

Ocean properties beneath Pine Island Glacier revealed by Autosub3 and implications for circulation and melting

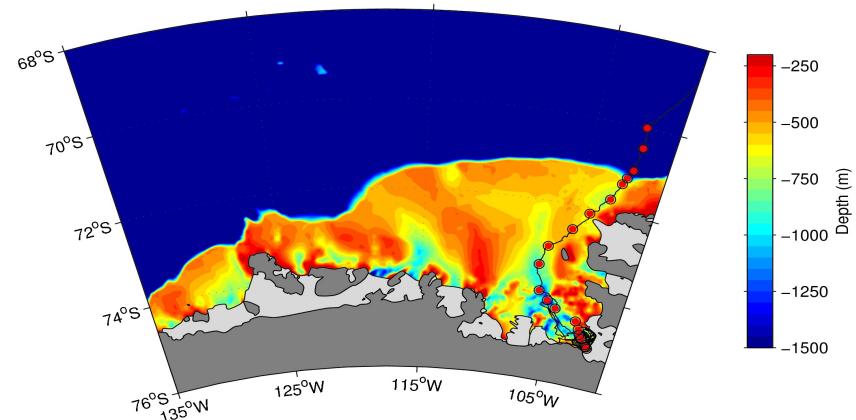


Pierre Dutrieux¹, Adrian Jenkins¹, Stan Jacobs², Steve Mcphail³, James Perrett³, Andy Webb³, Dave White³

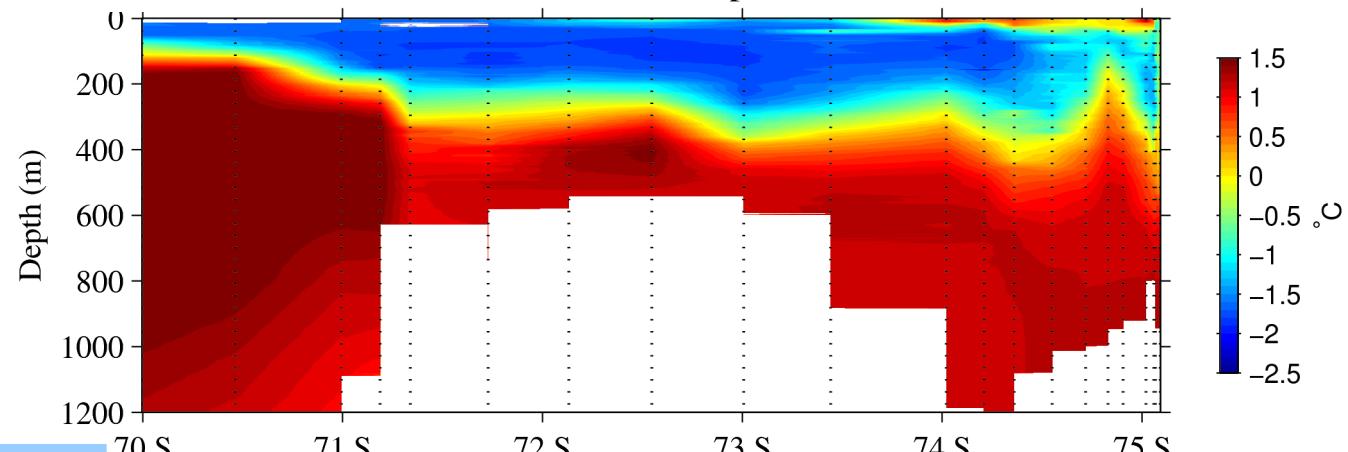
¹*British Antarctic Survey, NERC, Cambridge*

