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1 Goals

- 1) Investigate sea-ice growth and melt processes
- 2) Produce high spatial resolution and accuracy digital elevation models and maps of acoustic backscatter
- 3) Co-locate data sets with airborne laser scanner freeboard to achieve full 3D geometries of the MOSAIC floes
- 4) Evaluate relation of sea-ice draft and 3D ridge structures to electromagnetic-induction sounding and drillhole measurements of ice thickness
- 5) Publish data set to make available to science community

2 Data

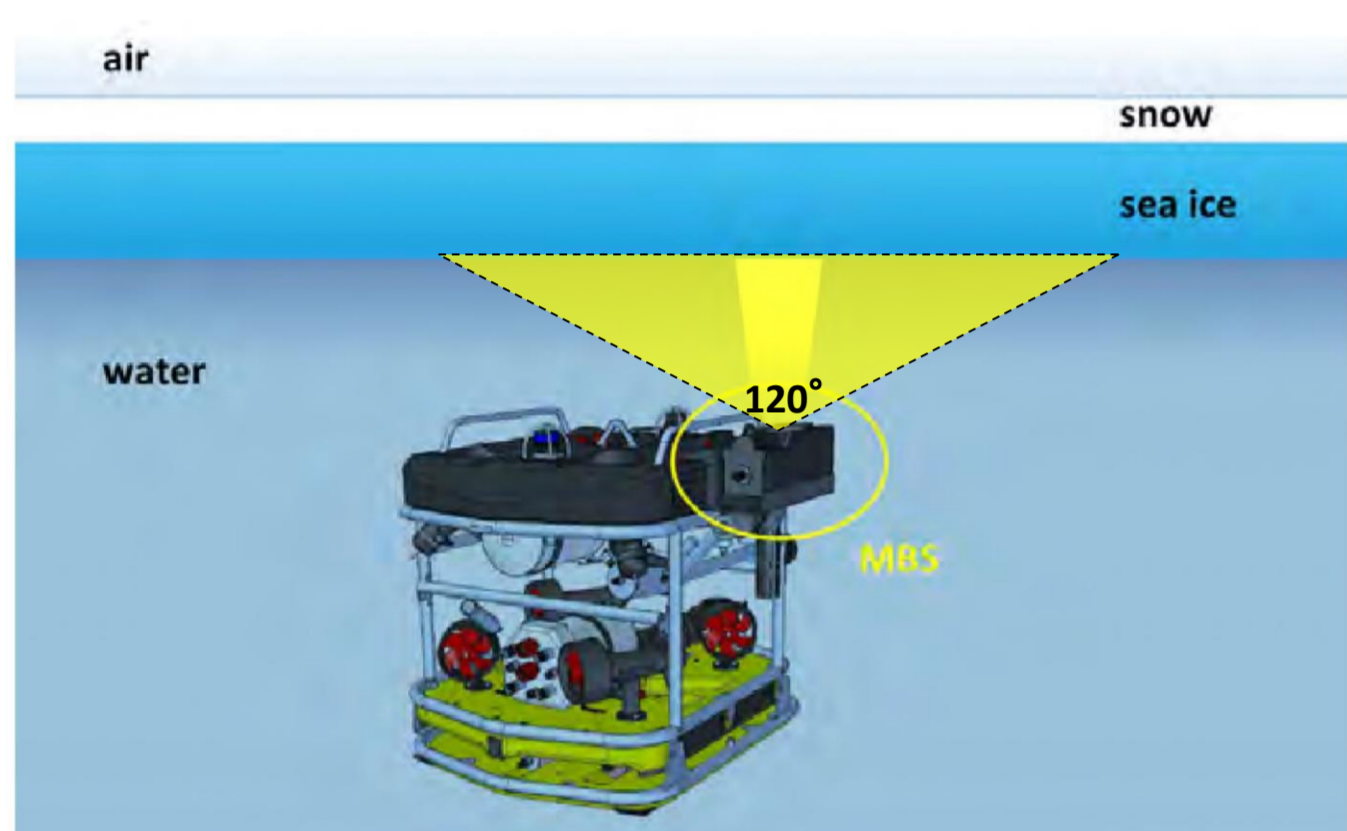


Figure 1: Schematic view of the MBS (yellow circle) mounted on the ROV (Coppolaro, 2017).

