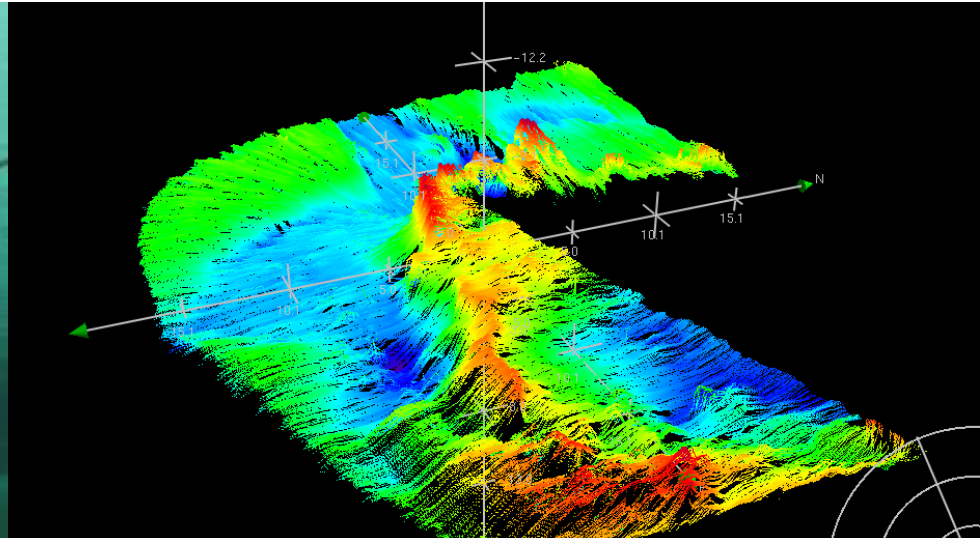
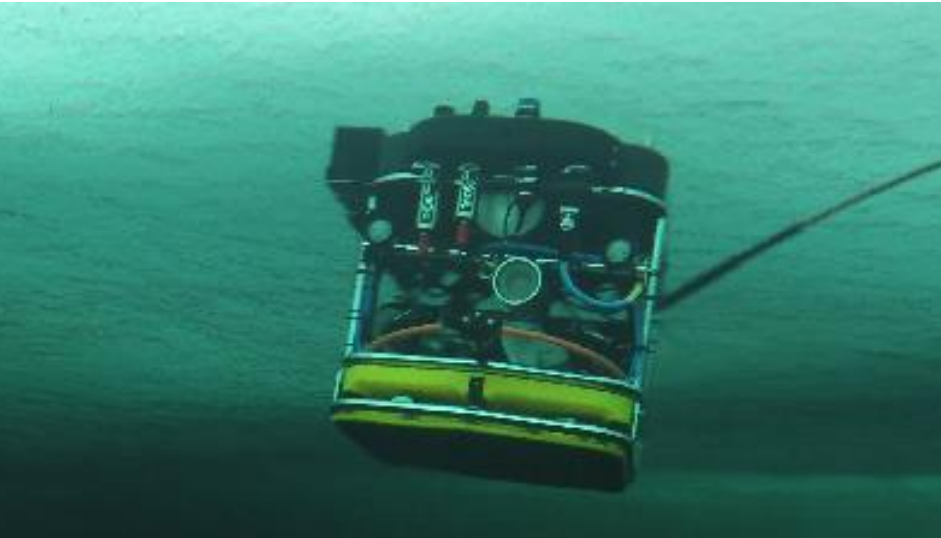


Christian Katlein, Mario Hoppmann
Marcel Nicolaus, Veronica Coppolaro,
Jakob Belter

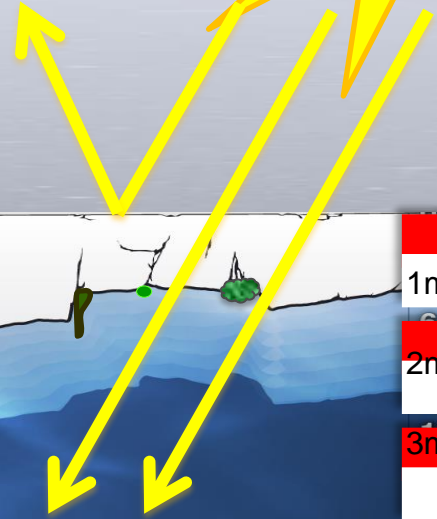


**First results from a new interdisciplinary robotic
vehicle for under-ice research**

45/00

What is an under-ice ROV (good for)?

(ROV = Remotely Operated Vehicle)