²*Lamont-Doherty Earth Observatory, Columbia University, USA*

³*National Oceanography Centre, Southampton*

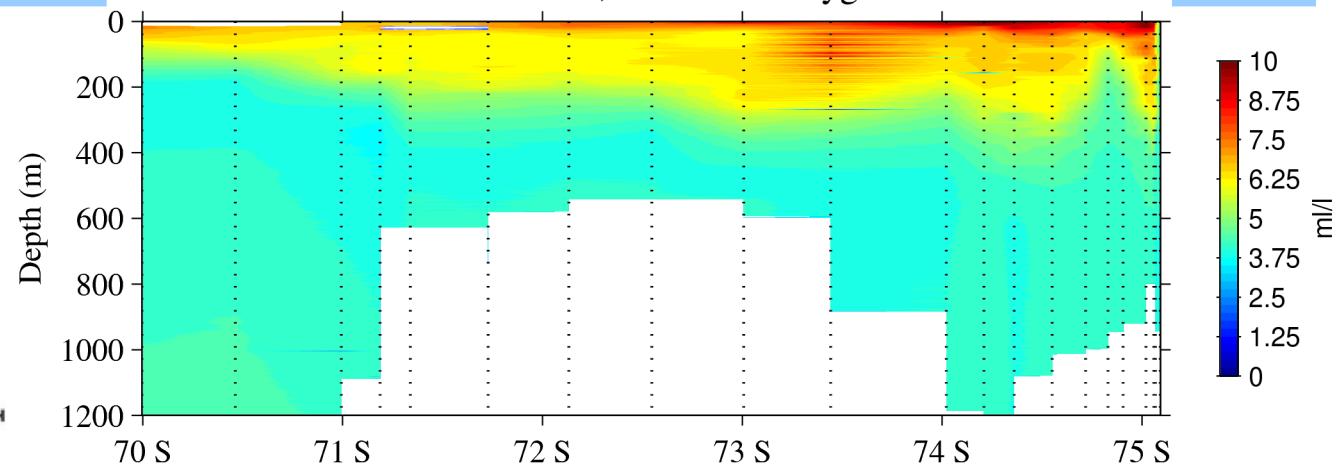


Toward PIG, Temperature

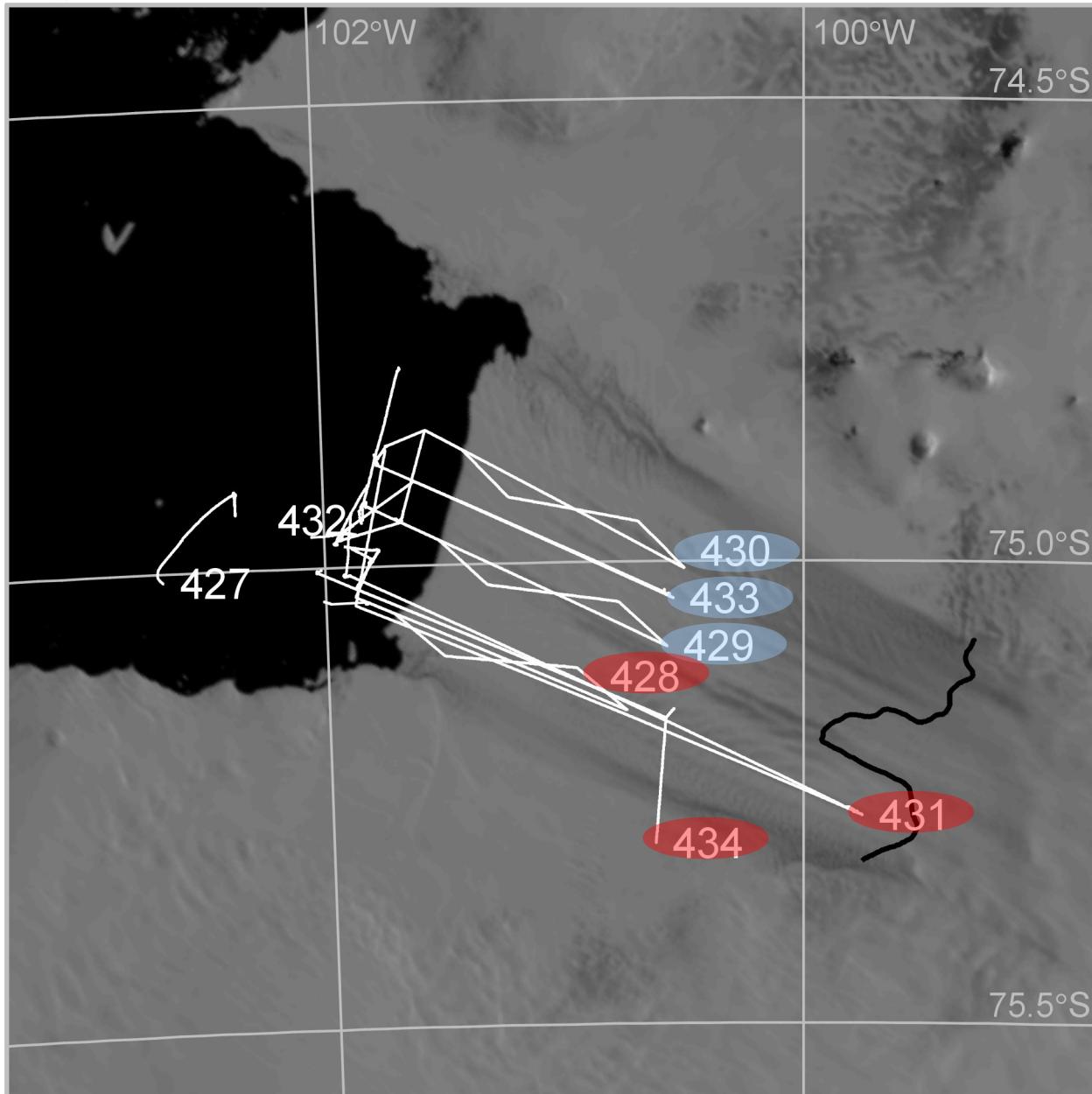


Outer shelf

Toward PIG, Dissolved Oxygen



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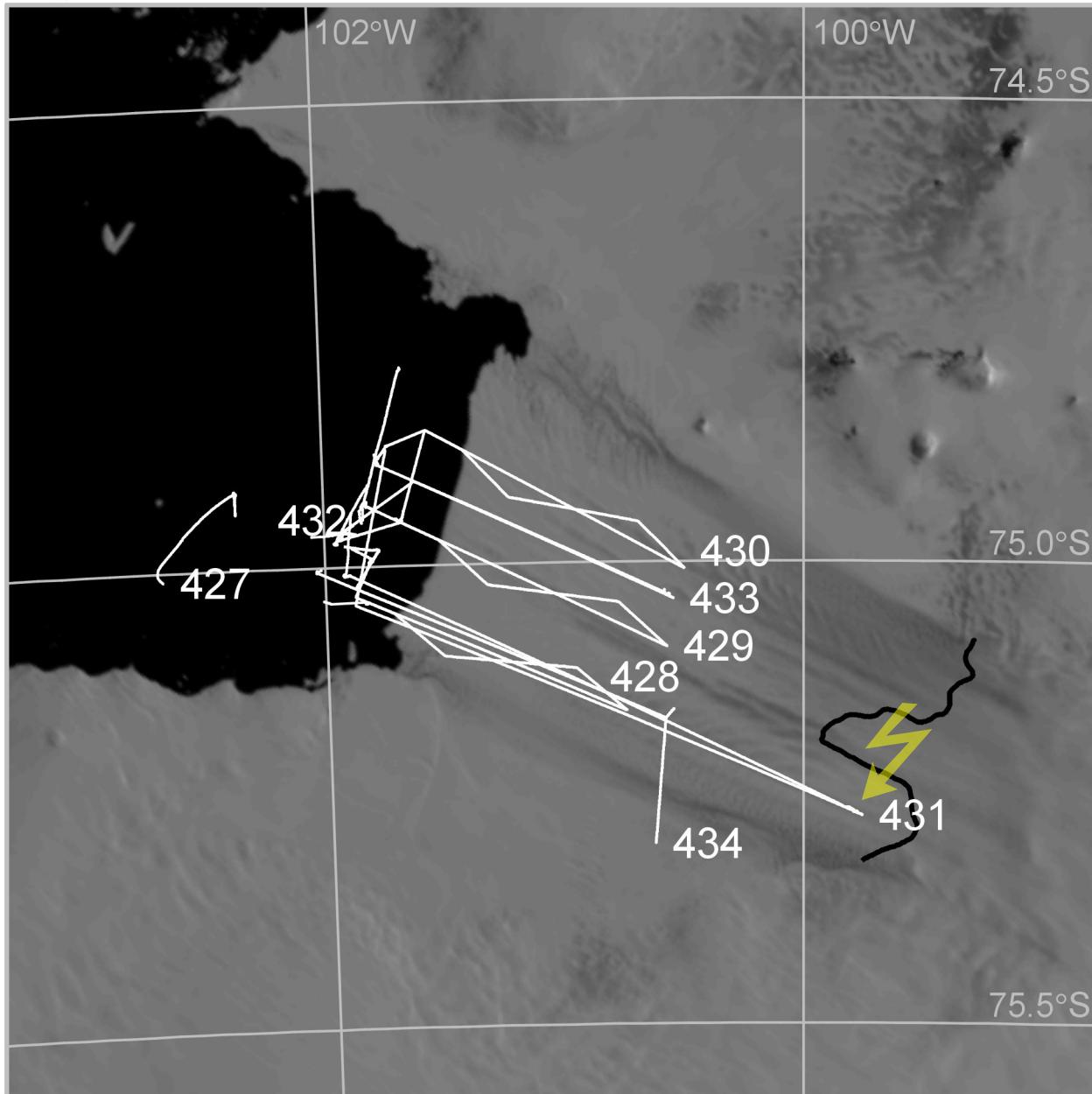


