0.05	51	Amaco
N Öland	Degerhamn		Alum Shale	Furongian	AS 11		0.40	0.06	28	Amaco
N Öland	Degerhamn		Alum Shale	Furongian	AS 38		0.58	0.08	75	Amaco
N Öland	Degerhamn		Alum Shale	Furongian	AS 39		0.59	0.09	70	Amaco
Baltic Sea		B-7	Alum Shale	Furongian	694w	853.0	0.66	0.06	87	GEUS
Baltic Sea		B-7	Alum Shale	Furongian	695w	855.0	0.62	0.05	123	GEUS
Baltic Sea		B-7	Alum Shale	Furongian	696w	857.0	0.64	0.06	107	GEUS
Baltic Sea		B-7	Alum Shale	Furongian	B-7		0.51			GEUS
Gotland		Lukse-1	Alum Shale	L. Ordovician	895w		0.32	0.02	5	GEUS
Gotland		Lajrhagen-1	Alum Shale	L. Ordovician	896w		0.32	0.02	10	GEUS
Gotland		Långvät-1	Alum Shale	L. Ordovician	897w		0.56	0.03	100	GEUS
Gotland		Lau-1	Alum Shale	L. Ordovician	697w		0.49	0.06	53	GEUS
Baltic Sea		Pernille-1	Colonus Shale	Silurian	2908A	3622.0	1.80	0.4	30	GEUS
Baltic Sea		Yoldia-1	Alum Shale	L. Ordovician	Yold-2	756.0	1.79			GEUS
Baltic Sea		G-14	Alum Shale	Furongian			4.70			BGR
Baltic Sea		B1.c	Alum Shale	Furongian			1.48			BGR
Baltic Sea		L-a	Alum Shale	Furongian			1.80			BGR
Poland		Z-2	Alum Shale	Furongian			1.20			BGR
Poland		IG-1. Zarnowiec	Alum Shale	Furongian	Z-01	2724.1	1.14			GEUS
Poland		IG-1. Zarnowiec	Alum Shale	Furongian	Z-02	2726.9	1.20			GEUS

Location	Outcrop	Well	Formation	Stratigraphy	Sample	Depth	Ro	STD_Ro	N	Lab
Poland		IG-1. Zarnowiec	Alum Shale	Furongian	Z-04	2729.0	1.03			GEUS
Poland		*Koscierzyna IG-1*	Alum Shale	Furongian			2.15			Unknown
Poland		Slupsk IG1	Alum Shale	Furongian			5.50			Unknown
Poland		*Hel IG1*	Alum Shale	Furongian			1.22			Unknown
Olso	Möllegaten		Alum Shale	Furongian	BB 86-04		5.30	0.6	70	GEUS
Olso	Möllegaten		Alum Shale	Furongian	BB 86-02		4.9	0.25	50	RWTH Aachen
Olso	Ekeberg		Alum Shale	Furongian	AS 01		4.11	0.7	55	Amaco
Olso	Ekeberg		Alum Shale	Furongian	AS 02		3.85	0.5	50	Amaco
Olso	Ekeberg		Alum Shale	Furongian	AS 03		3.42	0.3	51	Amaco
Olso	Ekeberg		Alum Shale	Furongian	AS 04		4.16			Amaco
Olso	Tøyenhagen		Alum Shale	Furongian	AS 05		4.23	0.7	53	Amaco
Olso	Tøyenhagen		Alum Shale	Furongian	AS 06		4.25			Amaco
Olso	Slemmestad		Alum Shale	Furongian	AS 12		5.80	0.7	70	Amaco
Olso	Slemmestad		Alum Shale	Furongian	AS 13		4.58	0.5	70	Amaco
Olso	Slemmestad		Alum Shale	Furongian	AS 14		5.66	0.8	70	Amaco
Olso	Slemmestad		Alum Shale	U. Ordovician	AS 16		5.94	1.0	38	Amaco
Olso	Slemmestad		Alum Shale	U. Ordovician	AS 17		5.60	0.8	20	Amaco
