Buried iceberg-keel scouring on the southern Spitsbergenbanken, NW Barents Sea

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Abstract
PARASOUND (3.5 kHz) subbottom echosounder profiles acquired on the southern Spitsbergenbanken, NW Barents Sea, show iceberg-keel scouring features which are buried by sediment that accumulated during the post-glacial sea-level rise. Four acoustic units (Units 1 to 4 in stratigraphic order) were differentiated, based on the characterization of their acoustic facies and reflection surfaces.
Unit 1 is interpreted as a glacial till, whereas Units 2 to 4 accumulated by sediment settling from suspension clouds and bottom currents during the last deglaciation

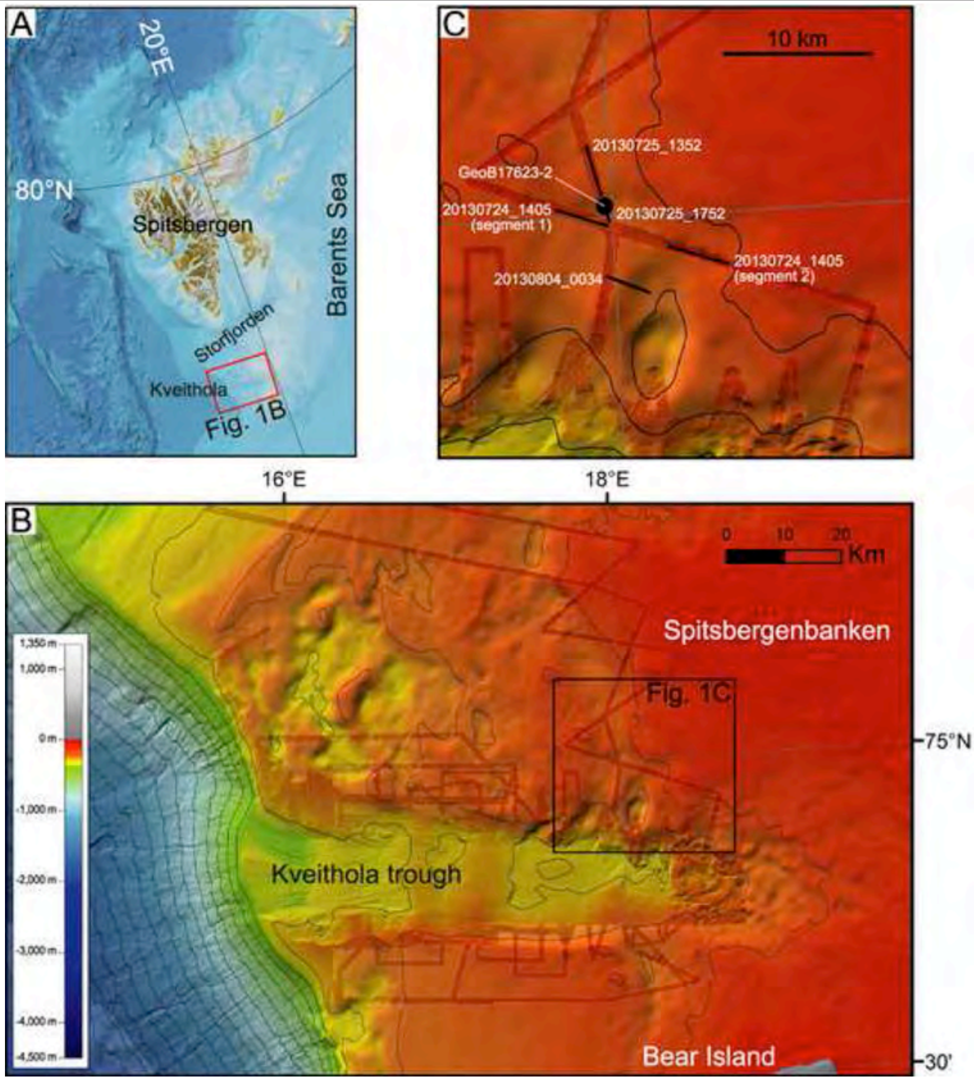

Figure 1: *(A) Location map with the study area (red box) in the NW Barents Sea (bathymetry from IBCAO, Jakobsson et al., 2012). (B) Shaded relief map of the study area, showing the Kveithola Trough and the SW margin of the Spitsbergenbanken (modified from Rebesco et al., 2016, in press). (C) Detail of (B) showing the position of the PARASOUND profiles and core GeoB17623-2*

phase.

