The GDP for the **M**ultidisciplinary Drifting **O**bservatory for the **S**tudy of **A**rct**i**c **C**limate (MOSAiC)

Marion Maturilli[1], Michael Sommer[2], Erik Dünschede[3], Sandro Dahlke[1]

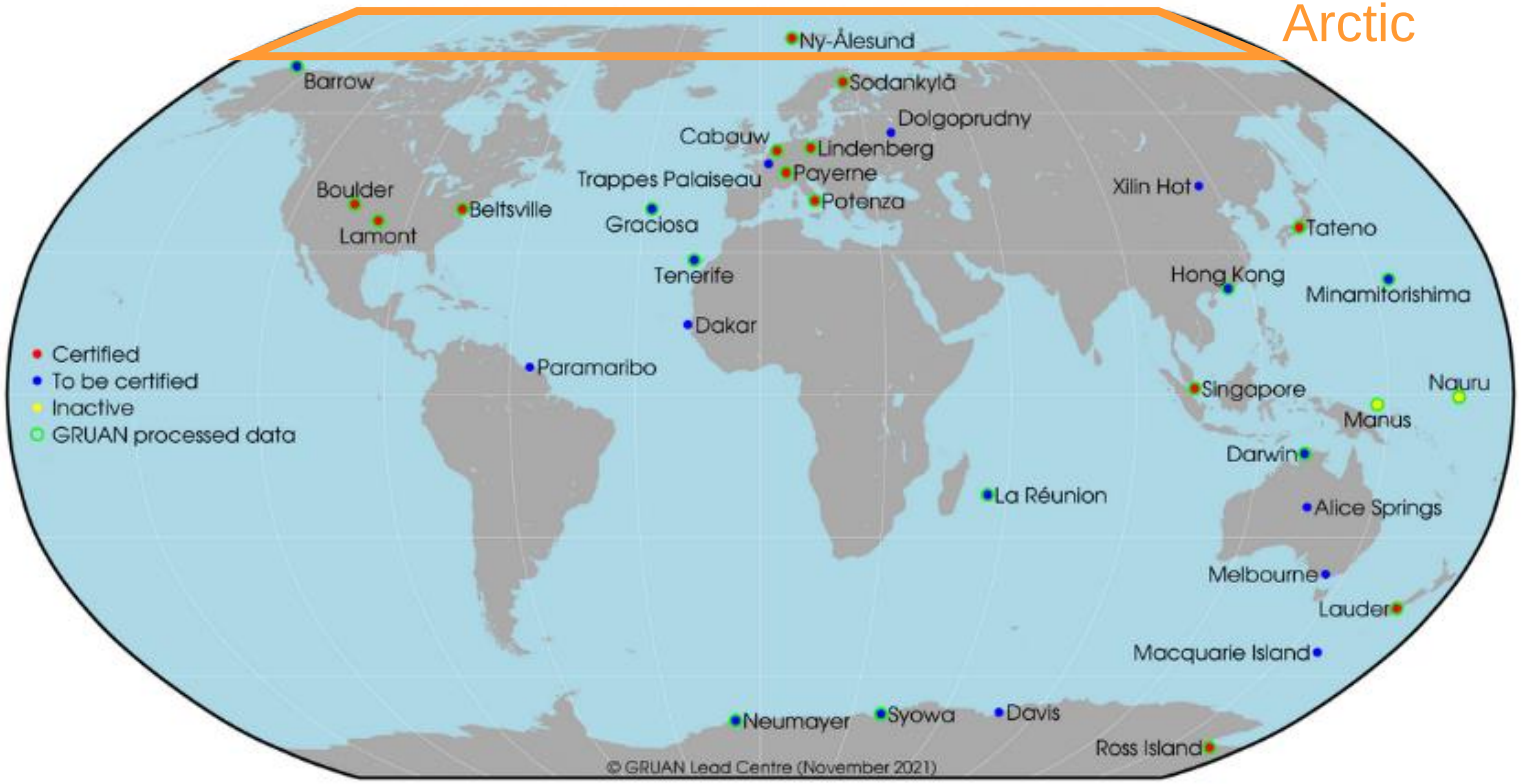
[1] Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research
[2] GRUAN Lead Centre, DWD
[3] University of Freiburg, Germany

