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Vitrinite reflectance (Ro) of dispersed organics from Husky-Bow Valley et al. Chebucto K-90

Report No. EPGS-DOM.1-90MPA

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January 9, 1990

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G.S.C. Locality No.: D242 **Location:** 43°39'44.73"N, 59°42'51.52"W

R.T. Elevation: 22.8m **Water Depth:** 86.2m **Total Depth:** 5234m

Sample Interval: 416 - 5234m **Interval Studied:** 780 - 5234m

Depth Units: Metres referenced to R.T.

Vitrinite reflectance has been determined on 23 rotary cuttings samples (Table II) from Husky-Bow Valley et al. Chebucto K-90 which was classified as a wildcat well and is located on the Scotian Shelf approximately 330 km east southeast of Halifax, Nova Scotia. The well was designated a gas discovery and was plugged and abandoned.

Data acquisition and manipulation for this report utilized the Zeiss Photo-multiplier III system interfaced with a PC AT microcomputer which provides reliable data acquisition and fast statistical summaries.

Sample preparation followed the procedures listed in Appendix I. The analysis of the well revealed the thermal maturation intervals given in Table I. The specific maturation levels, as set out in this report, were based on those of Dow (1977) with modified terminology (Appendix II).

Table I
Inferred Thermal Maturation Levels*

(Seafloor)-1690m	0.24 - 0.4	% Ro	immature
1690-2413m	0.4 - 0.5	% Ro	immature approaching maturity
2413-3004m	0.5 - 0.6	% Ro	marginally mature
3004m	0.6	% Ro	onset of significant oil generation
3936m	0.8	% Ro	peak of oil generation
4523m	1.0	% Ro	onset of significant wet gas generation
4730m	1.2	% Ro	onset of significant dry gas generation
4863m	1.35	% Ro	oil floor
5309m	(2.0)	% Ro	wet gas preservation limit
5769m	(3.0)	% Ro	dry gas preservation limit
5234m	1.88	% Ro	maturity at total depth

Note: ( ) indicate Ro extrapolated at 0.383 log Ro/km

* Maturation levels are provided for all types of organic matter. Actual hydrocarbon products depend on type of organic matter present.

Remarks

Sample coverage for vitrinite reflectance analysis (Figure 1, Table II) was very good over the section penetrated by Chebucto K-90. The data are plotted on a log Ro vs. linear depth scale and a linear regression line was calculated by the least squares method (Figure 1). The 'error bars' plotted on the maturation profile indicate one standard deviation on either side of the mean and may be deceivingly small for samples with very few readings. The slopes of the maturation lines are 0.134 log Ro/km (upper) and 0.383 (lower).

Selection of the reflectance population which represented the true maturation of the sediments was aided significantly by the histogram display plot (Figure 2). This interpretation tool helps to reveal linear trends (populations) in the Ro data. It also demonstrates the effects of cavings, geology, casing points and other factors on the vitrinite reflectance populations.

The lithology strip plot (Figure 1) was produced directly from the Basin Analysis Subdivision's LITHFILE database which extracts data from digitized CANSTRAT logs.

The vitrinite reflectance data provides evidence that the thermal regime at Chebucto K-90 (between 2413 and 5234m) was suitable for the generation and preservation of hydrocarbons within the drilled section assuming potential source rocks and traps were present.

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

Seq. #	Sample #	Depths in metres	Mean Ro (SD) non-rotated	Number of Readings Total	Edited
1	K0757A	780-820	0.31(±.06)	33	33
2	K0757B	960-1000	0.30(±.04)	25	16
3	K0757C	1230-1240	0.35(±.04)	31	30
4	K0758A	1380-1390	0.38(±.05)	37	35
5	K0758B	1500-1540	0.40(±.04)	21	13
6	K0758C	1680-1720	0.36(±.03)	8	5
7	K0759A	2005-2045	0.40(±.04)	46	35
8	K0759C	2155-2195	0.53(±.06)	27	20
9	K0759C	2520-2560	0.53(±.06)	27	20
10	K0760A	2880-2920	0.56(±.05)	20	14
11	K0760B	3150-3190	0.64(±.07)	48	40
12	K0760C	3430-3470	0.69(±.08)	16	15
13	K0761A	3670-3680	0.72(±.06)	44	42
14	K0761B	3820-3860	0.73(±.05)	62	35
15	K0761C	4000-4010	0.81(±.05)	35	27
16	K0762A	4150-4160	0.87(±.03)	49	22
17	K0762B	4300-4340	0.92(±.06)	47	28
18	K0762C	4480-4490	0.95(±.09)	39	35
19	K0763A	4630-4670	1.07(±.06)	44	27
20	K0763B	4810-4820	1.36(±.10)	11	6
21	K0763C	4990-5030	1.49(±.08)	44	25
22	K0764A	5140-5150	1.65(±.08)	68	38
23	K0764B	5225-5234	1.91(±.08)	44	21

Note: All samples are kerogen concentrate type.

Table III

Formation Tops (Wade, pers. comm.)

Formation	Depth
Banquereau	in casing
Wyandot	1771m
Dawson Canyon	1911m
Logan Canyon	2025m
Marmora Mbr	2025m
Sable Mbr	2483m
Cree Mbr	2643m
Naskapi Mbr	3920m
Top OP approx.	4180m
Missisauga	4225m
T.D.	5234m

