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Motivation

East Antarctica currently **gains mass** due to an increase in surface mass balance (SMB), contrary to West Antarctica. The contribution of the East Antarctic ice sheet to contemporary **global mean sea level rise** is debated across the scientific community, models and observations [e.g. 1, 2]. How or if this increase in SMB is linked to anthropogenic warming is not yet clear and requires better understanding of the **accumulation** and **SMB history** during the last centuries.

Moreover, accumulation rates show strong spatial variations on the 5 to 10 km scale related to the local **surface topography** likely caused by the associated variations in wind speed and snow redistribution [e.g. 3, 4]. This relationship should allow a spatial interpolation between point and line accumulation estimates to derive fields of accumulation rates and SMB.



AWI's Polar 6 aircraft equipped with the ultra-wideband antenna

Ideas or Questions?

- Are you interested in near-surface radargrams and isochrones?
- Do you have modelling data or more observations (radar, firn and ice cores, accumulation stakes, etc.) for this area?
- Do you have recent temperature reconstructions for this area?
- Do you want to discuss how consistent these changes are between the coast, at the grounding line and on the plateau?

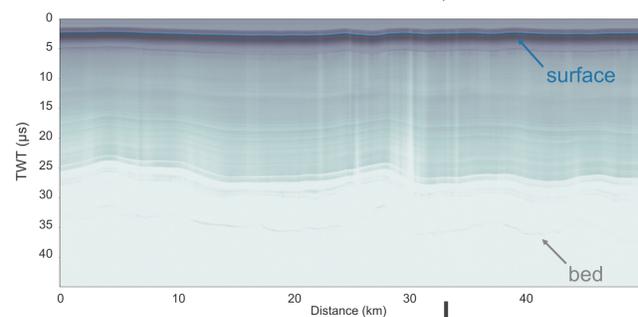
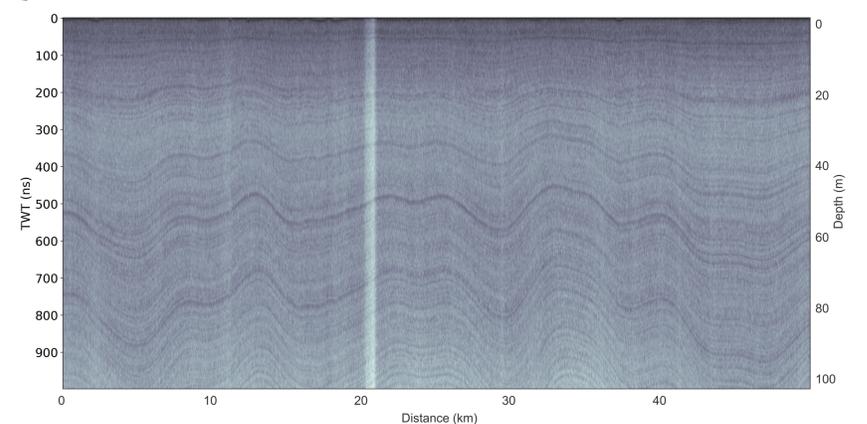
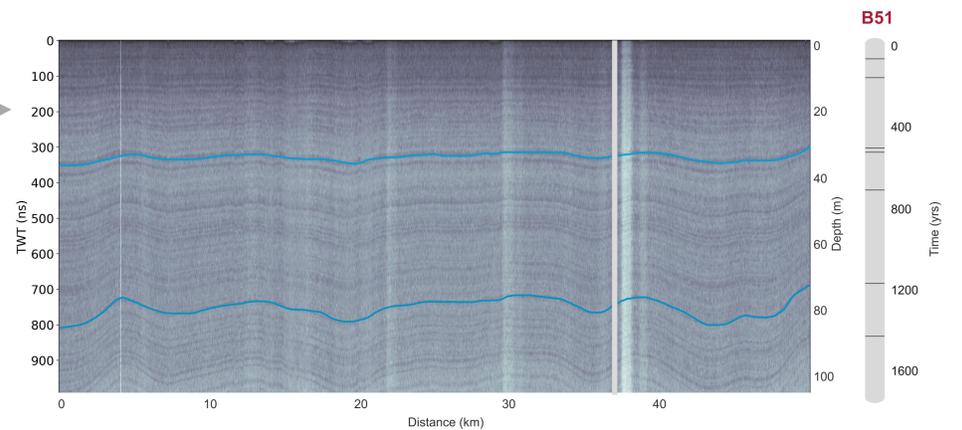
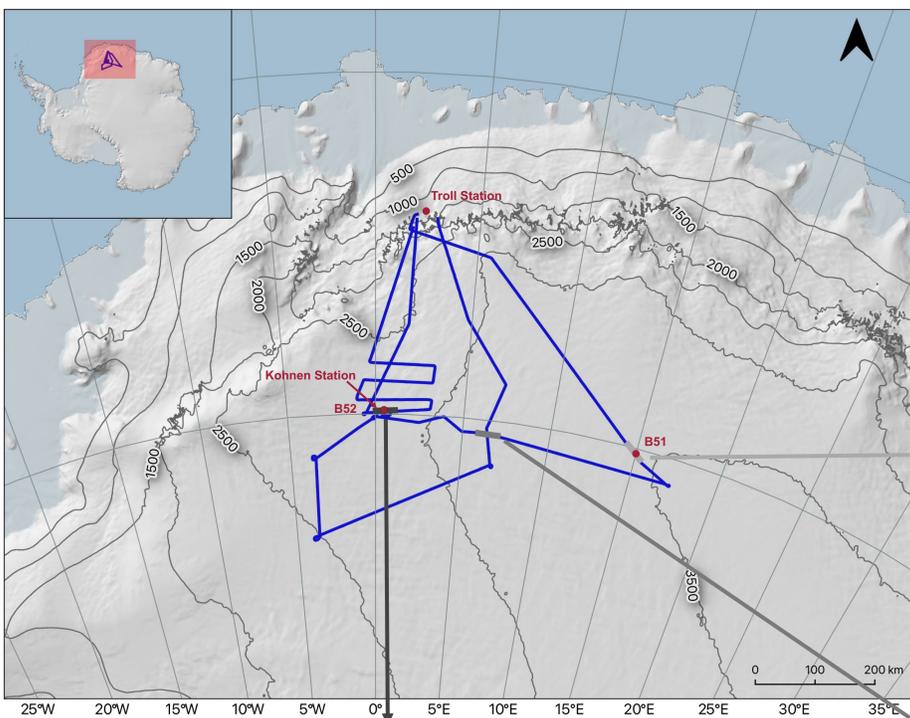
→ Ideas and questions are very welcome!