GRUAN ICM-14
28 Nov -2 Dec 2022, La Réunion

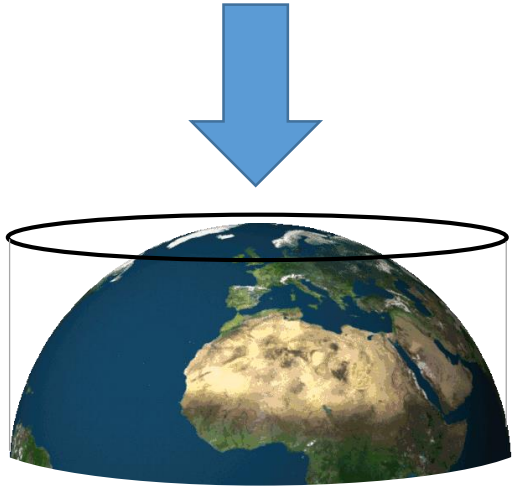
Photo: Lianna Nixon

The GRUAN View on the World

GRUAN Sites

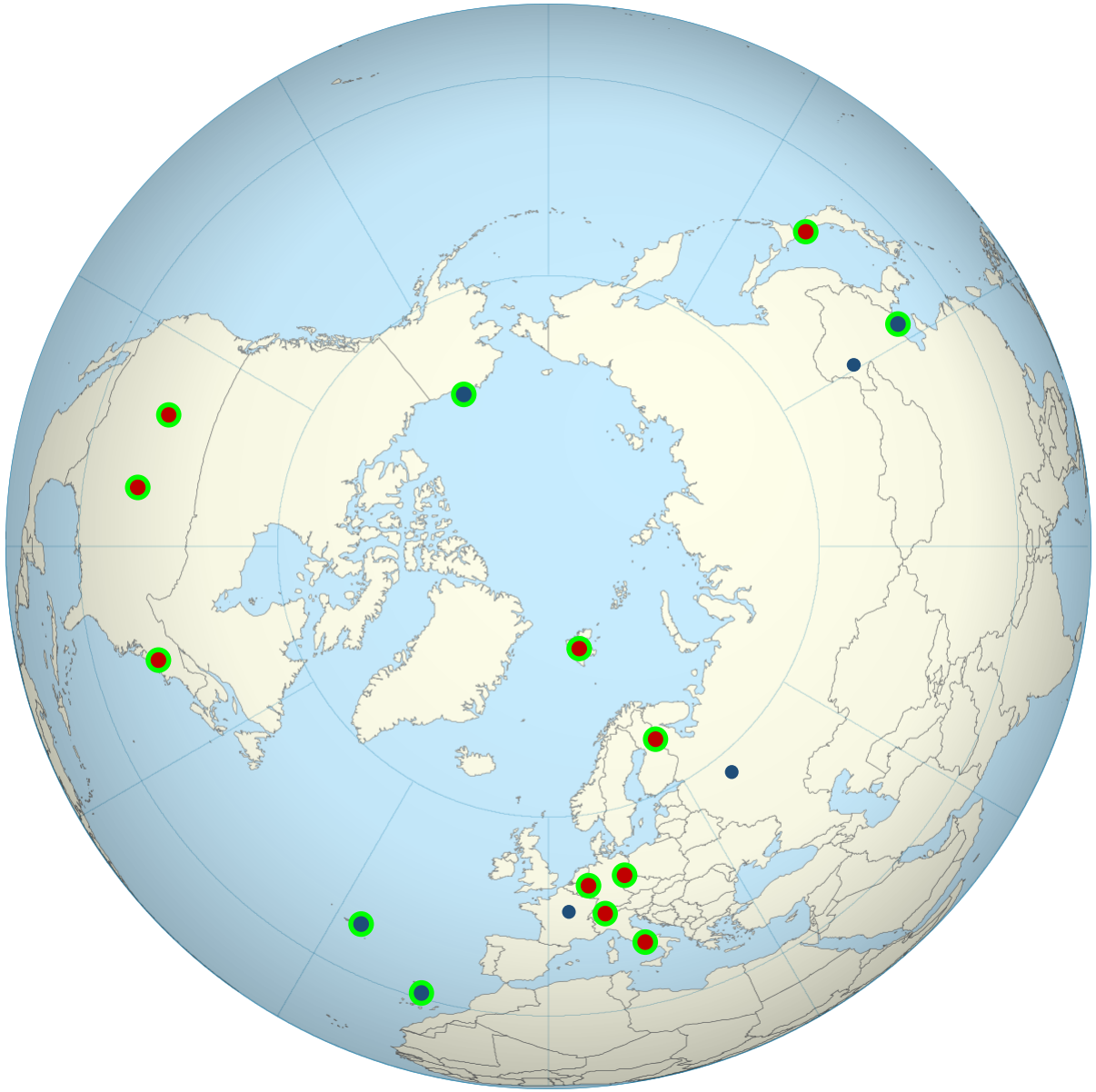


change of perspective

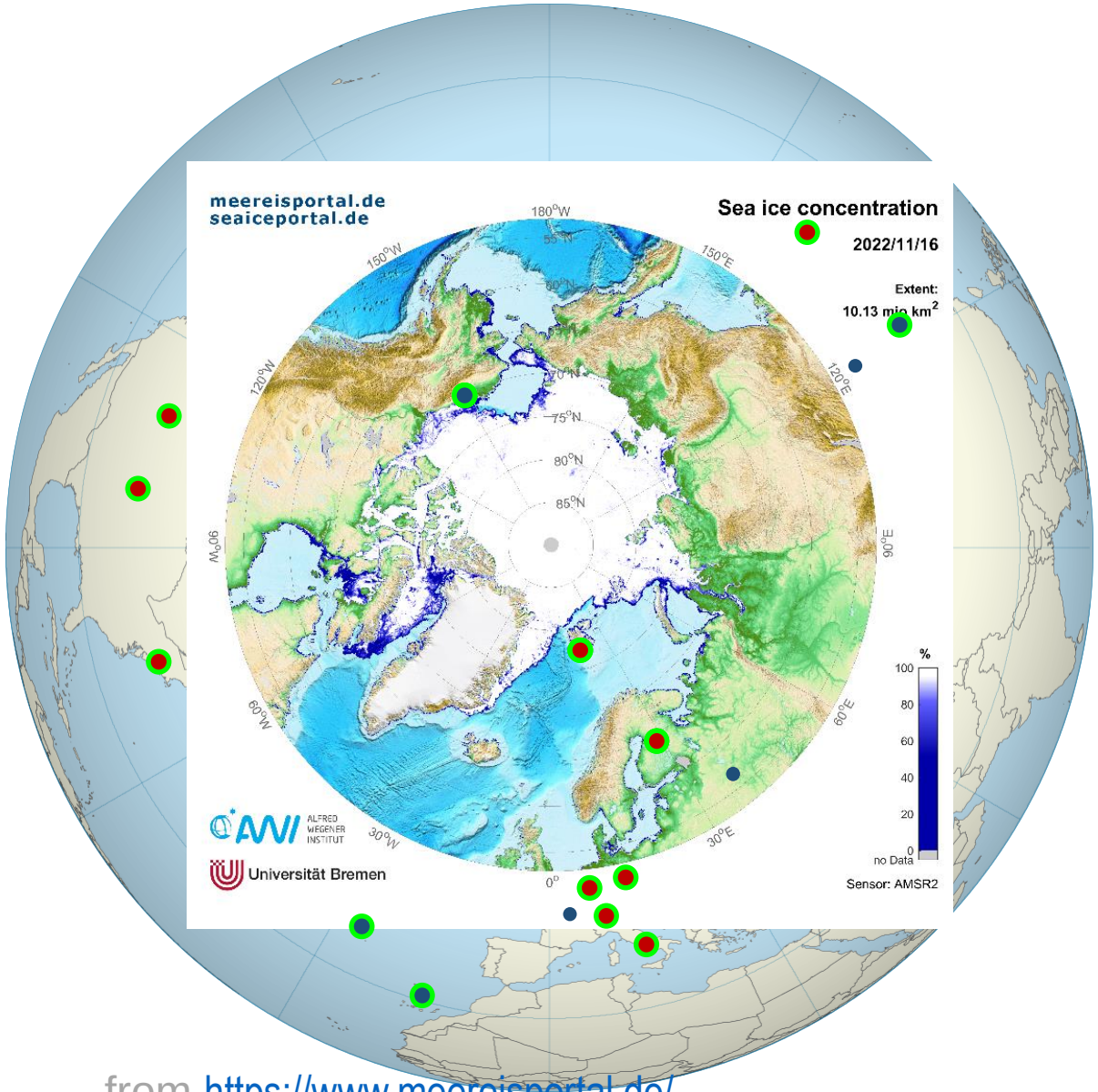


https://commons.wikimedia.org/wiki/File:Rotating_earth_(huge).gif

