



New data from the southern Bellingshausen Sea reveal a major lost drainage basin of the West Antarctic ice sheet

R.D. Larter (1), C. Ó Cofaigh (2), C.-D. Hillenbrand (1), J.A. Dowdeswell (3), C.J. Pudsey (1), J. Evans (3) and P. Morris (1)

(1) British Antarctic Survey, Cambridge CB3 0ET, UK, (2) University of Durham, Durham DH1 3LE, UK, (3) Scott Polar Research Institute, University of Cambridge, Cambridge CB2 1ER, UK (r.larter@bas.ac.uk / Phone: +44 1223 221573)

New marine geological and geophysical data show that during the last glaciation the West Antarctic ice sheet drained to the continental shelf edge of the Bellingshausen Sea through a 150 km-wide cross-shelf bathymetric trough as a grounded, fast-flowing ice stream. We propose the name “Belgica Trough” for this bathymetric trough. The drainage basin feeding the ice stream probably encompassed south-western Palmer Land, and parts of southern Alexander Island and the Bryan Coast of Ellsworth Land, with an area exceeding 200,000 km² and possibly as great as 365,000 km². At the mouth of the trough, sediments supplied by the ice stream have formed a large trough mouth fan on the continental slope, which has a surface dip of 1.5°.

The new data, comprising multibeam echo sounder data, sub-bottom acoustic profiles and sediment cores, were collected in January and February 2004 on RRS *James Clark Ross* cruise JR104. In Belgica Trough the multibeam data reveal mega-scale glacial lineations (MSGL) extending to within 40 km of the shelf edge. Nearer the shelf edge iceberg plough marks are observed in water depths up to 660m. We interpret these plough marks as having been produced by giant icebergs calved shortly after retreat of the grounding line from the shelf edge. Sub-bottom profiles show that MSGL in the outer part of the trough are developed in the upper part of an acoustically-transparent sediment layer that is up to 17 m thick. Gravity cores in the trough reveal that the cover of open-marine sediments overlying diamictons is generally <0.5 m thick. In a core only about 25 km from the shelf edge, diamicton with a shear strength >12 kPa

was encountered at a sub-bottom depth of only 80 cm, and shear strength continued to increase downcore to >20 kPa at 170 cm. We interpret this diamicton as a till deposited beneath a grounded ice stream during the last glacial period.

On the inner continental shelf, streamlined bedrock and drumlins revealed by the multibeam data show that the ice stream was fed by convergent ice flow from Eltanin Bay and bays to its east, as well as by ice flowing from the Ronne Entrance. The absence of a large bathymetric trough connecting the Ronne Entrance to Belgica Trough demonstrates that past ice flow directions cannot be reliably inferred from large-scale topographic features on the continental shelf today. To reconstruct past ice flow patterns it is important to examine kilometre scale and smaller features.