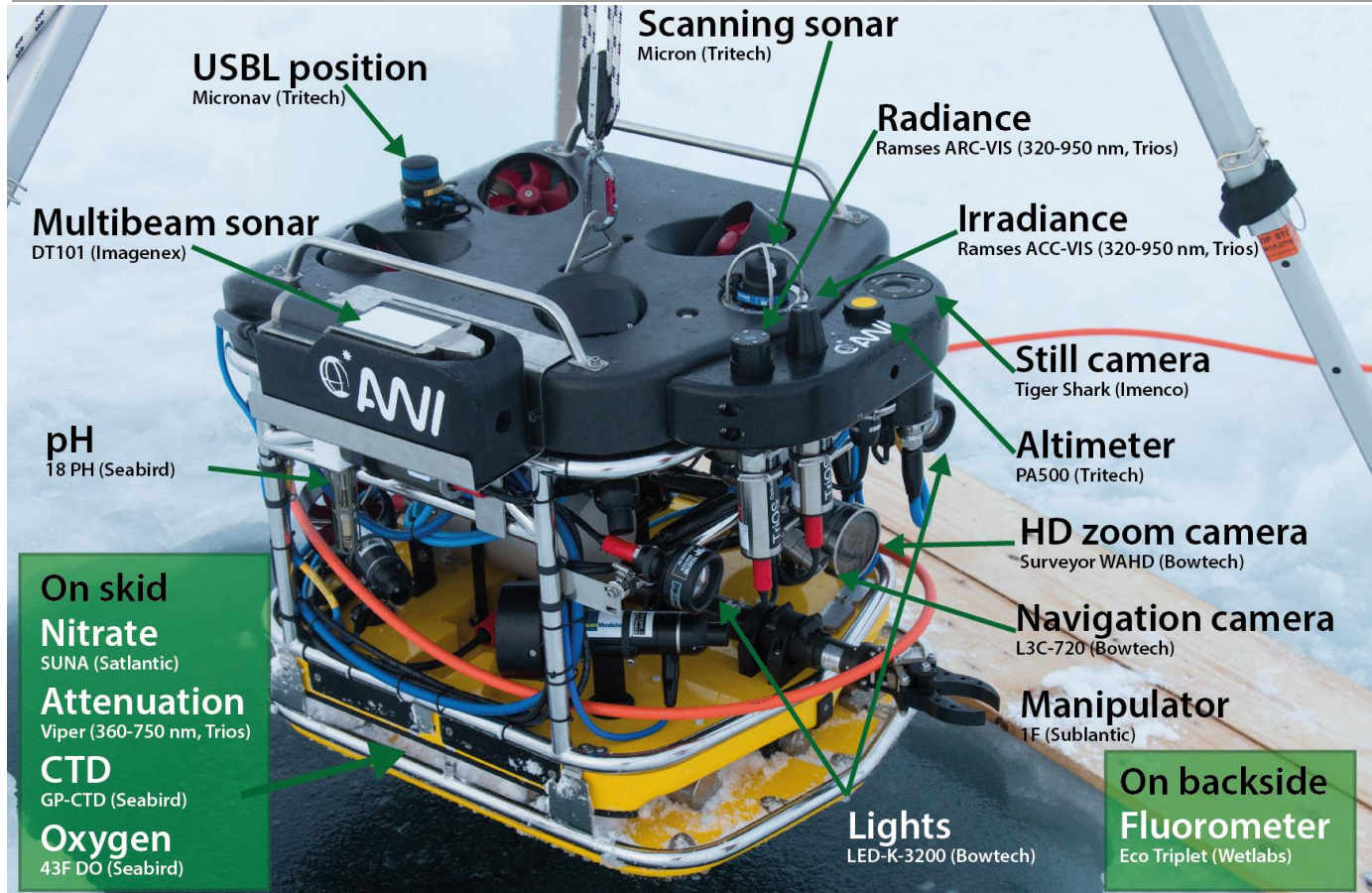
3x more

2015
1980



investigate spatial variability

Current ROV setup (Codename: BEAST)



Base Model:

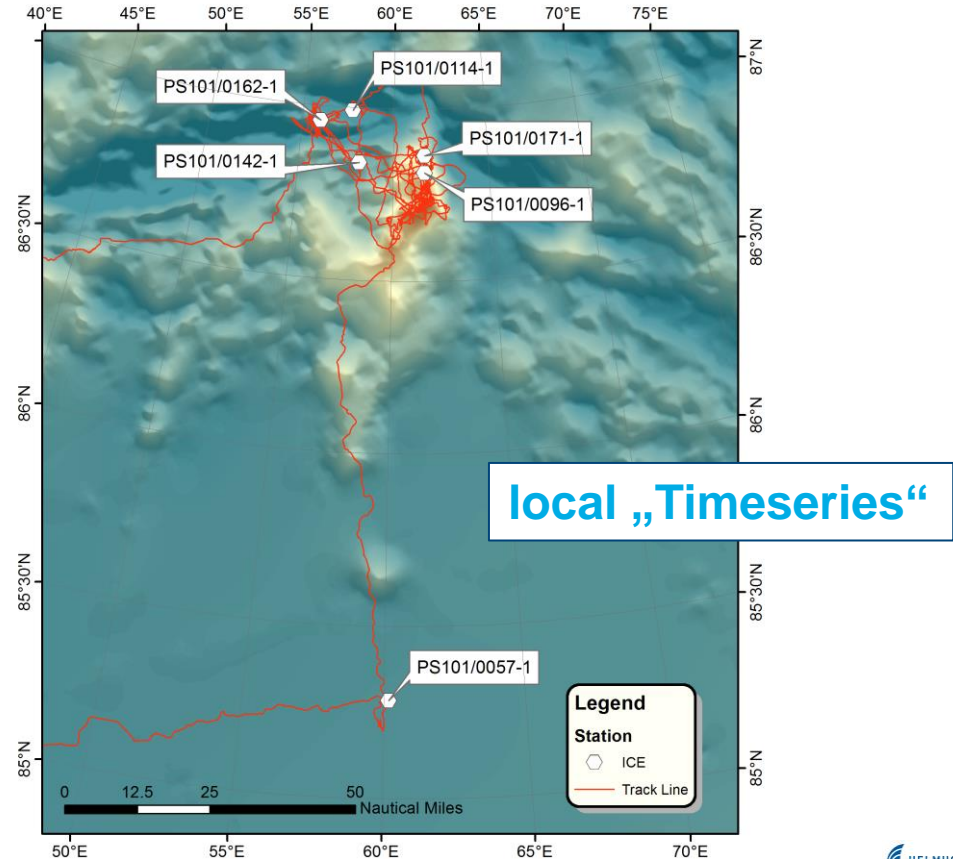
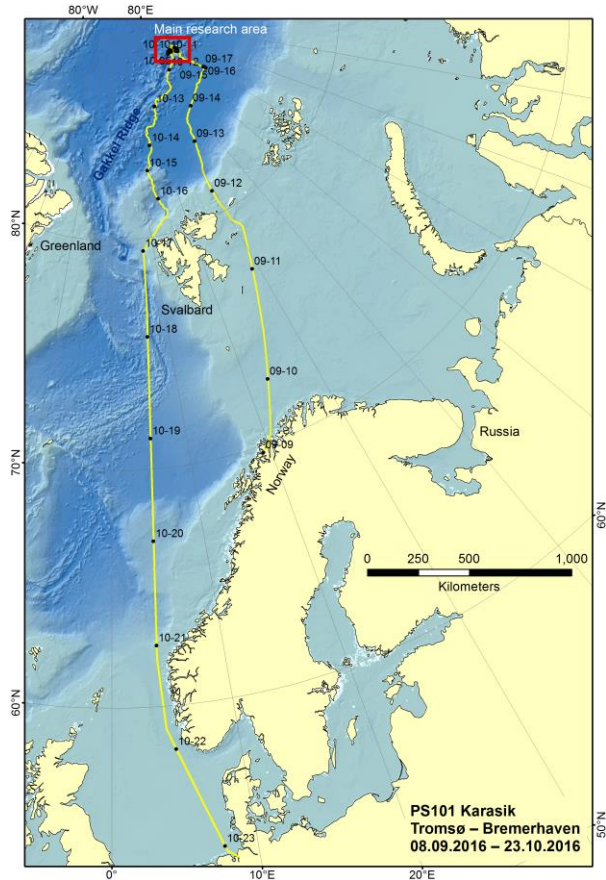
V8 M500
INTERVENTION