The top of Unit 2 was frequently incised by iceberg keels, resulting in up to 12 m deep ploughmarks

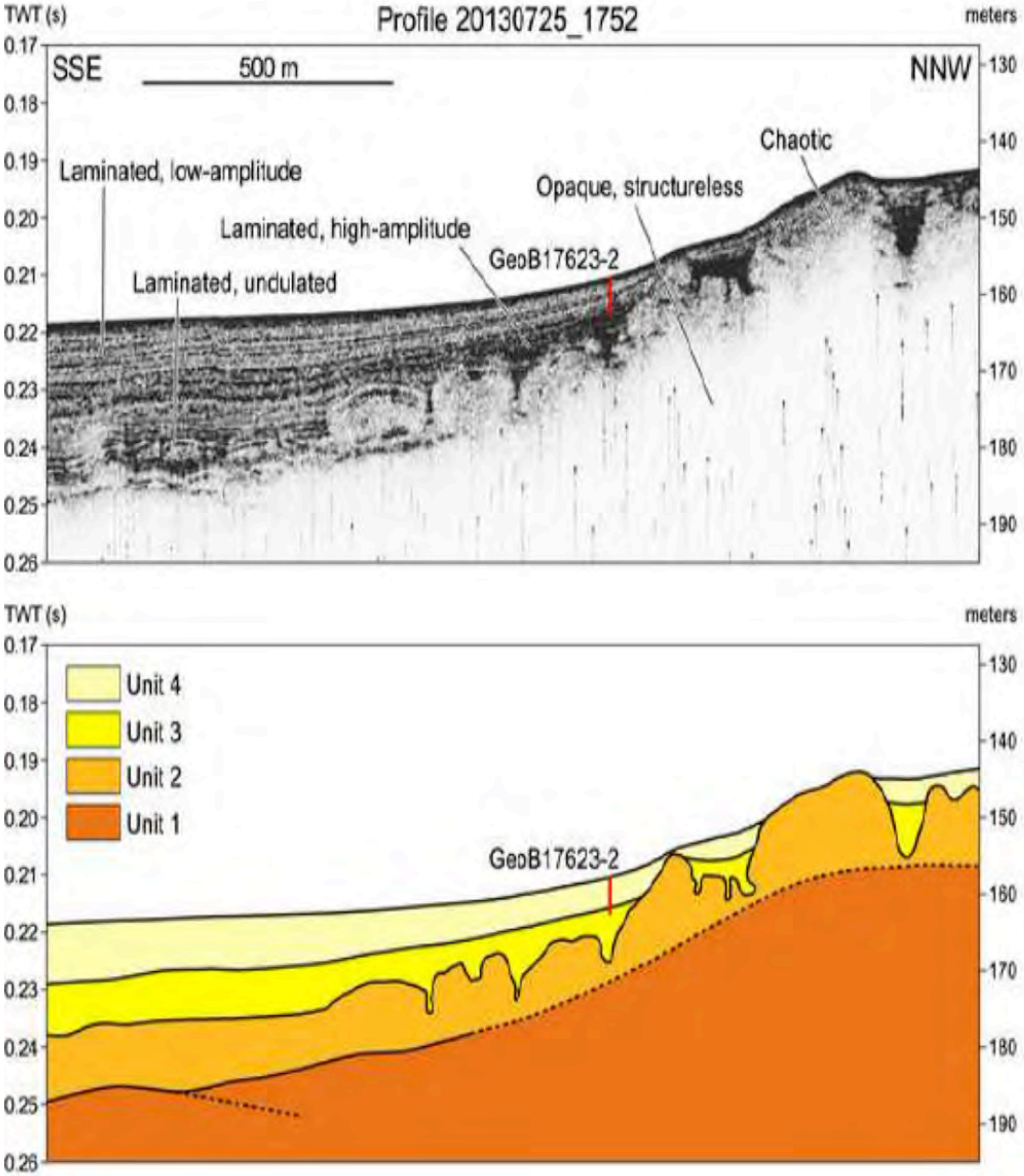

Figure 2: *PARASOUND profile 20130725_1352 (see Fig. 1C for location). Four acoustic units (Units 1-4) are identified (see the line drawing below). Note the irregular incisions one top of Unit 2, interpreted as iceberg-keel ploughmarks filled by Unit 3 deposits. The main characteristics of the acoustic facies are indicated in the raw profile*

which were later filled and buried by Unit 3 and 4 sediments.