Change of Perspective: The Arctic View



Change of Perspective: The Arctic View

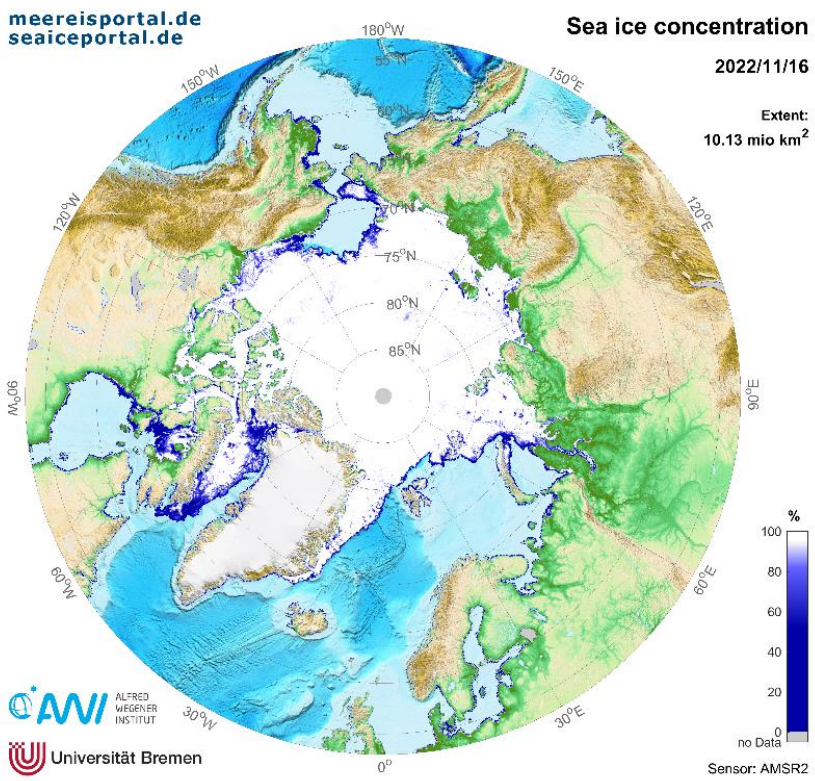


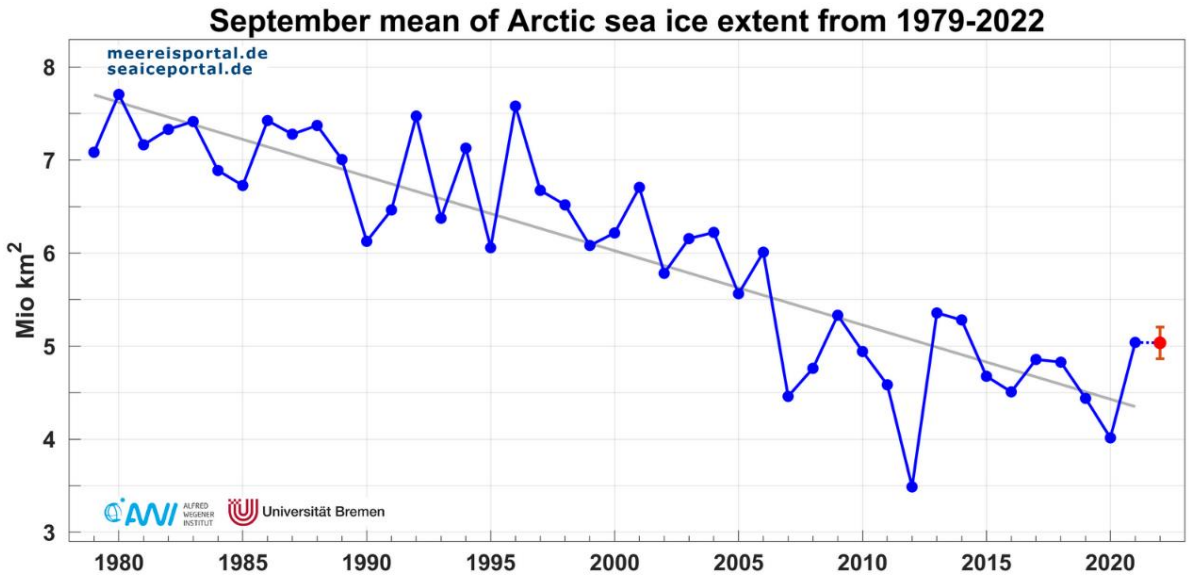
from https://www.meereisportal.de/

Change of Perspective: The Arctic View

The Arctic has warmed nearly four times faster than the globe since 1979.

Rantanen et al. (Nature, 2022)

