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Vitrinite reflectance (R_o) of dispersed organic matter
from
Petro-Canada *et al* Bonnet P-23

M. P. Avery

2003



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Vitrinite reflectance (Ro) of dispersed organic matter
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Figures 1-2 are Vitrinite Reflectance based Maturation Profiles

Figure 1 - Bonnet P-23

Figure 2 - Bonnet P-23 <histograms>

Appendix I - Sample Preparation Method

Appendix II - Zones of petroleum generation and destruction

Appendix III - Data listings and basic statistics

Well information

G.S.C. Locality No.: D244 Unique Well ID: 300 P23 42300 65000 Location: 42.38018°N, 65.050525°W

R.T. Elevation: 25 Water Depth: 133.5 m Total Depth: 4336 m

Sampled Interval: 455 - 3945 m Interval Studied: 590-3470 m

Depth Units: Metres referenced to R.T. Rig Release Date: April 4, 1984

Introduction

Vitrinite reflectance has been determined on kerogen obtained from 12 rotary cutting samples from Petro-Canada *et al* Bonnet P-23, which was classified as an exploratory well and is located on the edge of the Scotian Shelf, approximately 275 km south southwest of Halifax, Nova Scotia. Well status is Plugged and Abandoned.

Sample preparation followed the procedures listed in Appendix I. Data acquisition and manipulation was done with a Zeiss Photometer III system with a custom interface to a computer 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 Hydrocarbon Thermal Maturity Levels*

Depth in metres*	Vitrinite Reflectance* %Ro	Hydrocarbon generation levels**
134 [Sea floor]	(0.24)	immature
1170	0.3	immature
2500	0.4	immature approaching maturity
3530	0.5	marginally mature
4336 [T.D.]	(0.6)	onset of significant oil generation

* () indicate Ro's or depths extrapolated from linear regression slope of 0.094 log Ro/km.

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

Remarks

Sample coverage for vitrinite reflectance analysis (Figure 1, Table II) was adequate over the section penetrated between 590 and 3470 m at Bonnet P-23. No kerogen was available below 3470 m. Because of drilling problems, no cutting samples were obtained below 3945 m. 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 0.094 log Ro/km.

The histogram display shows the variability in the reflectance populations, which represent the maturity of the sediments with depth (Figure 2). Plotting reflectance histograms on a log scale may help reveal any trends 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 indicate, by projection of the maturity trend, that the thermal regime of the lower section of Bonnet P-23 is suitable to generate and preserve liquid hydrocarbons within the drilled section, between 3530 and 3470 m, provided potential source rocks and traps are present.

Discussion

All but the deepest sample contained very little autochthonous vitrinite or even vitrinite-like organic material. The deepest sample contained a significant amount of vitrinite, and organics in general, and therefore provided more confidence with the determination at this depth.

References

Dow, W. G.

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

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Table II

Summary of kerogen - based vitrinite reflectance

Sample Labels	Depth in metres	Mean Ro (SD) non-rotated	Number of Readings	
			Total	Edited
K0645A	590-600	0.27 (± 0.03)	14	14
K0645B	830-840	0.30 (± 0.03)	15	15
K0645C	1040-1050	0.29 (± 0.03)	15	15
K0646A	1280-1290	0.26 (± 0.02)	15	15
K0646B	1520-1530	0.31 (± 0.06)	8	8
K0646C	1760-1770	0.34 (± 0.04)	11	11
K0647A	2000-2010	0.43 (± 0.06)	4	4
K0647B	2240-2250	0.37 (± 0.01)	4	4
K0647C	2420-2430	0.42 (± 0.05)	3	3
K0648A	2750-2760	0.40 (± 0.02)	5	5
K0648B	3190-3200	0.43 (± 0.04)	4	4
K0648C	3460-3470	0.52 (± 0.05)	14	14

Table III

Formation Tops (McAlpine, pers. comm.)