Under-ice topography obtained from an acoustic multibeam sonar (MBS) attached to a remotely operated vehicle (ROV)

- MBS DT101 Imagenex, Canada
- Upward-looking transducer
- Frequency 240 kHz
- Swath width 120 x 0.75°
- 280 m horizontal coverage
- 0.1 – 0.5 m horizontal resolution
- Integrated Sound Velocity Probe and Motion Reference Unit

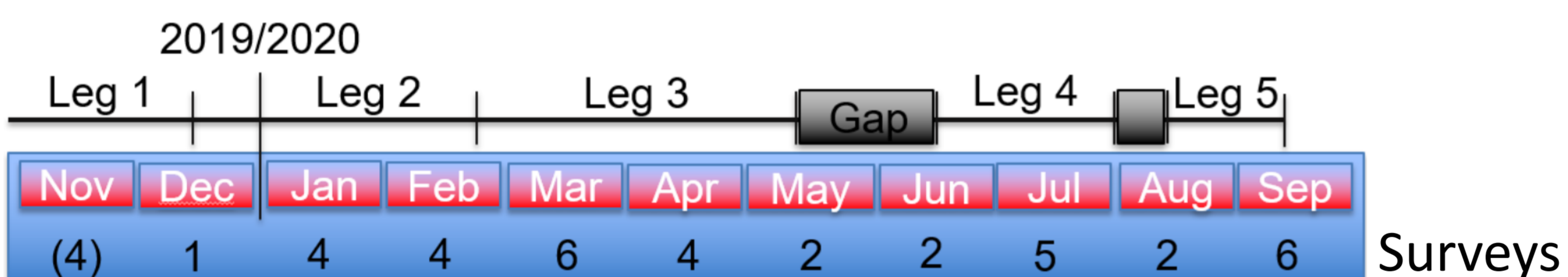


Figure 2: 40 MBS surveys conducted during the MOSAIC expedition.