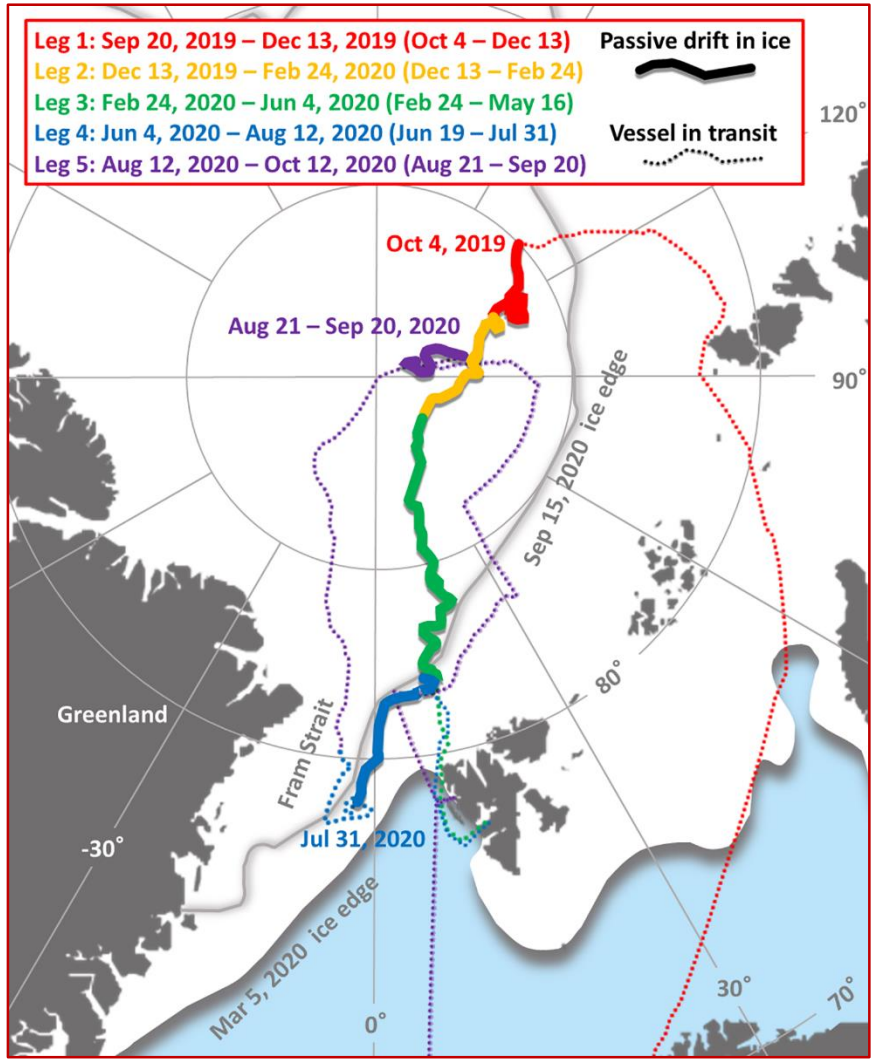




Arctic sea ice is dramatically decreasing.

from https://www.meereisportal.de/ *en/archive/2022-kurzmeldungen-gesamttexte/arctic-sea-ice-retreat-continues/*

MOSAiC - Multidisciplinary drifting Observatory for the Study of Arctic Climate



from Shupe et al. (2022)
'Overview of the MOSAiC expedition: Atmosphere'
doi:10.1525/elementa.2021.00060

→ Expedition with research vessel Polarstern frozen into the ice, to follow the transpolar drift for an entire annual cycle

October 2019 – September 2020

- 300 researchers of 20 countries
- observations of atmosphere, ocean, sea ice, ecosystem and biogeochemical cycle
- https://mosaic-expedition.org

MOSAiC
International Arctic Drift Expedition

> 1500 radiosondes launched

Multidisciplinary drifting Observatory for the Study of Arctic Climate

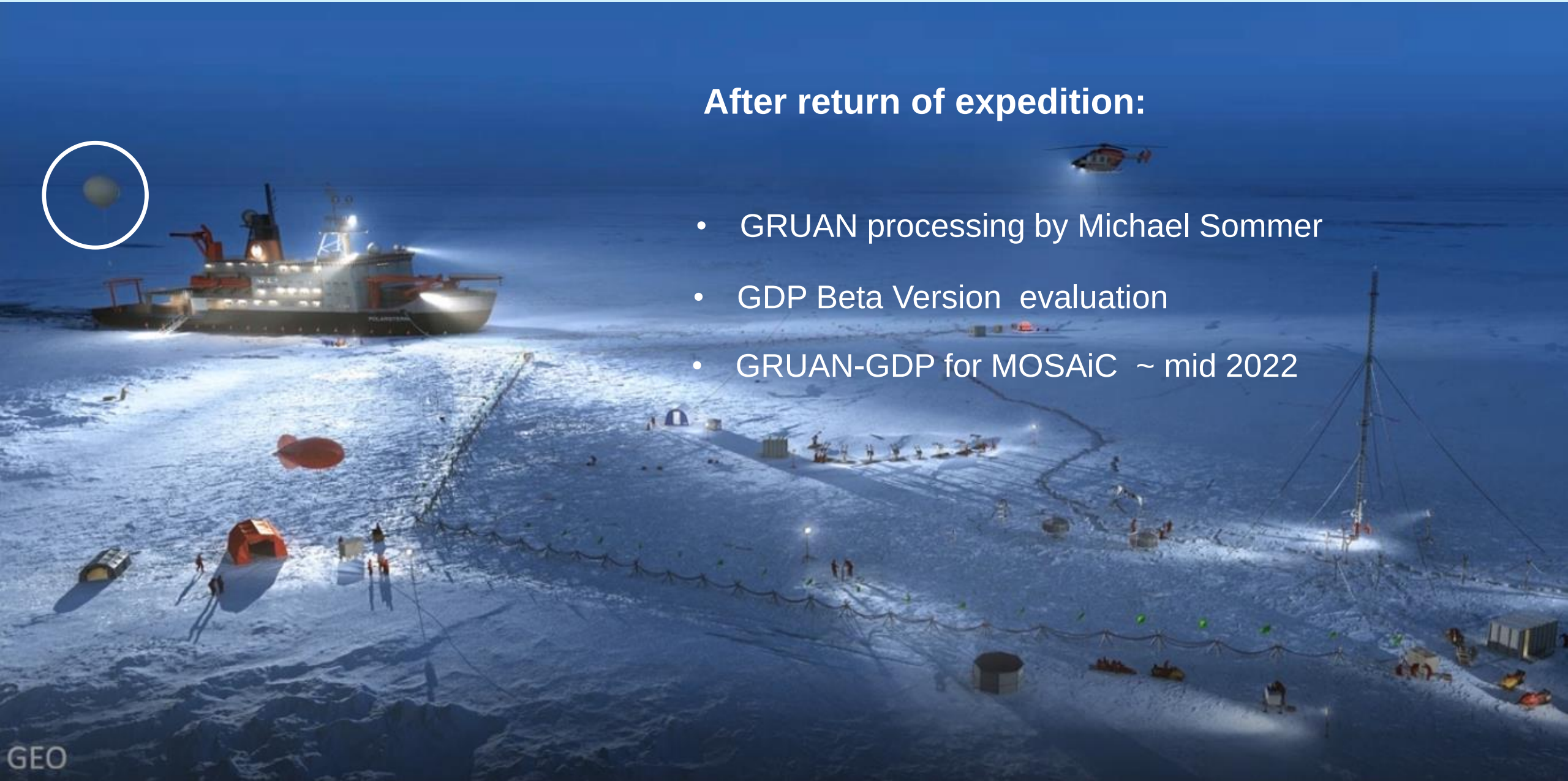
MOSAiC International Arctic Drift Expedition

- 6-hourly radiosondes [00, 06, 12, 18 UTC]
- following GRUAN standards:
  - Standard humidity chamber (SHC)
  - metadata documentation / data files
  - data collection with RSLaunchClient