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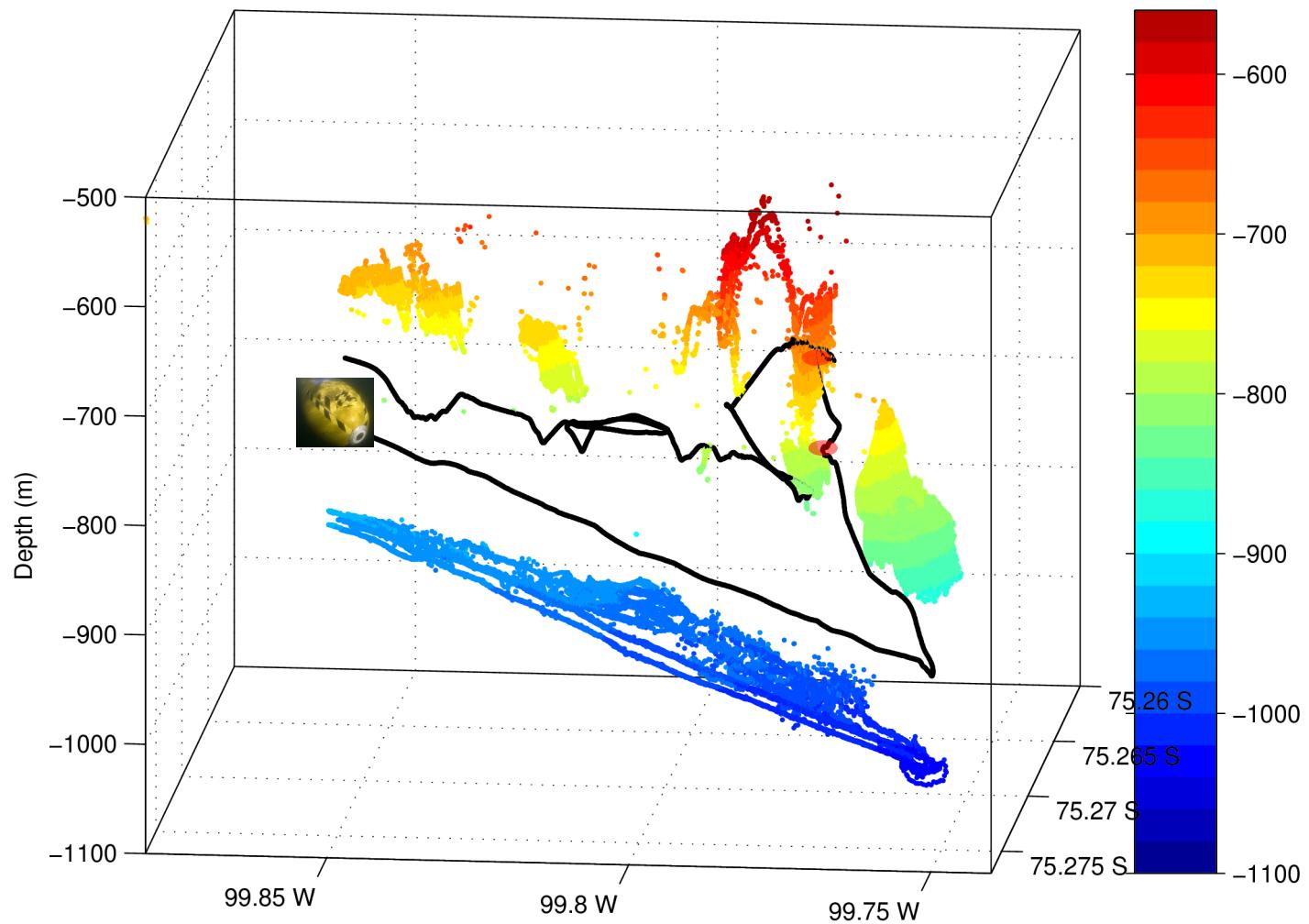
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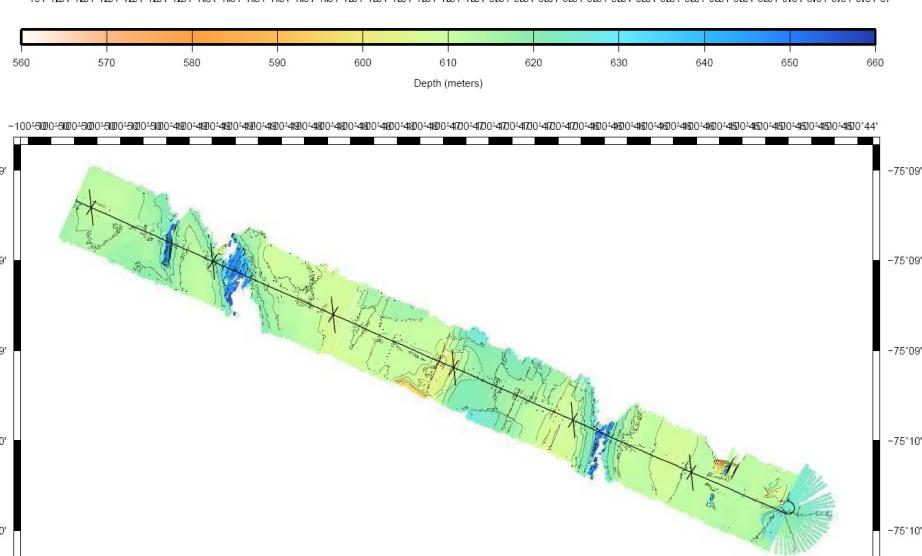
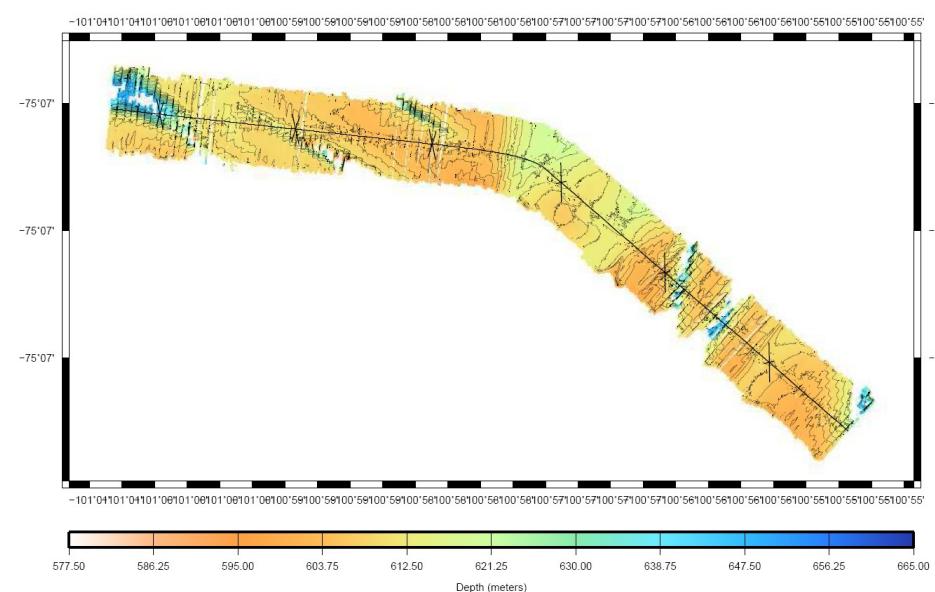
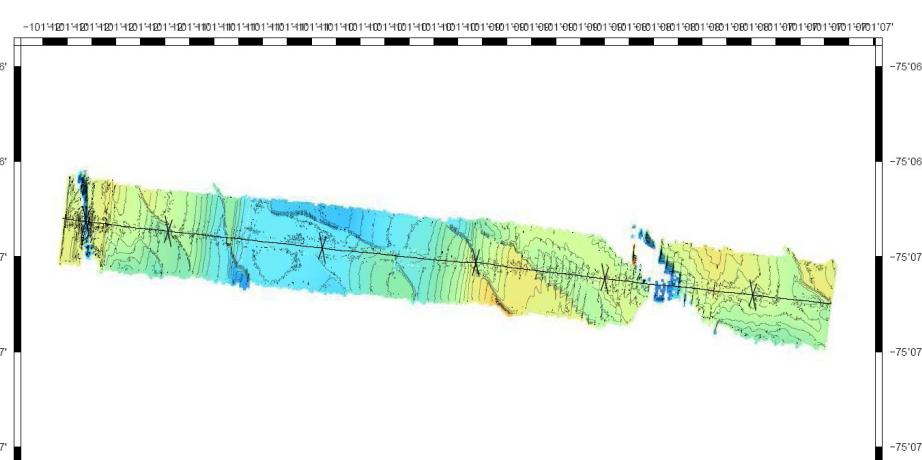
