Sea ice in 3D:
Relations between freeboard and draft

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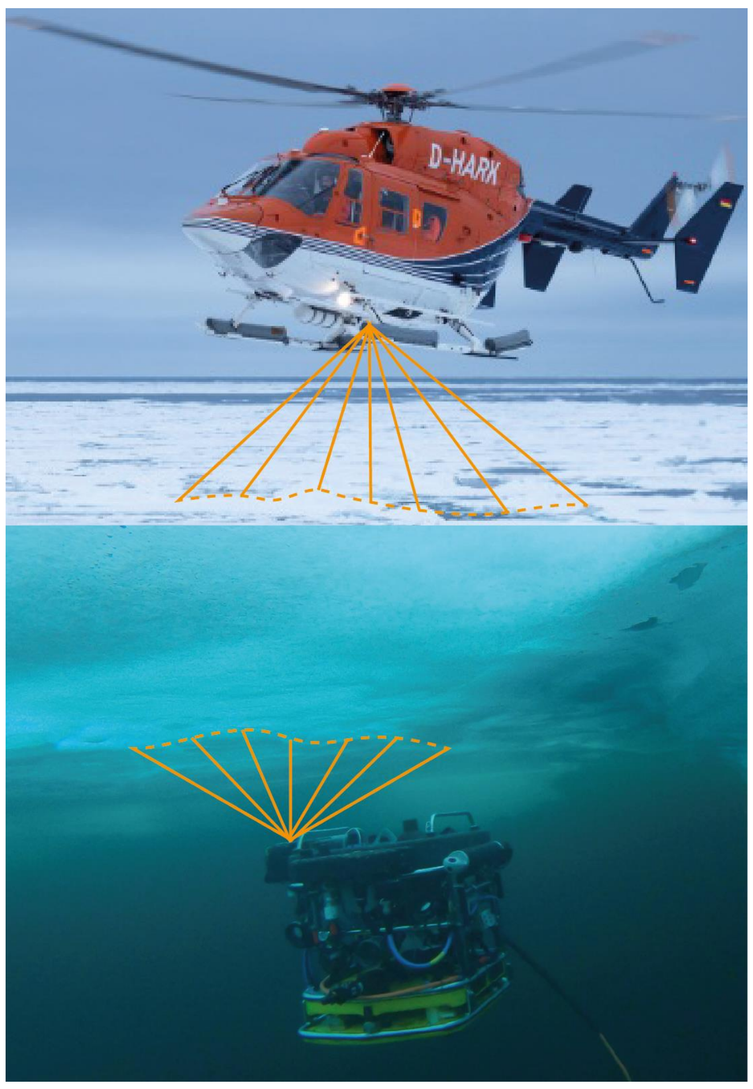
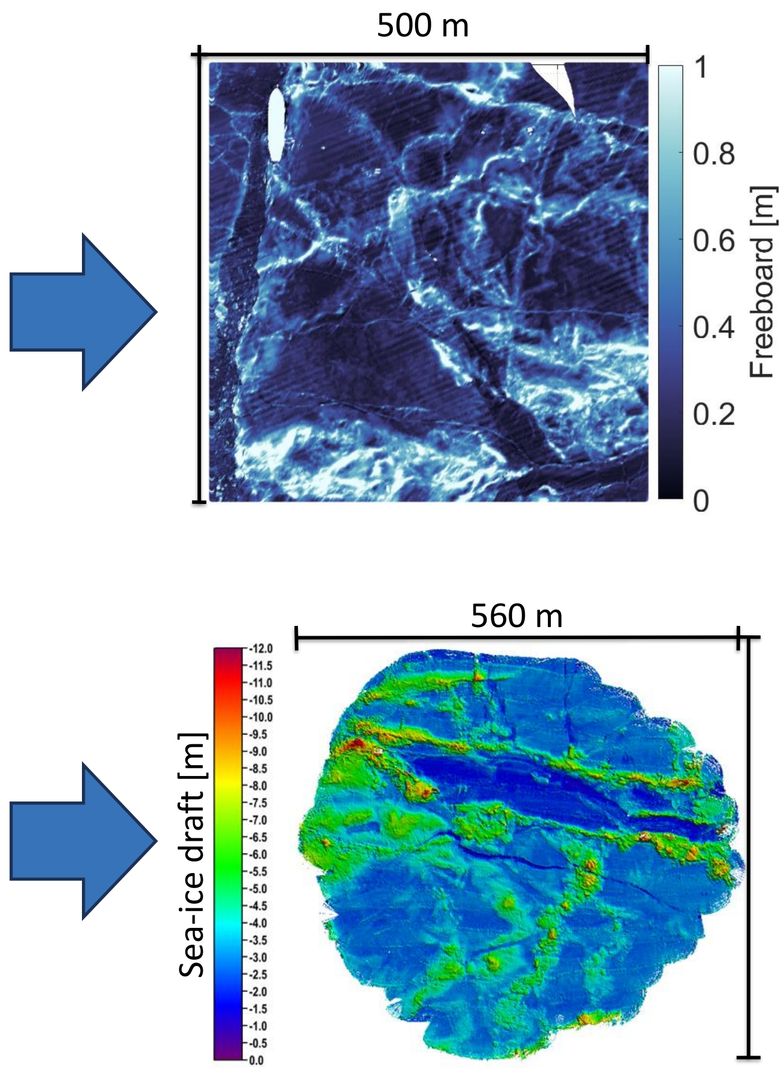
Field measurements

Surveys on 7 January 2020 (MOSAiC)
Ice floe at 87.4°N / 93.0°E
Laser scanner: Riegel VZ400i
Multibeam: Imagenex DT101





Cool data … but why?