Photo: H.Deckelmann

Multidisciplinary drifting Observatory for the Study of Arctic Climate

MOSAiC
International Arctic Drift Expedition

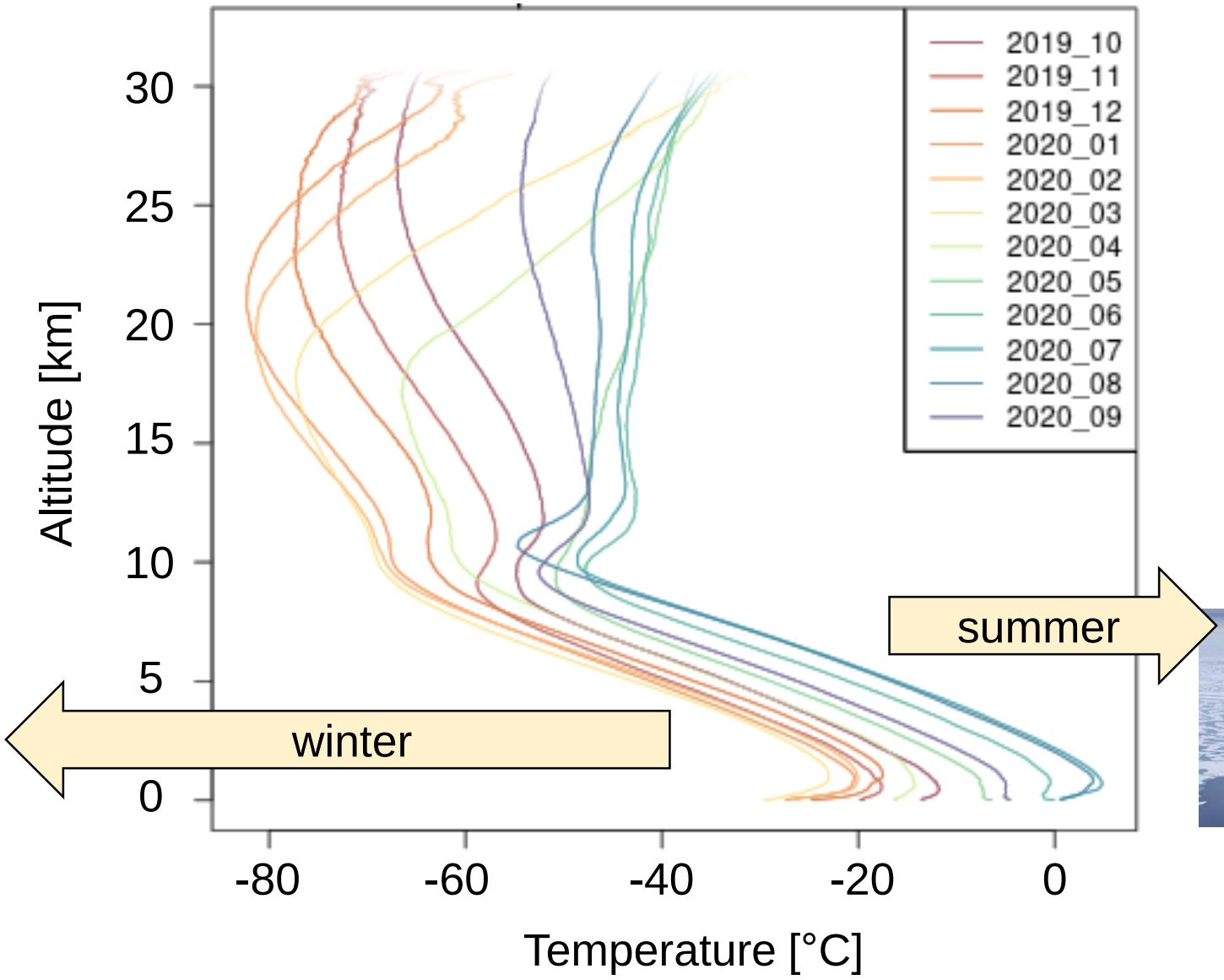


After return of expedition:

- GRUAN processing by Michael Sommer
- GDP Beta Version evaluation
- GRUAN-GDP for MOSAiC ~ mid 2022