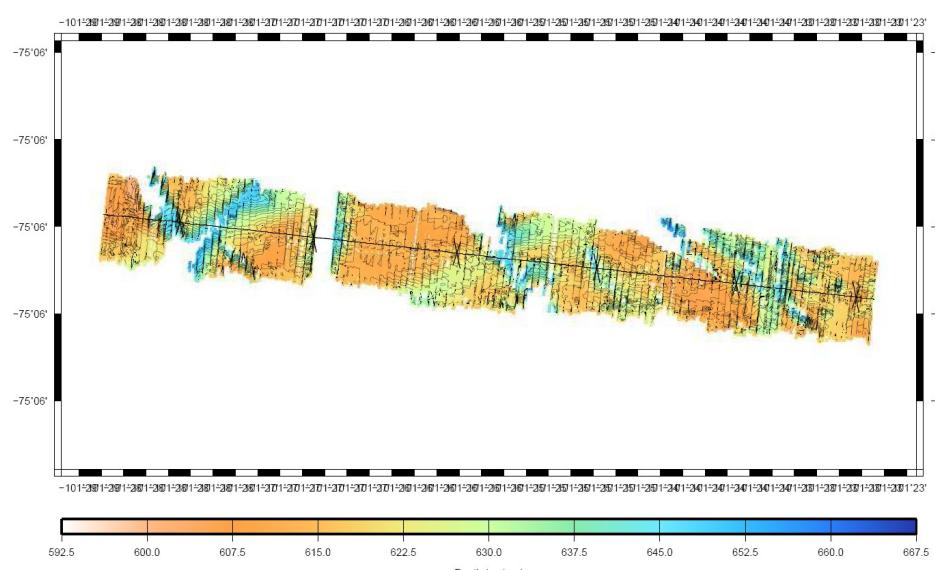
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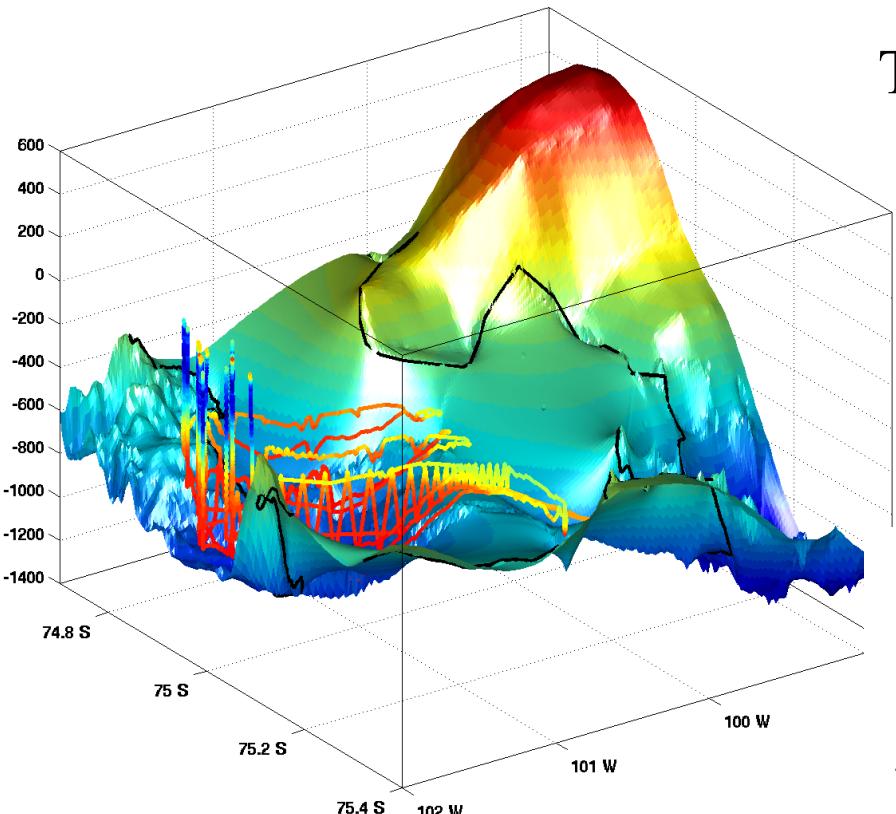
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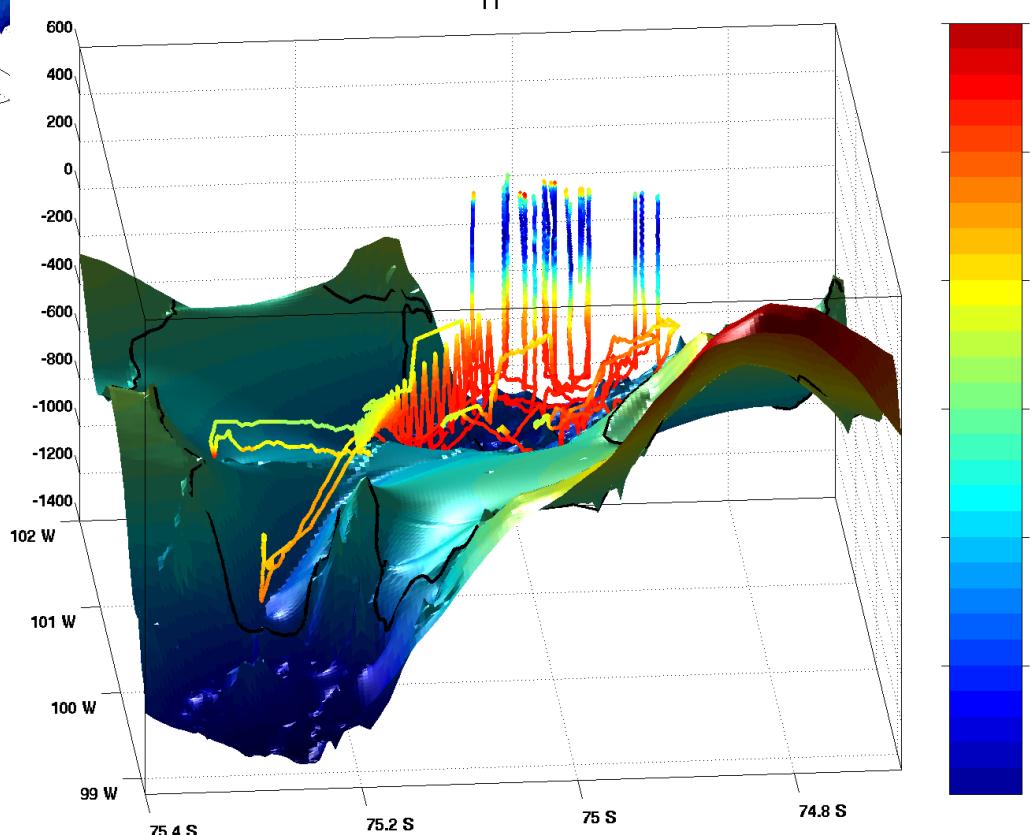
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T1



