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Vitrinite reflectance (R_o) of dispersed organic matter from Mobil et al Sheridan J-87

M.P. Avery
Marine Resources Geoscience Subdivision
Geological Survey of Canada (Atlantic), Dartmouth
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Vitrinite reflectance (Ro) of dispersed organic matter from Mobil et al Sheridan J-87

G.S.C. Locality No.: D201 **Unique Well ID:** 300 J87 48300 49450 **Location:** 48.44443°N, 49.96083°W

R.T. Elevation: 29 m **Water Depth:** 215.8 m **Total Depth:** 5486.4 m

Sampled Interval: 1050-5486 m **Interval Studied:** 1105-5455 m

Depth Units: Meters referenced to R.T. **Rig Release Date:** November 22, 1981

Vitrinite reflectance has been determined on 31 rotary cuttings samples from Mobil et al Sheridan J-87, which was classified as an exploratory well and is located on the Grand Banks approximately 226 km east northeast of St. John's, Newfoundland. Well status is Plugged and Abandoned.

Sample preparation followed the procedures listed in Appendix I. Data acquisition and manipulation for this report was done with a Zeiss Photometer III system with a custom interface to a microcomputer for data storage and statistical summaries.

Analysis of the well reveals thermal maturity intervals given in Table I. Specific maturity levels, as set out in this report, are based on those of Dow (1977) with modified terminology (Appendix II).

Table I
Inferred Thermal Maturity Levels*

Depth in meters	Vitrinite Reflectance %Ro	Maturity for oil generation*
216 [Sea floor]	(0.21)	immature
1500	0.3	immature
2530	0.4	immature approaching maturity
3330	0.5	marginally mature
3980	0.6	onset of significant oil generation
5010	0.8	peak of oil generation
5486 [T.D.]	(0.91)	within oil window
(5810)	1.00	still within oil window

* Actual hydrocarbon products depend on type of organic matter present.

** ()'s indicate Ro's or depths extrapolated from linear regression (0.121 log Ro/km).

Remarks

Sample coverage for vitrinite reflectance analysis (Figure 1, Table II) was very good over the section penetrated at Sheridan J-87. The data were plotted on a log Ro vs. linear depth scale and regression lines were calculated and plotted (Figure 1). The 'error bars' displayed on the maturity profile indicate one standard deviation on either side of the mean and may be deceptively small for samples with very few readings. The slope of the maturity line is 0.121 log Ro/km.

The histogram display shows the variability in the reflectance populations, which represents the maturity of the sediments with depth (Figure 2). Plotting reflectance histograms on a log scale may help reveal any trends that may be present in the Ro data. It also can help to demonstrate the effects of cavings, geology, casing points and other influences on the vitrinite reflectance populations.

These vitrinite reflectance data show that the thermal regime of the lower section of Sheridan J-87 is suitable to generate and preserve liquid hydrocarbons within the drilled section, between 3330 and 5486 m (T.D.), assuming potential source rocks and traps are present.

Discussion

The vitrinite reflectance based maturity profile for this Grand Banks well shows a quite regular but slightly stepwise increase in reflectance with depth. The very good kerogen sample coverage available for Sheridan J-87 provides a good example of this feature, which is present in many wells. Most of this well was drilled in the undifferentiated Banquereau Formation. The samples in this section generally yielded very good histograms, while below the unconformity at 4530 m the data were not as good. The difference cannot be explained by any significant difference in lithology, since the whole well section is shale-dominated, with only slightly less shale in the lower section (Figures 1 & 2).

The maturity is also very similar to the vitrinite reflectance data from the Cumberland B-55 well, although those data consisted of only 12 samples, with 1 sample at 925 m and 11 samples concentrated between 2665 and 3525 m (W. Irvine, pers. comm.).

References

Dow, W.G., 1977. Kerogen studies and geological interpretations. Journal of Geochemical Exploration, no. 7, p. 77-99.

c.c. K.D. McAlpine, MResG, Dartmouth
A.E. Jackson, MResG, Dartmouth
MResG Files, Dartmouth
Central Technical Files, Ottawa

K. Osadetz, GSC (Calgary)
N. DeSilva, CNOPB, St. John's (3 copies)
C. Beaumont, Dalhousie Univ., Halifax

Table II
Summary of kerogen - based vitrinite reflectance

Sample Labels	Depths in meters	Mean Ro (SD) non-rotated	Number of Readings	
			Total	Edited
K0613A	1105-1145	0.28 (± 0.04)	14	14
K0613B	1225-1270	0.24 (± 0.04)	10	10
K0613C	1405-1445	0.29 (± 0.04)	19	19
K0614A	1705-1745	0.32 (± 0.04)	6	6
K0614B	1825-1865	0.36 (± 0.05)	16	16
K0614C	1945-1985	0.32 (± 0.04)	8	8
K0615A	2035-2085	0.37 (± 0.02)	14	14
K0615B	2135-2175	0.36 (± 0.02)	13	13
K0615C	2255-2295	0.37 (± 0.03)	17	17
K0616A	2405-2445	0.40 (± 0.04)	17	17
K0616B	2495-2535	0.39 (± 0.03)	16	16
K0616C	2680-2690	0.42 (± 0.04)	9	9
K0617A	2710-2720	0.43 (± 0.04)	13	13
K0617C	2830-2870	0.47 (± 0.05)	23	23
K0618A	2950-2990	0.49 (± 0.05)	23	23
K0618B	3130-3170	0.50 (± 0.05)	22	22
K0618C	3280-3320	0.52 (± 0.05)	23	23
K0619B	3570-3610	0.55 (± 0.05)	22	22
K0619C	3660-3700	0.58 (± 0.06)	12	12
K0620A	3810-3850	0.59 (± 0.05)	22	22
K0620B	3960-4000	0.60 (± 0.05)	21	21
K0620C	4080-4120	0.59 (± 0.04)	14	14
K0621A	4170-4210	0.64 (± 0.05)	25	25
K0621B	4290-4330	0.67 (± 0.06)	33	33
K0621C	4410-4450	0.70 (± 0.06)	20	20
K0622A	4620-4660	0.68 (± 0.03)	3	3
K0622B	4740-4780	0.75 (± 0.09)	5	5
K0622C	4835-4875	0.72 (± 0.07)	6	5
K0623A	5055-5095	0.78 (± 0.06)	10	10
K0623B	5325-5360	0.86 (± 0.09)	13	13
K0623C	5420-5455	0.95 (± 0.09)	10	10

Table III

Formation Tops (McAlpine, 1988, pers. comm.)