Ocean Modules
ROV Systems
Sweden

Similar sensors also
used on buoys, AUVs,
moorings etc

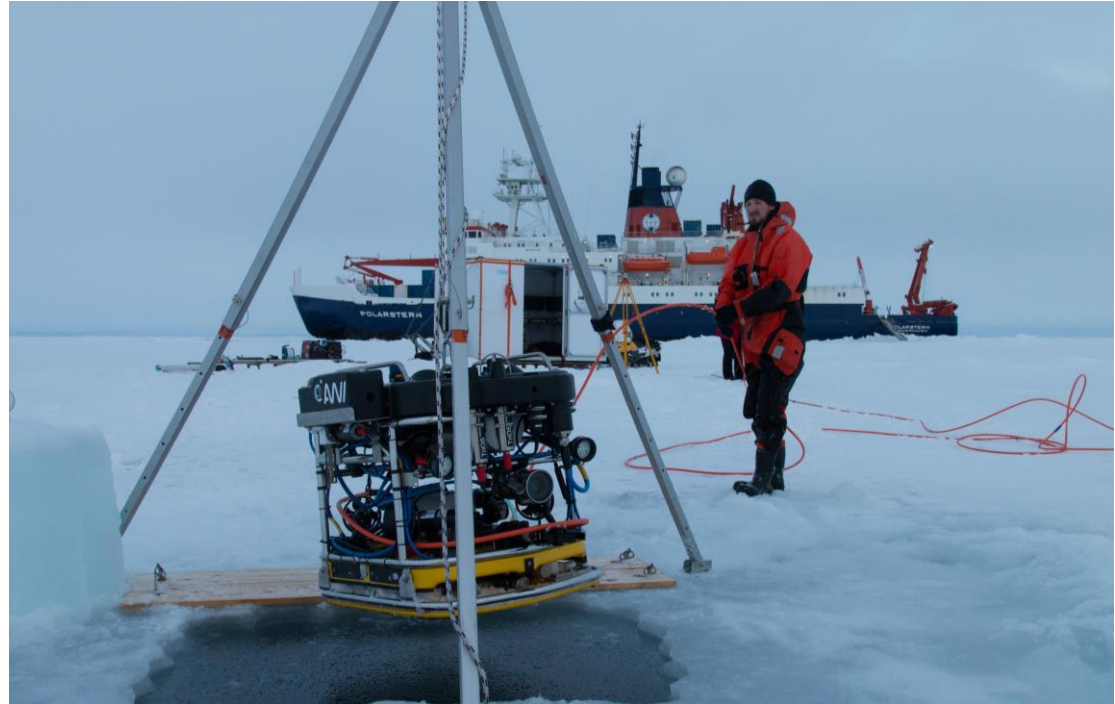
More information:
sensor.awi.de

1st mission: PS101 (Sep-Oct 2016)