Temperature beneath the floating ice

T1

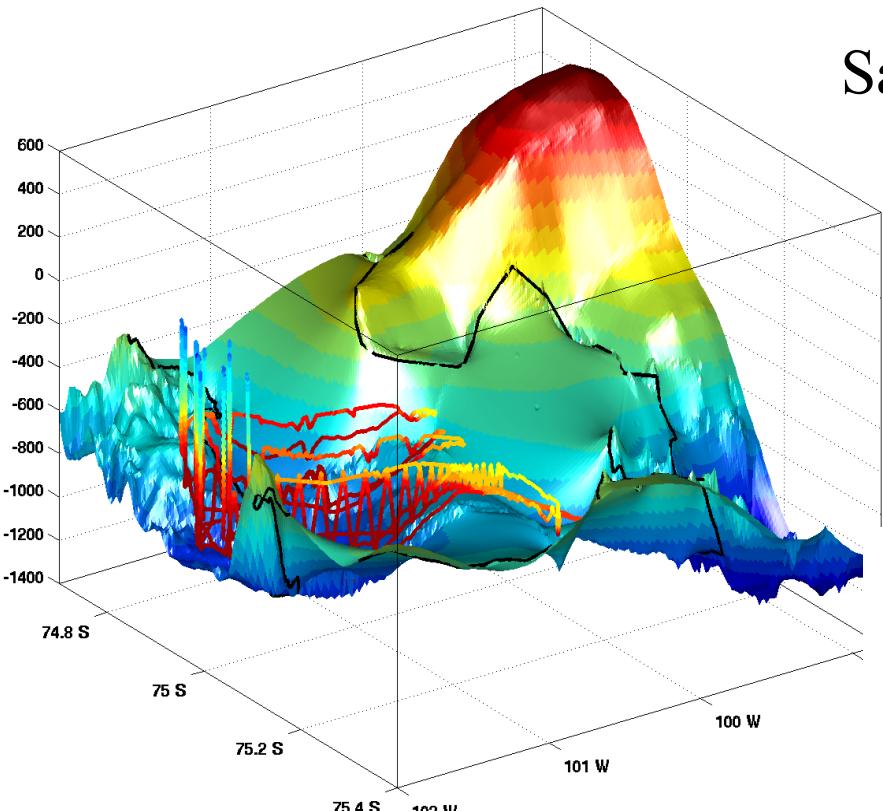


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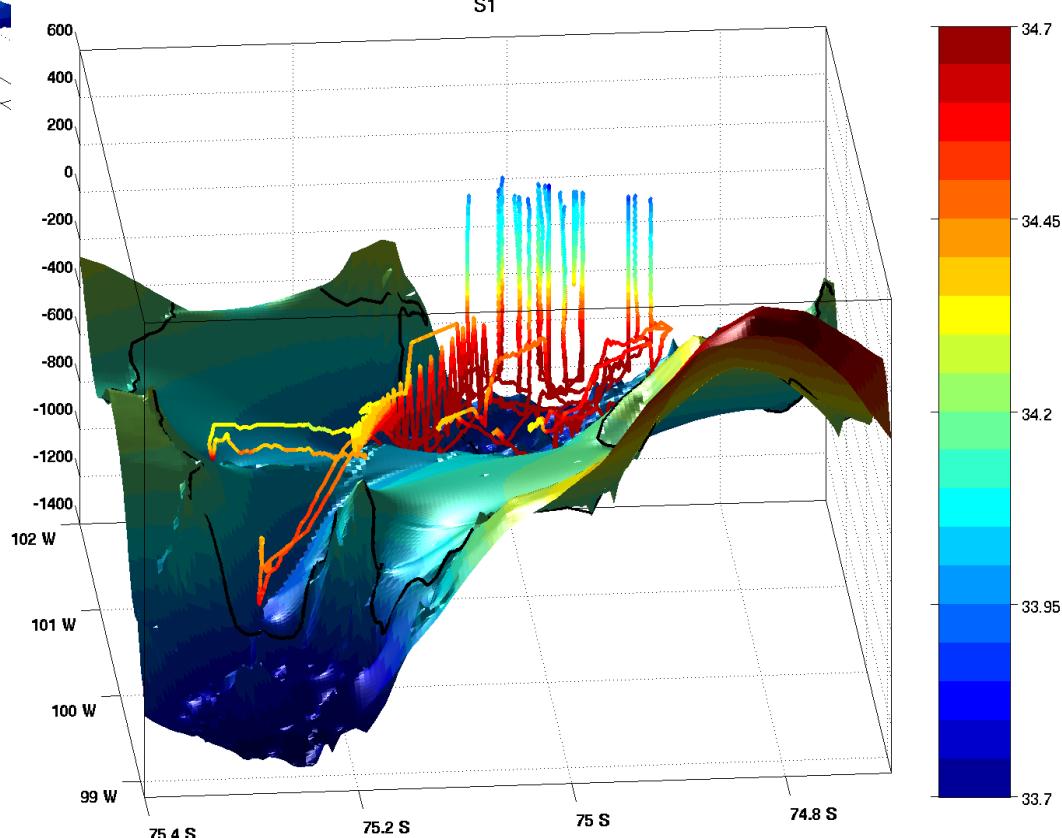
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S1