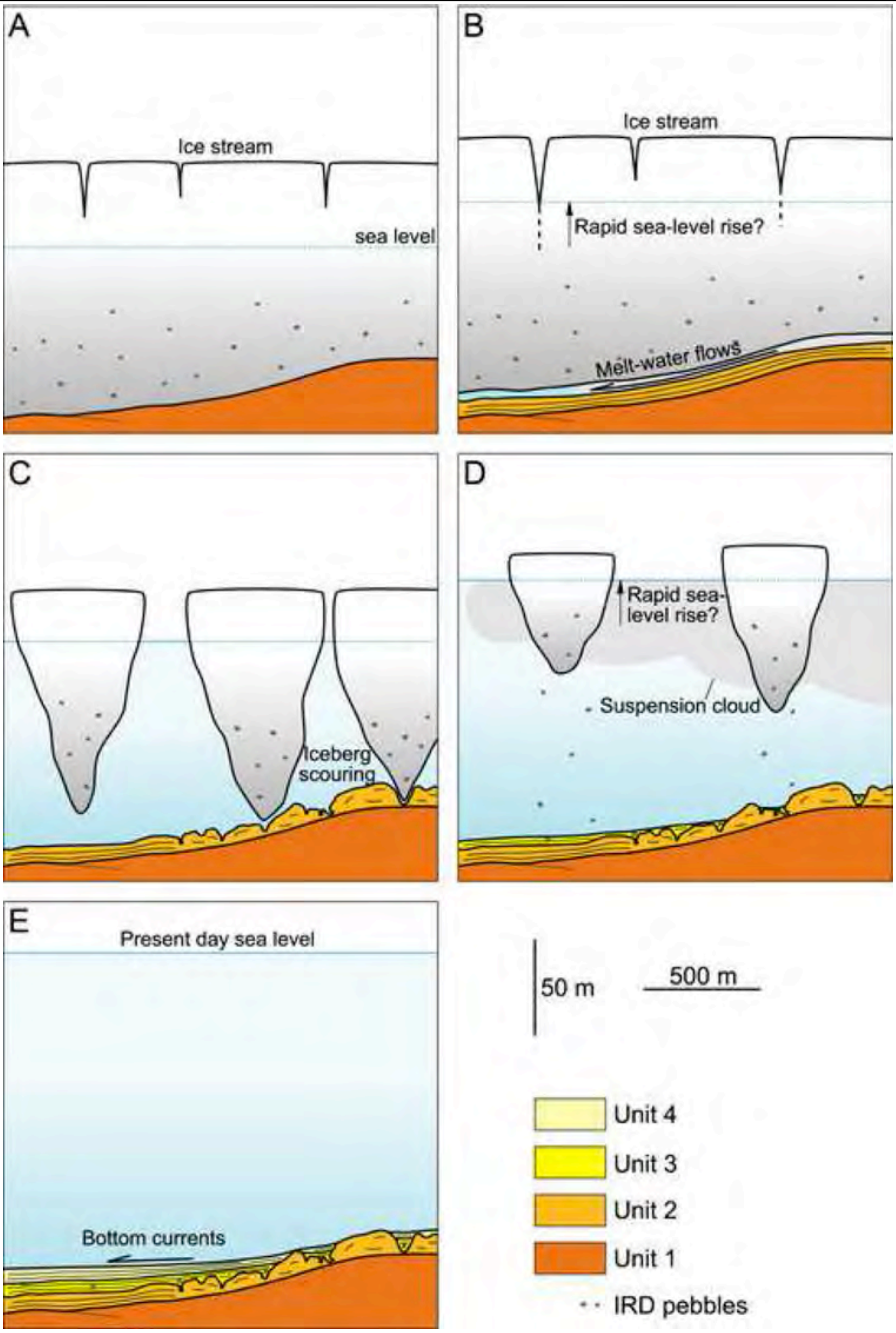

Figure 3: *Interpreted depositional history of Units 1-4. (A) The phase between Last Glacial Maximum and initial deglaciation was characterized by the accumulation of glacial till at the base of ice streams (Unit 1). (B) The subsequent sea-level rise and lifting of the ice cover, possibly related to meltwater pulse (MWP) 1A (see text), allowed the meltwater to flowing underneath the ice and the accumulation of Unit 2 sediments. (C) The break-up of the ice cover produced big icebergs, which disturbed the sediment on top of Unit 2 on the topographic highs with their keels leaving widespread ploughmarks. (D) At a later phase of sea-level rise, ice stream melting favored the intense supply of suspended sediments leading to the accumulation of plumites intercalated by IRD layers (Unit 3). This material filled the ploughmarks. (E) The subsequent accumulation of Unit 4 sediments resulting from bottom currents probably occurred under iceberg-free conditions.*

Three main paleo-evironmental changes controlled the evolution of the facies succession: (1) The major shift from till formation (Unit 1) below grounded ice to the accumulation of laminated sediments (Unit 2) which are inferred to reflect ice lifting and meltwater release; (2) Iceberg-keel scouring after sedimentation of Unit 2; (3) the probable abrupt termination of iceberg-keel scouring related to the glacio-eustatic sea-level rise. A linkage between these episodes of changes and short-lasting phases of rapid post-glacial sea-level rise, such as meltwater pulses, is inferred, although further studies are needed to better understand the relationships between the sedimentary events recognized in the Barents Sea and climate changes.

References

Zecchin M., et al., Submitted. Buried iceberg-keel scouring features in the southern Spitsbergenbanken, NW Barents Sea. Marine Geology