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Plate 2. Composite data set and results from SEM analyses of selected samples from Cape Roberts Project, Drillcore-3

This data set shows the distribution of detrital clay, authigenic smectite, zeolite, and opal-CT cements for CRP-3 with corresponding rock type. The unit and interval descriptions, depositional environment, facies numbers, and fault zones, are referenced from studies conducted by the Cape Roberts Science Team, 2000. Detrital clay type is referenced from Ehrmann et al., 2001, listed in relative abundance from highest to lowest. All other data this study. Color scheme is as follows: Detrital clay (no color), authigenic smectite (green), opal-CT (gray), zeolite (blue), fault zones (red). The term "cavatized grains" refers to a qualitative degree of secondary porosity; N = none, F = few, M = moderate, E = extensive. See bottom of chart for full references.

Sample (mbsf)	Unit no.	Unit Interval (m)	Unit Description	Interval Description	Depositional Environment	Facies no.	Cement	Type	Clay Thickness	Zeolites	Cavitized Grains	Other Authigenics
22.40	1.2	16.72-52.00	**Muddy sandstone locally with dispersed clasts.** Massive to weakly laminated (cm scale), fine and medium-grained sandstone with dispersed clasts. Sparse lamination of mudstone. Dk grey (5Y4/1)	Abundant fractures with local brecciation.	Regressive shoreline - inner shelf/proglacial delta	3	Detrital Clay	Illite, Smectite, Chlorite			N	
44.25				Fast-track sample just above brecciated interval.	Inner shelf with iceberg influence	3	Detrital Clay	Illite, Chlorite, Smectite			N	?Albite ?Salt
62.95	1.3	52.00-70.40	**Sandy mudstone.** Massive to faintly laminated (cm scale) becoming well laminated (down core) sandy mudstone. Locally with dispersed clasts, dk. Grey (5Y4/1). Scattered fossils, pyrite and patches of carbonate cement.	Fast-track sample.	Open marine with iceberg influence	1	Detrital Clay	Illite, Chlorite, Smectite			N	
81.16	1.4	70.40-83.10	**Very fine-grained sandstone and mudstone.** Interlaminated and thinly bedded very fined-grained sandstone and mudstone. Very gradational upper contact with unit 1.3. Variable proportions of the two lithologies. Discrete sand beds up to 15 cm thick, some of which contain ripple-cross lamination and parallel lamination. Parallel lamination intervals have dips as steep as 5 degrees. Beds without primary structures contain a mixture of sand, mud, and granules, apparently mixed during deposition. Beds show extensive soft sediment deformation; beds are loded, and are commonly deformed internally. No bioturbation evident. Little fracturing.	Interlaminated and thinly interbedded mudstone (~75% with 25% being ss. and diamictite) , very fine to fine-grained sandstone, and clast-poor to clast-rich diamictite. Low-abundances of gravel-sized clasts throughout this interval. Fractures occur throughout, as well as faults with vertical displacements of 1 cm or less. Brecciated at 81.09 m. Carbonate-filled microfault at 81.92.	Glacimarine grounding-line fan	2	Detrital Clay	Smectite, Illite, Chlorite			N	?Salt, ?Gypsum
100.07	2.2	95.48-120.20	**Fine-grained muddy sandstone with dispersed clasts,** grading locally to clas-poor sandy diamictite. Dk. Grey (5Y4/1). Various forms of load balls are common, as well as carbonate-cemented patches and veins. Clasts are dominated by dolerite and diorite.	Sandy mudstone with rare dispersed clasts. Contains thin, carbonate-filled veins. Unstratified.	Ice marginal grounding-line fan/delta	1	Detrital Clay	Smectite, Illite, Chlorite			N	