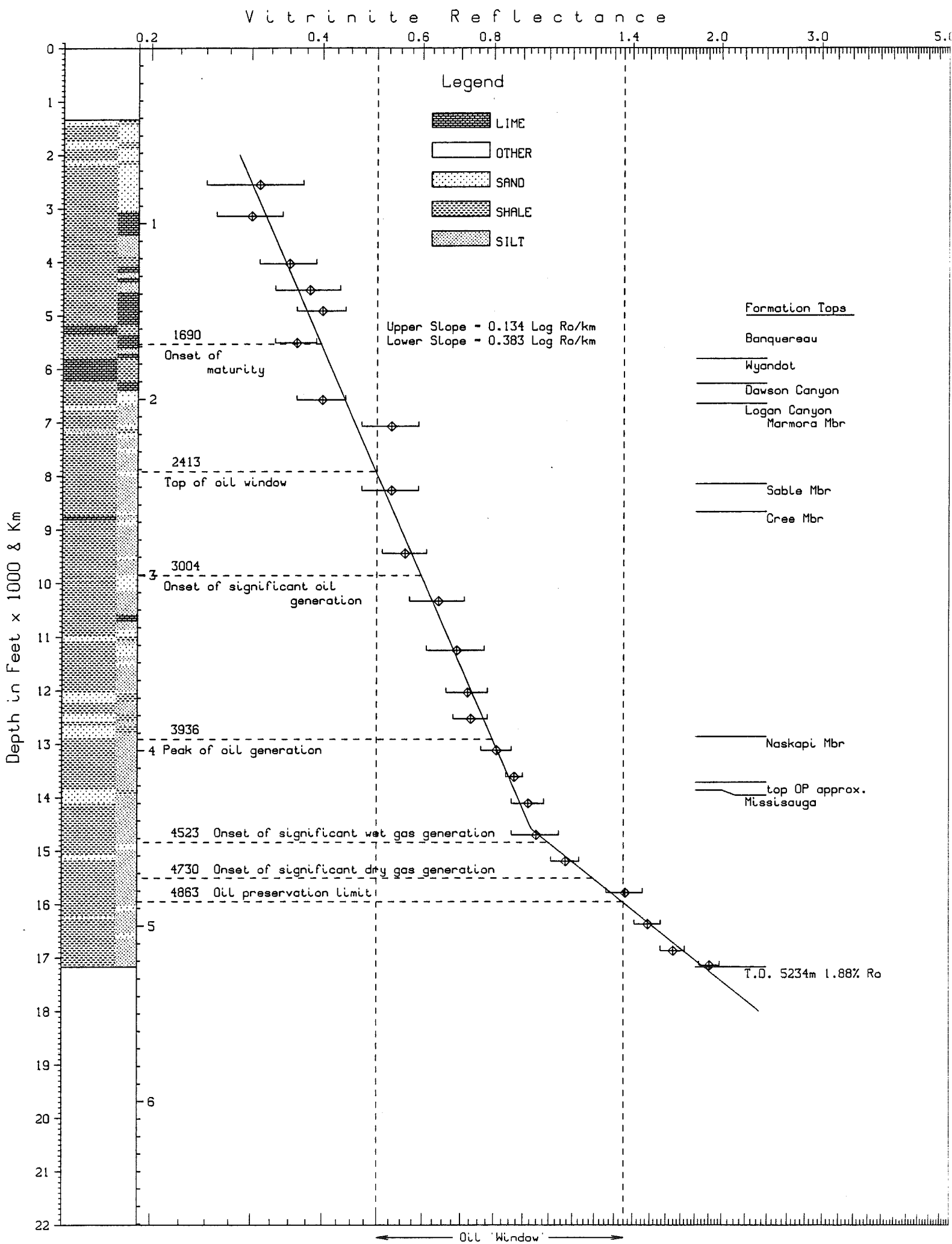


Fig. 1 Chebucto K-90 < Maturation Profile >

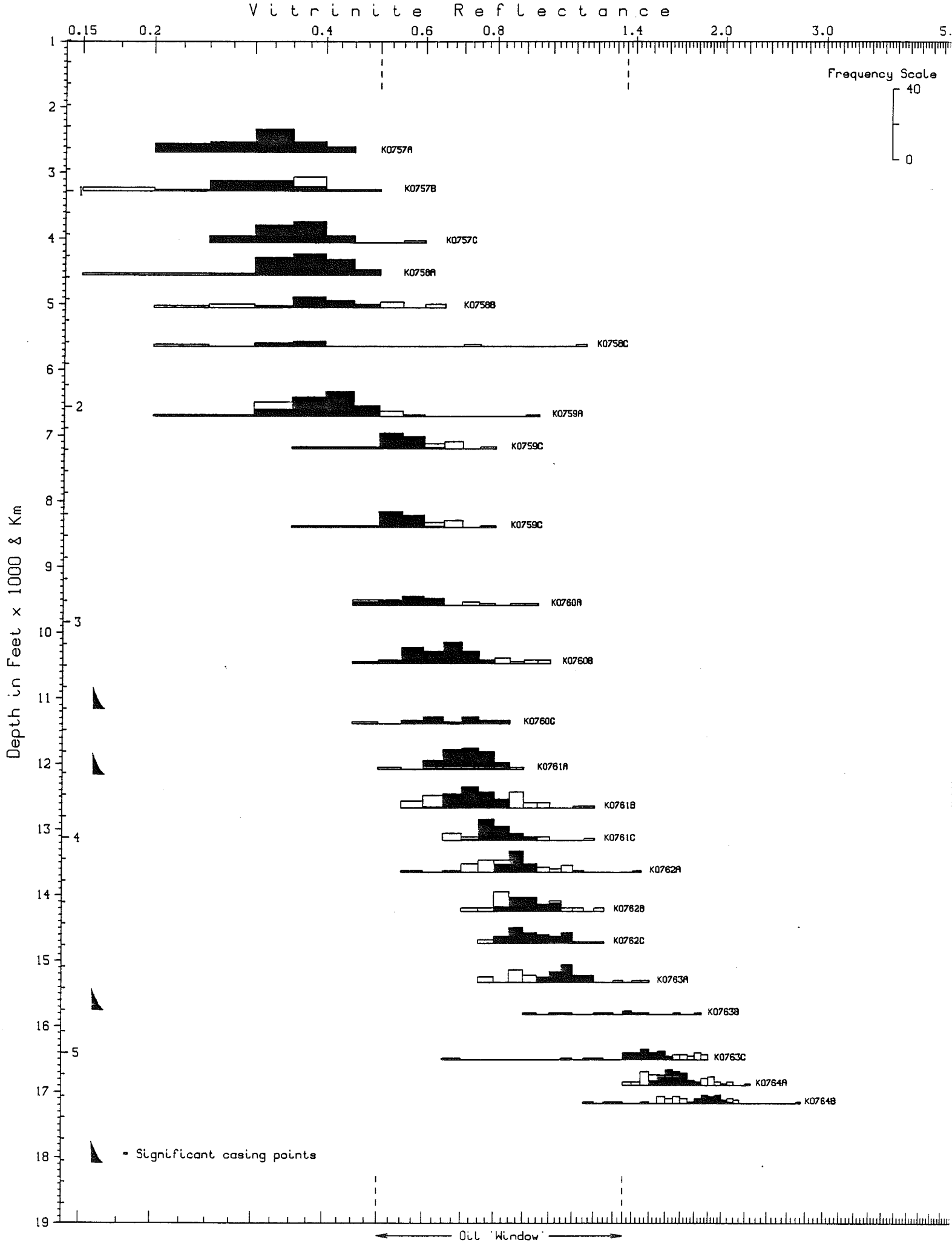


Fig. 2 Chebucto K-90 < Histograms >

APPENDIX I

Sample Preparation Method

COGLA Lab preparation

Preliminary Wash
Samples dried in oven
Split: a. all of coarse to Petrology Lab
b. ½ medium to Palynology Lab
c. rest of medium and all of fine combined for Micropaleo Lab
Split "b" is delivered to Palynology Lab and treated as follows:

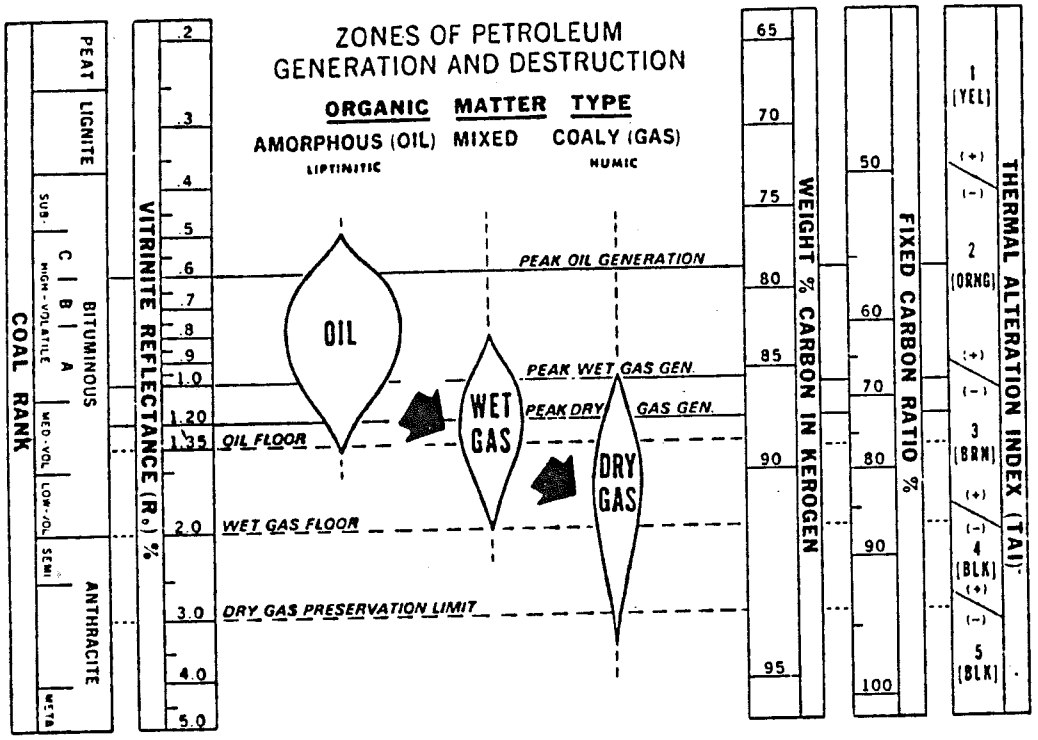
PALYNOLOGY Lab preparation

20-30 grams placed in 250 ml plastic beaker.
Add 10% HC1 till reaction ceases (removes carbonates).
Washed (rinsed) 3 times.
Conc. HF overnight (removes silicates).
Washed (rinsed) 3 times.
Heated (60-65°C) conc. HC1 (remove fluorides caused by HF).
Washed 3 times.
Then put into 15 ml test tube with 4-5 ml 4% Alconox.
Differential centrifuge at 1500 rpm for 90 sec.
Decant.
Wash 3 times with centrifuging.
Float off organic fraction using 2.0 S.G. Znbr solution.
Centrifuge 1000 rpm, 8 min.
Float fraction into second test tube.
Wash 3 times with centrifuging.
Kerogen smear slide made.
Remaining kerogen material delivered to Vitrinite Reflectance Lab.

VITRINITE REFLECTANCE Lab preparation

Excess water pipetted off.
Freeze dried.
Mounted using epoxy resin (EPO-TEK 301) in predrilled plastic stubs.
Polished using modified coal petrology polishing methods.
Examined under oil lens at approximately 800x mag'n.

Appendix II (Dow, 1977)



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

Appendix III

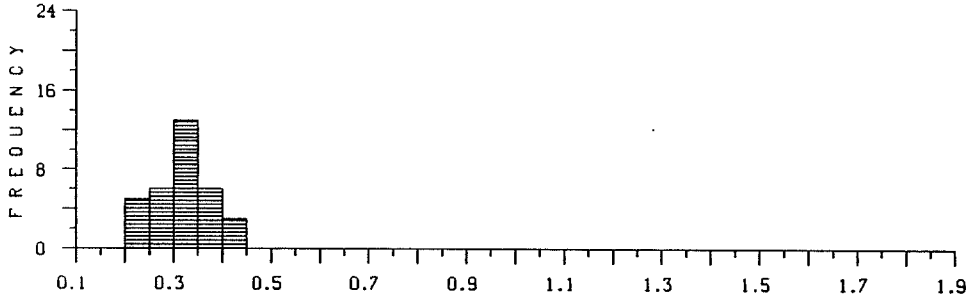
Reflectance Histograms

K0757A,780-820M,CHEBUCTO K-90

COL >	1	2	3	4	5	6	7	8	9	0
ROW	.21<	.22<	.22<	.22<	.24<	.25<	.25<	.28<	.29<	.29<
1	.29<	.30<	.30<	.30<	.32<	.32<	.32<	.32<	.33<	.33<
2	.34<	.34<	.34<	.34<	.35<	.35<	.35<	.37<	.37<	.37<
3	.40<	.42<	.44<							

	MEAN	STAND DEV	PTS	MIN	MAX	SUM
TOTAL	.31	.06	33	.21	.44	10.38
EDIT<	.31	.06	33	.21	.44	10.38

REFLECTANCE HISTOGRAM

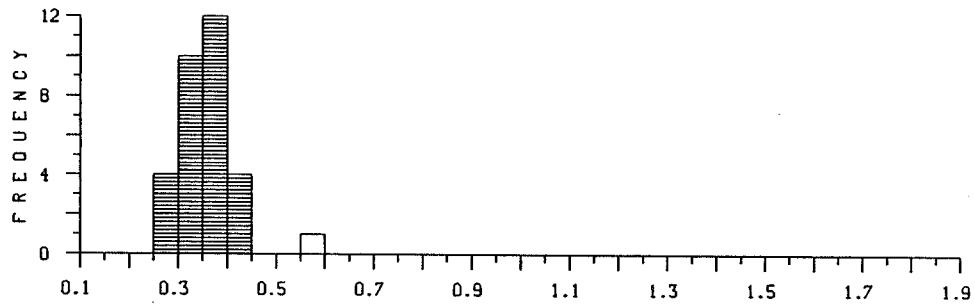


K0757C,1230-1240M,CHEBUCTO K-90

COL >	1	2	3	4	5	6	7	8	9	0
ROW	.26<	.27<	.29<	.29<	.32<	.32<	.33<	.33<	.33<	.33<
1	.34<	.34<	.34<	.34<	.35<	.36<	.36<	.37<	.37<	.37<
2	.38<	.38<	.38<	.39<	.39<	.39<	.40<	.42<	.43<	.44<
3	.55									

