

## SEDIMENTS EXPOSED ON THE SURFACE OF THE ROSS ICE SHELF, ANTARCTICA

By DAVID R. GAYLORD

(Ross Ice Shelf Project, University of Nebraska, Lincoln, Nebraska 68508, U.S.A.)

and JAMES D. ROBERTSON

(Geophysical and Polar Research Center, University of Wisconsin, Middleton, Wisconsin 53562, U.S.A.)

**ABSTRACT.** A highly crevassed region near a grounded ice rise on the Ross Ice Shelf, Antarctica was investigated and found to contain poorly sorted sediments. Preliminary analysis of a 27 g sample of sediments was undertaken using megascopic, microscopic, and X-ray diffraction methods. Igneous and metamorphic rock fragments, their constituent minerals, and micro-fossils were noted in the sample. Insufficient data have been collected at this time to denote a particular source area for the sediments.

**RÉSUMÉ.** *Sédiments trouvés à la surface de la Ross Ice Shelf en Antarctique.* On a inventorié une région très crevassée près d'une avancée de glace de terre dans la Ross Ice Shelf en Antarctique et on y a trouvé des sédiments peu assortis. Une analyse préliminaire d'un échantillon de 27 g de sédiments a été entreprise par des méthodes mégascopiques, microscopiques et par diffraction aux rayons X. On y a trouvé des fragments de roches volcaniques et métamorphiques, leurs minéraux constitutifs et des microfossiles. On a pour le moment recueilli trop peu de données pour pouvoir désigner une origine particulière pour ces sédiments.

**ZUSAMMENFASSUNG.** *Freigelegte Sedimente an der Oberfläche des Ross-Ice-Shelfs, Antarktis.* Bei der Untersuchung einer spaltenreichen Region in der Nähe einer am Untergrund feststehenden Eiserhebung auf dem Ross-Schelfeis, Antarktis, wurden schwach sortierte Sedimente festgestellt. Mit Hilfe von magaskopischen, mikroskopischen und Röntgen-Diffraktionsverfahren wurde eine vorläufige Analyse einer 27 g schweren Probe von Sedimenten durchgeführt. In der Probe wurden vulkanische und metamorphe Gesteinsfragmente, ihre Grundmineralien und Mikrofossilien gefunden. Bisher sind noch nicht genügend Daten gesammelt worden, um auf ein bestimmtes Herkunftsgebiet der Sedimente schliessen zu können.

DURING the 1973–74 field operations of the Ross Ice Shelf Project, curious dark areas were sighted in a crevasse field located approximately 0.5 km north of a grounded ice rise at about lat. 82° 45' S., long. 172° 30' W. (Fig. 1). Radio-echo sounding measurements in this area indicated an ice thickness of approximately 400 m.

One darkened ice zone was sampled. At this site ice contained an abundance of poorly sorted clay and silt-sized particles combined with lesser amounts of coarse sand to gravel-sized sediments. Nine plastic bags containing both the encasing ice and a total of about 300 g of sedimentary material were collected. Due to the time limit and extensive crevassing adjacent to the sampling location little local reconnaissance was attempted. Shearing was indicated near the sampling site where a nearly vertical sediment band, 10–15 m thick, was repeated by faulting. In other spots, however, the distribution of the sediments appeared random and exhibited no simple stratigraphic or structural relationships.

The 27 g of sediment collected for the preliminary data was reworked material occurring in a stream-bottom deposit on the ice; it contained only a very small percentage of ice. Examination of these sediments revealed predominantly angular to sub-rounded igneous and metamorphic rock fragments and their constituent minerals.

Igneous particles identified either megascopically and/or in thin section include granite fragments, gabbroic particles, basaltic glass shards, and pyroclastic tuff. Granites and their component mineral grains were predominant in the sample examined. The volcanic glass shards in the sample range in size from silts to medium-sized sands. These shards have refractive indices which are comparable to those described by Gow and Williamson (1971) from the deep ice cores at "Byrd" station. Metamorphics which were noted include numerous quartz-mica-schist particles and a few gneiss and quartzite fragments. Mineral grains found in the sample include hornblende, biotite, epidote, orthoclase, microcline, plagioclase, magnetite, quartz, and chlorite. Kaolinite and illite clays were identified using X-ray diffraction methods.