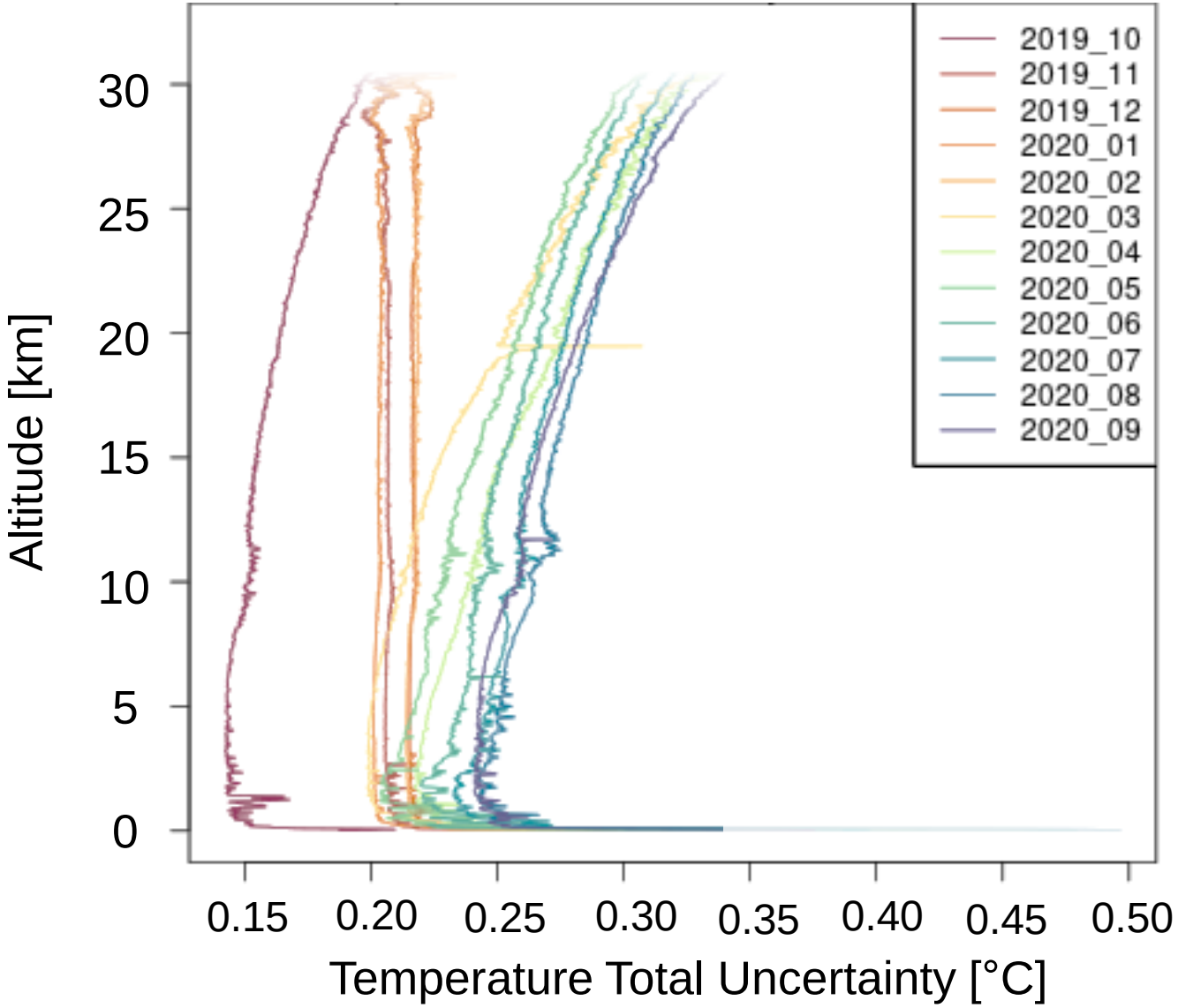
Monthly Mean Temperature Profiles

polar night

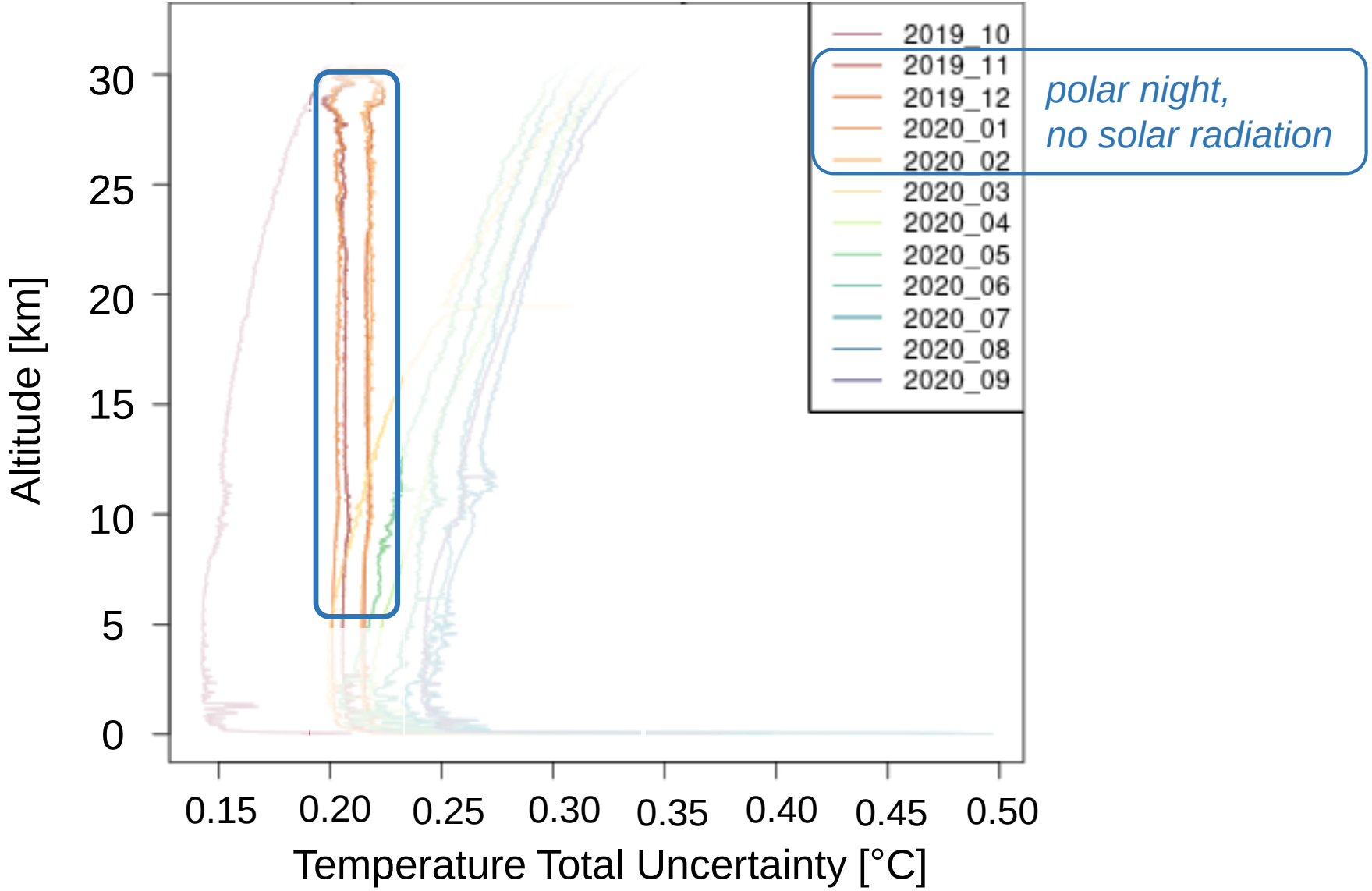