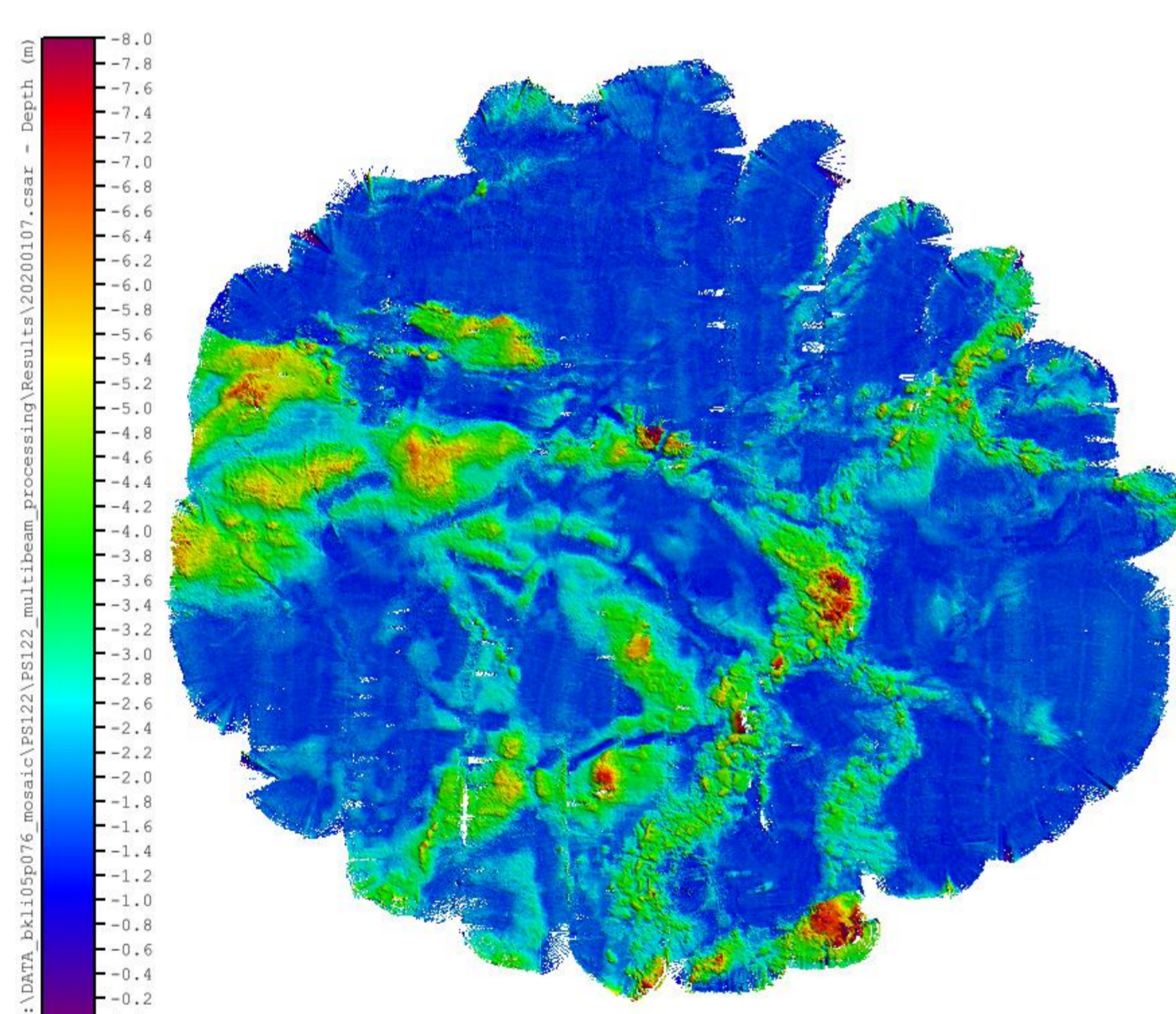


Figure 3: MBS sea-ice draft on 07.01.2020.



Figure 4: Image of ridge structure from upward-looking camera attached to the ROV on 09.05.2020.

Preliminary data release

- 36 pre-processed data sets available on workspace under 03_ICE/07_ROV
- File types: .png, raster.tiff, ASCII
- Only relative draft change
- No sound speed correction
- Data amount: 26 GB

Further data processing

- Renavigation of ROV position
- Absolute draft change
- Improved quality control
- More “custom-made” products