	MEAN	STAND DEV	PTS	MIN	MAX	SUM
TOTAL	.36	.06	31	.26	.55	11.16
EDIT<	.35	.04	30	.26	.44	10.61

REFLECTANCE HISTOGRAM

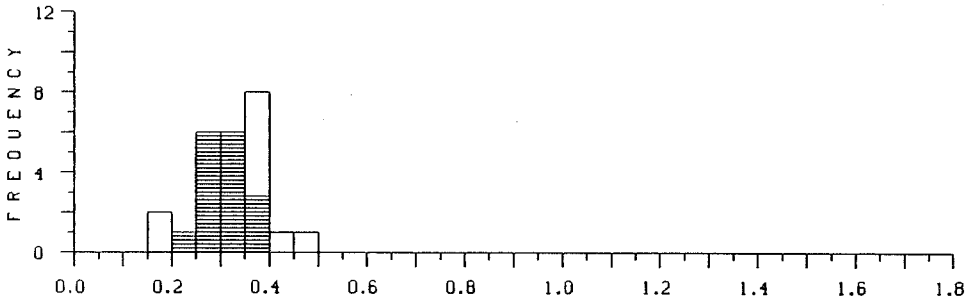


K0757B,960-1000M,CHEBUCTO K-90

COL >	1	2	3	4	5	6	7	8	9	0
ROW	.18	.19	.22<	.26<	.26<	.27<	.28<	.28<	.29<	.31<
1	.32<	.33<	.33<	.33<	.34<	.35<	.35<	.36<	.36	.37
2	.37	.37	.38	.41	.48					

	MEAN	STAND DEV	PTS	MIN	MAX	SUM
TOTAL	.32	.07	25	.18	.48	7.99
EDIT<	.31	.04	16	.22	.36	4.88

REFLECTANCE HISTOGRAM

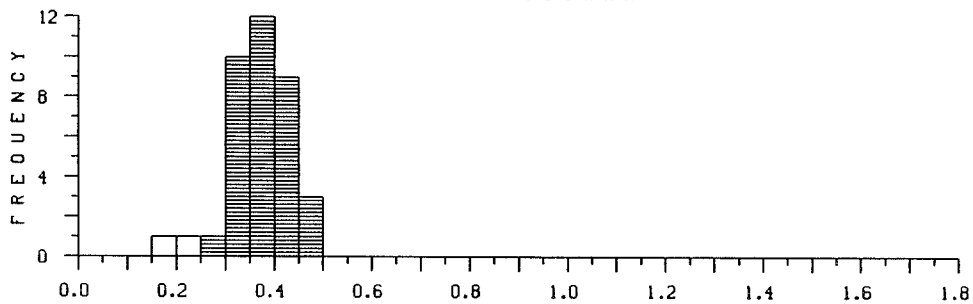


K0758A,1380-1390M,CHEBUCTO K-90

COL >	1	2	3	4	5	6	7	8	9	0
ROW	.19	.23	.28<	.30<	.30<	.31<	.31<	.32<	.32<	.33<
1	.33<	.33<	.34<	.36<	.36<	.36<	.36<	.37<	.37<	.38<
2	.38<	.39<	.39<	.39<	.39<	.40<	.40<	.42<	.42<	.42<
3	.43<	.43<	.44<	.44<	.45<	.45<	.47<			

	MEAN	STAND DEV	PTS	MIN	MAX	SUM
TOTAL	.37	.06	37	.19	.47	13.56
EDIT<	.38	.05	35	.28	.47	13.14

REFLECTANCE HISTOGRAM

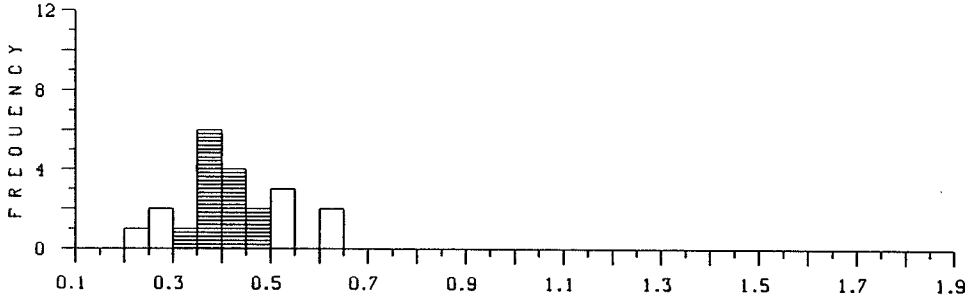


K0758B,1500-1540M,CHEBUCTO K-90

COL >	1	2	3	4	5	6	7	8	9	0
ROW	.22	.25	.29	.32<	.37<	.37<	.37<	.37<	.38<	.38<
1	.40<	.41<	.43<	.44<	.46<	.46<	.50	.51	.52	.61
2	.64									

	MEAN	STAND DEV	PTS	MIN	MAX	SUM
TOTAL	.41	.11	21	.22	.64	8.70
EDIT<	.40	.04	13	.32	.46	5.16

REFLECTANCE HISTOGRAM

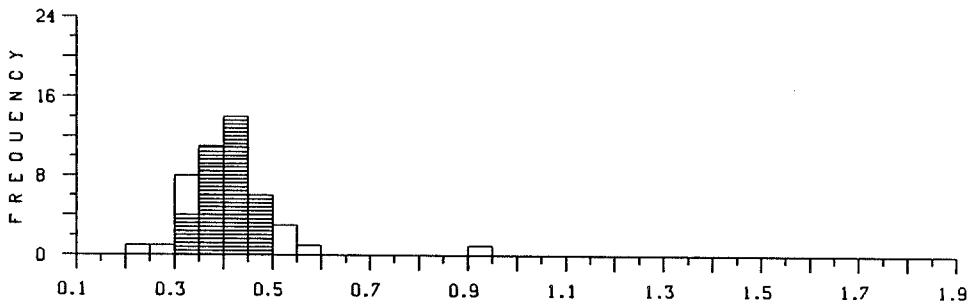


K0759A,2005-2045M,CHEBUCTO K-90

COL >	1	2	3	4	5	6	7	8	9	0
ROW	.24	.27	.31	.31	.32	.32	.34<	.34<	.34<	.34<
1	.35<	.36<	.36<	.36<	.37<	.37<	.38<	.38<	.38<	.38<
2	.39<	.40<	.40<	.41<	.41<	.41<	.42<	.42<	.42<	.42<
3	.42<	.43<	.44<	.44<	.44<	.45<	.46<	.46<	.46<	.46<
4	.47<	.50	.53	.53	.58	.94				