Formation	Depth
Banquereau (unconformity)	in casing 4530
Wyandot Fm	4530
Dawson Canyon Fm (unconformity)	4573 4842
Nautilus shale	4842
Total Depth	5486

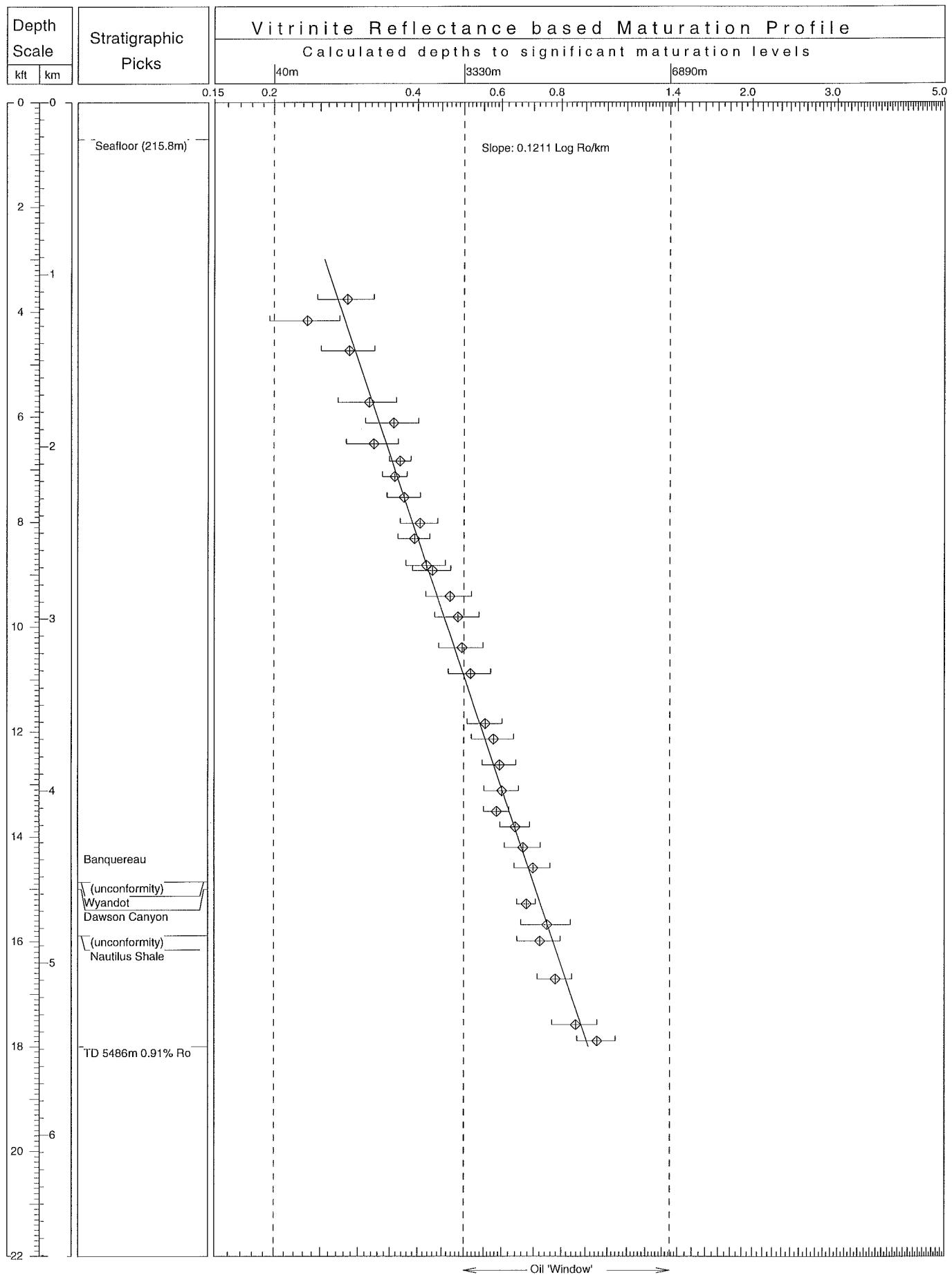


Fig. 1 Sheridan J-87

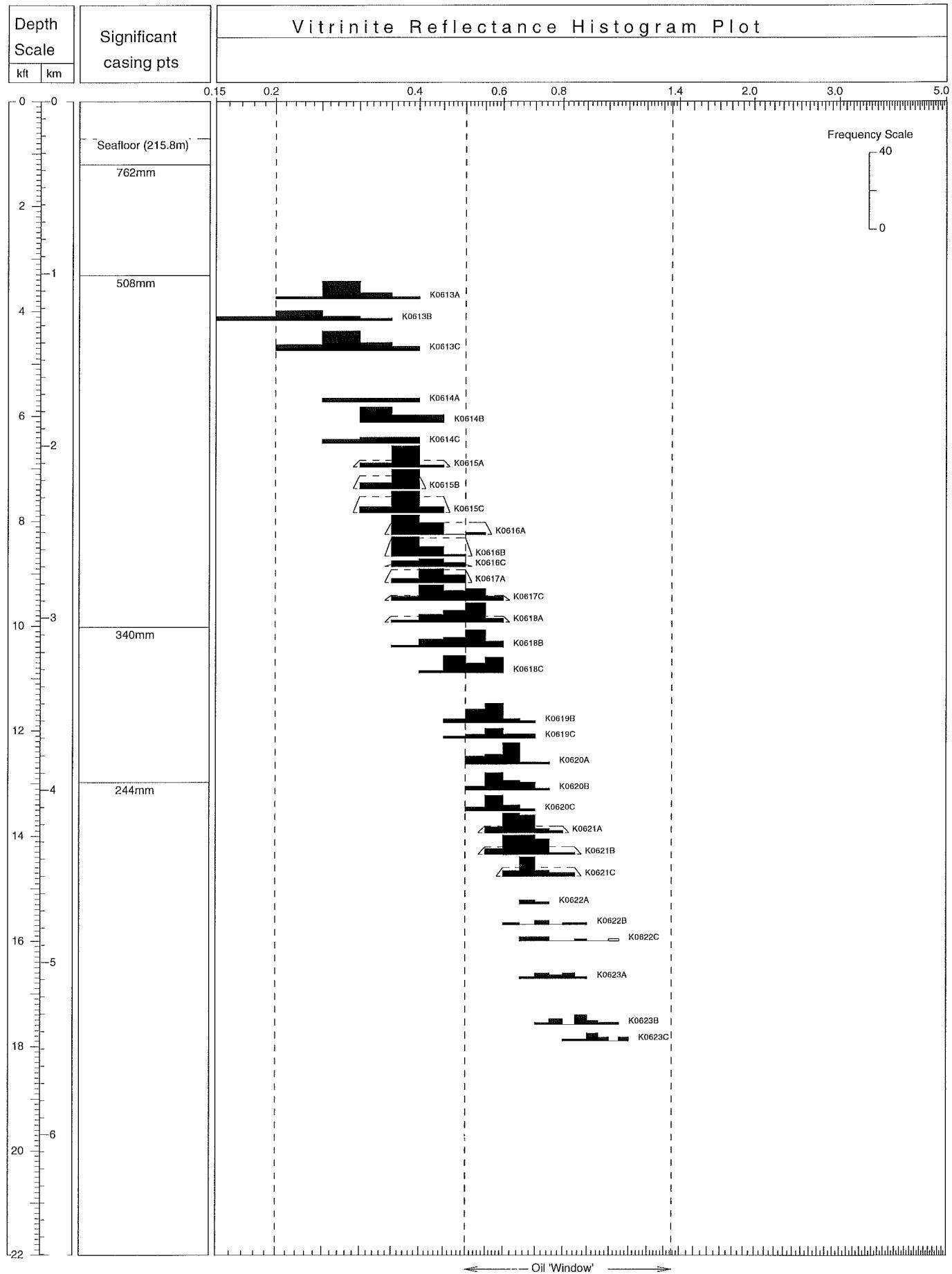


Fig. 2 Sheridan J-87 <Histograms>

Appendix I

Sample Preparation Method

Kerogen Concentrate

Preliminary wash (preparation for cuttings)

Dry samples in oven (25°C)

PALYNOLOGY Lab preparation

Place 20-30 grams in 250 ml plastic beaker.

Add 10% HC1 till reaction ceases (removes carbonates).

Rinse 3 times.

Immerse in hot concentrated HF overnight (removes silicates).

Rinse 3 times.

