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Short Note

Reassessment of the Miocene - Quaternary Boundary in CRP-1, Cape Roberts Project, Antarctica

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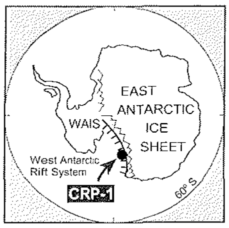

INTRODUCTION

During the course of the 1997 drilling campaign, lithostratigraphic boundaries were assigned to the CRP-1 core on the basis of perceived changes in lithology. The geologically most important boundary in the core, between the Miocene and overlying Quaternary sections, was placed at 43.55 mbsf. This horizon was described in the core logs (Cape Roberts Science Team, 1998) as a contact between muddy, fine-grained sandstones (which were assigned a Lower Miocene age based on diatom biostratigraphy) and overlying diamictons containing Quaternary diatoms. This boundary is a major unconformity, recognisable on seismic reflection records. As such, it has considerable significance in the ongoing scientific analysis of the drillcore.

During a re-examination of the core, focusing on the archive half held at the Antarctic Geology Research Facility of the Florida State University at Tallahassee, the authors noted that the core across the published boundary (43.55 mbsf) did not show any lithological change, but logged a sharp contact between dark olive grey, muddy sandstone and overlying diamicton at 43.15 mbsf (Fig. 1). We suggest, therefore, that the core log in appendix 1 of Cape Roberts Science Team (1998) is misleading over this interval. In order to test the veracity of the suggested boundary revision, a series of thin-sections was examined and point-counted for framework grain abundances.

RESULTS AND CONCLUSION

Point-count results from five thin-sections are summarised in table 1. A clear change in the abundances of quartz, volcanic rock fragments and volcanic glass fragments, along with a lesser change in pyroxene, occurs between 42.95 and 43.20 mbsf. Other coincident petrographic changes include a marked decrease in clay, a similar increase in diagenetic calcite and a significant increase in visible porosity, along with less dramatic changes in mean grain-size and sorting (Tab. 1).

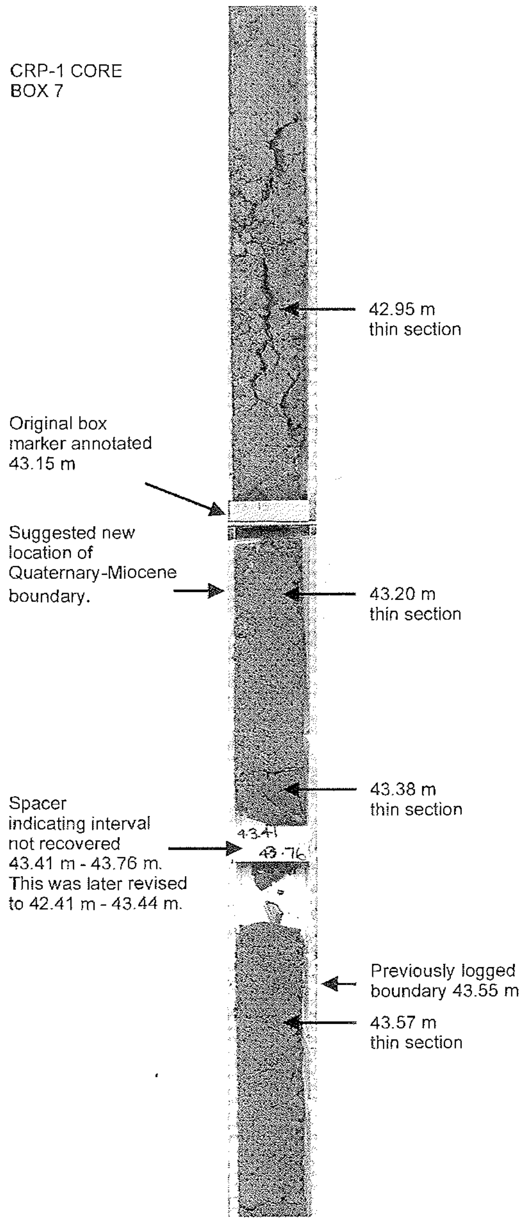

Fig. 1 - Portion of the scanned core image from CRP-1 showing the interval of interest, and annotated to show the original and revised Quaternary-Miocene boundary picks, and the location of samples examined in this study.

Tab. 1 - Modal analyses of thin-sections examined in this study. See figure 1 for location within core.

Depth (mbsf)	Age	Qtz	Cht	Kfe	Pla	VRF	Glass	Pyrx	Cal	Mic	Opq	Clay	V-P	MGS	Sor
38.41	Pleistocene	23.5	-	4.8	8.4	0.6	1.6	6.3	-	2.3	0.3	52.2	-	0.26	poor
42.95	Pleistocene	34.0	-	7.0	9.7	1.3	0.7	6.0	-	-	-	41.3	-	0.23	poor
43.20	Miocene	17.0	-	3.0	7.0	13.0	19.0	4.5	9.5	-	1.5	16.5	9.0	0.13	mod
43.38	Miocene	17.2	0.3	1.5	7.0	13.5	16.0	3.0	8.0	-	2.0	17.5	14.0	0.13	mod
43.57	Miocene	16.0	-	2.5	3.0	11.0	17.0	4.0	5.5	-	3.5	16.0	21.5	0.13	mod

Note: Qtz = quartz, Cht = chert, Kfe = K-feldspar, Pla = plagioclase, VRF = volcanic rock fragments, Glass = volcanic glass, Pyrx = pyroxene, Cal = diagenetic calcite, Mic = micrite (calcareous mud), Opq = opaques, V-P = visible porosity, MGS = estimated mean grain size (mm), Sor = sorting.