A few micro-fossils appeared in both the silt and very fine sand fractions of the 27 g sample. Elongate siliceous spicules were numerous in the silts in particular, but also occurred in the very fine sands. A few diatom-like forms were found in the silts, but further work must be completed to further describe and classify them.

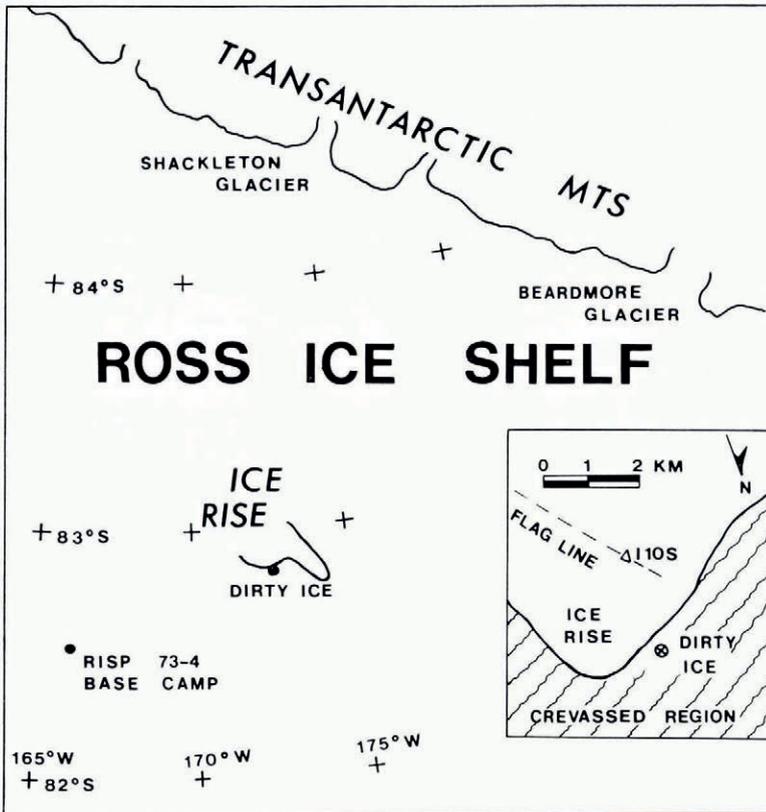


Fig. 1. Part of the Ross Ice Shelf showing the RISP 1973-74 base camp and the dirty ice area in relation to a grounded ice rise and geophysical station IroS.

At this point a number of possibilities exist concerning the origin of the sediments. They may be sea bottom sediments frozen onto the bottom of the ice shelf up-stream of the ice rise, or they may have originated as moraine from some point beneath the land ice. Another possible source area is beneath the edge of the ice rise where tidal rise and fall may allow penetration of sea-water which could freeze to the bottom of the ice along with a suspension of bottom sediments (personal communication from R. H. Thomas).

Except on the Ross Ice Shelf in McMurdo Sound, exposures of sediments on ice shelves appear to be rare. Apparently the only previous investigation of similar nature which yielded sediments was by P. Coslett of the British Antarctic Survey on the Brunt Ice Shelf during the 1968-69 field season (personal communication from R. H. Thomas). Unfortunately, the results have not yet been published.

More detailed analysis of both the sediments and the encasing ice is still to be completed. Persons wishing to conduct further study on the sediments and/or the ice should contact Mr Guy Guthridge, Polar Information Service, National Science Foundation, Washington, D.C. 20550, U.S.A.

This work was supported by NSF Grant GV-4073X awarded to the University of Nebraska, Lincoln and NSF Grant GV-39639 to the University of Wisconsin. We especially thank Dr R. H. Thomas, and Dr S. B. Treves for their suggestions and critical review of the manuscript. We also wish to thank the Department of Geology, University of Nebraska, Lincoln, for their generous donation of time and facilities.

MS. received 6 May 1974

#### REFERENCE

- Gow, A. J., and Williamson, T. 1971. Volcanic ash in the Antarctic ice sheet and its possible climatic implications. *Earth and Planetary Science Letters*, Vol. 13, No. 1, p. 210-18.