Heat (60-65°C) in concentrated HC1 (removes fluorides caused by HF).

Rinse 3 times.

Transfer to 15 ml test tube with 4-5 ml 4% Alconox.

Centrifuge at 1500 rpm for 90 sec.

Decant.

Rinse and centrifuge 3 times.

Float off organic fraction using 2.0 S.G. ZnBr solution.

Centrifuge at 1000 rpm for 8 min.

Float fraction into second test tube.

Wash and centrifuge 3 times.

Make kerogen smear slide.

Remaining kerogen material is made available to Organic Petrology Lab.

VITRINITE REFLECTANCE Lab preparation

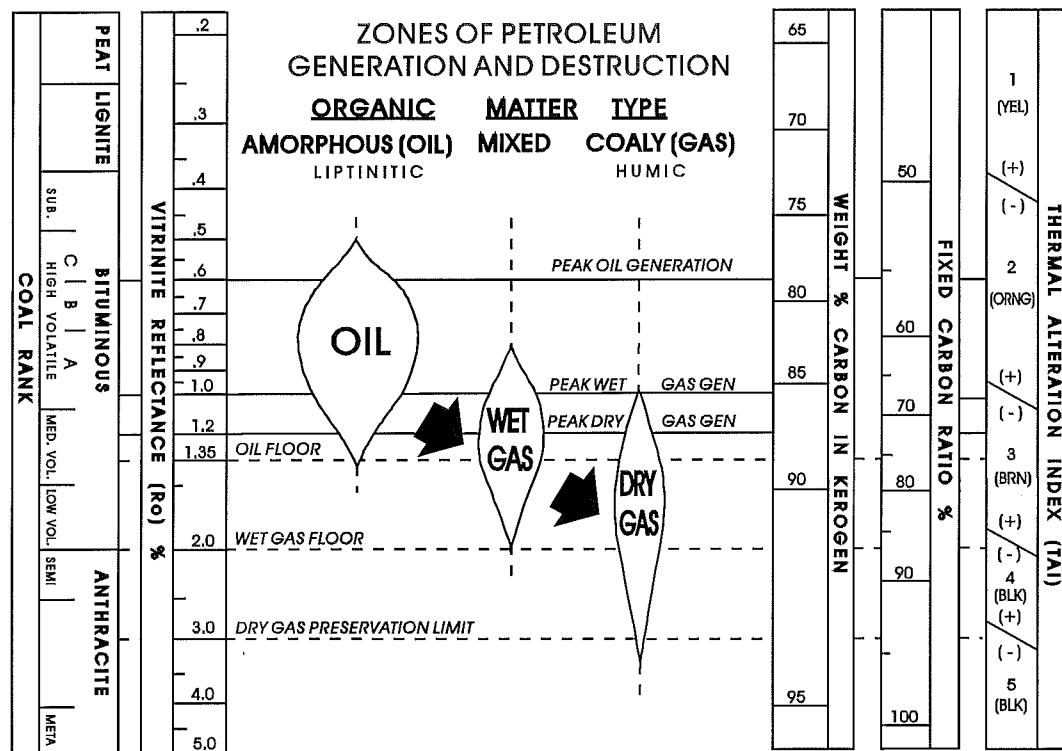
Pipette off excess water and prepare as 2.5 cm (1") diameter plastic stubs to fit polisher.