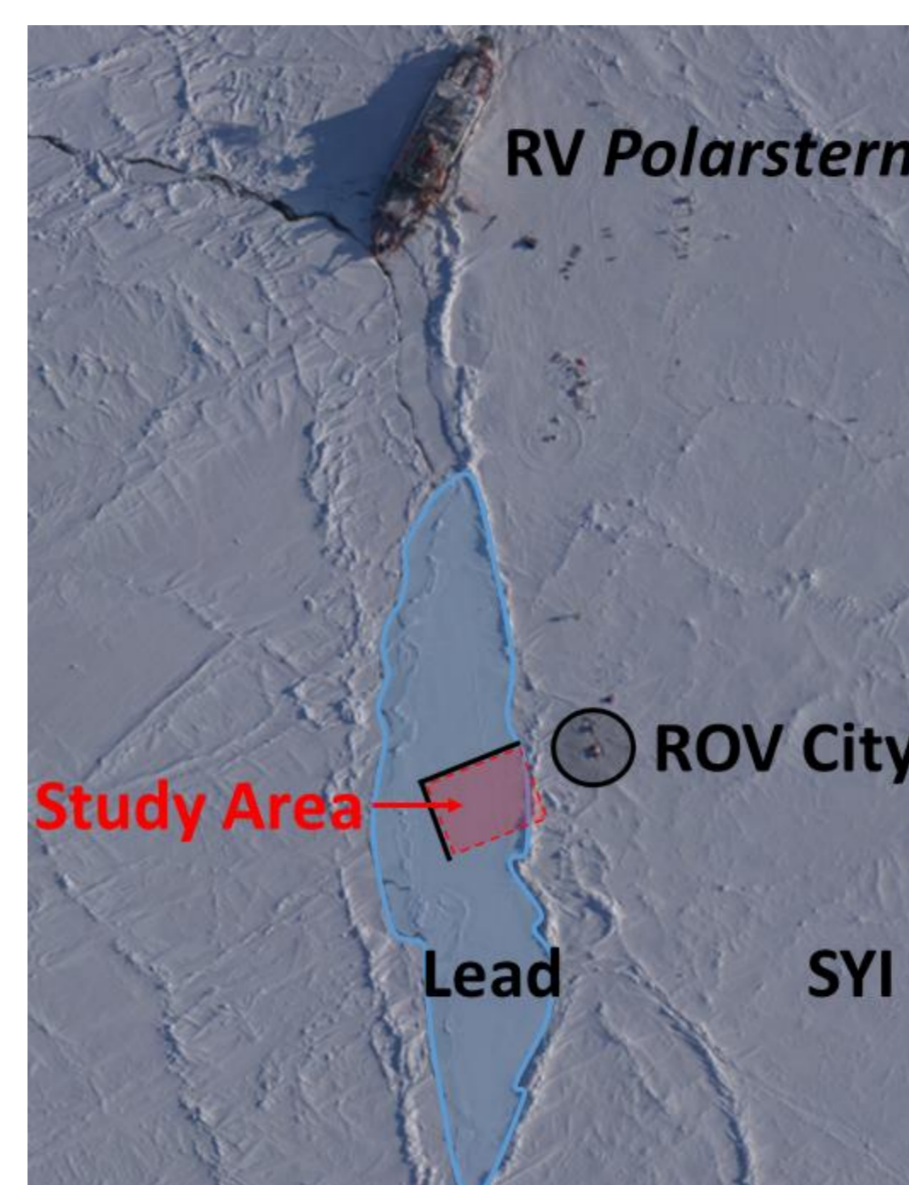
Additional ROV-based data sets

- Sea-ice optics
- Physical and biological ocean parameters
- Video footage

3 Work in progress

1) Evolution of the light field under a refreezing lead in spring

Anhaus, Katlein, Nicolaus, Arndt, Haas



ROV-based data

- Light transmittance (radiometers)
- Sea-ice draft (single altimeter)
- Survey area 50 x 80 m
- 8 surveys between 21 March and 9 May

Additional data

- Snow depth (*in-situ*)

Figure 5: Aerial image of the study area on the refrozen lead on 23 April (credit: N. Neckel, AWI).

Preliminary results

- Radiative transfer in thin ice might not be well described using assumptions made for thicker ice, e.g., exponential decay law
- High spatial variability of light transmittance across lead