123.65	3.1	120.20-144.67	**Sandy mustone with dispersed clasts.** Vaguely stratified at a decimeter scale becoming overprinted by colour mottling downcore. Slightly bioturbated. Patchy carbonate cement is common, and shell/shell fragments are present to common.	Brecciated. Patchy carbonate cement is present.	Ice marginal grounding-line fan/delta	1	Detrital Clay	Smectite, Illite, Chlorite			N		
142.93				Carbonate cemented. Interval contains 5mm wide pyrite filled vein (not my sample).	Open marine shelf with iceberg influence to ice marginal/grounding-line lan/delta	1	Detrital Clay	Smectite, Illite, Chlorite			N		
160.87	5.1	157.22-169.47	**Sandy mudstone with dispersed clasts.** Dk grey (N4/). Bioturbated throughout. Carbonate-filled fractures and open fractures throughout.	Diffusely interbedded sandy mudstone. Soft-sediment deformation. Bioturbated.	Open marine shelf with iceberg influce	2	Detrital Clay	Smectite, Illite, Chlorite			N		
182.63	5.3	176.42-184.85	**Pebbly sandstone and pebble to cobble conglomerate.** Moderately sorted (mud-free) fine to coarse-grained sandstone with parallel lamination, cross stratification and dispersed clasts. Soft-sediment deformation is pervasive and small faults are present in the upper portion. Clast concentrations locally increase to produce pebbly sandstone and pebble to cobble conglomerate.	Mudstone with soft-sediment deformation.	Ice proximal/grounding-line fan/delta	2	Detrital Clay	Smectite, Chlorite, Illite		?Analcime ®	F		
205.11	7.1	202.18-211.40	**Sandstone and minor conglomerate.** Generally mud-free sandstone and conglomerate. Well-developed stratification is locally disrupted to varying degrees by soft-sediment deformation (and possibly by low-angle shear zones). Coal fragments are dispersed throughout and are concentrated along discrete laminae.	Medium and fine-grained sandstone. Well-stratified but disrupted by fractures and small faults. Possible remnants of cross-bedding.	Ice marginal to ice proximal glacimarine with grounding-line oscillation	5	Zeolite	No clays present		?Heulandite, Clinoptilolite (a)	F-M	K-Feldspar	
207.65				Fine-grained muddy sandstone to sandy mudstone. Gravel fraction almost entirely coal fragments, dispersed and concentrated in discrete laminae. Patchy carbonate cement present.		5	Detrital Clay	Smectite, Illite, Chlorite		?Heulandite, Clinoptilolite Analcime ©	F		
221.17	7.2	211.40-264.33	**Interbedded sandy mudstone, sandstone, and conglomerate.** Sandy mudstone with dispersed clasts, dk grey, vague stratification in some intervals. Sandstone ranges from very fine to medium-grained, well-sorted and well-stratified, with parallel lamination, ripple cross-lamination, and cross-bedding. Locally, primary structures are modified or destroyed by soft-sediment deformation. Conglomerate ranges from granule to cobble grade; pebble conglomerates are most common. The conglomerate is moderately to poorly sorted, conains angular to well-rounded clasts (10-80%) and generally shows weak to no stratification. Clasts predominately dolerite, with lesser amounts of other intrusives. Coal fragments are present to abundant in specific intervals, generally in the coarse sand to granule size fractions. Carbonate cement distributed irregularly. Nodular carbonate cement locally. Small faults present to abundant in some intervals.	Interstratified fine and medium-grained sandstone, both of which are well-stratified and exhibit ripple cross-lamination and cross-bedding. Patchy carbonate cement.		5	Detrital and Authigenic Clay (Transformed)?	Smectite, Illite, Chlorite	1um, patchy	?Heulandite, Clinoptilolite (a)	N		