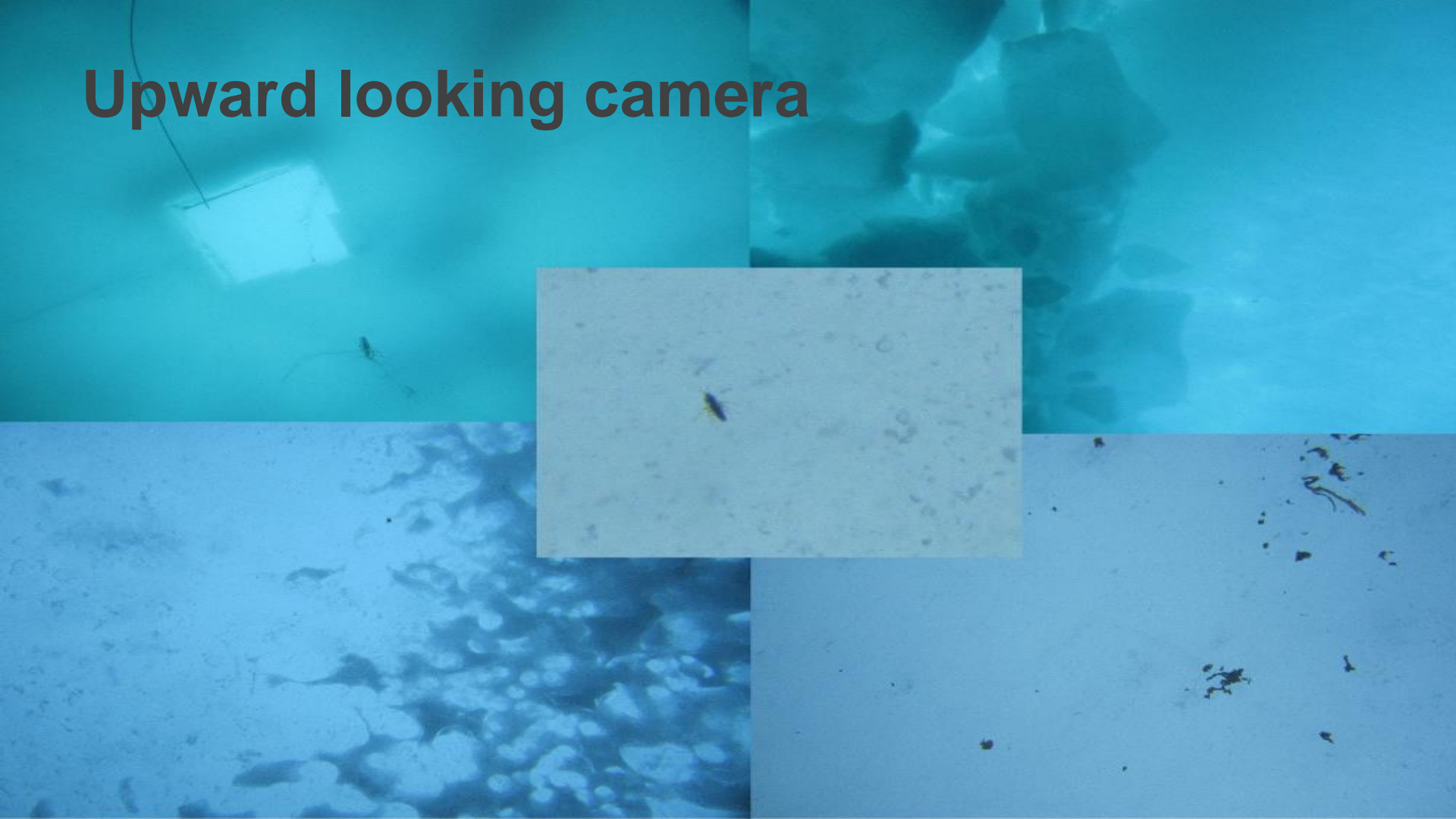


PS101 ROV work

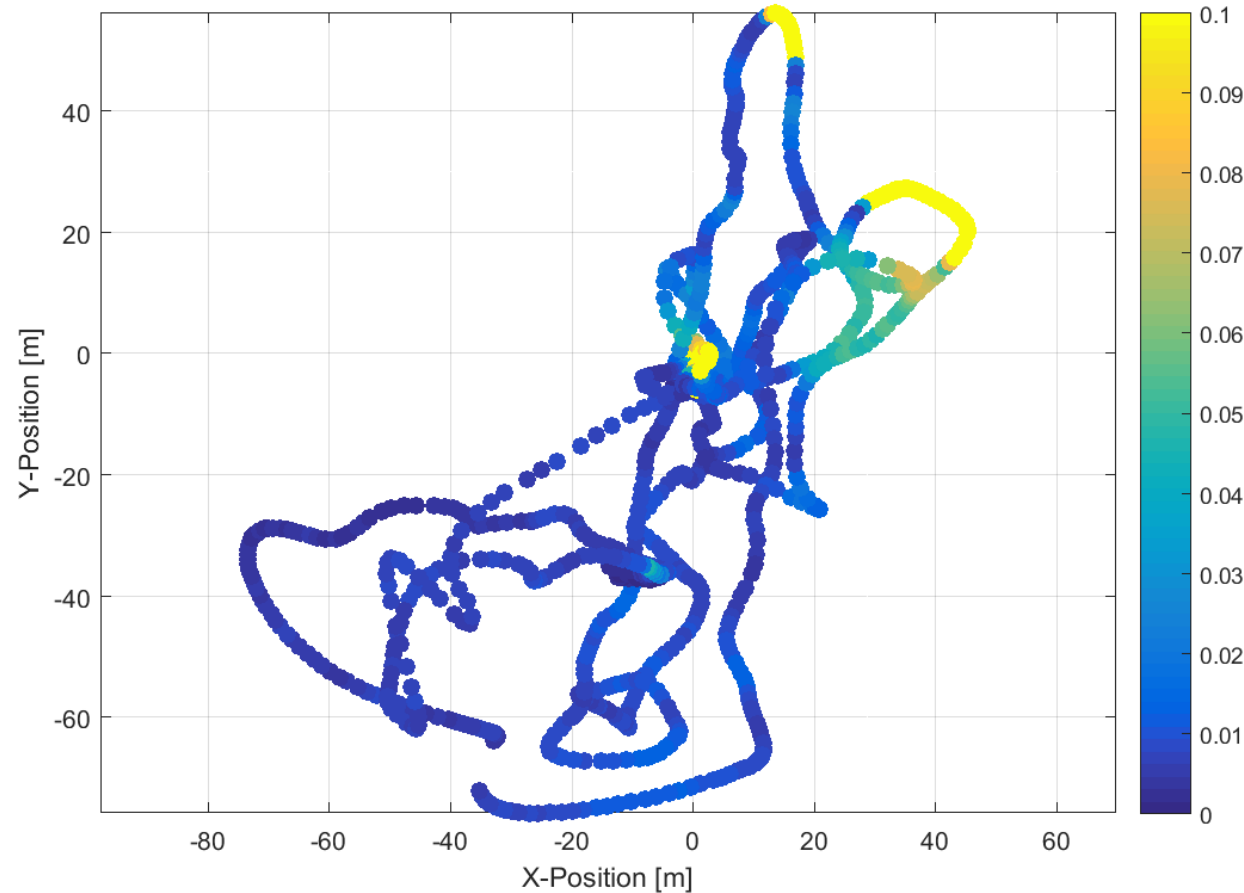
- 6 successful ROV ice stations in conjunction with other ice work
- All systems acquired data successfully
- Very complex system
- Ongoing data processing, archiving and evaluation