Olso	Slemmestad		Alum Shale	U. Ordovician	AS 18		5.25	1.0	48	Amaco
Olso	Slemmestad		Alum Shale	U. Ordovician	OSLO-3		5.12			GEUS
Olso	Slemmestad		Alum Shale	U. Ordovician	OSLO-16		5.38			GEUS
Olso	Slemmestad		Alum Shale	U. Ordovician	OSLO-20		4.77			GEUS
Mjøsa	Steinsviken		Alum Shale	L. Ordovician	AS 22		2.61	0.3	68	Amaco
Mjøsa	Steinsviken		Alum Shale	M. Cambrian	AS 23		2.95	0.4	70	Amaco
Mjøsa	Steinsviken		Alum Shale	Furongian	BB 86-12		1.99	0.3	70	GEUS
Norge	Lillehammar		Alum Shale	Furongian	2069A		2.26	0.23	120	GEUS
Estonia		F-342	Alum Shale	L. Ordovician	Esto-2	116.2	0.53			GEUS
Estonia		K-16	Alum Shale	L. Ordovician	Esto-3	103.2	0.53			GEUS
Estonia		K-14	Alum Shale	L. Ordovician	Esto-4	69.5	0.53			GEUS
Estonia	Paldinski		Alum Shale	L. Ordovician	Paldinski		0.62	0.07	110	GEUS
Kattegat		Terne-1	Jurassic	Jurassic	450	450.0	0.28	0.03	48	GEUS
Kattegat		Terne-1	Jurassic	Jurassic	490	490.0	0.30	0.04	60	GEUS
Kattegat		Terne-1	Jurassic	Jurassic	530	530.0	0.30	0.03	57	GEUS
Kattegat		Terne-1	Jurassic	Jurassic	570	570.0	0.31	0.03	62	GEUS
Kattegat		Terne-1	Jurassic	Jurassic	610	610.0	0.32	0.02	35	GEUS
Kattegat		Terne-1	Jurassic	Jurassic	890	890.0	0.41	0.08	32	GEUS
Kattegat		Terne-1	Triassic	Triassic	970	970.0	0.42	0.07	23	GEUS
Kattegat		Terne-1	Triassic	Triassic	1010	1010.0	0.43	0.07	62	GEUS
Kattegat		Terne-1	Triassic	Triassic	1050	1050.0	0.43	0.05	35	GEUS
Kattegat		Terne-1	Triassic	Triassic	1090	1090.0	0.43	0.06	62	GEUS
Kattegat		Terne-1	Triassic	Triassic	1130	1130.0	0.45	0.08	65	GEUS
Kattegat		Terne-1	Triassic	Triassic	1170	1170.0	0.44	0.07	61	GEUS
Kattegat		Terne-1	Triassic	Triassic	1210	1210.0	0.43	0.05	62	GEUS
Kattegat		Terne-1	Triassic	Triassic	1250	1250.0	0.45	0.05	59	GEUS
Kattegat		Terne-1	Triassic	Triassic	1270	1270.0	0.46	0.06	62	GEUS
Kattegat		Terne-1	Silurian shale	Silurian	2534	2534.0	2.57	0.30	25	GEUS
Kattegat		Terne-1	Silurian shale	Silurian	2504	2504.0	2.50	0.14	19	GEUS
Kattegat		Terne-1	Silurian shale	Silurian	2564	2564.0	2.43	0.15	24	GEUS
Kattegat		Terne-1	Silurian shale	Silurian	2594	2594.0	2.51	0.19	26	GEUS

Location	Outcrop	Well	Formation	Stratigraphy	Sample	Depth	Ro	STD_Ro	N	Lab
Kattegat		Terne-1	Rastrites Shale	Silurian	2819	2819.0	2.60	0.34	120	GEUS
Kattegat		Terne-1	Rastrites Shale	Silurian	2849	2849.0	2.60	0.34	93	GEUS
Kattegat		Terne-1	Rastrites Shale	Silurian	2879	2879.0	2.79	0.37	56	GEUS
