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Supplement of

Geomorphology and shallow sub-sea-floor structures underneath the Ekström Ice Shelf, Antarctica

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Supplementary Material

1 S1 - Marine geophysical data acquisition parameters

Expedition	Technical Details	Year	Reference
ANT-VIII/5	Hydrosweep DS-1, 15.5 kHz, 59 beams	1989/1990	Steinmetz et al. (2011)
ANT-IX/3	Hydrosweep DS-1, 15.5 kHz, 59 beams	1991	Hinze et al. (2011)
ANT-X/2	Hydrosweep DS-1, 15.5 kHz, 59 beams	1992	Schöne et al. (2011)
ANT-XII/3	Hydrosweep DS-1, 15.5 kHz, 59 beams	1995	Niederjasper et al. (2011)
ANT-XIII/3	Hydrosweep DS-1, 15.5 kHz, 59 beams	1996	Niederjasper et al. (2020)
ANT-XIV/3	Hydrosweep DS-2, 15.5 kHz, 59 beams	1997	Dijkstra et al. (2011)
ANT-XV/2	Hydrosweep DS-2, 15.5 kHz, 59 beams	1997/1998	Schenke et al. (2009)
ANT-XV/3	Hydrosweep DS-2, 15.5 kHz, 59 beams	1998	Schenke (2009a)
ANT-XV/4	Hydrosweep DS-2, 15.5 kHz, 59 beams	1998	Schenke and Loske (2009)
ANT-XVI/3	Hydrosweep DS-2, 15.5 kHz, 59 beams	1999	Schenke (2009b)
ANT-XVII/3	Hydrosweep DS-2, 15.5 kHz, 59 beams	2000	Hohmann et al. (2011)
ANT-XXIII/8	Hydrosweep DS-2, 15.5 kHz, 59 beams	2006/2007	Gutt et al. (2010)
ANT-XXIII/9	Hydrosweep DS-2, 15.5 kHz, 59 beams	2007	Schenke et al. (2007)
ANT-XXVII/3	Hydrosweep DS-3, 15.5 kHz, 345 beams	2011	Fillinger et al. (2011)
PS82	Hydrosweep DS-3, 15.5 kHz, 345 beams	2013/2014	Dorschel and Jensen (2016)
PS96	Hydrosweep DS-3, 15.5 kHz, 345 beams	2015/2016	Arndt et al. (2016)

Table 1. List of the expeditions in which the swath bathymetry data were collected with Data Acquisition, Year and Reference.

2 S2 - Calculation of sea level reconstruction

As described in Section 'Paleo-ice sheet setting inferred only from marine geophysical data', iceberg ploughmarks are found with inside the trough and on the edge of the continental shelf, separated from the trough by a bathymetric sill. The ploughmarks outside the trough are found at deeper water depths. This leads us to the assumption that the ploughmarks outside the trough originated from icebergs carved outside the EIS embayment and those found inside the deeper sections of the trough originated from icebergs calved from the ice shelf itself. From this, an ice thicknesses of ~305 m to 320 m can be derived, including a Glacial Isostatic Adjustment (GIA) of 1 mm a^{-1} in East Antarctica (Argus et al., 2014), and depending on regional sea level at the time of calving between LGM and Holocene around 10 ka BP (Schannwell et al., 2020).

The iceberg ploughmarks occur in water depth between 290 m to 535 m, the maximal water depth at the continental margin is 420 m. The imprint depth is maximal 10 m. The deepest water depth where iceberg ploughmarks were found that originated from Ekströmisen is 420 m (+10 m imprint depth = -430 m). Schannwell et al. (2020) determined that the water depth at the LGM was 125 m, before 10 ka it was 50 m. The ice thickness at the LGM can therefore be determined with 305 m and 320 m at 10 ka.

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