Salinity



S1

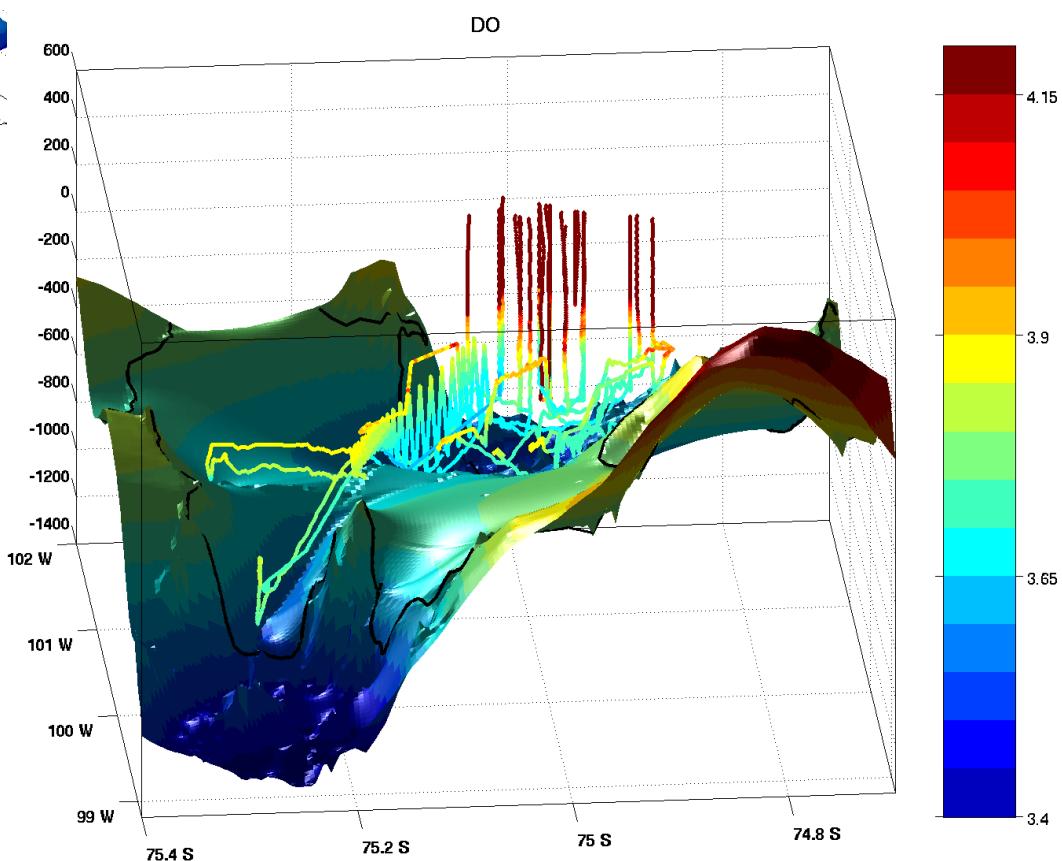
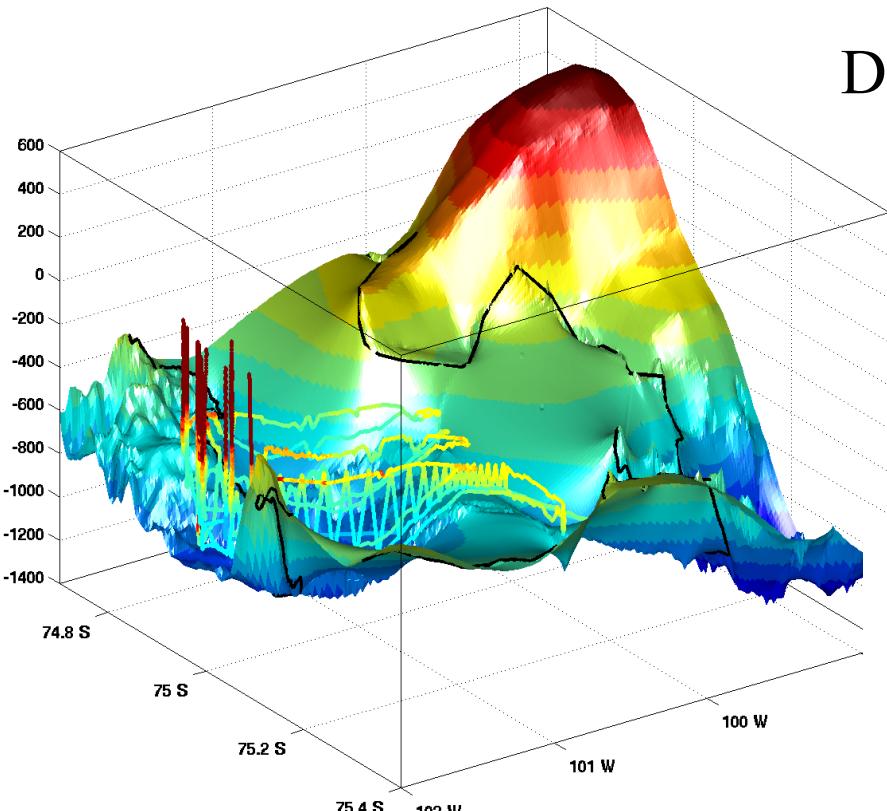