Formation	Depth in metres
Banquereau	in casing
Naskapi Mbr	1763
Logan Canyon Fm ?	1763
(unconformity)	1763
Roseway Unit ?	1796
Abenaki	2092
Baccaro Mbr	2092-3179
Misaine Mbr	3179
Scatarie Mbr	3347
Iroquois	3525
Total Depth	4336

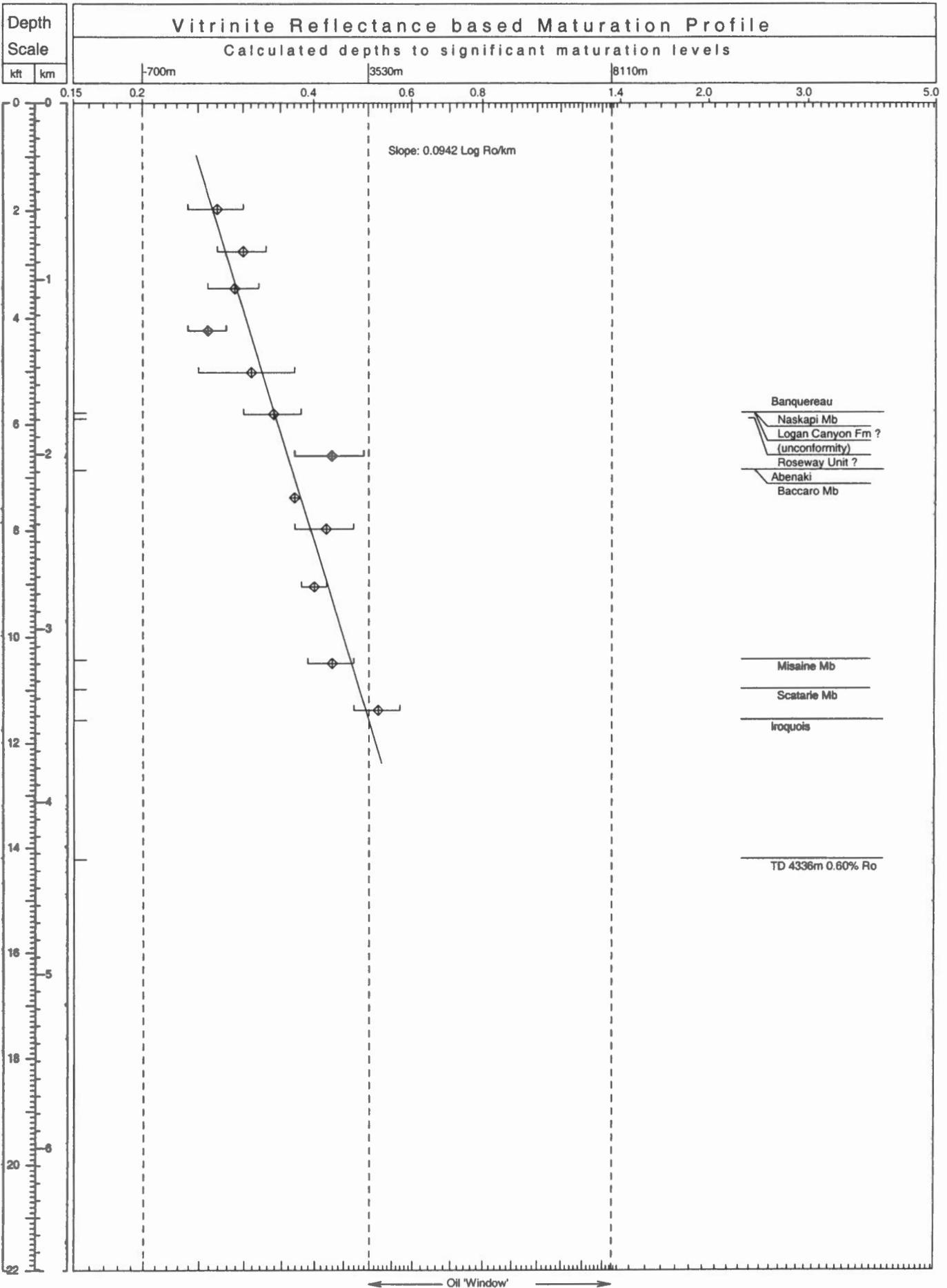