Freeze dry and fix material for polishing with epoxy resin.

Polish with diamond-based suspension to obtain low relief, scratch-free surface.

Examine under oil lens, incident light at approximately 1000x magnification.

Appendix II (Dow, 1977)



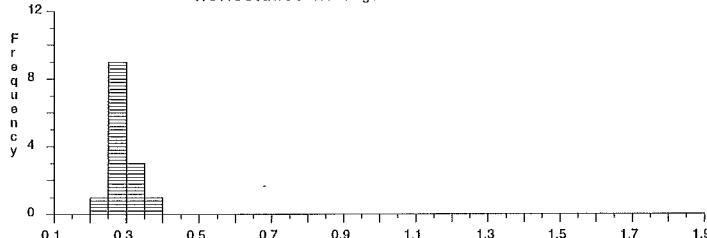
Note: In this report, the terminology used to describe the various maturity levels has been modified. The 'peak' designation, as used in this figure, has been changed to 'onset of significant' and 0.8 %Ro is herein used as the 'peak of oil generation' (Table I, Figure 1).

Appendix III
Reflectance Histograms

K0613A, 1105-1145m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.27)	(0.37)	(0.31)	(0.21)	(0.26)	(0.27)	(0.25)	(0.27)	(0.27)	(0.29)
	(0.29)	(0.33)	(0.32)	(0.28)						
Total	0.28	0.04	14	0.21	0.37	3.99				
(Edit)	0.28	0.04	14	0.21	0.37	3.99				

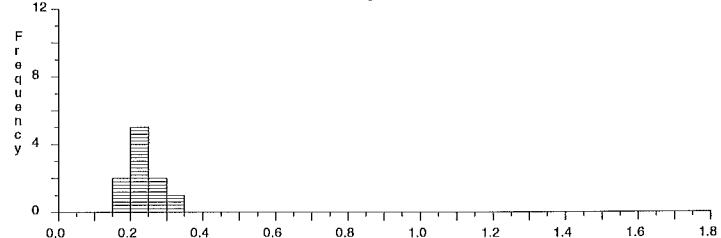
Reflectance Histogram



K0613B, 1225-1270m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.24)	(0.24)	(0.22)	(0.19)	(0.25)	(0.22)	(0.32)	(0.19)	(0.27)	(0.21)
	(0.24)	(0.24)	(0.22)	(0.19)	(0.25)	(0.22)	(0.32)	(0.19)	(0.27)	(0.21)
Total	0.24	0.04	10	0.19	0.32	2.35				
(Edit)	0.24	0.04	10	0.19	0.32	2.35				

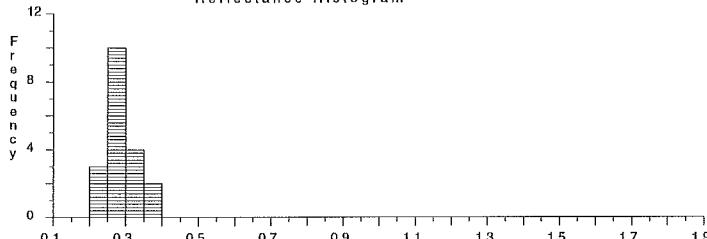
Reflectance Histogram



K0613C, 1405-1445m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.24)	(0.33)	(0.26)	(0.25)	(0.24)	(0.29)	(0.28)	(0.27)	(0.29)	(0.30)
	(0.23)	(0.29)	(0.29)	(0.35)	(0.36)	(0.27)	(0.33)	(0.32)	(0.28)	(0.30)
Total	0.29	0.04	19	0.23	0.36	5.47				
(Edit)	0.29	0.04	19	0.23	0.36	5.47				

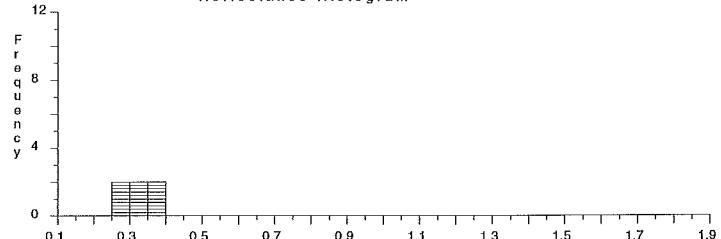
Reflectance Histogram



K0614A, 1705-1745m

Col >	1	2	3	4	5	6
Row	(0.28)	(0.25)	(0.37)	(0.32)	(0.33)	(0.35)
	(0.28)	(0.25)	(0.37)	(0.32)	(0.33)	(0.35)
Total	0.32	0.04	6	0.25	0.37	1.90
(Edit)	0.32	0.04	6	0.25	0.37	1.90

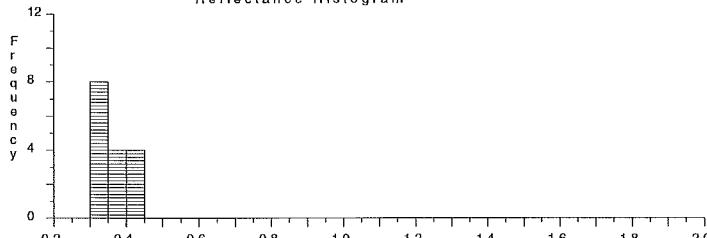
Reflectance Histogram



K0614B, 1825-1865m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.31)	(0.35)	(0.33)	(0.39)	(0.41)	(0.36)	(0.44)	(0.32)	(0.34)	(0.42)
	(0.32)	(0.30)	(0.31)	(0.33)	(0.42)	(0.35)				
Total	0.36	0.05	16	0.30	0.44	5.70				
(Edit)	0.36	0.05	16	0.30	0.44	5.70				