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DO

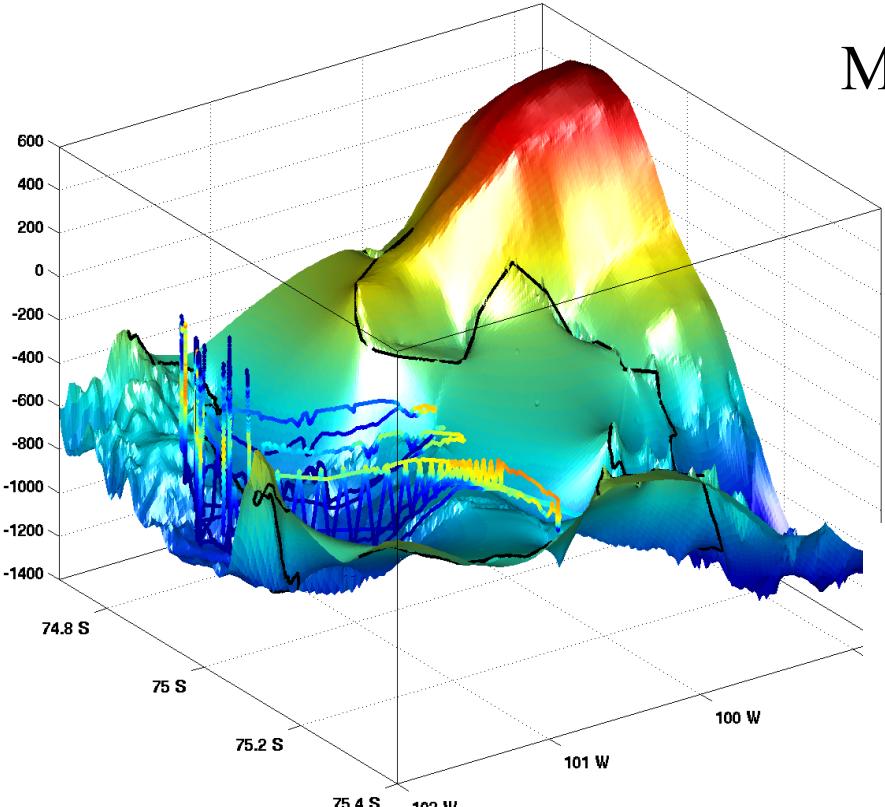
Dissolved oxygen



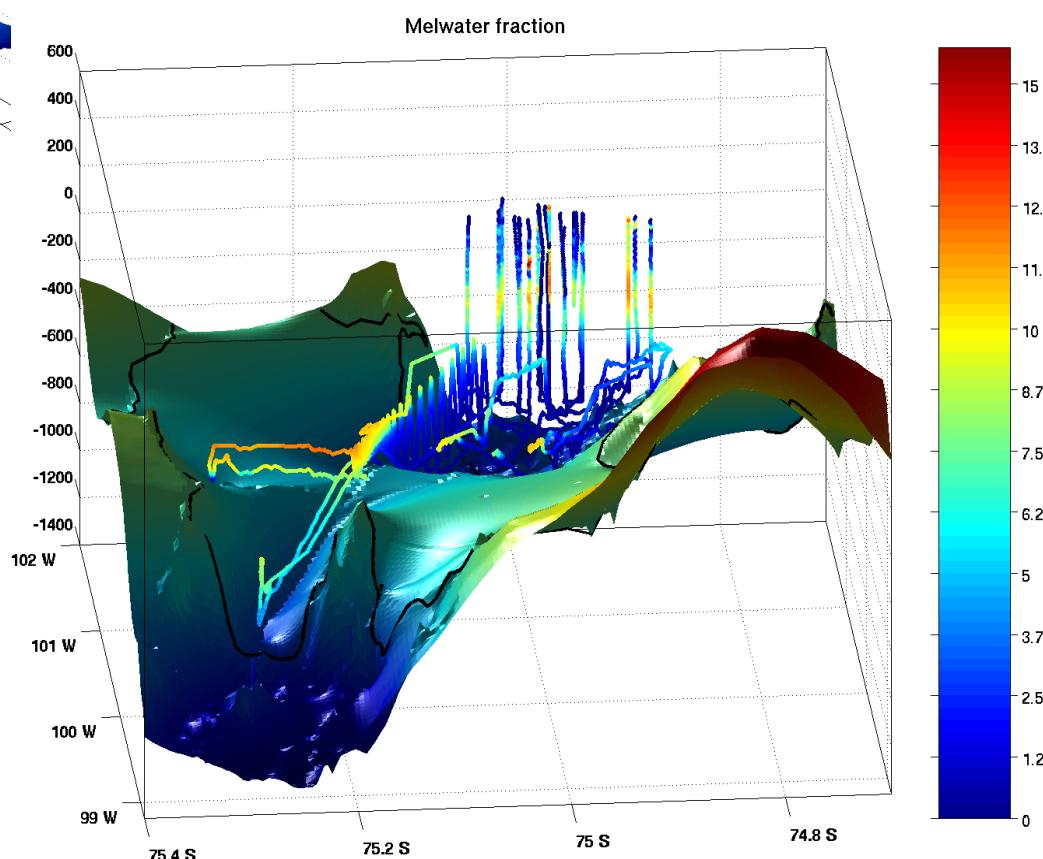
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Melwater fraction



Meltwater fraction

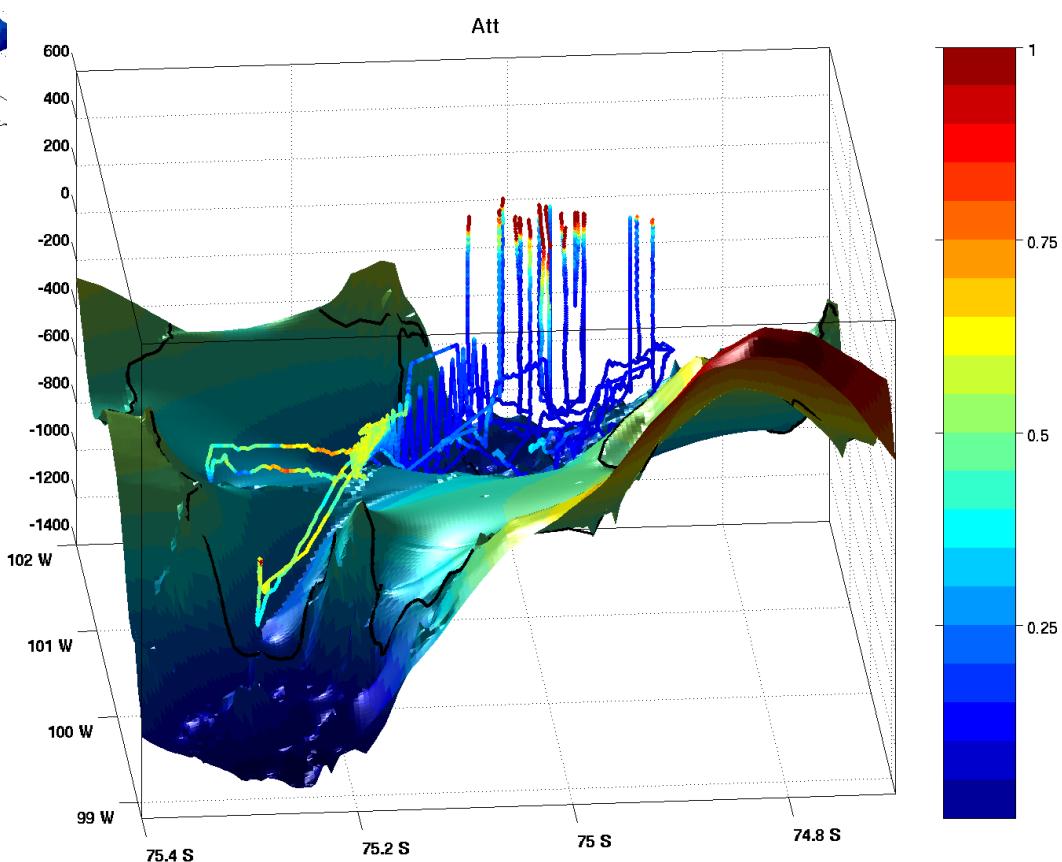
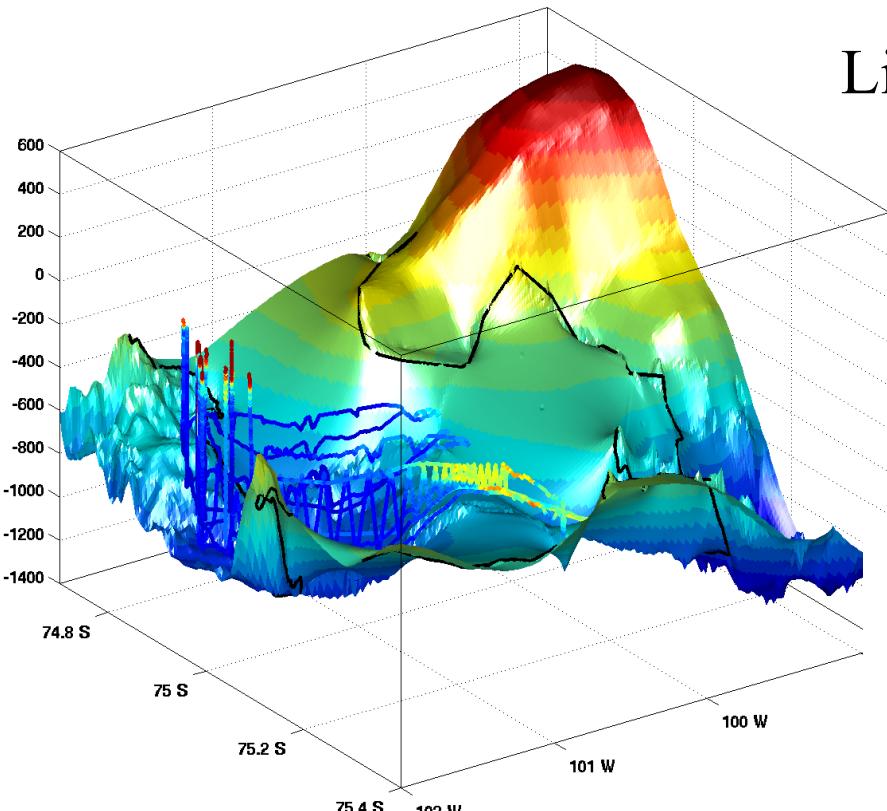


