Sediment features beneath Ekström Ice Shelf, East Antarctica, imaged using on-ice vibroseis

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Where?

- Antarctic Peninsula
- Ekström Ice Shelf
- Ronne-Filchner Ice Shelf
Where?

Antarctic Peninsula

Ronne-Filchner Ice Shelf

Ekström Ice Shelf

Neumayer III 23/09/2017
Where?

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Where?

Antarctic Peninsula

Ronne-Filchner Ice Shelf

Ekström Ice Shelf

Neumayer Station

Neumayer III 23/09/2017
Motivation: Why? And What?

Why?

- Little data documenting landforms beneath ice shelves.
- Sub-shelf = recent evidence of palaeo-flow, retreat and current sediment processes.
- Western Dronning Maud Land (DML) - limited information about the LGM and subsequent deglaciation.
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Klages et al., *Quat Sci Rev*, 2014 – Amundsen Sea, Antarctica

King et al., *Nature Geosci*, 2009 – Rutford Ice Stream, Antarctica
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What?

- Sub-shelf bathymetry and sediment features:
  - Geomorphological evidence of past ice flow and retreat
  - Sedimentary volumes and properties
- Parametrise and test ice-flow models
- Important for understanding ice-ocean interactions -> future implications
Data Aquisition: Vibroseis on Ice

Eisen et al., *Polar Sci.*, 2015

- Sweep: 10 – 220 Hz
- Time: 10 seconds
- SPs 50 – 125 m
- 1500 m, 60 channels

Total data: ~280 km data in 25 days
Data Acquisition: The Data
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- Sediment wedge at shelf front – 60 m thick
- Glacial deposit on top of pre-glacial dipping bedding between 10-30 m thick
- Discontinuity
- Truncated bedding dipping towards shelf edge

Line 554

Line 551
Data Acquisition: The Data

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- Seismic multiple

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- ~50 m
- 2000 m

[Map and diagrams showing seafloor geological features]
Data Acquisition: The Data
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Possible sediment or channel features - indicative of faster ice flow in ‘trough’ area orientation

Seismic multiple

N Shelf edge S

~50 m 2000 m

Line 555
Data Acquisition: The Data

- **Shelf edge**
- **Possible sediment or channel features** indicative of faster ice flow in 'trough' area orientation
- **Seismic multiple**

**Line 555**

**NW**
- Bed is deeper than in more easterly lines

**Line 554**
- Possible grounding zone wedge features ~100 m in height

**Line 556**
- Bed becomes rougher inland

**Line 555**

**Line 556**
Data Acquisition: The Data
Summary

- Bathymetry of the sea floor has been determined from seismic reflection data
- Over deepend basin to the West of Neumayer
- Probably sea-floor trough -> palaeo-ice stream at the western edge of survey area with streamlines channels/lineations
- Sediment wedge at ice front - ice retreat feature?
- Likely grounding zone wedge series to the West of the survey area

Seismic vibroseis surveying is a fast effective method to determine sub-shelf bathymetry and deeper features

Sub-shelf contains important information about past deglaciation

Questions? email: emma.smith@awi.de
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