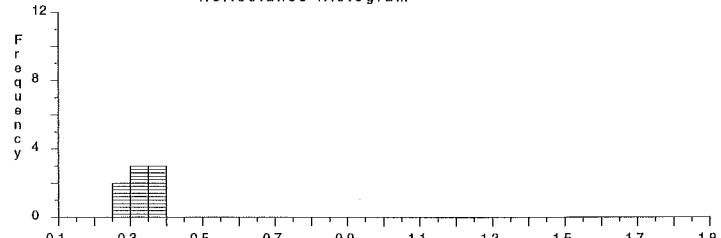
Reflectance Histogram



K0614C, 1945-1985m

Col >	1	2	3	4	5	6	7	8
Row	(0.31)	(0.37)	(0.30)	(0.27)	(0.38)	(0.33)	(0.35)	(0.28)
	(0.31)	(0.37)	(0.30)	(0.27)	(0.38)	(0.33)	(0.35)	(0.28)
Total	0.32	0.04	8	0.27	0.38	2.59		
(Edit)	0.32	0.04	8	0.27	0.38	2.59		

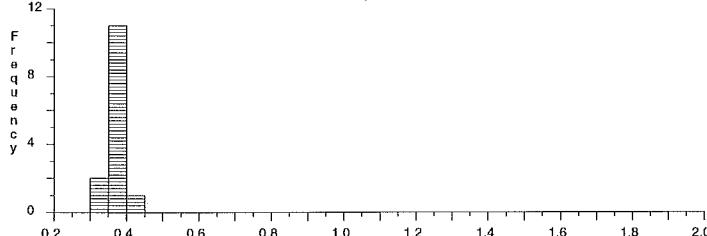
Reflectance Histogram



K0615A, 2035-2085m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.36)	(0.38)	(0.36)	(0.37)	(0.38)	(0.36)	(0.34)	(0.37)	(0.40)	(0.36)
	Mean	Stand Dev	Pts	Min	Max	Sum				
Total	0.37	0.02	14	0.33	0.40	5.15				
(Edit)	0.37	0.02	14	0.33	0.40	5.15				

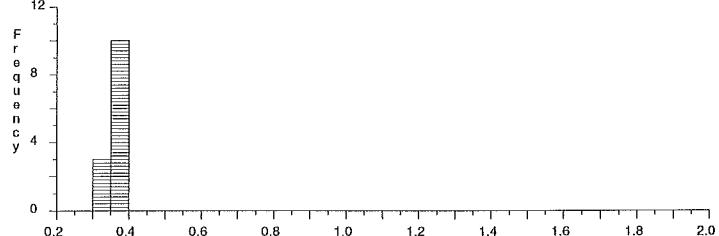
Reflectance Histogram



K0615B, 2135-2175m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.32)	(0.33)	(0.38)	(0.33)	(0.35)	(0.36)	(0.37)	(0.36)	(0.38)	(0.36)
	Mean	Stand Dev	Pts	Min	Max	Sum				
Total	0.36	0.02	13	0.32	0.39	4.66				
(Edit)	0.36	0.02	13	0.32	0.39	4.66				

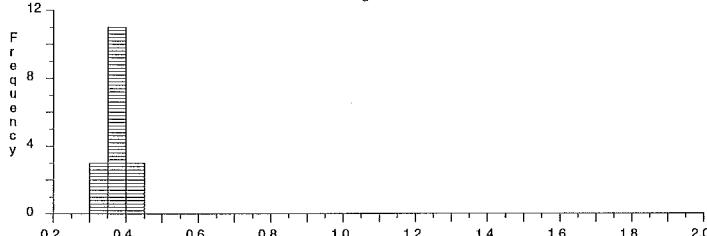
Reflectance Histogram



K0615C, 2255-2295m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.32)	(0.34)	(0.37)	(0.36)	(0.42)	(0.44)	(0.37)	(0.41)	(0.37)	(0.39)
	Mean	Stand Dev	Pts	Min	Max	Sum				
Total	0.37	0.03	17	0.32	0.44	6.37				
(Edit)	0.37	0.03	17	0.32	0.44	6.37				

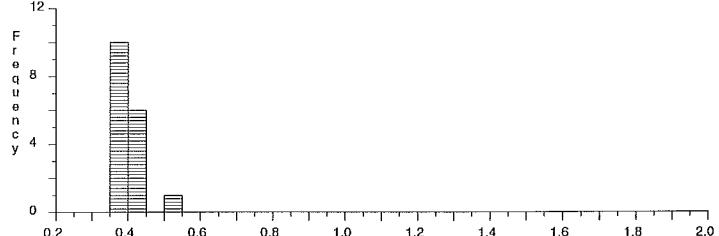
Reflectance Histogram



K0616A, 2405-2445m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.41)	(0.37)	(0.39)	(0.51)	(0.38)	(0.41)	(0.38)	(0.39)	(0.44)	(0.43)
	Mean	Stand Dev	Pts	Min	Max	Sum				
Total	0.40	0.04	17	0.37	0.51	6.88				
(Edit)	0.40	0.04	17	0.37	0.51	6.88				