polar day

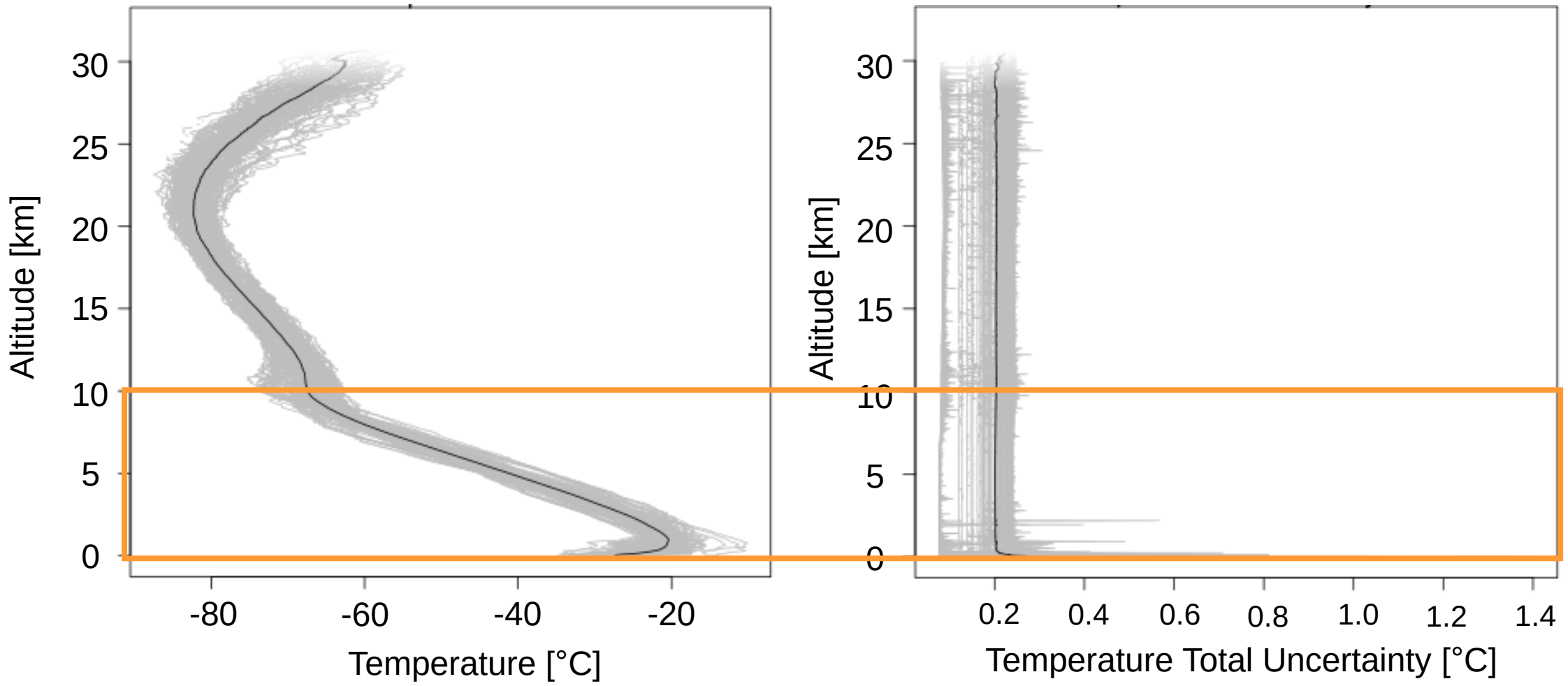
Monthly Mean Temperature Uncertainty Profiles