	MEAN	STAND DEV	PTS	MIN	MAX	SUM
TOTAL	.41	.10	46	.24	.94	18.93
EDIT<	.40	.04	35	.34	.47	14.08

REFLECTANCE HISTOGRAM

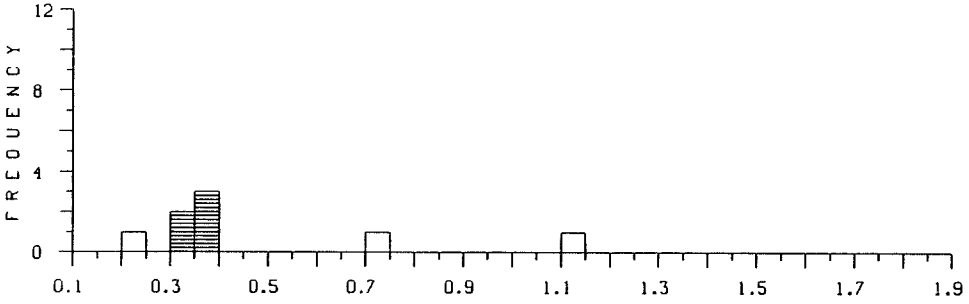


K0758C,1680-1720M,CHEBUCTO K-90

COL >	1	2	3	4	5	6	7	8	9	0
ROW	.23	.33<	.33<	.37<	.38<	.39<	.73	1.11		

	MEAN	STAND DEV	PTS	MIN	MAX	SUM
TOTAL	.48	.29	8	.23	1.11	3.87
EDIT<	.36	.03	5	.33	.39	1.80

REFLECTANCE HISTOGRAM

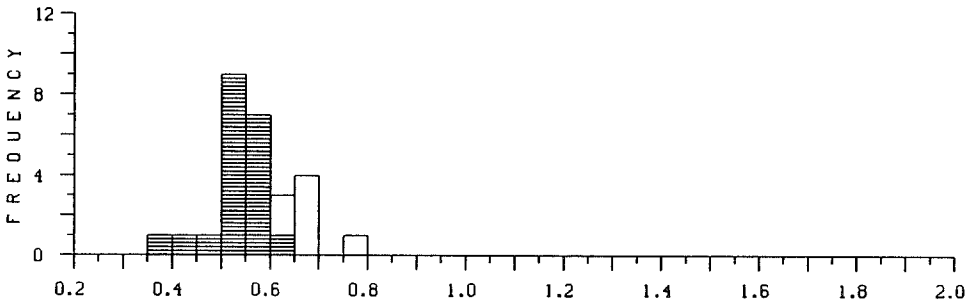


K0759C,2155-2195M,CHEBUCTO K-90

COL >	1	2	3	4	5	6	7	8	9	0
ROW	.38<	.42<	.47<	.50<	.51<	.51<	.51<	.52<	.52<	.52<
1	.54<	.54<	.56<	.57<	.57<	.57<	.58<	.59<	.59<	.62<
2	.63	.63	.65	.66	.66	.67	.75			

	MEAN	STAND DEV	PTS	MIN	MAX	SUM
TOTAL	.56	.08	27	.38	.75	15.24
EDIT<	.53	.06	20	.38	.62	10.59

REFLECTANCE HISTOGRAM

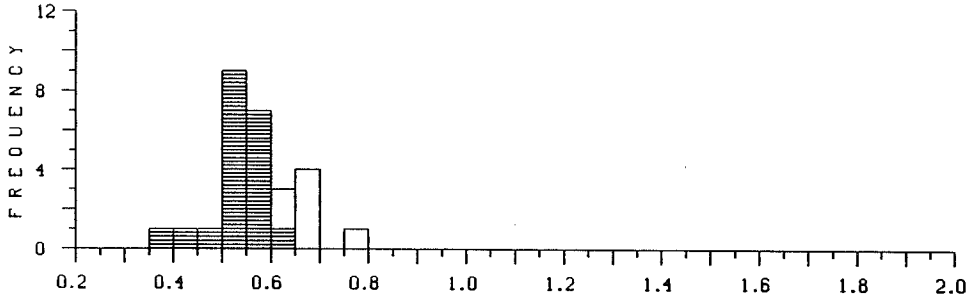


K0759C,2520-2560M,CHEBUCTO K-90

COL >	1	2	3	4	5	6	7	8	9	0
ROW	.38<	.42<	.47<	.50<	.51<	.51<	.51<	.52<	.52<	.52<
1	.54<	.54<	.56<	.57<	.57<	.57<	.58<	.59<	.59<	.62<
2	.63	.63	.65	.66	.66	.67	.75			

	MEAN	STAND DEV	PTS	MIN	MAX	SUM
TOTAL	.56	.08	27	.38	.75	15.24
EDIT<	.53	.06	20	.38	.62	10.59

REFLECTANCE HISTOGRAM

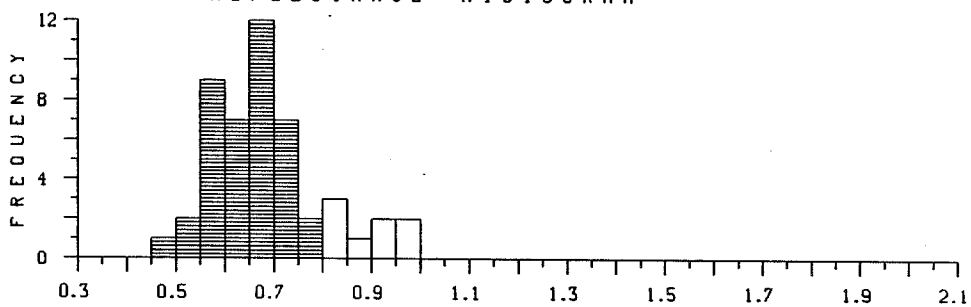


K0760B,3150-3190M,CHEBUCTO K-90

COL >	1	2	3	4	5	6	7	8	9	0
ROW	.48<	.51<	.53<	.55<	.55<	.58<	.58<	.59<	.59<	.59<
1	.59<	.59<	.63<	.63<	.63<	.64<	.64<	.64<	.64<	.65<
2	.65<	.65<	.66<	.67<	.67<	.68<	.68<	.68<	.69<	.69<
3	.69<	.70<	.70<	.70<	.71<	.71<	.71<	.74<	.75<	.75<
4	.80	.81	.84	.89	.92	.93	.95	.97		

	MEAN	STAND DEV	PTS	MIN	MAX	SUM
TOTAL	.68	.11	48	.48	.97	32.82
EDIT<	.64	.07	40	.48	.75	25.71

REFLECTANCE HISTOGRAM

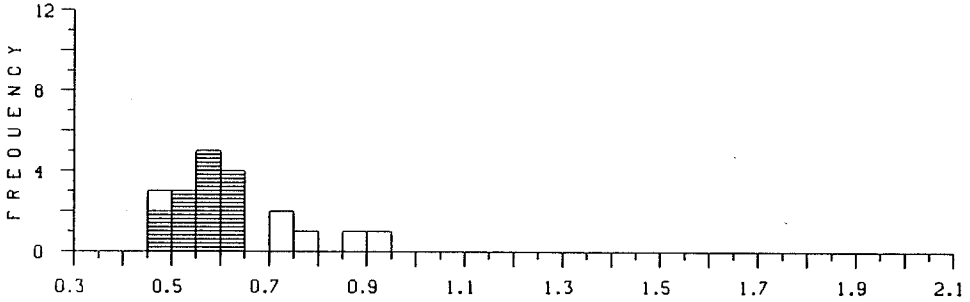


K0760A,2880-2920M,CHEBUCTO K-90

COL >	1	2	3	4	5	6	7	8	9	0
ROW	.45	.48<	.49<	.50<	.52<	.53<	.55<	.56<	.56<	.57<
1	.59<	.61<	.63<	.64<	.64<	.70	.73	.77	.88	.92

