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Short Note
New marine core record of Late Pleistocene glaciation history, Rauer Group, East Antarctica

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Introduction

The evolution of the East Antarctic Ice Sheet (EAIS) during the Late Quaternary is poorly known, partly because some regions, such as the Prydz Bay vicinity, indicate significant variability in the glaciation patterns (e.g. Domack *et al.* 1998, Zwartz *et al.* 1998, Hodgson *et al.* 2005).

Refinement of glaciation in Prydz Bay vicinity could be obtained from a 2143 cm long sediment core (Co1010) from Rauer Group (77°54'E; 68°48'S), which is an ice-free archipelago between Vestfold and Larsemann hills. Core Co1010 was recovered at 37 m water depth from a marine inlet. Visual description, geochemical parameters, and diatom assemblages in combination with radiocarbon age determinations of the sediment sequence provide a first interpretation of the ice sheet extent during the Late Quaternary for Rauer Group.

Results and discussion

Three major sedimentary units were defined in core Co1010.

Unit I (2143–1930 cm) is characterized by olive colour and a flaked structure (Fig. 1). A low proportion of fine-grained minerogenic material, consisting of platy micas and unrounded grains (e.g. quartz, pyroxene) is associated with high contents of biogenic silica (BSi) and total organic carbon (TOC) (Fig. 1). BSi is mainly derived from diatom frustules whereas *Chaetoceros* resting spores are the main diatom components. Another abundant species, *Rouxia leventerae*, is reported to have a last occurrence date in marine isotope stage (MIS) 6 (Zielinski & Gersonde 2002). Both diatom species show marine conditions. Four bulk sediment samples from unit I yielded radiocarbon ages between 42 and 29 ^{14}C Ka, including one reversal (Table I, Fig. 1). These ages show that unit I was deposited prior to the LGM, during a period of ice-free, marine conditions. Marine conditions in the inlet around 40–30 ^{14}C Ka would require an isostatic load that compensated the *c.* 100 m lower than present global sea level at that time (Huybrechts 2002). However, a large-scale ice expansion at this period is unlikely, since the distance from the ice sheet margin to the inlet is only *c.* 6 km today. Local ice expansion, such as indicated in some records from Vestfold and Larsemann hills (Aharon 1988, Hodgson *et al.* 2005), might explain the isostatic load required. On the other hand, the presence of *Rouxia leventerae* indicates too young radiocarbon ages in unit I.

The flaked structure of unit I probably derives from postdepositional freezing of the marine sediments below a cold-based glacier. Similar structures have been described by Bird *et al.* (1991) from frozen fine-grained sediments. However, since overconsolidation is not observed, freezing occurred more likely at subaerial conditions, probably with subsequent glacial overriding. Both scenarios imply that marine sedimentation was interrupted in the inlet.

Unit II (1930–1600 cm) is characterized by greenish colour and a higher content of fine-grained minerogenic matter with some interspersed sandy horizons. The sporadic occurrence of pebbles and probably redeposited sediments with flaked structure in the lowermost 30 cm indicate glacial influence on sedimentation. From 1900 cm topwards, the structure of the sediment is massive, but some algal mats occur and are horizontally bedded. TOC and TS contents are slightly higher than in unit I (Fig. 1). Sample KIA34077 from 1873 cm yielded an age of 10 880 ^{14}C yr BP (Table I). The diatom taxa in unit II indicate marine conditions, with abundant *Chaetoceros* resting spores. Marine conditions in the inlet match with relative sea level reconstructions from Vestfold and Larsemann hills (Verleyen *et al.* 2005). The distinct change in structure and the radiocarbon ages imply that units I and II are separated by a hiatus. This hiatus could be due to glacial overriding. Low amounts of clastic material in the overriding ice could explain the absence of a till layer between units I and II. Similar observations have been made in lake sediments from Baffin Island, Canada (Miller *et al.* 2002). A widespread glaciation across Rauer Group at some stage during the Late Pleistocene is supported by glacial deposits and the degree of weathering of local bedrock and glacial boulders (D. White, unpublished data). Further support comes from a marine sediment sequence

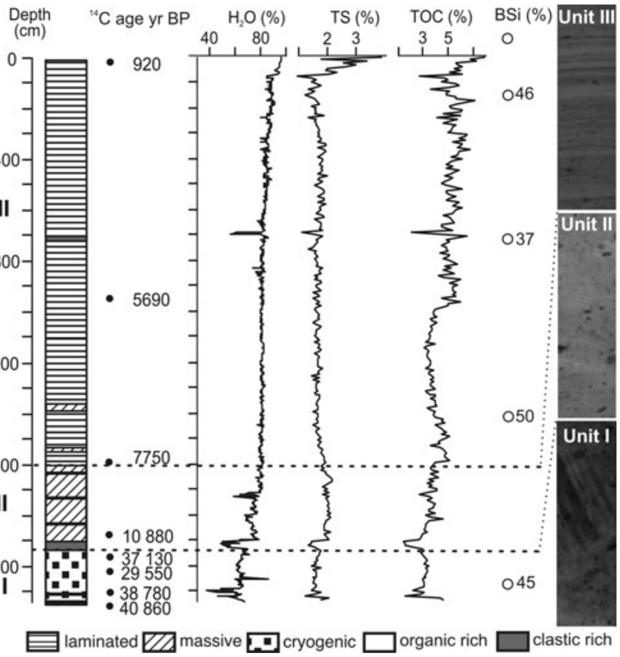

Fig. 1. Lithological profile of Co1010: contents of water (H_2O), total sulphur (TS), total organic carbon (TOC), and biogenic silica (BSi). Radiographic images were made by an ITRAX core scanner, image width 1 cm.

Table I. Radiocarbon ages of bulk organic carbon from core Co1010.

Lab. no.	Depth (cm)	^{14}C age (yr BP)	Error
KIA34076	4	920	± 80
KIA35017	957	5690	± 55
KIA35021	1593	7750	+260/-250
KIA34077	1873	10 880	± 40
KIA35023	1946	37 130	+1430/-1220
KIA35024	2001	29 550	+180/-170
KIA35025	2100	38 780	+920/-830
KIA34078	2143	40 860	+2080/-1650

recovered *c.* 30 km off Rauer Group, where a glacial diamicton underlays sediments, which indicate open marine conditions prevailing since 11 100–10 800 cal yr BP (Leventer *et al.* 2006). Deglaciation at that time matches with the age of sample KIA34077 at the base of unit II. The relatively high minerogenic content in this unit, particularly in its lowermost 30 cm, could be due to deglaciation and subsequent enhanced availability of detrital material on the islands or increased meltwater discharge from snowfields and residual ice masses in the catchment.

Unit III (1600–0 cm) is characterized by green to black, laminated sediments that contain relatively high proportions of organic matter (Fig. 1). The diatom assemblage, with high abundances of *Fragilariopsis curta* and *F. cylindrus*, displays marine open water conditions in the inlet. A gradual decrease of radiocarbon ages topwards throughout unit III (Table I) and relatively constant sedimentary characteristics suggest that these conditions prevailed until today.

In summary, Rauer Group was probably ice-covered during the LGM. Marine sediments at the base of the sequence, deposited prior to the LGM, and the lack of a till layer indicate low erosive energy of the overriding ice sheet. Deglaciation of the inlet likely occurred prior to 10 880 ^{14}C yr BP.

Acknowledgements

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