Kattegat		Terne-1	Rastrites Shale	Silurian	2909	2909.0	2.62	0.35	73	GEUS
Kattegat		Terne-1	Rastrites Shale	Silurian	2939	2939.0	2.56	0.48	78	GEUS
Kattegat		Terne-1	Rastrites Shale	Silurian	2969	2969.0	2.78	0.45	82	GEUS
Kattegat		Terne-1	Rastrites Shale	Silurian	2978	2978.0	2.75	0.43	102	GEUS
Kattegat		Terne-1	Lindegård	U. Ordovician	2987	2987.0	2.88	0.56	91	GEUS
Kattegat		Terne-1	Lindegård	U. Ordovician	2996	2996.0	2.71	0.35	91	GEUS
Kattegat		Terne-1	Lindegård	U. Ordovician	3005	3005.0	2.83	0.48	62	GEUS
Kattegat		Terne-1	Lindegård	U. Ordovician	3015	3015.0	3.13	0.55	96	GEUS
Kattegat		Terne-1	Lindegård	U. Ordovician	3023	3023.0	3.07	0.35	84	GEUS
Kattegat		Terne-1	Dicellograptus	U. Ordovician	3032	3032.0	3.09	0.39	96	GEUS
Kattegat		Terne-1	Dicellograptus	U. Ordovician	3041	3041.0	3.01	0.39	69	GEUS
Kattegat		Terne-1	Dicellograptus	U. Ordovician	3056	3056.0	3.11	0.33	79	GEUS
Kattegat		Terne-1	Dicellograptus	U. Ordovician	3071	3071.0	3.27	0.40	115	GEUS
Kattegat		Terne-1	Dicellograptus	U. Ordovician	3086	3086.0	3.31	0.39	85	GEUS
Kattegat		Terne-1	Almelund Shale	M. Ordovician	3101	3101.0	3.41	0.37	49	GEUS
Kattegat		Terne-1	Almelund Shale	M. Ordovician	3116	3116.0	3.53	0.33	91	GEUS
Kattegat		Terne-1	Tøyen Shale	L. Ordovician	3131	3131.0	3.44	0.25	73	GEUS
Kattegat		Terne-1	Tøyen Shale	L. Ordovician	3146	3146.0	3.33	0.44	76	GEUS
Kattegat		Terne-1	Tøyen Shale	L. Ordovician	3161	3161.0	3.41	0.29	49	GEUS
Kattegat		Terne-1	Alum Shale	L. Ordovician	3176	3176.0	3.58	0.30	96	GEUS
Kattegat		Terne-1	Alum Shale	L. Ordovician	3191	3191.0	3.12	0.31	100	GEUS
Kattegat		Terne-1	Alum Shale	L. Ordovician	3206	3206.0	3.32	0.24	78	GEUS
Kattegat		Terne-1	Alum Shale	Furongian	3224	3224.0	3.53	0.38	85	GEUS
Kattegat		Terne-1	Alum Shale	Furongian	3236	3236.0	3.71	0.40	78	GEUS
Kattegat		Terne-1	Alum Shale	Furongian	3251	3251.0	3.95	0.30	56	GEUS
Kattegat		Terne-1	Alum Shale	Furongian	3266	3266.0	3.73	0.39	97	GEUS
Kattegat		Terne-1	Alum Shale	Furongian	3281	3281.0	3.77	0.37	85	GEUS
Kattegat		Terne-1	Alum Shale	M. Cambrian	3296	3296.0	3.91	0.46	97	GEUS
Kattegat		Terne-1	Alum Shale	M. Cambrian	3356	3356.0	3.43	0.49	58	GEUS
Kattegat		Terne-1	Alum Shale	M. Cambrian	3326	3326.0	3.42	0.24	42	GEUS
Kattegat		Terne-1	Alum Shale	M. Cambrian	3341	3341.0	3.66	0.41	87	GEUS

9. Appendix B: Selected Rock Eval data

Location	Well/outcrop	Formation	Age	Sample	Depth	TOC	S1	S2	HI	Tmax