	MEAN	STAND DEV	PTS	MIN	MAX	SUM
TOTAL	.62	.13	20	.45	.92	12.32
EDIT<	.56	.05	14	.48	.64	7.87

REFLECTANCE HISTOGRAM

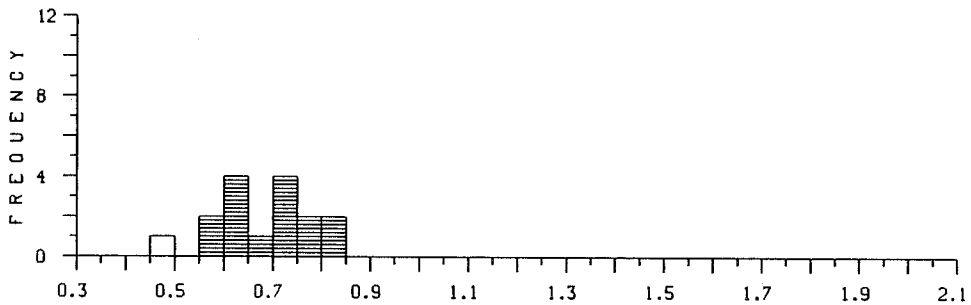


K0760C,3430-3470M,CHEBUCTO K-90

COL >	1	2	3	4	5	6	7	8	9	0
ROW	.49	.56<	.58<	.61<	.64<	.64<	.64<	.65<	.71<	.71<
1	.73<	.73<	.76<	.77<	.80<	.80<				

	MEAN	STAND DEV	PTS	MIN	MAX	SUM
TOTAL	.68	.09	16	.49	.80	10.82
EDIT<	.69	.08	15	.56	.80	10.33

REFLECTANCE HISTOGRAM

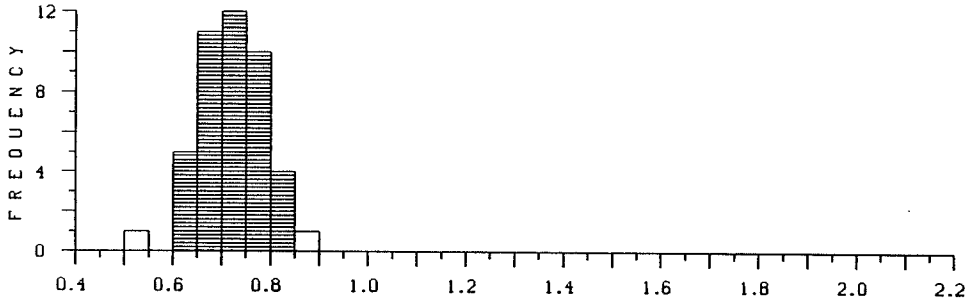


K0761A,3670-3680M,CHEBUCTO K-90

COL >	1	2	3	4	5	6	7	8	9	0
ROW	.53	.60<	.61<	.63<	.63<	.64<	.65<	.65<	.66<	.66<
1	.66<	.66<	.66<	.67<	.68<	.69<	.69<	.71<	.71<	.71<
2	.72<	.72<	.73<	.73<	.74<	.74<	.74<	.74<	.74<	.75<
3	.75<	.76<	.76<	.76<	.76<	.77<	.77<	.78<	.78<	.81<
4	.81<	.84<	.84<	.88						

	MEAN	STAND DEV	PTS	MIN	MAX	SUM
TOTAL	.72	.07	44	.53	.88	31.52
EDIT<	.72	.06	42	.60	.84	30.11

REFLECTANCE HISTOGRAM

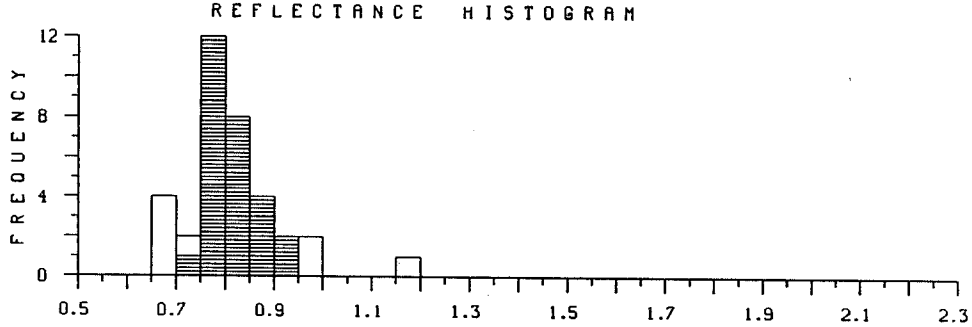


K0761C,4000-4010M,CHEBUCTO K-90

COL >	1	2	3	4	5	6	7	8	9	0
ROW	.67	.68	.68	.69	.70	.73<	.75<	.75<	.75<	.77<
1	.77<	.78<	.78<	.78<	.79<	.79<	.79<	.79<	.80<	.80<
2	.81<	.82<	.82<	.82<	.83<	.84<	.85<	.85<	.87<	.89<
3	.90<	.90<	.95	.95	1.15					

	MEAN	STAND DEV	PTS	MIN	MAX	SUM
TOTAL	.81	.09	35	.67	1.15	28.29
EDIT<	.81	.05	27	.73	.90	21.82

REFLECTANCE HISTOGRAM

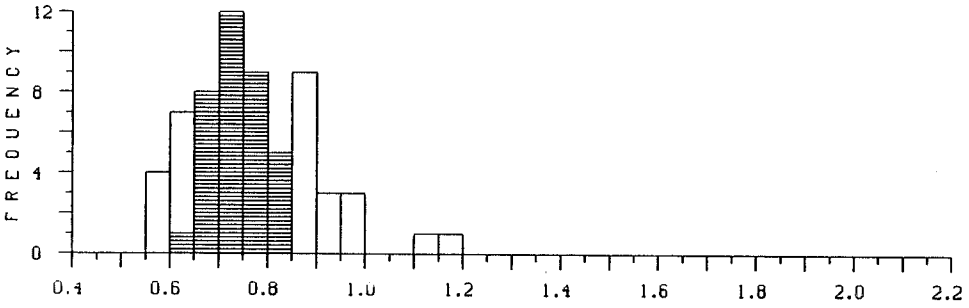


K0761B,3820-3860M,CHEBUCTO K-90

COL >	1	2	3	4	5	6	7	8	9	0
ROW	.56	.56	.57	.59	.60	.60	.62	.62	.63	.63
1	.64<	.65<	.65<	.66<	.67<	.67<	.67<	.68<	.69<	.70<
2	.70<	.71<	.71<	.72<	.72<	.73<	.74<	.74<	.74<	.74<
3	.74<	.75<	.75<	.76<	.76<	.77<	.77<	.77<	.78<	.78<
4	.80<	.80<	.82<	.82<	.83<	.85	.85	.85	.85	.86
5	.86	.88	.89	.89	.92	.93	.93	.96	.96	.98
6	1.12	1.18								