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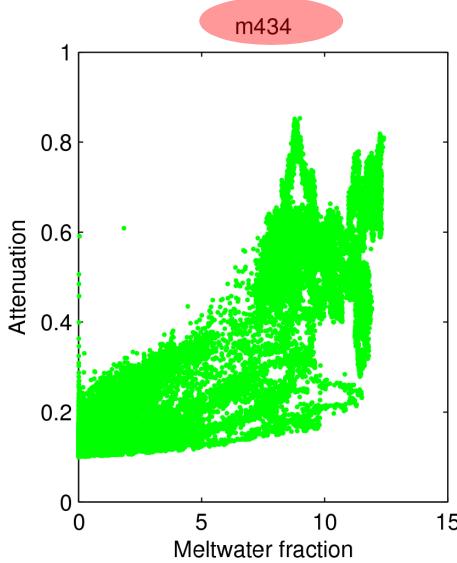
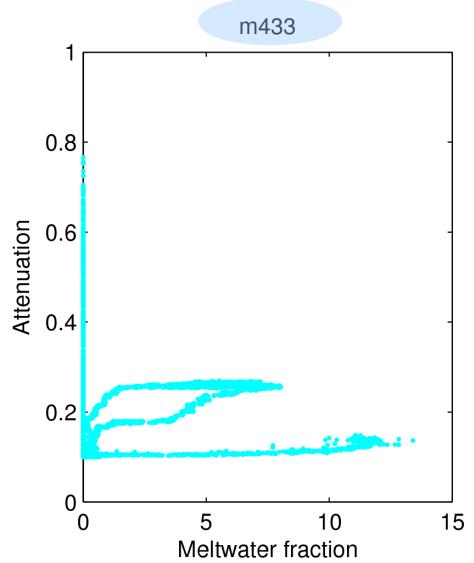
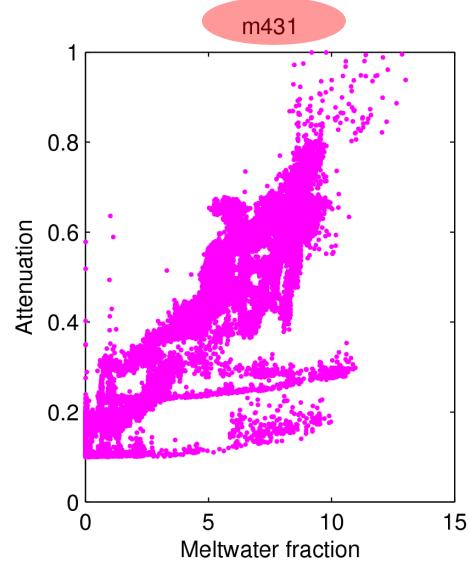
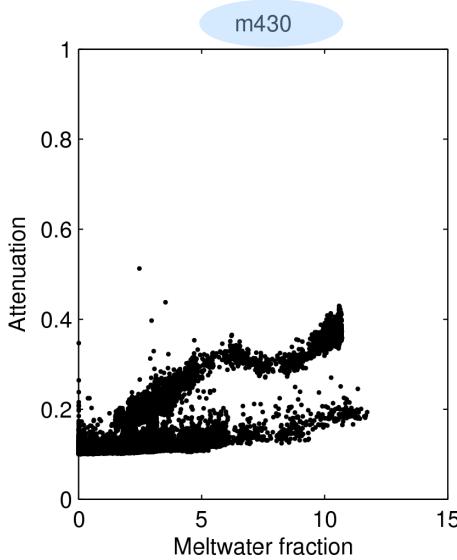
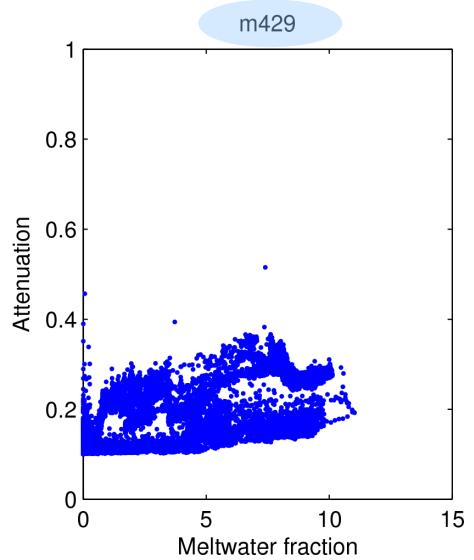
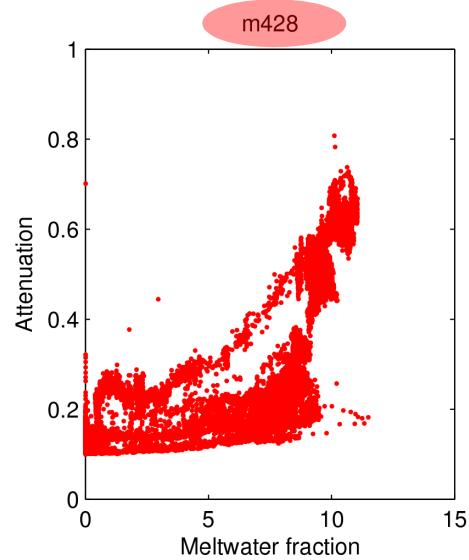
Att

Light attenuation



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Implications:

Ice cavity topography:

- numerous 50-200+m deep / large crevasses, especially close to the grounding line;
- and dent-like features with sharp 20m drops;

Ocean:

- the ridge has a profound impact on circulation and melting, as warm water must pass over it;
- meltwater is associated with relatively turbid water, suggesting a sediment source from the grounding line;
- the ridge also represents a source for tidal flow and local mixing enhancement;
- positive feedback as thinning ice gives warm water access to greater ice surface and increase the melting potential.

Special thanks to the science team of NBP0901,
to Captain Mike Watson
and the crew of the R/V NBP...



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