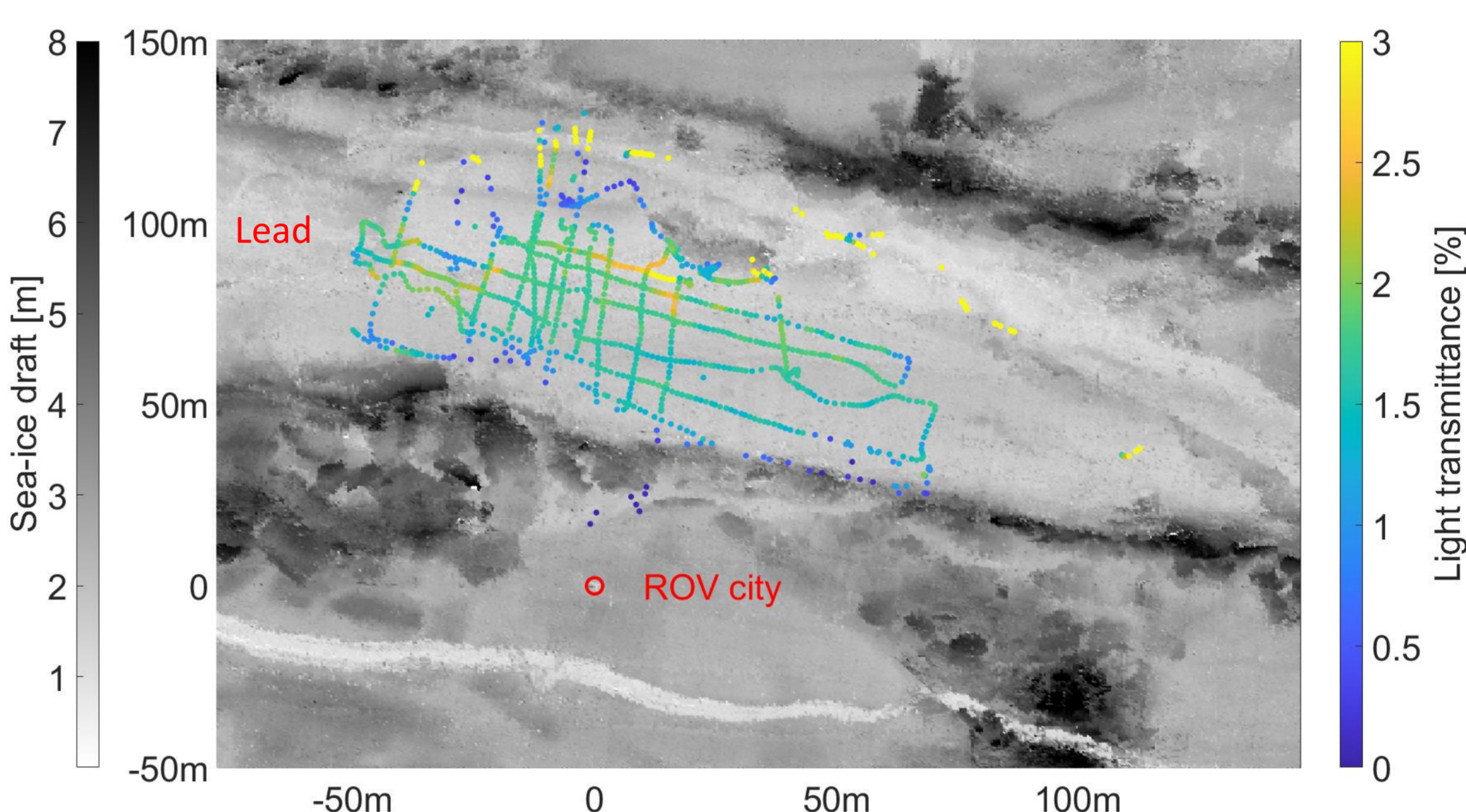


Figure 6: MBS sea-ice draft on 28.04.2020. Overlaid is the light transmittance on 25.04.2020.

- Higher resolution and coverage of MBS sea-ice draft might help to reduce uncertainties and explain results

2) ROV data paper

Anhaus, Katlein, Nicolaus, Arndt, Krampe, Lange, Matero, Regnery, Rohde, Schiller

- Presentation, description, and example plots for all data collected with the ROV

3) Kilometer-scale digital elevation models of the sea ice surface with airborne laser scanning during MOSAIC

Jutila et al., abstract ID 244

- New 3D sea-ice models
- Link with IceSense project



Figure 7: Merging of airborne laser scanner freeboard (grey) and MBS under-ice topography (blue) (credit: A. Jutila, AWI)

4) Ice, snow, meltwater, and false bottom temporal evolution for ponded and unponded level ice and corresponding ice physical properties

Salganik et al., abstract ID 137

- Link with HAVOC project

5) Improving bio-physical characterization of Arctic sea ice habitats using an Underwater Hyperspectral Imager

Lange et al., abstract ID 139

- High resolution ridge data
- Link with HAVOC project

6) Turbulent Mixing in Ice-Ocean Boundary Layer near the North Pole: Results from the MOSAIC Expedition

Kawaguchi et al., in review