	MEAN	STAND DEV	PTS	MIN	MAX	SUM
TOTAL	.76	.13	62	.56	1.18	47.37
EDIT<	.73	.05	35	.64	.83	25.63

REFLECTANCE HISTOGRAM

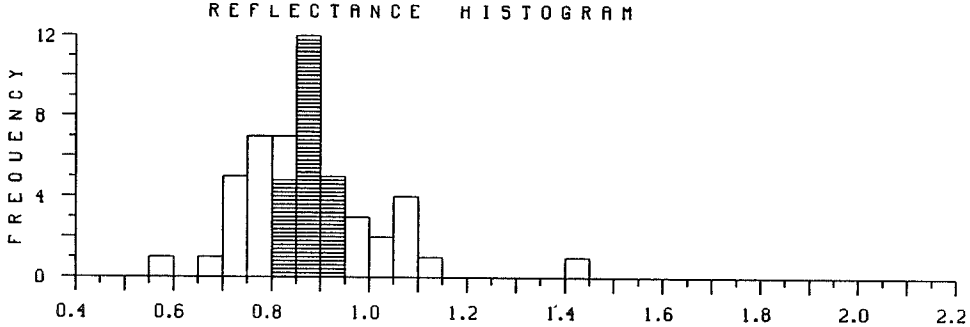


K0762A,4150-4160M,CHEBUCTO K-90

COL >	1	2	3	4	5	6	7	8	9	0
ROW	.57	.66	.70	.70	.72	.74	.74	.76	.76	.77
1	.78	.79	.79	.79	.80	.81	.82<	.83<	.83<	.84<
2	.84<	.85<	.85<	.86<	.86<	.86<	.87<	.87<	.88<	.88<
3	.88<	.88<	.88<	.90<	.90<	.92<	.94<	.94<	.98	.98
4	.99	1.00	1.01	1.05	1.05	1.06	1.09	1.12	1.41	

	MEAN	STAND DEV	PTS	MIN	MAX	SUM
TOTAL	.87	.14	49	.57	1.41	42.80
EDIT<	.87	.03	22	.82	.94	19.18

REFLECTANCE HISTOGRAM

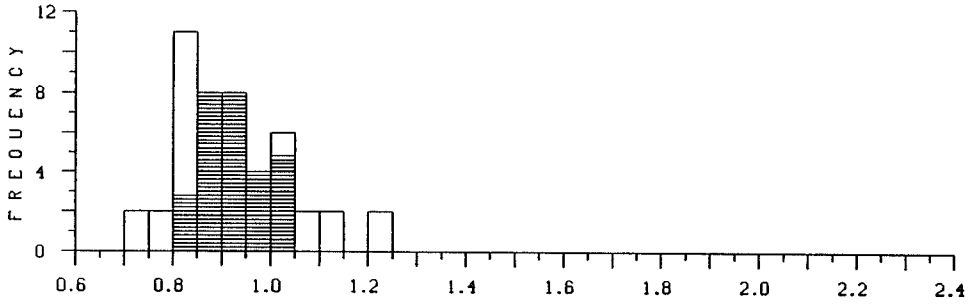


K0762B,4300-4340M,CHEBUCTO K-90

COL >	1	2	3	4	5	6	7	8	9	0
ROW	.71	.73	.75	.78	.80	.80	.82	.83	.83	.83
1	.83	.83	.84<	.84<	.84<	.85<	.85<	.86<	.86<	.88<
2	.88<	.88<	.89<	.90<	.91<	.91<	.91<	.92<	.93<	.93<
3	.94<	.96<	.96<	.98<	.99<	1.00<	1.00<	1.01<	1.02<	1.02<
4	1.04	1.05	1.09	1.10	1.12	1.22	1.22			

	MEAN	STAND DEV	PTS	MIN	MAX	SUM
TOTAL	.92	.12	47	.71	1.22	43.14
EDIT<	.92	.06	28	.84	1.02	25.76

REFLECTANCE HISTOGRAM

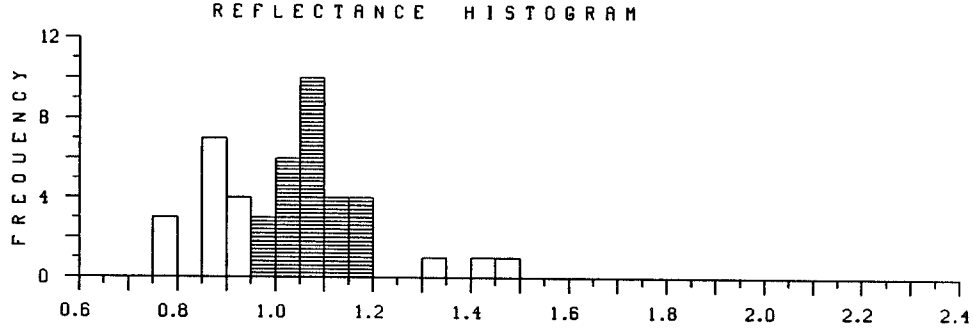


K0763A,4630-4670M,CHEBUCTO K-90

COL >	1	2	3	4	5	6	7	8	9	0
ROW	.75	.76	.79	.85	.86	.87	.87	.88	.88	.89
1	.91	.91	.91	.92	.96<	.97<	.98<	1.00<	1.00<	1.01<
2	1.02<	1.03<	1.04<	1.05<	1.06<	1.07<	1.08<	1.08<	1.08<	1.08<
3	1.08<	1.09<	1.09<	1.10<	1.11<	1.11<	1.13<	1.15<	1.17<	1.18<
4	1.18<	1.31	1.40	1.49						

	MEAN	STAND DEV	PTS	MIN	MAX	SUM
TOTAL	1.03	.15	44	.75	1.49	45.15
EDIT<	1.07	.06	27	.96	1.18	28.90

REFLECTANCE HISTOGRAM

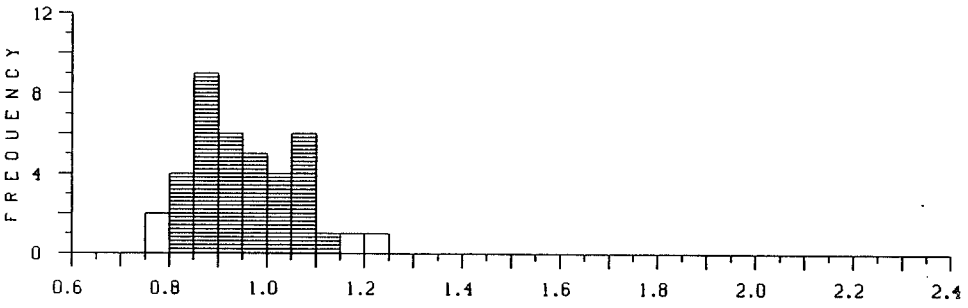


K0762C,4480-4490M,CHEBUCTO K-90

COL >	1	2	3	4	5	6	7	8	9	0
ROW	.76	.76	.84<	.84<	.84<	.84<	.86<	.86<	.87<	.87<
1	.87<	.87<	.88<	.88<	.88<	.90<	.91<	.91<	.93<	.93<
2	.93<	.95<	.98<	.99<	.99<	.99<	1.01<	1.01<	1.03<	1.04<
3	1.05<	1.06<	1.07<	1.07<	1.07<	1.09<	1.11<	1.16	1.22	