					m	%	1)	1)	2)	C
N. Öland	Djupvik-1	Alum Shale	M. Cambrian	91.719	5.3	8.66	2.13	38.05	439	415
N. Öland	Djupvik-1	Alum Shale	Tremadoc	91.715	3.2	10.77	1.9	60.86	565	419
N. Öland	Djupvik	Alum Shale	Tremadoc	NS91-701	Outcrop	10.29	2.58	58.11	565	420
S. Öland	Ottenby-2	Köpingsklint Fm	Tremadoc	9020	2.5	0.69	0.75	0.75	109	395
S. Öland	Ottenby-2	Alum Shale	Tremadoc	9001	3.9	10.60	2.77	41.88	395	440
S. Öland	Ottenby-2	Alum Shale	Tremadoc	9002	5.1	7.76	2.12	30.72	396	437
S. Öland	Ottenby-2	Alum Shale	Tremadoc	9003	6.2	7.51	2.00	30.78	410	437
S. Öland	Ottenby-2	Alum Shale	Tremadoc	9004	7.4	9.86	1.84	39.13	397	433
S. Öland	Ottenby-2	Alum Shale	Tremadoc	9005	8.5	10.7	2.18	42.49	397	429
S. Öland	Ottenby-2	Alum Shale	Tremadoc	9006	9.6	11.10	1.40	46.85	422	430
S. Öland	Ottenby-2	Alum Shale	Tremadoc	9007	11.0	11.50	1.37	48.39	421	431
S. Öland	Ottenby-2	Alum Shale	Tremadoc	9008	12.3	10.60	1.44	43.49	410	430
S. Öland	Ottenby-2	Alum Shale	Furongian	9009	13.5	12.70	2.09	54.57	430	430
S. Öland	Ottenby-2	Alum Shale	Furongian	9010	15.3	13.10	1.93	45.35	346	423
S. Öland	Ottenby-2	Alum Shale	Furongian	9011	17.0	11.30	1.27	33.01	292	423
S. Öland	Ottenby-2	Alum Shale	Furongian	9012	18.3	13.2	1.10	41.19	312	427
S. Öland	Ottenby-2	Alum Shale	Furongian	9013	19.7	10.90	2.17	39.37	361	433
S. Öland	Ottenby-2	Alum Shale	M. Cambrian	9014	21.0	9.90	1.50	31.37	317	429
S. Öland	Ottenby-2	Alum Shale	M. Cambrian	9015	21.9	9.69	1.51	28.44	293	427
S. Öland	Ottenby-2	Alum Shale	M. Cambrian	9016	23.0	9.66	1.43	30.64	317	430
S. Öland	Ottenby-2	Alum Shale	M. Cambrian	9017	24.1	8.48	1.24	22.43	265	427
S. Öland	Ottenby-2	Alum Shale	M. Cambrian	9018	25.0	7.01	1.56	24.62	351	431
S. Öland	Ottenby-2	Alum Shale	M. Cambrian	9019	26.0	1.03	0.76	2.48	241	436
S. Öland	Ottenby	Alum Shale	L. Ordovician	BB91-10	Outcrop	9.09	2.65	42.33	466	436
Västergötland	Hällekis-1	Tøyen Shale	Tremadoc	93-223	21.0	0.31	0.11	0.94	303	423
Västergötland	Hällekis-1	Alum Shale	Furongian	93-225	23.0	11.56	1.42	57.41	497	413
Västergötland	Hällekis-1	Alum Shale	Furongian	93-226	23.9	14.55	0.99	53.07	365	417
Västergötland	Hällekis-1	Alum Shale	Furongian	UW-2	24.0	15.22	0.40	53.38	351	420
Västergötland	Hällekis-1	Alum Shale	Furongian	93-227	24.4	0.47	0.17	1.64	349	421
Västergötland	Hällekis-1	Alum Shale	Furongian	93-228	25.2	4.07	0.20	11.56	284	420