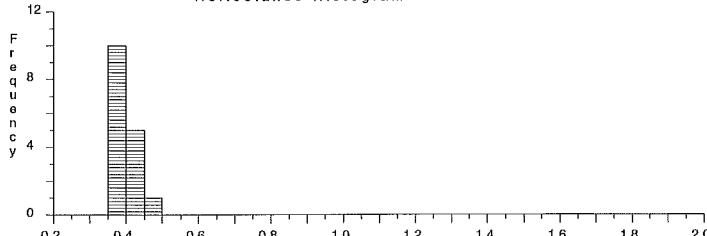
Reflectance Histogram



K0616B, 2495-2535m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.39)	(0.39)	(0.38)	(0.41)	(0.37)	(0.42)	(0.38)	(0.37)	(0.42)	(0.41)
	Mean	Stand Dev	Pts	Min	Max	Sum				
Total	0.39	0.03	16	0.36	0.48	6.31				
(Edit)	0.39	0.03	16	0.36	0.48	6.31				

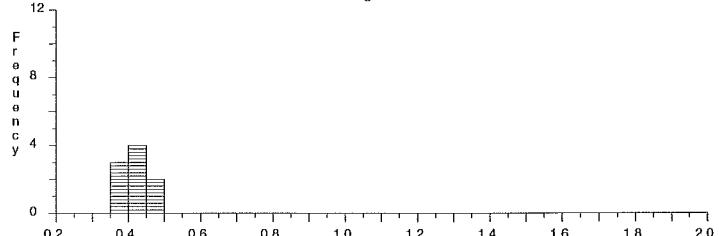
Reflectance Histogram

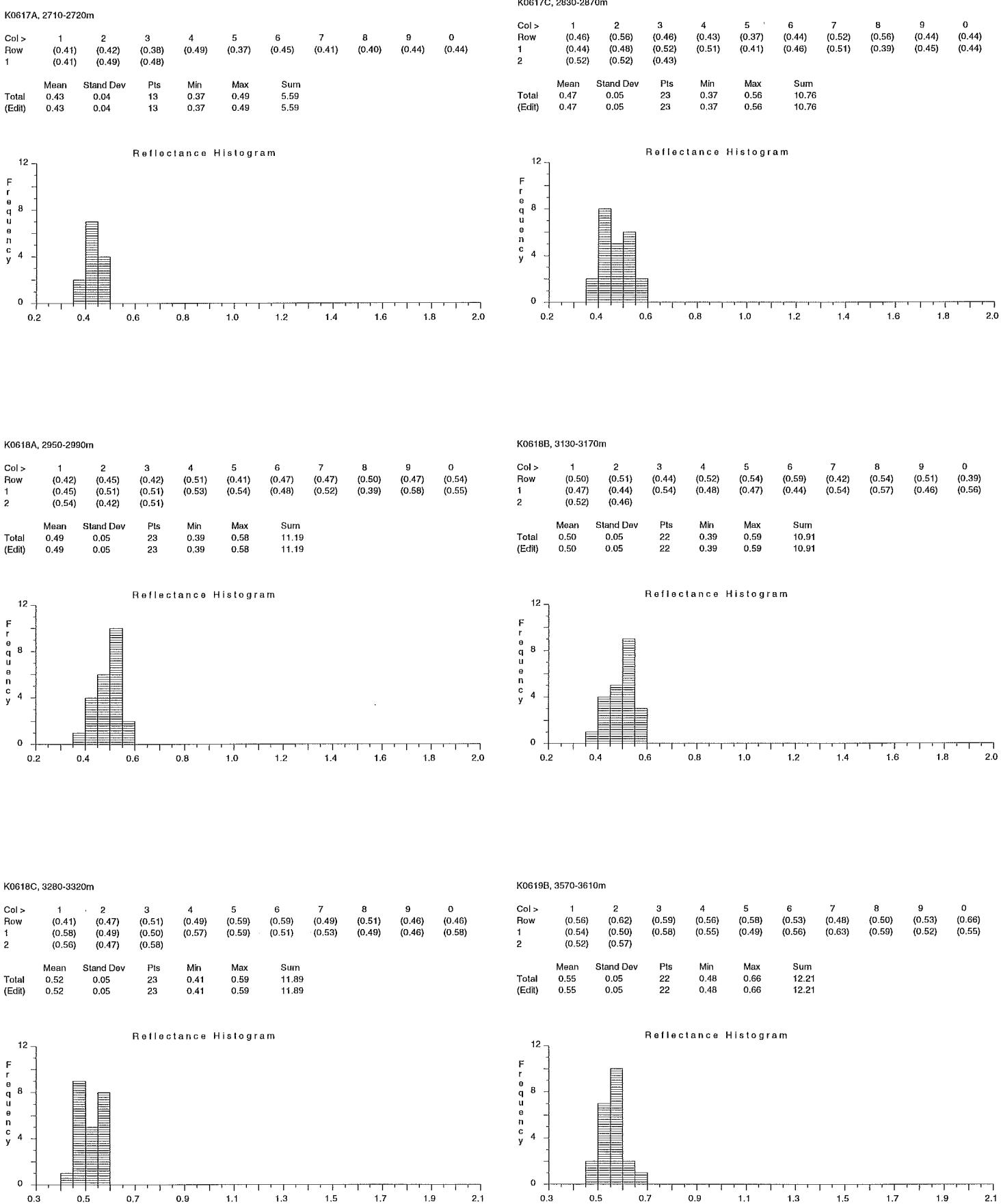


K0616C, 2680-2690m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.40)	(0.49)	(0.44)	(0.37)	(0.43)	(0.45)	(0.39)	(0.42)	(0.37)	(0.37)
	Mean	Stand Dev	Pts	Min	Max	Sum				
Total	0.42	0.04	9	0.37	0.49	3.76				
(Edit)	0.42	0.04	9	0.37	0.49	3.76				

Reflectance Histogram



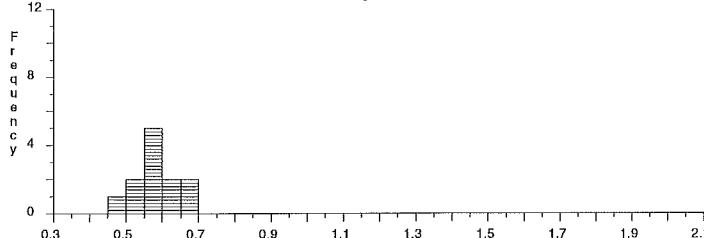


K0619C, 3660-3700m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.55)	(0.62)	(0.55)	(0.53)	(0.48)	(0.59)	(0.60)	(0.59)	(0.59)	(0.68)
1	(0.65)	(0.50)								