Fig. 1 Bonnet P-23

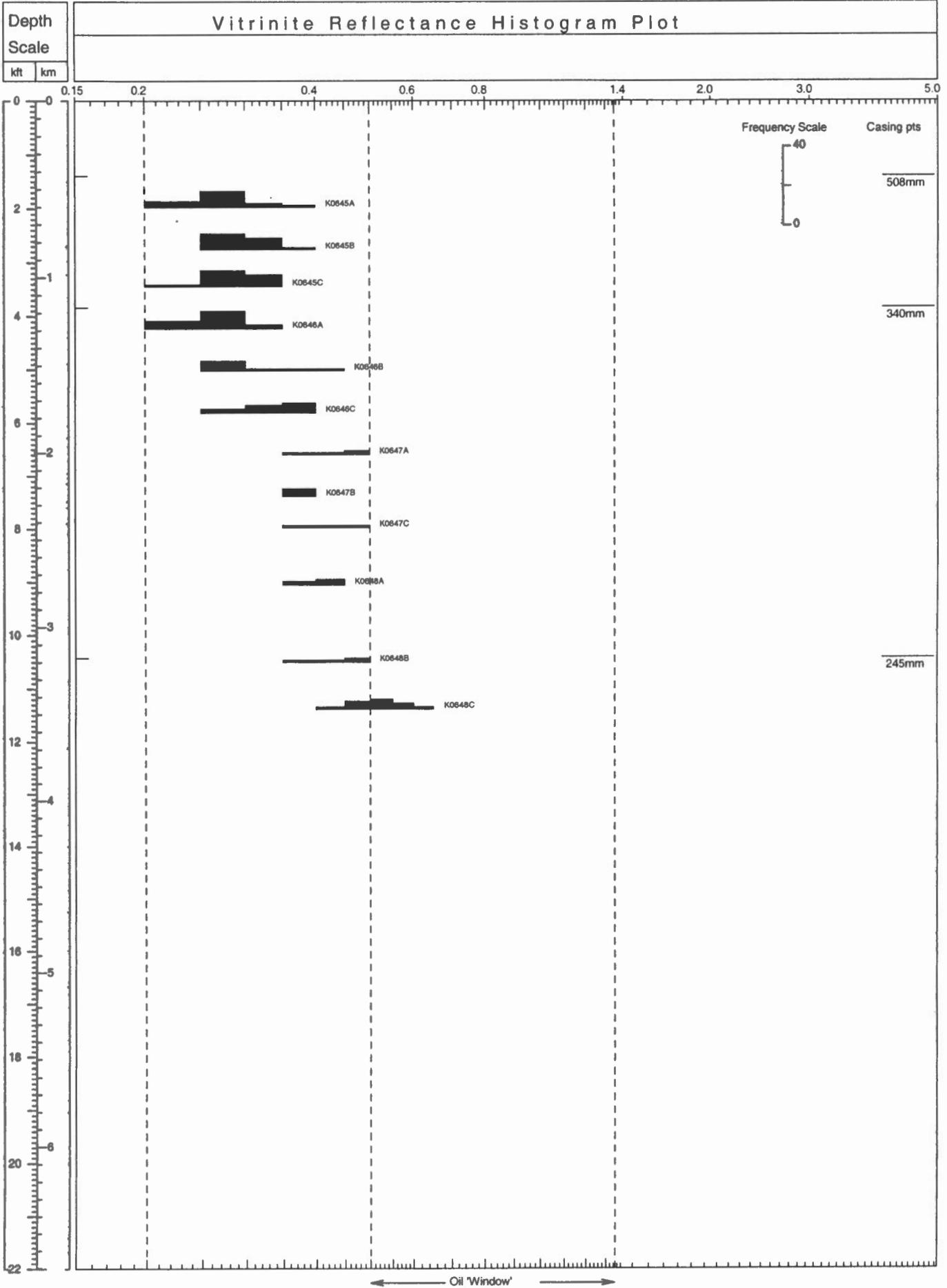


Fig. 2 Bonnet P-23 <Histograms>

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% HCl 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 HCl (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.