Västergötland	Hällekis-1	Alum Shale	Furongian	93-229	26.0	2.96	0.45	8.82	298	419
Västergötland	Hällekis-1	Alum Shale	Furongian	93-230	26.7	1.10	0.24	3.66	333	423
Västergötland	Hällekis-1	Alum Shale	Furongian	93-231	27.6	14.01	0.90	60.88	435	420
Västergötland	Hällekis-1	Alum Shale	Furongian	93-232	28.8	12.63	0.85	58.95	467	420
Västergötland	Hällekis-1	Alum Shale	Furongian	93-233	29.7	1.25	0.28	7.03	562	424
Västergötland	Hällekis-1	Alum Shale	Furongian	93-234	30.6	13.38	0.93	64.12	479	421
Västergötland	Hällekis-1	Alum Shale	Furongian	93-235	31.2	22.14	1.96	138.07	624	426
Västergötland	Hällekis-1	Alum Shale	Furongian	93-236	32.5	10.65	1.30	52.18	490	424
Västergötland	Hällekis-1	Alum Shale	M. Cambrian	93-237	33.3	11.14	2.51	59.79	537	423
Västergötland	Hällekis-1	Alum Shale	M. Cambrian	UW-1	34.0	10.96	1.49	36.94	337	425
Västergötland	Hällekis-1	Alum Shale	M. Cambrian	Hälstd	35.4	11.06	3.86	56.56	511	420
Västergötland	Hällekis-1	Alum Shale	M. Cambrian	93-239	35.4	10.82	2.12	21.14	195	423
Västergötland	Hällekis-1	Alum Shale	M. Cambrian	93-240	36.2	11.27	3.15	77.31	686	426
Västergötland	Hällekis-1	Alum Shale	M. Cambrian	93-241	36.9	22.02	2.65	128.38	583	423
Västergötland	Hällekis-1	Alum Shale	M. Cambrian	93-242	37.7	10.40	2.91	52.83	508	416
Västergötland	Hällekis-1	Alum Shale	M. Cambrian	93-244	39.7	12.21	4.36	55.02	451	418
Västergötland	Hällekis-1	Alum Shale	M. Cambrian	93-246	41.8	3.26	1.47	16.25	498	426
Västergötland	Hällekis-1	Alum Shale	M. Cambrian	93-248	43.8	5.92	1.82	31.33	529	422
Estonia. Hiiumaa	K14	Alum Shale	Tremadoc	Esto-4	69.5	13.33	2.49	45.38	340	404
Estonia. Hiiumaa	K16	Alum Shale	Tremadoc	Esto-3	103.6	11.75	1.39	35.31	301	409

(Appendix B continued)

Location	Well/outcrop	Formation	Age	Sample	Depth	TOC*	S1	S2	HI	Tmax
					m	%	1)	1)	2)	C
W. Estonia	F342	Alum Shale	Tremadoc	Esto-1	113.9	10.27	2.41	39.18	381	408
W. Estonia	F342	Alum Shale	Tremadoc	Esto-2	116.2	13.82	1.62	37.59	272	405
Baltic Sea	Yoldia-1	Alum Shale	Tremadoc	Yold-2	756.0	14.97	0.48	2.68	18	457
N. Poland	Zarnowiec IG-1	Alum Shale	Furongian	Z-2	2726.9	6.60	2.58	6.61	100	434
N. Poland	Zarnowiec IG-1	Alum Shale	Furongian	Z-4	2729.0	5.99	1.57	6.49	108	437
Scania	Andrarum	Alum Shale	Furongian	AS-42	outcrop	10.4	0.06	0.25	2	505
Scania	Andrarum	Alum Shale	Furongian	AS-43	outcrop	10.1	0.20	0.45	8	452
Scania	Albjära-1	Almelund	U. Ordovician	alb 1/01 (79-009)	8.3	1.3	0.05	0.09	7	477