Upward looking camera



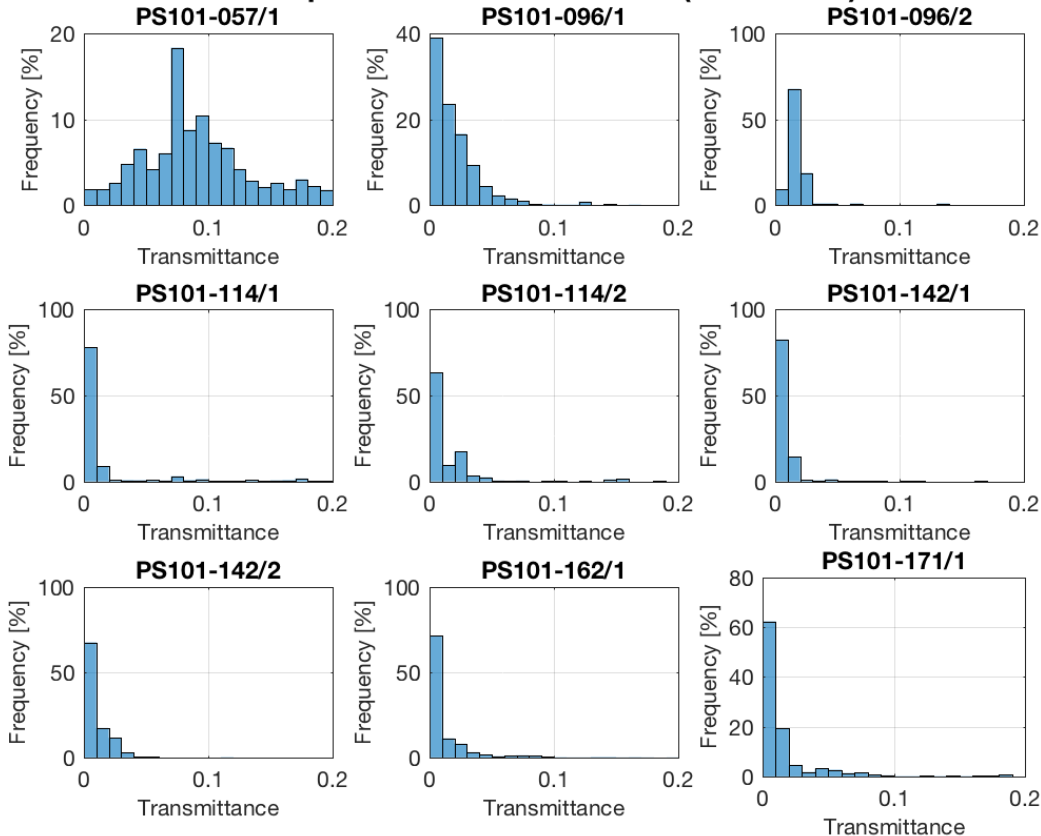
Light transmittance during freeze-up



- yellow = open water over the floe edge (and access hole)
- green = thin ice with higher transmittance
- blue = second year ice with low transmittance (snow covered)

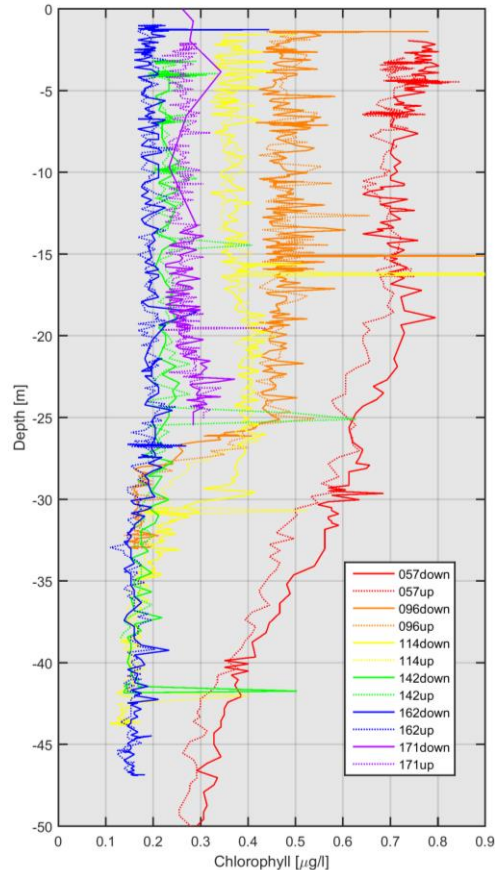
Light transmittance during freeze-up

Comparison of Transmittance (all stations)



- Light transmittance decreases during freeze-up mostly due to snowfall
- Late autumn: still light transmission through young ice and leads