	MEAN	STAND DEV	PTS	MIN	MAX	SUM
TOTAL	.95	.11	39	.76	1.22	37.12
EDIT<	.95	.09	35	.84	1.11	33.22

REFLECTANCE HISTOGRAM

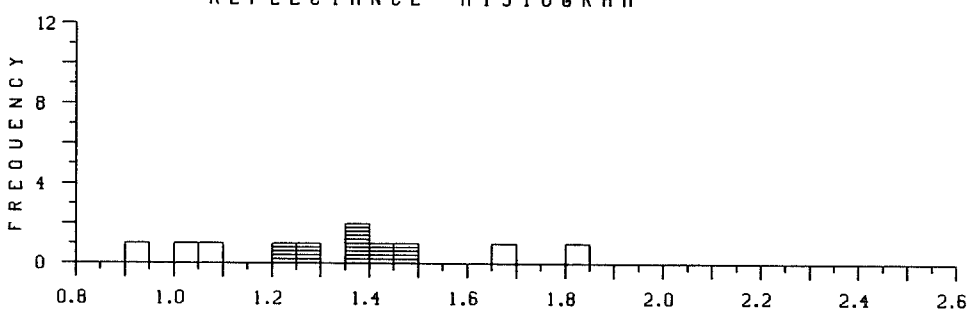


K0763B,4810-4820M,CHEBUCTO K-90

COL >	1	2	3	4	5	6	7	8	9	0
ROW	.94	1.01	1.07	1.21<	1.29<	1.37<	1.39<	1.43<	1.47<	1.68
1	1.82									

	MEAN	STAND DEV	PTS	MIN	MAX	SUM
TOTAL	1.33	.27	11	.94	1.82	14.68
EDIT<	1.36	.10	6	1.21	1.47	8.16

REFLECTANCE HISTOGRAM

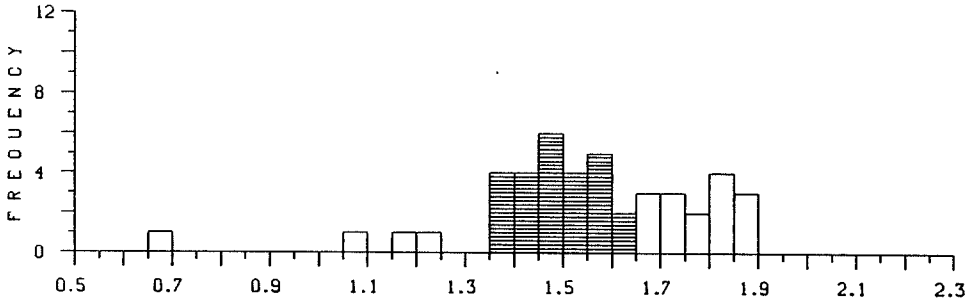


K0763C,4990-5030M,CHEBUCTO K-90

COL >	1	2	3	4	5	6	7	8	9	0
ROW	.66	1.06	1.17	1.23	1.35<	1.35<	1.39<	1.39<	1.42<	1.43<
1	1.44<	1.44<	1.45<	1.46<	1.47<	1.47<	1.48<	1.49<	1.52<	1.52<
2	1.54<	1.54<	1.56<	1.57<	1.57<	1.57<	1.59<	1.61<	1.63<	1.68
3	1.68	1.68	1.70	1.72	1.74	1.76	1.76	1.80	1.80	1.81
4	1.82	1.87	1.88	1.89						

	MEAN	STAND DEV	PTS	MIN	MAX	SUM
TOTAL	1.54	.23	44	.66	1.89	67.96
EDIT<	1.49	.08	25	1.35	1.63	37.25

REFLECTANCE HISTOGRAM

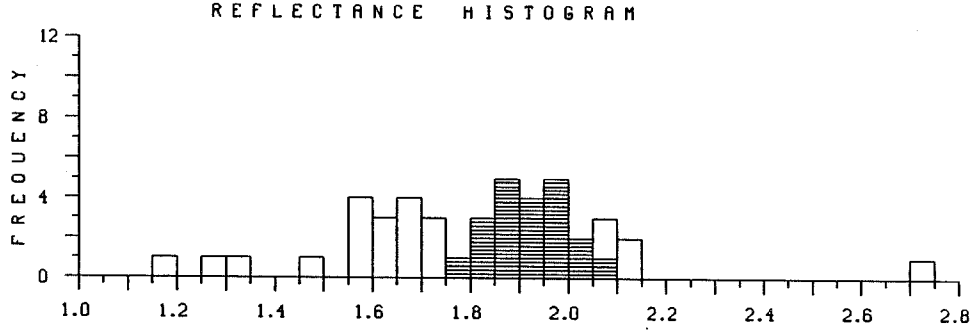


K0764B,5225-5234M,CHEBUCTO K-90

COL >	1	2	3	4	5	6	7	8	9	0
ROW	1.15	1.29	1.30	1.45	1.55	1.55	1.57	1.58	1.61	1.62
1	1.63	1.66	1.66	1.66	1.67	1.72	1.73	1.73	1.77<	1.81<
2	1.81<	1.83<	1.85<	1.85<	1.86<	1.87<	1.89<	1.90<	1.90<	1.93<
3	1.94<	1.95<	1.95<	1.96<	1.98<	1.98<	2.02<	2.04<	2.05<	2.09
4	2.09	2.11	2.14	2.72						

	MEAN	STAND DEV	PTS	MIN	MAX	SUM
TOTAL	1.81	.27	44	1.15	2.72	79.42
EDIT<	1.91	.08	21	1.77	2.05	40.14

REFLECTANCE HISTOGRAM



K0764A,5140-5150M,CHEBUCTO K-90

COL >	1	2	3	4	5	6	7	8	9	0
ROW	1.38	1.39	1.43	1.43	1.46	1.47	1.47	1.47	1.47	1.47
1	1.48	1.48	1.50	1.50	1.52	1.53<	1.53<	1.53<	1.55<	1.56<
2	1.56<	1.57<	1.57<	1.58<	1.60<	1.61<	1.61<	1.61<	1.62<	1.63<
3	1.63<	1.63<	1.64<	1.66<	1.66<	1.66<	1.67<	1.67<	1.68<	1.68<
4	1.69<	1.70<	1.70<	1.71<	1.72<	1.72<	1.73<	1.73<	1.76<	1.77<
5	1.79<	1.81<	1.82<	1.85	1.85	1.87	1.88	1.90	1.90	1.92
6	1.93	1.94	1.95	1.98	2.00	2.05	2.07	2.22		

	MEAN	STAND DEV	PTS	MIN	MAX	SUM
TOTAL	1.68	.18	68	1.38	2.22	114.12
EDIT<	1.66	.08	38	1.53	1.82	62.89

REFLECTANCE HISTOGRAM