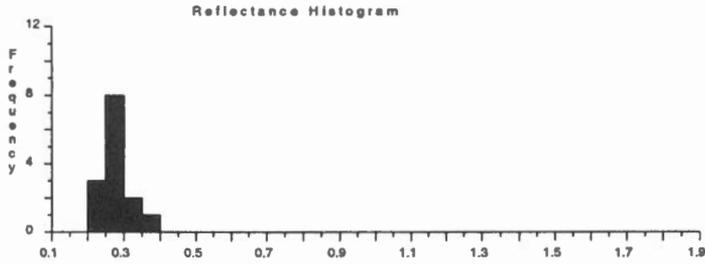
Appendix III

Data listings and basic statistics

Data listings and basic statistics for: Bonnet P-23

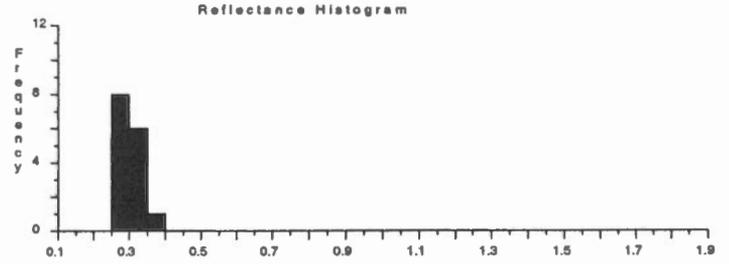
K0645A, 590-600m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.28)	(0.30)	(0.28)	(0.22)	(0.27)	(0.22)	(0.24)	(0.29)	(0.30)	(0.27)
1	(0.28)	(0.35)	(0.25)	(0.25)						
	Mean	Stand Dev	Pts	Min	Max	Sum				
Total	0.27	0.03	14	0.22	0.35	3.80				
(EdIt)	0.00	0.00	0	0.00	0.00	0.00				



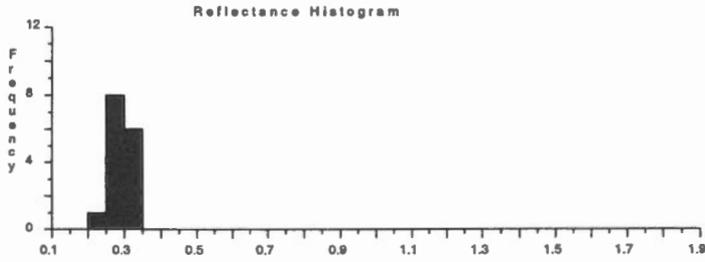
K0645B, 830-840m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.28)	(0.31)	(0.30)	(0.32)	(0.25)	(0.27)	(0.33)	(0.28)	(0.32)	(0.29)
1	(0.28)	(0.28)	(0.27)	(0.33)	(0.37)					
	Mean	Stand Dev	Pts	Min	Max	Sum				
Total	0.30	0.03	15	0.25	0.37	4.48				
(EdIt)	0.00	0.00	0	0.00	0.00	0.00				



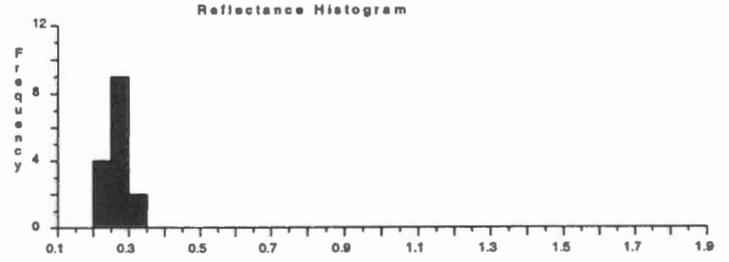
K0645C, 1040-1050m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.30)	(0.26)	(0.34)	(0.27)	(0.24)	(0.32)	(0.30)	(0.31)	(0.27)	(0.34)
1	(0.28)	(0.29)	(0.28)	(0.29)	(0.27)					
	Mean	Stand Dev	Pts	Min	Max	Sum				
Total	0.29	0.03	15	0.24	0.34	4.36				
(EdIt)	0.00	0.00	0	0.00	0.00	0.00				