Highlight: under-ice autumn bloom

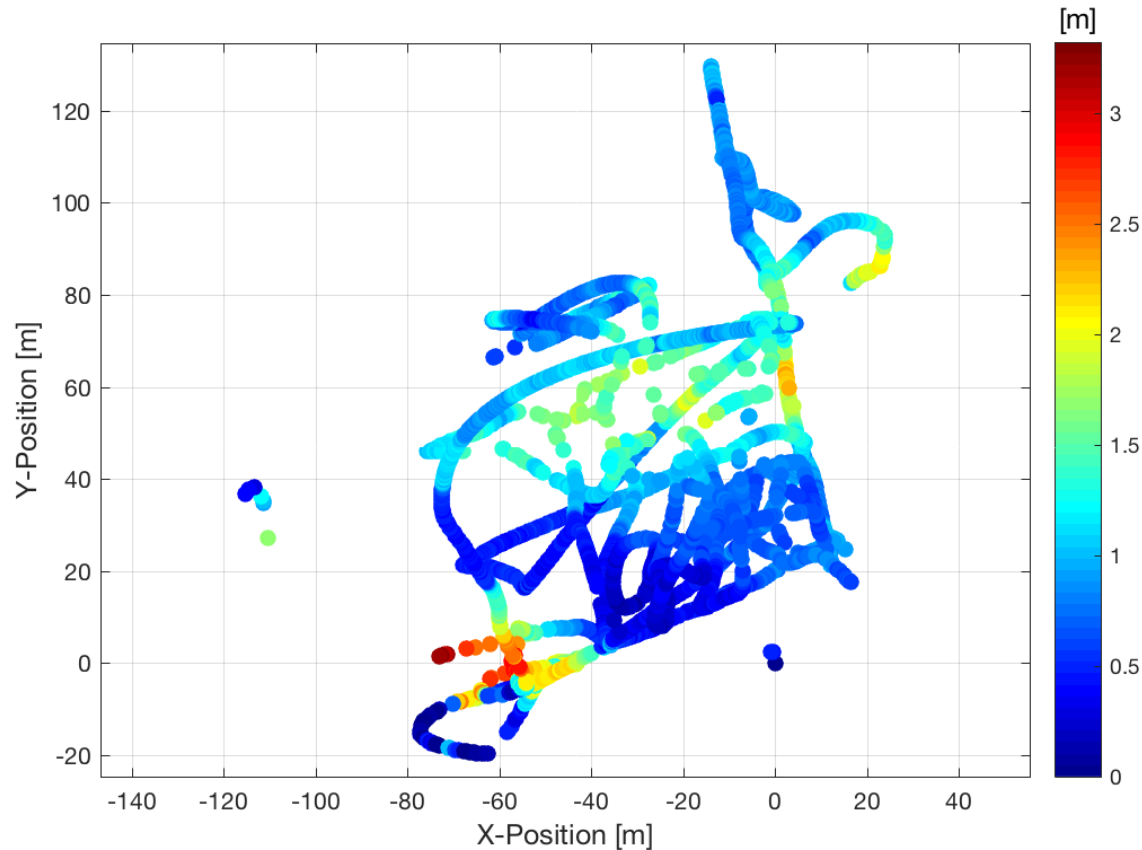


- Decreasing chlorophyll signal in the mixed layer
- Stunning zooplankton abundances under the ice (not shown)
- Unusually low sea ice concentration in the area

Rare observation in the central Arctic pack ice zone!