Total	Mean	Stand Dev	Pts	Min	Max	Sum
(Edit)	0.58	0.06	12	0.48	0.68	6.93

Reflectance Histogram

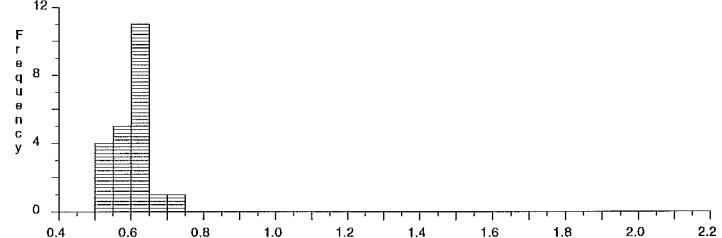


K0620A, 3810-3850m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.60)	(0.52)	(0.54)	(0.67)	(0.63)	(0.60)	(0.57)	(0.58)	(0.61)	(0.64)
1	(0.58)	(0.61)	(0.51)							

Total	Mean	Stand Dev	Pts	Min	Max	Sum
(Edit)	0.59	0.05	22	0.51	0.72	13.08

Reflectance Histogram

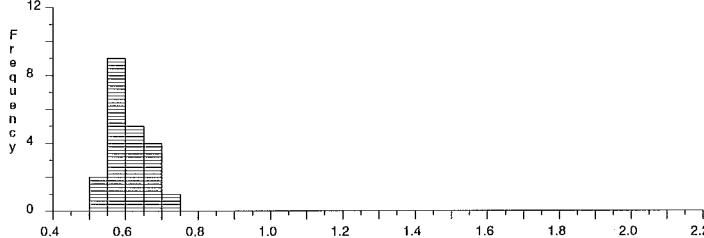


K0620B, 3960-4000m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.56)	(0.62)	(0.58)	(0.58)	(0.62)	(0.53)	(0.53)	(0.55)	(0.59)	(0.67)
1	(0.65)	(0.60)	(0.62)	(0.55)	(0.58)	(0.63)	(0.66)	(0.57)	(0.56)	(0.68)

Total	Mean	Stand Dev	Pts	Min	Max	Sum
(Edit)	0.60	0.05	21	0.53	0.70	12.63

Reflectance Histogram

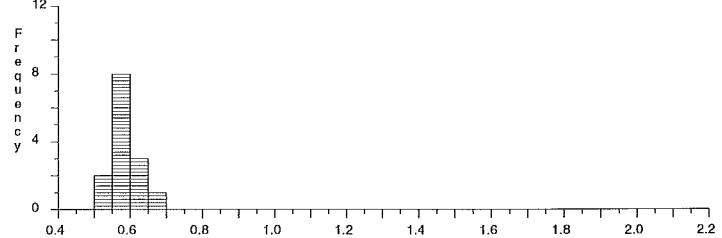


K0620C, 4080-4120m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.64)	(0.54)	(0.60)	(0.63)	(0.58)	(0.59)	(0.57)	(0.59)	(0.56)	(0.57)
1	(0.56)	(0.58)	(0.66)	(0.54)						

Total	Mean	Stand Dev	Pts	Min	Max	Sum
(Edit)	0.59	0.04	14	0.54	0.66	8.21

Reflectance Histogram

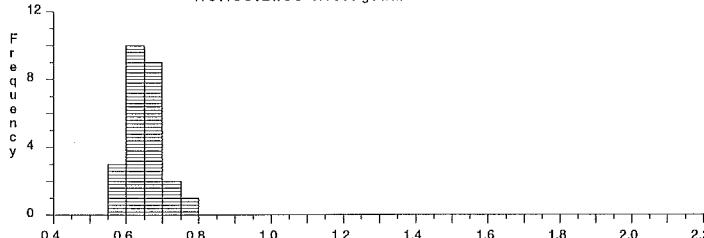


K0621A, 4170-4210m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.58)	(0.61)	(0.66)	(0.56)	(0.62)	(0.63)	(0.67)	(0.65)	(0.61)	(0.76)
1	(0.65)	(0.63)	(0.64)	(0.68)	(0.63)	(0.67)	(0.55)	(0.64)	(0.70)	(0.66)

Total	Mean	Stand Dev	Pts	Min	Max	Sum
(Edit)	0.64	0.05	25	0.55	0.76	16.04

Reflectance Histogram

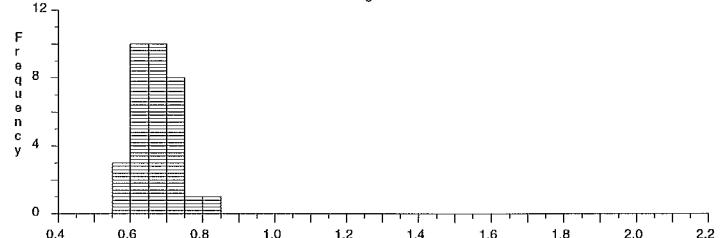


K0621B, 4290-4330m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.59)	(0.72)	(0.59)	(0.65)	(0.70)	(0.71)	(0.59)	(0.61)	(0.61)	(0.68)
1	(0.68)	(0.61)	(0.69)	(0.61)	(0.84)	(0.73)	(0.65)	(0.70)	(0.66)	(0.69)