What and Where

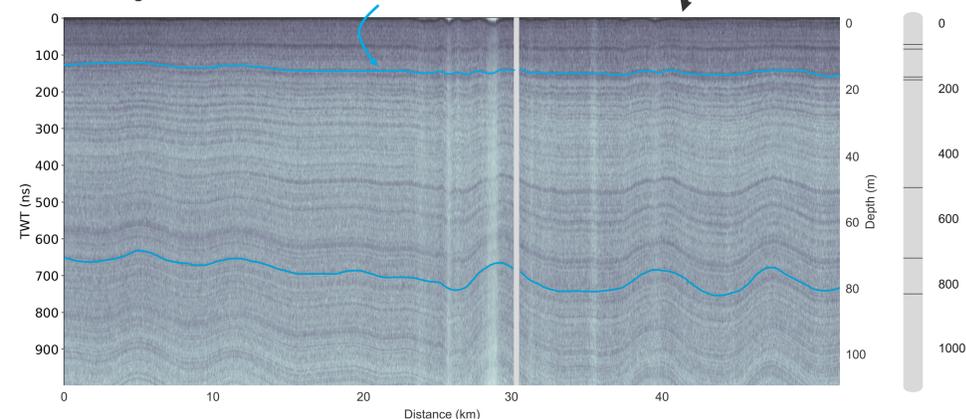
- Airborne radio sounding using AWI's Polar 6 aircraft
- Ultra-wideband radar with 8 channels
- Frequency: 150-520 MHz
- About 3.400 km of surveys covering an area of 220.000 km²
- Low accumulation region in Dronning Maud Land, East Antarctica, with elevations between 1.500 and 3.500 m asl and accumulation rates ranging from 40 kg m⁻² a⁻¹ at firn core B51 to 80 kg m⁻² a⁻¹ at firn core B52 and Kohnen station [5]

How

- Combining 1D information from firn cores with large scale airborne radio sounding data
- Using internal reflection horizons to date radargrams with depth-age scales derived from firn cores B51 and B52
- Applying statistical relationship between surface slope and SMB/accumulation rate to generate spatio-temporal fields of SMB and accumulation



- Considering the first 100 ns traveltime = ~100 m
- Using firn cores to date **internal reflection horizons**



What is next

- Dating firn cores and radargrams
- Establishing a new high-resolution snow accumulation history
- Applying statistical relationship to extrapolate SMB patterns and generate spatio-temporal accumulation fields
- Estimation of the sensitivity of snow accumulation to temperature

References

- [1] Payne et al. (2021), Future sea level change under coupled model intercomparison project phase 5 and phase 6 scenarios from the Greenland and Antarctic ice sheets. GRL, 48(16), <https://doi.org/10.1029/2020GL091741>
- [2] Edwards et al. (2021), Projected land ice contributions to twenty-first-century sea level rise. Nature, 593(7857), 74-82, doi.org/10.1038/s41586-021-03302-y.
- [3] Eisen et al. (2005), Characteristics of accumulation around the EPICA deep drilling site in Dronning Maud Land, Antarctica. Annals of Glaciology, 41, 41-46, <https://doi.org/10.3189/172756405781813276>.
- [4] Van Liefvering et al. (2021), Surface Mass Balance Controlled by Local Surface Slope in Inland Antarctica: Implications for Ice-Sheet Mass Balance and Oldest Ice Delineation in Dome Fuji. GRL, 48(24), <https://doi.org/10.1029/2021GL094966>.
- [5] Weinhart et al. (2020), Representative surface snow density on the East Antarctic Plateau, The Cryosphere, 14, 3663-3685, doi.org/10.5194/tc-14-3663-2020.