Sea ice draft maps from single beam sonar

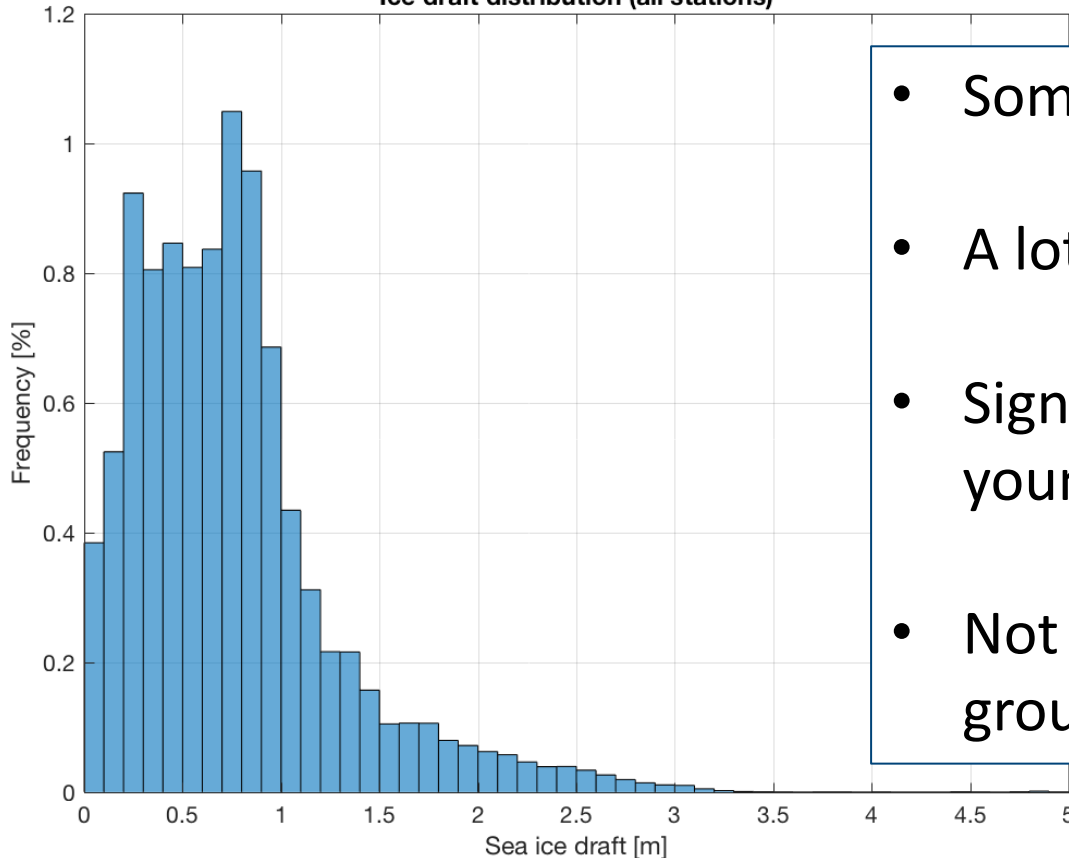
PS101-142/1/20160926 - Ice Draft map



Sea ice draft distribution from single beam sonar



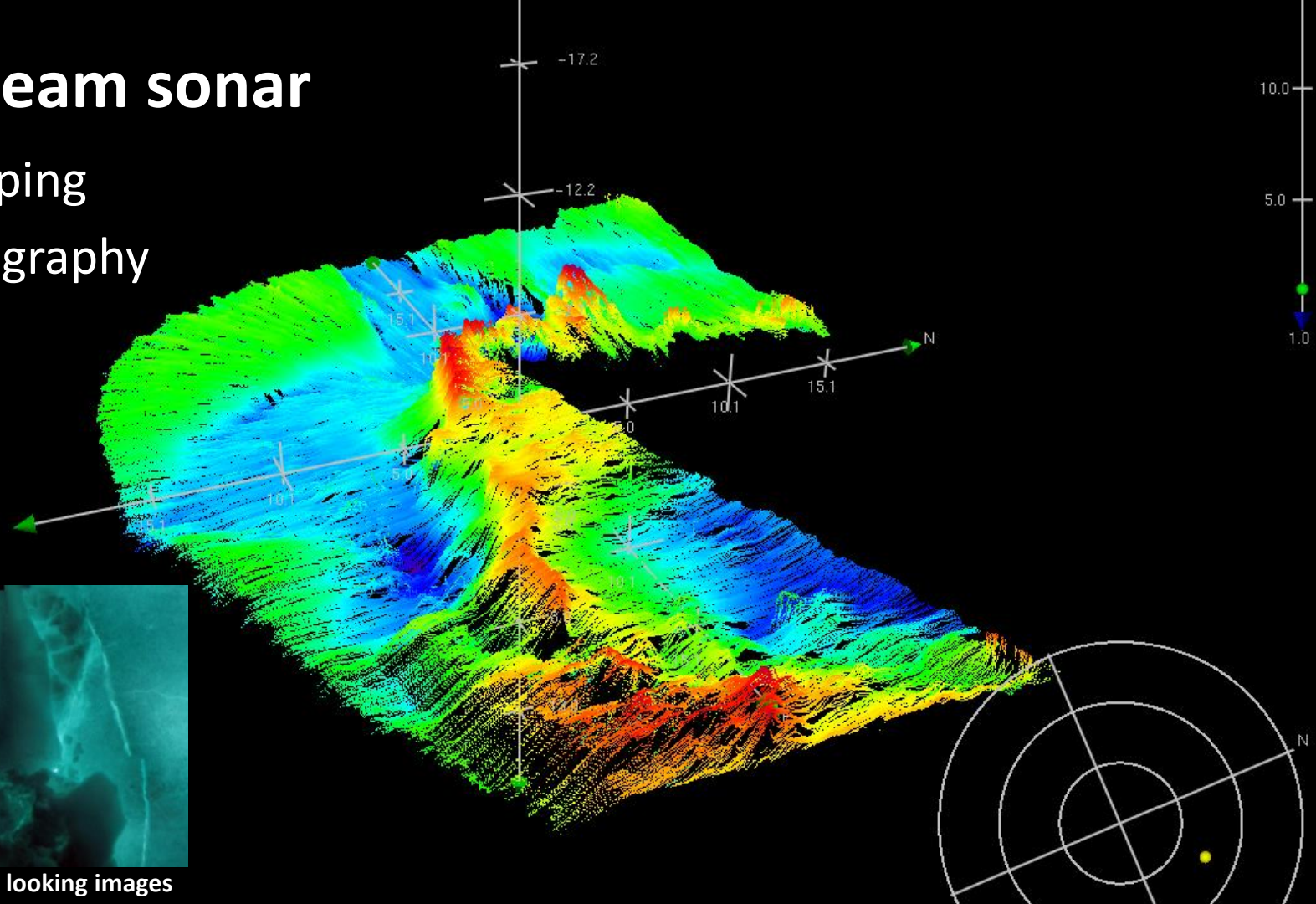
Ice draft distribution (all stations)



- Some thick ice (ridges)
- A lot of FYI (mode at 0.8 m)
- Significant contribution of young, thin ice < 0.3 m
- Not biased, unlike traditional, ground-based EM-methods