240.31				Mudstone with rare small gravel. Soft-sediment deformation and load balls of sandstone. Fractures present, some mineralized (not in this sample). Carbonate cement present.		1	Detrital Clay	Smectite, Illite, Chlorite			N	Carbonate
						Brittle Fault Zone (257-263)						
264.44	7.3	264.33-270.51	**Sandy mudstone with dispersed clasts.** Medium grey to dk grey sandy mudstone, locally carbonate-cemented and with carbonate-filled fractures. At least two generations of fractures. Dispersed pyrite, black surface stain or cement. Gradational lower contact.	Sub-rounded to well-rounded grains.		1	Detrital Clay	Smectite, Illite, Chlorite			N	?Zircon
281.79	7.4	270.51-293.43	**Well-stratified medium-grained sandstoned with dispersed clasts.** Mainly well-stratified interbedded with lesser amounts of sandy mudstone, sandstone with abundant clasts, and pebble to cobble conglomerate. The sandstone, sandy mudstone, and conglomerate have textural and compositional characteristics similar to those present in the lithologies of unit 7.2.	Fine to medium-grained sandstone, well-sorted and well-stratified. Patchy carbonate cement concentrated in zones without primary stratification.		5	Authigenic Clay	Smectite, ?Illite, ?Chlorite	1um, patchy	?Heulandite Clinoptilolite (a)	N	Carbonate, Salt (KCl)
311.18	8.1	306.26-324.88	**Muddy fine-grained sandstone with dispersed clasts and sandy mudstone with dispersed clasts.** Predominately muddy fine-grained sandstone with dispersed clasts.	Contains diffusely distributed fine-grained to medium-grained sandstone laminations with abundant soft-sediment deformation and bioturbation.	Proglacial delta with iceberg influence	3	Detrital Clay, ?Transformed in some areas from alteration	Smectite, Illite, Chlorite			F	Quartz, Albite, ?Fe-mineral
324.39				Sandy mudstone, apparently bioturbated. Conatians abundant shell fragments and patchy carbonate cement (not this sample). Shell fragments reported throughout interval.		1	Detrital Clay	Smectite, Illite, Chlorite			F	Albite, K-Feldspar, ?Fe-mineral
340.17	9.1	324.88-406.00	**Well-stratified sandstone, sandy mudstone, and muddy sandstone, all with dispersed clasts and minor conglomerate.** Beds range from less than 50 cm thick to more than 4m thick.	Muddy fine-grained sandstone with dispersed clasts. Tightly cemented with carbonate.		5	Authigenic Clay ?Transformed	Saponite/Nontronite	1-2 um, patchy		F	Carbonate
358.89	9.1			Fine to medium-grained sandstone. Greeish-grey		5	Authigenic Clay	Smectite, ?Chlorite	3-4 um		E	Carbonate
360.61				Medium grey sandy mudstone with dispersed clasts, soft-sediment deformed.		1	Mianly detrital clay, authigenic (?transformed) in some areas from alteration	Smectite, ?Chlorite			N	
383.15	9.1			Mainly clean, well-sorted medium-grained sandstone, local vague stratification, rare dispersed gravel, patchy and nodular carbonate cement, colour 5Y2.5/1 to 5Y3/1.	Deltaic; inner shelf depths above fair-weather base (?) with iceberg influence	5	Authigenic Clay	Saponite/Nontronite	4-5 um		F	
396.35	9.1			Mainly medium-grained, clean, moderately-sorted sandstone, patchy and nodular carbonate cemented.		5	Authigenic Clay	Saponite/Nontronite	4-5 um		E	

400.49	9.1			Mainly medium-grained, clean, moderately-sorted sandstone, patchy and nodular carbonate cemented.		5	Authigenic Clay	Saponite/Nontronite	4-5 um	M-E	Carbonate (nodule)
435.84	11.1	413.56-444.44	**Sandstone and congolmerate.** Mainly clean, green, moderate to well-sorted, fine to coarse-grained sandstone, with minor clast-rich sandstone and conglomerate.	Fine-grained massive sandstone with dispersed small gravel and sand-sized coal grains, interstratified with intervals of fine-grained sandstoned containing rhythmic fine to medium-grained sandstone laminae, parallel-laminated and cross-bedded.		5	Mainly detrital clay, Authigenic in some areas	Montmorillonite, Beidelite	3-4 um, patchy	N	K-Feldspar
461.82	12.2	458.48-462.91	**Sandstone and mudstone.** Interstratified very fine to fine-grained sandstone, sandy siltstone, and silty claystone.	Silty claystone.		2	Detrital Clay	Montmorillonite/Beidelite		N	
500.27	12.3	462.91-539.31	**Quartzose sandstone.** Mainly clean, well-sorted, light-colored quartzose sandstone.	Clean, quartzose, moderately sorted, fine to medium-grained sandstone with rare dispersed gravel. Nodular and patchy carbonate cement.		5	?Zeolite cement		?Clinoptilolite	N	K-Feldspar, KCl
518.33	12.3			Fine-grained sandstone tightly cemented with carbonate.		4	Authigenic Clay	Smectite	1-2 um, patchy	N	Carbonate
520.88	12.3			Fine-grained sandstone, cemented with carbonate.		5	Authigenic Clay	Smectite	2-3 um, patchy	N	Carbonate
536.41	12.3					5	Authigenic Clay	Smectite	basal-1 um, patchy	N	Carbonate
					Brittle Fault Zone (539)						
542.14	12.4	539.31-558.87	**Dark sandstone and conglomerate.** Dark greenish-grey (5GY2.5/1) to greenish-grey (5GY5/1) sandstone with minor pebbly sandstone and pebble conglomerate.	Fine-grained dark grey-green sandstone, dispersed gravel and local carbonate cementation around some clasts.		5	Authigenic Clay	Smectite	6-7 um	M	Carbonate
560.23	12.5	558.87-576.28	**Clean, quartzose sandstone and minor conglomerate.** Mainly clean, well-sorted, quartzose, light-colored sandstone with minor pebbly sandstone and pebble to cobble conglomerate.	Light-colored, quartzose, clean, fine-grained sandstone, minor green/grey coloration, carbonate cementation throughout. Well stratified.		5	?Opal-CT ?Lepispheres		4-6 um	N	K-Feldspar
584.48	12.6	576.28-605.90	**Dark sandstone and minor conglomerate.** Dark greenish grey sandstone with minor pebbly sandstone and pebble to cobble conglomerate.	Poorly sorted, muddy medium-grained, green/grey sandstone (10Y3/1), abundant nodular carbonate cement and carbonate-filled fractures.	Deltaic; shelf depths above storm wave base (?) with iceberg influence	3	?Opal-CT		4-6 um	M	
601.77	12.6			as 584.48		3	Authigenic Clay	Saponite/Nontronite	3-4 um	F	
621.79	13.1	611.03-767.70	**Greenish grey, quartzose sandstone.** Mainly grey/green, muddy sandstone with minor pebbly sandstone and pebble to cobble conglomerate.	Fine-grained sandstone, greenish-grey. Common nodular carbonate cement. Scattered coal particles.		5	Authigenic Clay	Saponite/Nontronite	5-6 um	F	K-Feldspar
640.73	13.1			Clean, light-grey, medium-grained sandstone, tightly carbonate cemented.		3	Authigenic Clay	Saponite/Nontronite	5-6 um	F	K-Feldspar, Carbonate