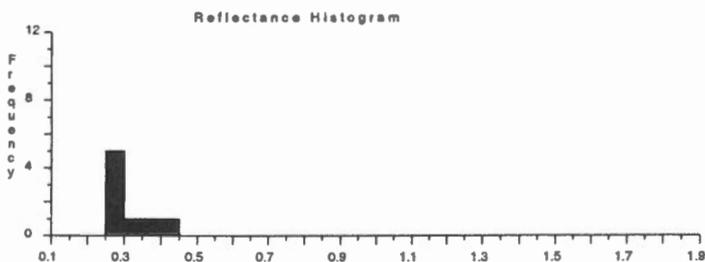
K0646A, 1280-1290m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.30)	(0.24)	(0.27)	(0.25)	(0.27)	(0.23)	(0.27)	(0.27)	(0.24)	(0.25)
1	(0.27)	(0.24)	(0.26)	(0.30)	(0.25)					
	Mean	Stand Dev	Pts	Min	Max	Sum				
Total	0.26	0.02	15	0.23	0.30	3.91				
(EdIt)	0.00	0.00	0	0.00	0.00	0.00				



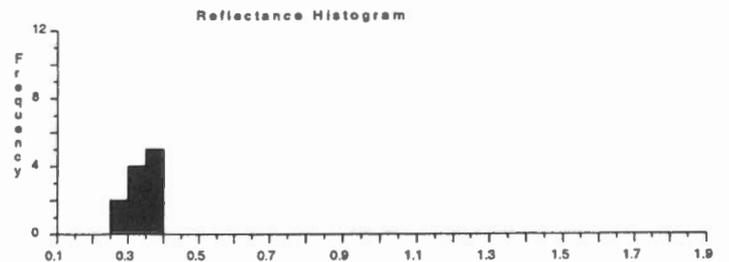
K0646B, 1520-1530m

Col >	1	2	3	4	5	6	7	8
Row	(0.25)	(0.27)	(0.26)	(0.35)	(0.29)	(0.28)	(0.41)	(0.34)
1								
	Mean	Stand Dev	Pts	Min	Max	Sum		
Total	0.31	0.06	8	0.25	0.41	2.45		
(EdIt)	0.00	0.00	0	0.00	0.00	0.00		



K0646C, 1760-1770m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.31)	(0.33)	(0.37)	(0.26)	(0.34)	(0.38)	(0.38)	(0.38)	(0.34)	(0.29)
1	(0.38)									
	Mean	Stand Dev	Pts	Min	Max	Sum				
Total	0.34	0.04	11	0.26	0.38	3.76				
(EdIt)	0.00	0.00	0	0.00	0.00	0.00				

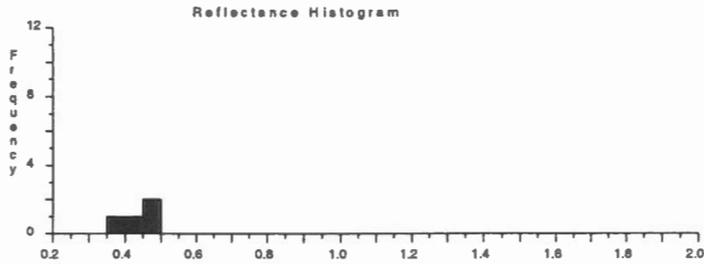


Data listings and basic statistics for: Bonnet P-23

K0647A, 2000-2010m

Col > 1 2 3 4
 Row (0.35) (0.49) (0.43) (0.45)