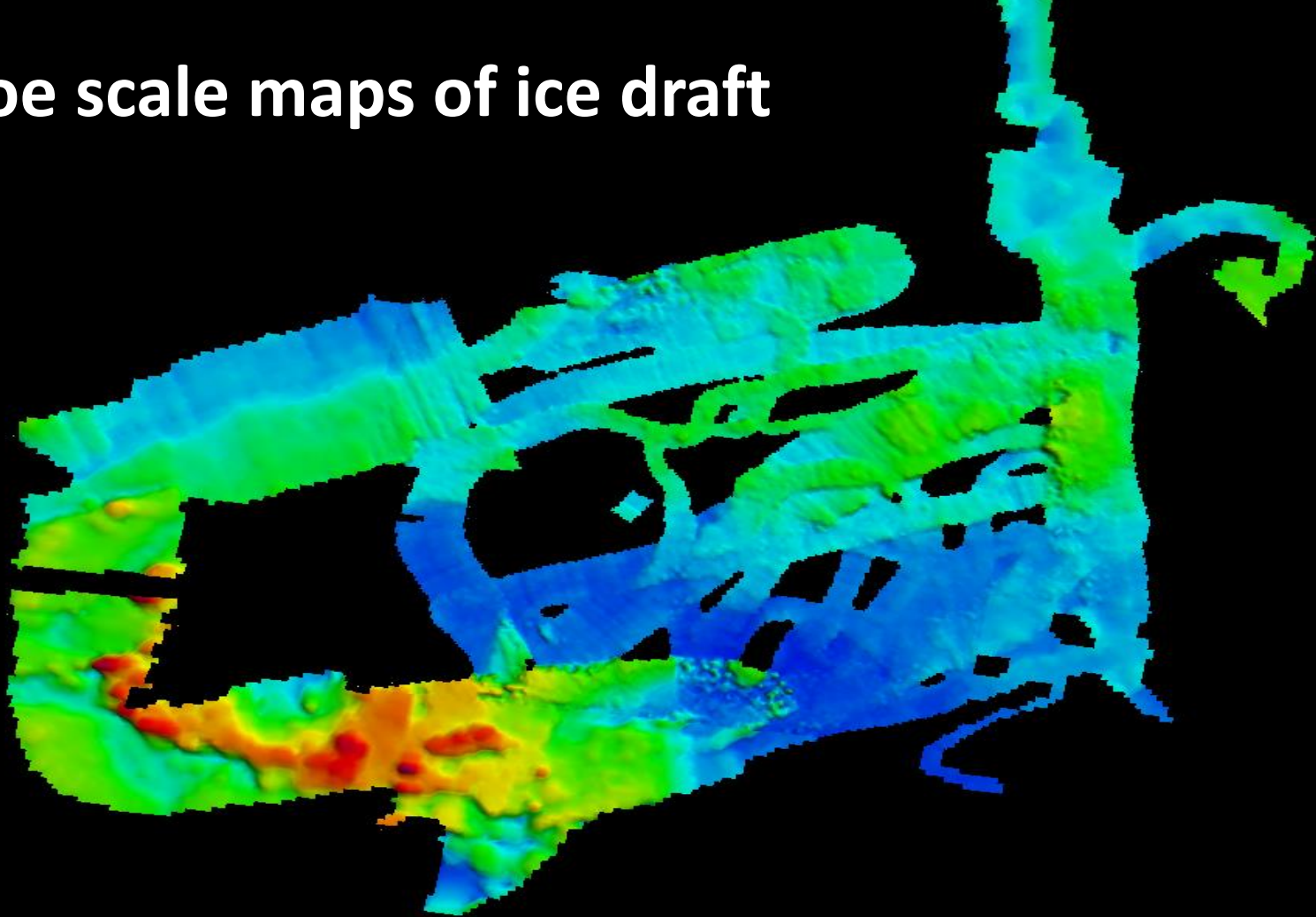
Multibeam sonar

- 3D mapping
- Ice topography



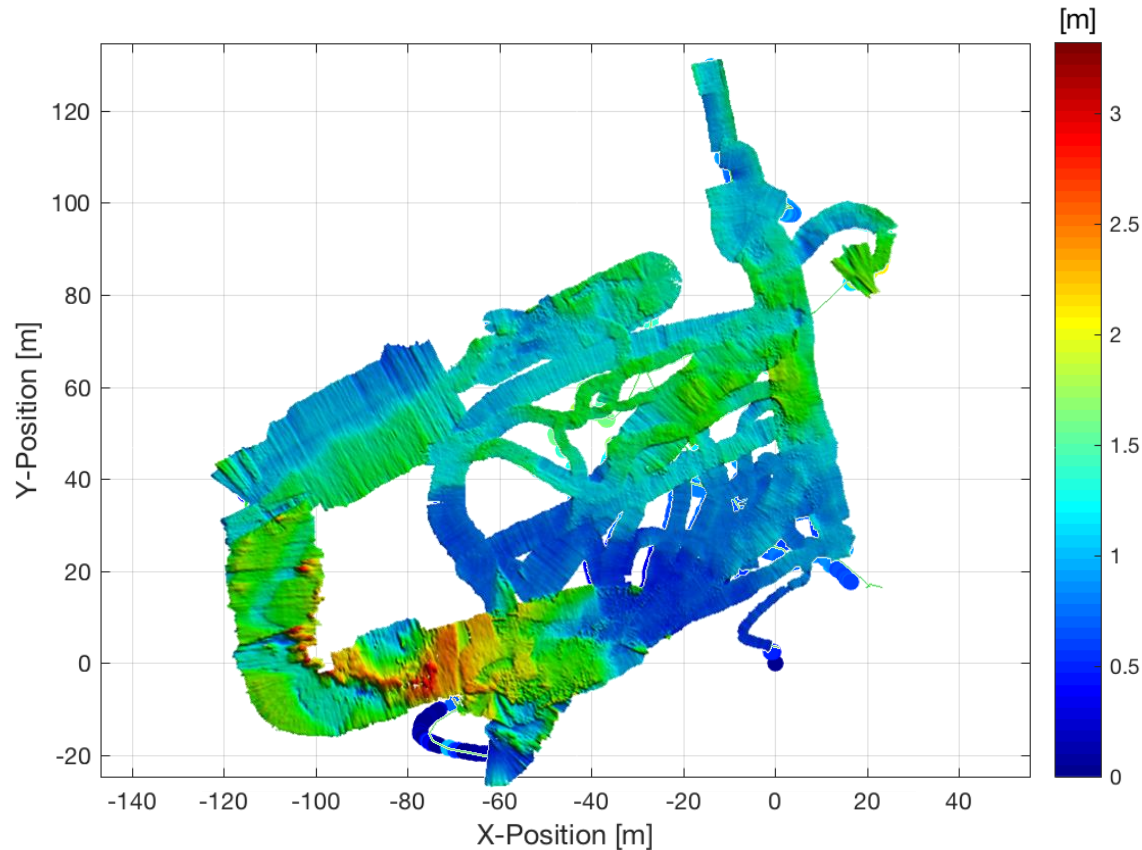
Comparison to upward looking images

Floe scale maps of ice draft




Multibeam vs. Single beam sonar

PS101-142/1/20160926 - Ice Draft map



Progress & future work



- Data will be made publicly available on PANGAEA 
- New AWI data portal (in development)
- Enable full vehicle functionality: Improve positioning system!
- Further payload to be included for next mission:
 - Water sampling bottle, ADCP (watertrack and under-ice turbulence)
 - Zooplankton camera (ROV-LOKI), Under-ice net (ROV-SUIT)

First full-scale science mission during Polarstern cruise with two week drift camp this spring (PS 106, May-June)



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