662.86				Very fine to fine-grained, slightly muddy sandstone. Dispersed small coal particles.			3	Mainly detrital clay, Authigenic ?transformed in some areas	Montmorillonite/Beidelite		N	K-Feldspar
683.69	13.1			Fine-grained, grey/green sandstone with dispersed small gravel. Diffused parallel stratification.			3	Authigenic Clay	Saponite/Nontronite	8-10 um	M	
700.26				Fine-grained muddy sandstone, grey/green.			3	Mainly detrital clay, Authigenic ?transformed in some areas	Montmorillonite/Beidelite		F	Albite
706.58	13.1			Very fine/fine-grained, muddy sandstone			9	Authigenic Clay	Saponite/Nontronite	10 um	M	
716.44	13.1			Fine-grained muddy grey/blue sandstone			3	Authigenic Clay	Saponite/Nontronite	10 um	M	Carbonate
725.89	13.1			Fine-grained, muddy, grey/blue sandstone, with minor pebbly sandstone.			3	Authigenic Clay	Saponite/Nontronite	10-12 um	F	Carbonate
741.04	13.1			Muddy, fine/medium-grained grey/blue sandstone, vague parallel stratification.			3	Authigenic Clay	Saponite/Nontronite	10 um	F	Carbonate
773.72	13.2	767.70-789.77	**Pebble conglomerate and pebbly sandstone.** Mainly pebble to cobble conglomerate and pebbly sandstone, with minor grey/green, mudyy sandstone.	Pebbly, poorly-sorted, dark grey/blue, medium/coarse-grained sandstone.		3 & 10		Authigenic Clay	Saponite/Nontronite	10-13 um	F	Carbonate
781.27				Dark grey sandy mudstone with dispersed small coal particles.			1	Detrital and authigenic clay ?transformed	Montmorillonite/Beidelite		N	
789.77-805.60			**Dolerite (cataclastic) breccia**		Nearshore marine adjacent to high-gradient fluvial system	Shear Zone						
898.99	16.1	823.11-901.48	**Light red/brown quartz sandstone.** Generally medium-grained, light red/brown, quartz sandstone. Mostly parallel-laminated (cm scale), areas of brecciation.	Very well indurated quartzarenite. Contains increasing carbonate-filled fractures.	Sub-humid to semi-arid continental setting with fluvial systems aeolian reworking			Quartz, some authigenic clay		Basal	N	Quartz overgrowths
899.65								Quartz, and authigenic clay		Basal to 2-3 um	N	

901.76	17.1	901.48-919.95	**Strongly altered intrusive rock.** Zone of brown intrusive clast breccia (as for 901.09 m to 901.30 m) from 901.48 m to 902.10 m. Rock then becomes more coherent, light blue/grey (5BG5/1), slightly porphyritic with ghost (highly altered) phenocrysts (basic to intermediate compsition).	Red color, highly altered.	
902.26				Blue/grey color, partially altered.	
920.02	18.1	919.95-939.42	**Light red/brown quartz sandstone.** Generally medium-grained, light red/brown, quartz sandstone. Mostly parallel-laminated (cm scale), areas of brecciation.	Tough, hard, purple-stained, and carbonate-veined.	Sub-humid to semi-arid continental setting with fluvial systems aeolian reworking

References

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