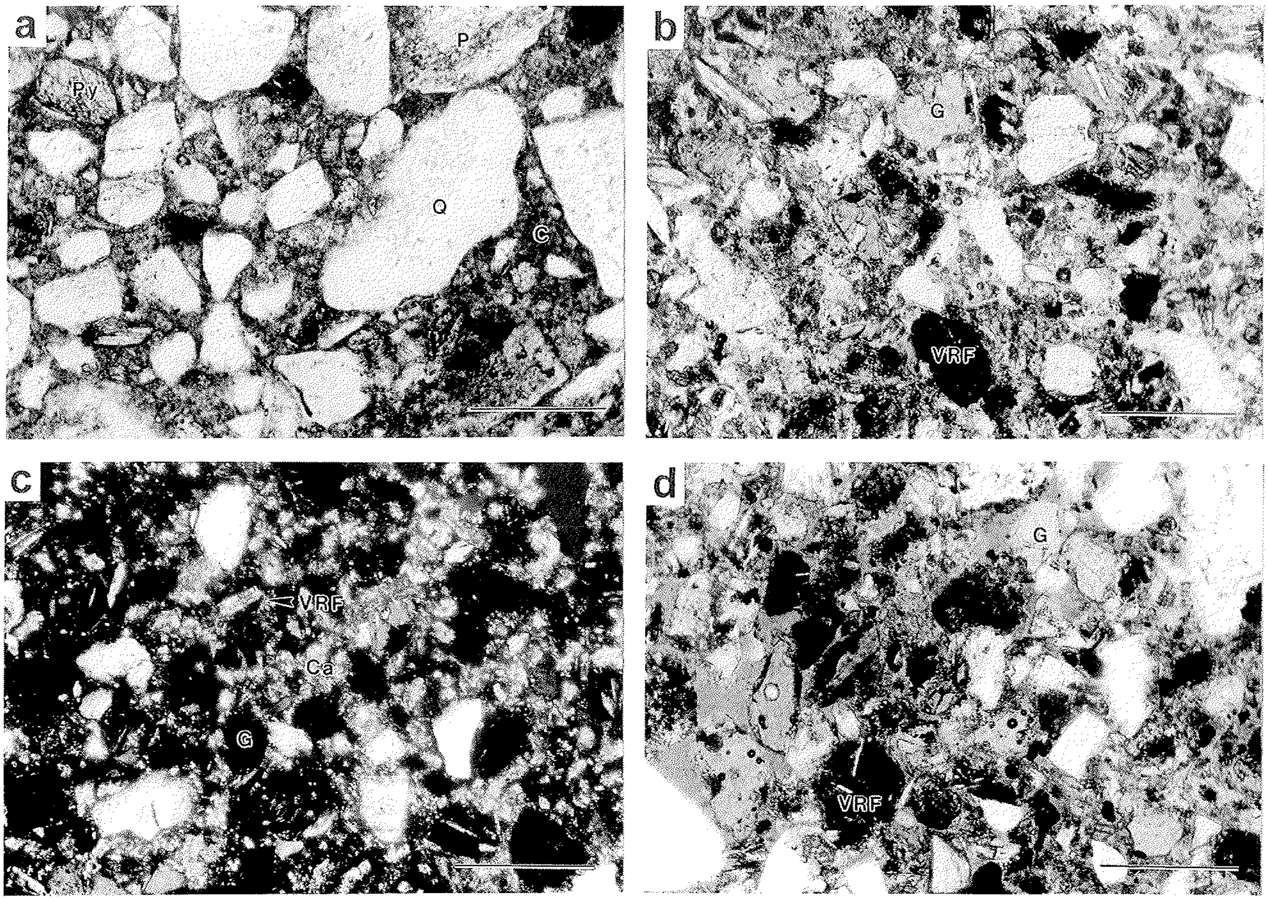

Fig. 2 - Photomicrographs of critical thin-sections examined and point-counted in this study. Scale bar in all photos is 0.2 mm. *a)* 42.95 mbsf, in plane-polarised light. Note the abundance of quartz (Q) and clay (C), and paucity of volcanic rock fragments and glass. P – plagioclase, Py – pyroxene. *b)* 43.20 mbsf, in plane-polarised light. Note the abundance of volcanic rock fragments (VRF) and brown volcanic glass (G), particularly relative to the sample illustrated in A). *c)* 43.20 mbsf, cross-polarised light. Note the abundance of volcanic rock fragments (VRF), volcanic glass (G) and diagenetic calcite (Ca). *d)* 43.57 mbsf, in plane-polarised light. Note the abundance of volcanic rock fragments (VRF), volcanic glass (G), and primary intergranular porosity (stained blue).

Representative photomicrographs of samples from above (42.95 mbsf: Fig. 2a) and below the proposed revised boundary (43.20 and 43.57 mbsf: Fig. 2b, c & d) further illustrate the changes noted. Baker & Fielding (this volume) have noted the abundance of diagenetic calcite in the form of microconcretions in CRP-1, which in many cases line or fill brittle fractures of uncertain origin (Cape Roberts Science Team, 1998). The fractures, and the diagenetic calcite that fills or lines them, are only found in the Miocene section. Given all of the above, we propose that the boundary between the Quaternary and Miocene sections in CRP-1 be revised from 43.55 to 43.15 mbsf.

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REFERENCES

Cape Roberts Science Team, 1998. Initial Report on CRP-1, Cape Roberts Project, Antarctica. *Terra Antartica*, **5**(1), 187 p.