Geoscience
- Melt and freeze processes of different ice types
- Ice thickness distribution for large-scale modelling

Atmospheric & ocean science
- Roughness to derive drag coefficients

Industry
- Risk evaluation of offshore structures
- Model dynamics and confinement of oil spills

Navigation
- Mechanical force that ships need to overcome
- Sound scattering of acoustic positioning systems

Science communication
- Sea ice to touch

Merging to 3D

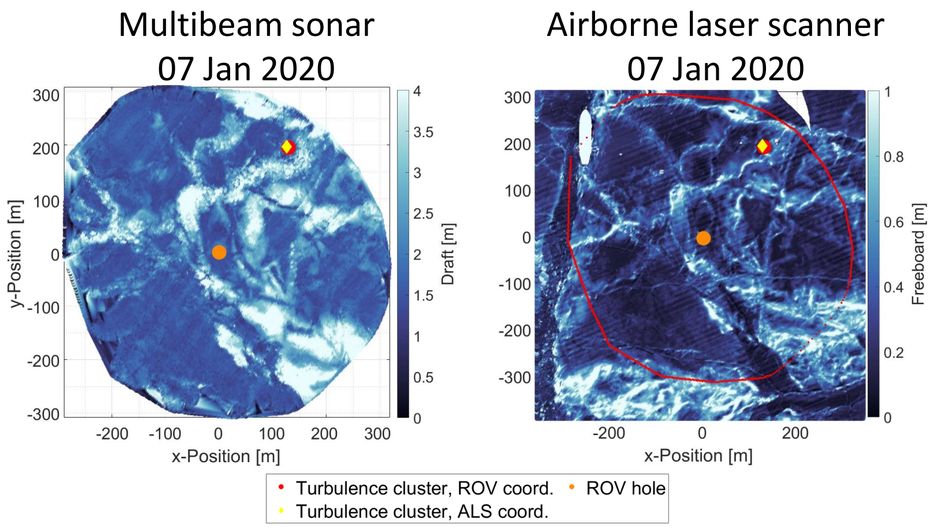


Figure 1. Mapping sea ice (top) from above with a laser scanner on a helicopter and (bottom) from below with a multi-beam sonar on a remotely operated vehicle (ROV)

Figure 2. Resulting data sets. (top) Snow freeboard from the laser scanner, (bottom) sea ice draft from the multi-beam.

Figure 3. A key challenge is merging the surface and bottom topography using known tie points and adjusting for position uncertainties.

3-dimensional print

- Model is exaggerated by a factor of 3 in the vertical (relative to the horizontal)
- 8 elements were composed (4 surface + 4 bottom)
- Printing time was 8x 12-16 hours

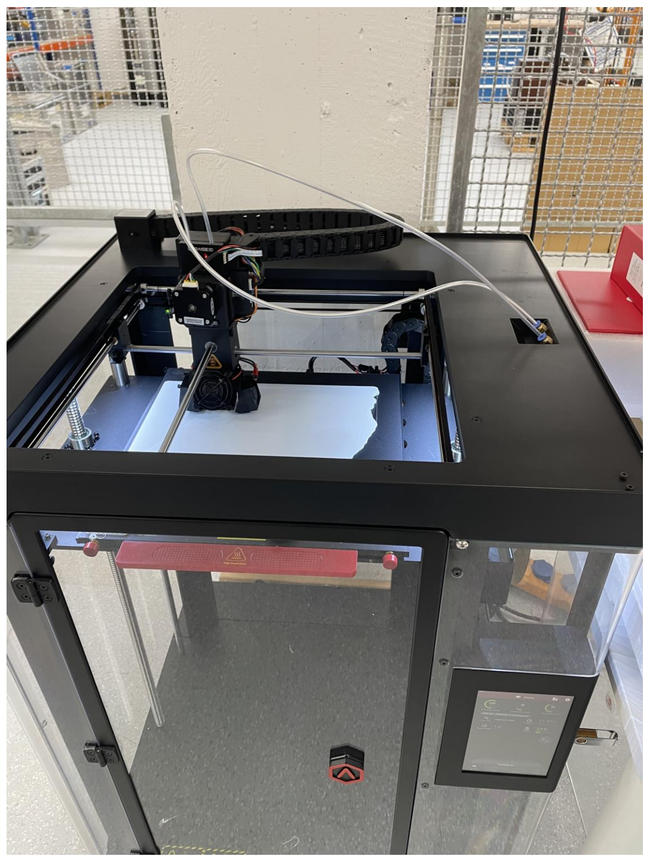


Figure 4. Photographs of the printing process at AWI. (left) The entire 3D printer. (right) close up of the lowest layer of the sample.

3D-animation
(if you have no means to touch the printed version)

Scan me

Acknowledgements

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