Total	Mean	Stand Dev	Pts	Min	Max	Sum
(Edit)	0.67	0.06	33	0.59	0.84	21.99

Reflectance Histogram



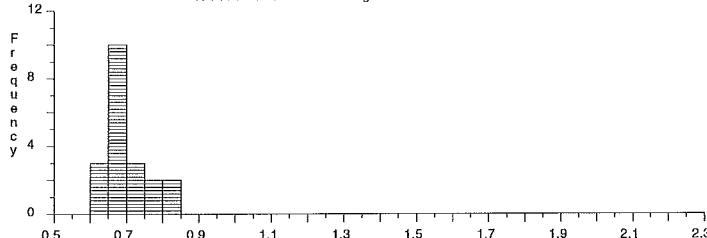
K0621C, 4410-4450m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.80)	(0.68)	(0.73)	(0.64)	(0.77)	(0.62)	(0.69)	(0.66)	(0.65)	(0.77)
	Mean	Stand Dev	Pts	Min	Max	Sum				
Total	0.70	0.06	20	0.60	0.84	13.97				
(Edit)	0.70	0.06	20	0.60	0.84	13.97				

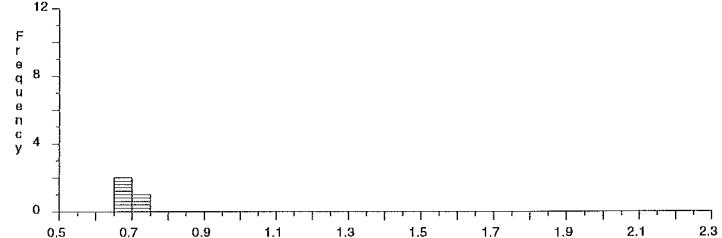
K0622A, 4620-4660m

Col >	1	2	3			
Row	(0.65)	(0.71)	(0.67)			
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	0.68	0.03	3	0.65	0.71	2.03
(Edit)	0.68	0.03	3	0.65	0.71	2.03

Reflectance Histogram



Reflectance Histogram



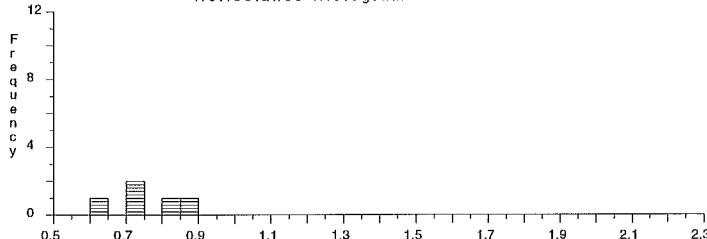
K0622B, 4740-4780m

Col >	1	2	3	4	5	
Row	(0.81)	(0.72)	(0.86)	(0.72)	(0.63)	
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	0.75	0.09	5	0.63	0.86	3.74
(Edit)	0.75	0.09	5	0.63	0.86	3.74

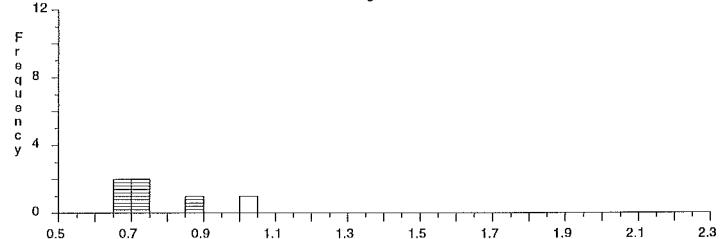
K0622C, 4835-4875m

Col >	1	2	3	4	5	6
Row	(0.71)	(0.68)	(0.71)	(0.85)	(0.66)	1.03
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	0.77	0.14	6	0.66	1.03	4.64
(Edit)	0.72	0.07	5	0.66	0.85	3.61

Reflectance Histogram



Reflectance Histogram



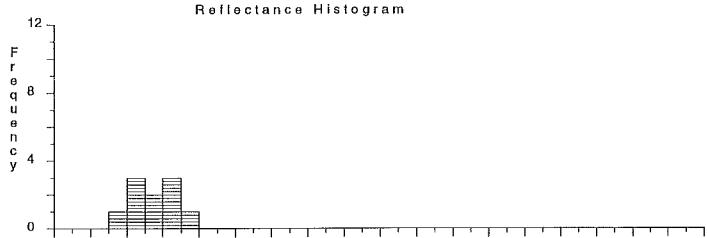
K0623A, 5055-5095m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.88)	(0.84)	(0.80)	(0.71)	(0.79)	(0.78)	(0.72)	(0.68)	(0.74)	(0.84)
	Mean	Stand Dev	Pts	Min	Max	Sum				
Total	0.78	0.06	10	0.68	0.88	7.78				
(Edit)	0.78	0.06	10	0.68	0.88	7.78				

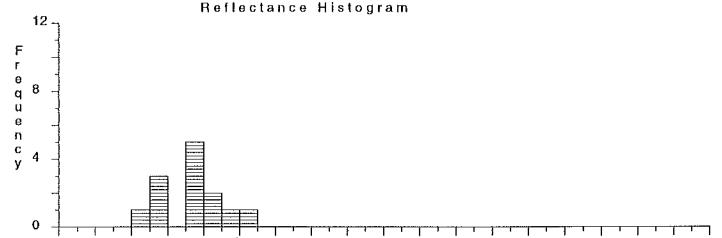
K0623B, 5325-5360m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.76)	(0.86)	(0.77)	(0.91)	(0.70)	(1.02)	(0.88)	(0.92)	(0.98)	(0.89)
	Mean	Stand Dev	Pts	Min	Max	Sum				
Total	0.86	0.09	13	0.70	1.02	11.16				
(Edit)	0.86	0.09	13	0.70	1.02	11.16				

Reflectance Histogram



Reflectance Histogram



K0623C, 5420-5455m

Col >	1 (1.09)	2 (1.09)	3 (0.91)	4 (0.99)	5 (0.94)	6 (0.88)	7 (0.92)	8 (0.98)	9 (0.91)	0 (0.81)
Row	Mean	Stand Dev	Pts	Min	Max	Sum				
Total	0.95	0.09	10	0.81	1.09	9.52				
(Edit)	0.95	0.09	10	0.81	1.09	9.52				