Scania	Albjära-1	Almelund	U. Ordovician	1/02	16.6	2.3	0.11	0.24	10	487
Scania	Albjära-1	Almelund	U. Ordovician	1/03	25.3	1.38	0.1	0.12	9	465
Scania	Albjära-1	Almelund	M. Ordovician	1/04	35.2	1.01	0.03	0.03	3	428
Scania	Albjära-1	Almelund	M. Ordovician	1/05	50.1	2.5	0.07	0.31	12	506
Scania	Albjära-1	Almelund	M. Ordovician	1/06	65	1.77	0.05	0.14	8	512
Scania	Albjära-1	Almelund	M. Ordovician	alb 1/07 (79-015)	80.0	1.2	0.03	0.07	6	505
Scania	Albjära-1	Almelund	M. Ordovician	1/08	94.9	2.37	0.05	0.17	7	521
Scania	Albjära-1	Almelund	M. Ordovician	1/09	103.7	0.22	0.01	0.01	5	398
Scania	Albjära-1	Almelund	M. Ordovician	1/10	106.25	0.2	0.03	0.01	5	430
Scania	Albjära-1	Alum Shale	L. Ordovician	alb 1/14 (79-022)	140.7	8.7	0.23	0.75	9	580
Scania	Albjära-1	Alum Shale	Furongian	letgas 6	145.2	8.4	0.08	0.38	5	462
Scania	Albjära-1	Alum Shale	Furongian	alb 1/15 (79-023)	150.5	13.5	0.09	0.85	6	587
Scania	Albjära-1	Alum Shale	Furongian	1/16	158.4	11.9	0.09	0.76	6	586
Scania	Albjära-1	Alum Shale	Furongian	97.153	158.4	11.9	0.12	0.28	2	444
S. Scania	Gislövshammar-2	Alum Shale	L. Ordovician	89.957	35.9	8.99	0.48	2.2	24	454
S. Scania	Gislövshammar-2	Alum Shale	Furongian	89.958	58.4	11.98	0.27	2.22	19	443
S. Scania	Gislövshammar-2	Alum Shale	Furongian	Gisstd	60.4	11.42	0.46	2.42	21	457
Bornholm	Skelbro-1	Alum Shale	Furongian	SKK 31	30.1	6.4	0.04	0.01	0	n.d.
Bornholm	Skelbro-1	Alum Shale	Furongian	SKK 35	26.2	10.3	0.04	0.14	1	n.d.
Bornholm	Skelbro-1	Alum Shale	Furongian	SKK 38	23.2	12.7	0.05	0.27	2	n.d.
Bornholm	Skelbro-1	Alum Shale	Furongian	SKK 41	20.2	9.8	0.04	0.11	1	n.d.
Bornholm	Skelbro-1	Alum Shale	Furongian	SKK 45	16.9	9.9	0.05	0.30	3	n.d.
Bornholm	Skelbro-1	Alum Shale	Furongian	SKK 48	13.6	8.5	0.03	0.41	5	n.d.
Bornholm	Skelbro-1	Alum Shale	Furongian	SKK 52	9.7	13.8	0.03	0.24	2	n.d.
Bornholm	Skelbro-1	Alum Shale	Furongian	SKK 56	6.0	7-1	0.05	0.31	4	n.d.

1): mg HC /g rock; 2) mg HC/ g TOC; * note that for Skelbro-1 well the TOC values presented by Buchardt et al. (1986) in Figure 4 is used and not the TOC presented in Table 1. The measurements in table 1 in Buchardt et al. (1986) were measured by Rock Eval wherase the others were measured on a LECO apparatus.

10. Appendix C: Histograms for vitrinite-like measurements

Available in folder Appendix on CD attached to the printed version of this report.