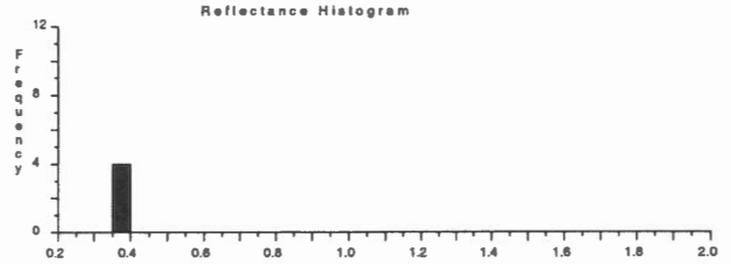
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	0.43	0.06	4	0.35	0.49	1.72
(Edit)	0.00	0.00	0	0.00	0.00	0.00



K0647B, 2240-2250m

Col > 1 2 3 4
 Row (0.37) (0.38) (0.35) (0.38)

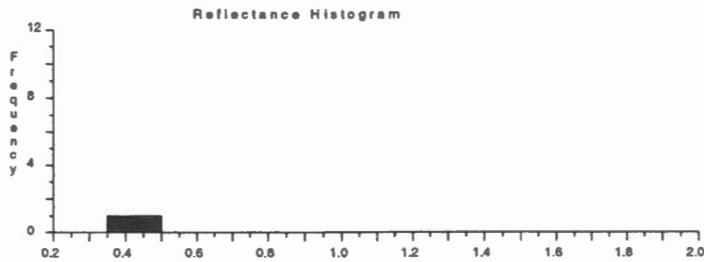
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	0.37	0.01	4	0.35	0.38	1.48
(Edit)	0.00	0.00	0	0.00	0.00	0.00



K0647C, 2420-2430m

Col > 1 2 3
 Row (0.38) (0.47) (0.40)

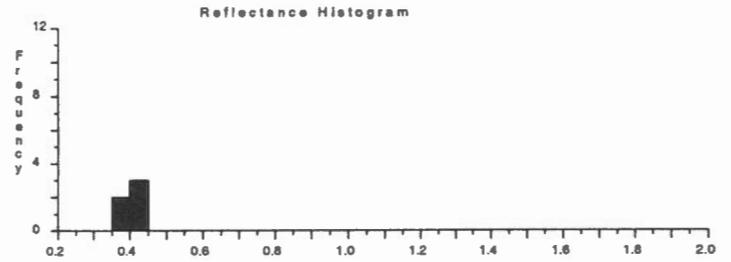
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	0.42	0.05	3	0.38	0.47	1.25
(Edit)	0.00	0.00	0	0.00	0.00	0.00



K0648A, 2750-2760m

Col > 1 2 3 4 5
 Row (0.43) (0.38) (0.40) (0.41) (0.38)

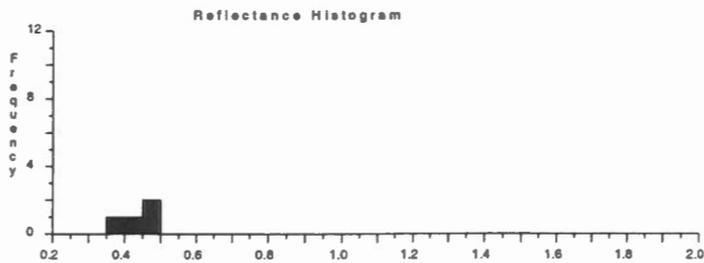
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	0.40	0.02	5	0.38	0.43	2.00
(Edit)	0.00	0.00	0	0.00	0.00	0.00



K0648B, 3190-3200m

Col > 1 2 3 4
 Row (0.38) (0.40) (0.47) (0.46)

	Mean	Stand Dev	Pts	Min	Max	Sum
Total	0.43	0.04	4	0.38	0.47	1.71
(Edit)	0.00	0.00	0	0.00	0.00	0.00



K0648C, 3460-3470m

Col > 1 2 3 4 5 6 7 8 9 0
 Row (0.52) (0.44) (0.45) (0.52) (0.48) (0.52) (0.48) (0.55) (0.52) (0.49)
 1 (0.50) (0.56) (0.58) (0.63)

	Mean	Stand Dev	Pts	Min	Max	Sum
Total	0.52	0.05	14	0.44	0.63	7.22
(Edit)	0.00	0.00	0	0.00	0.00	0.00