Monthly Mean Temperature Uncertainty Profiles

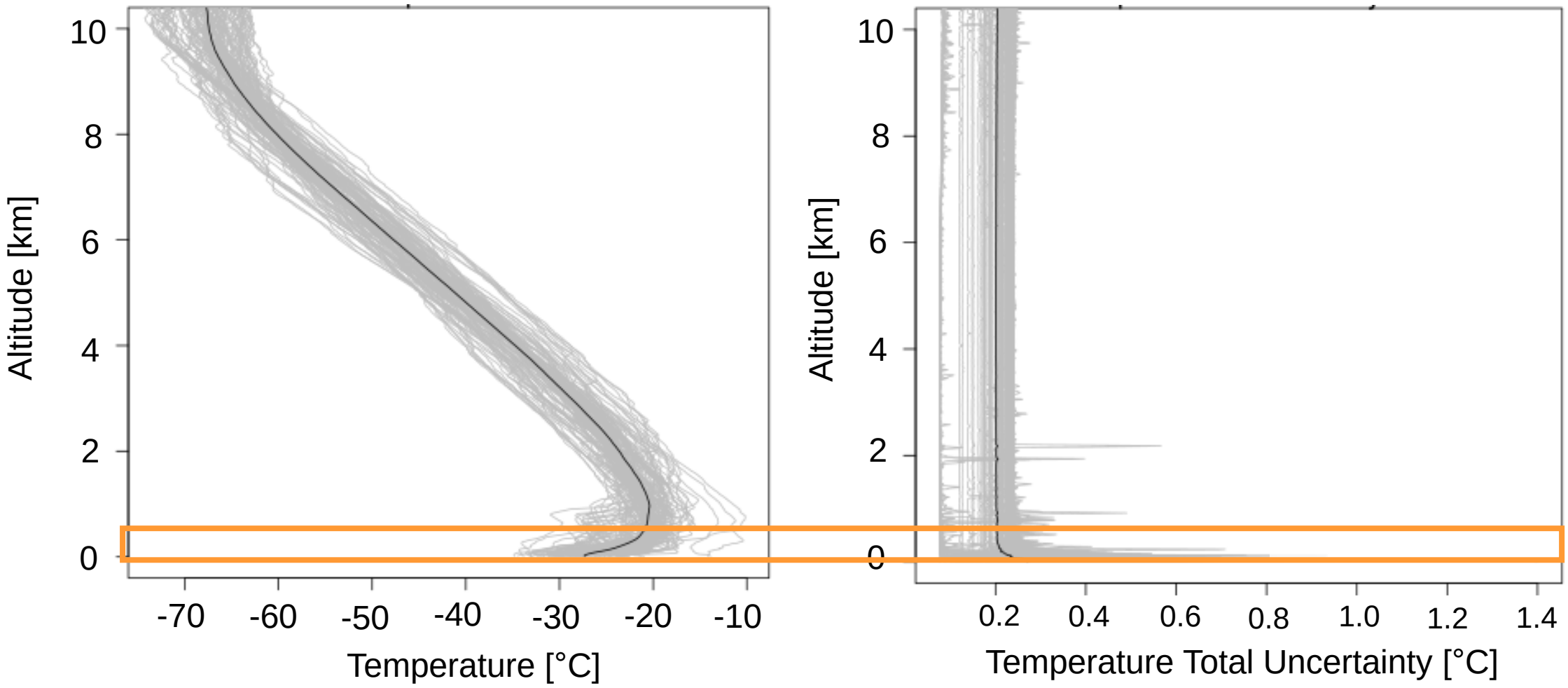


Temperature in January



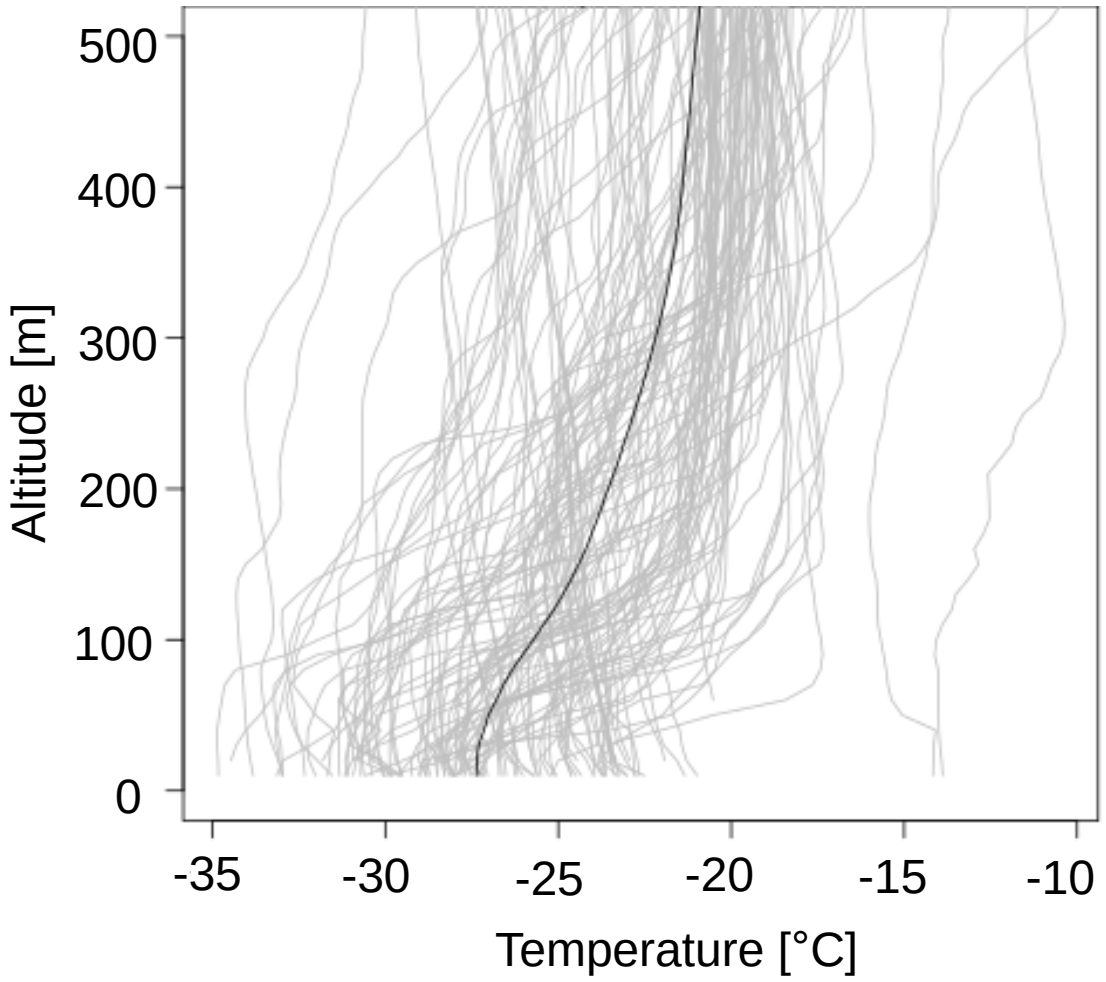
Temperature in January

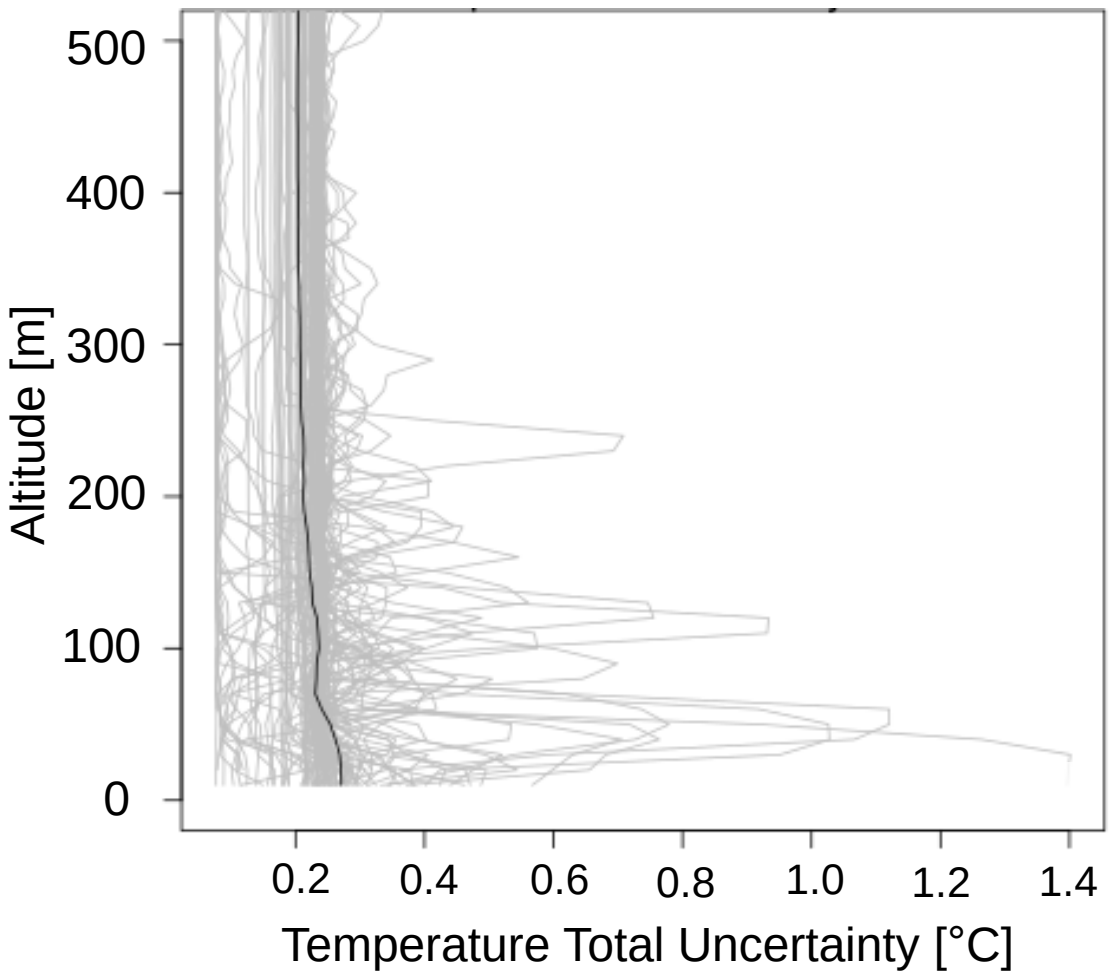
- troposphere -

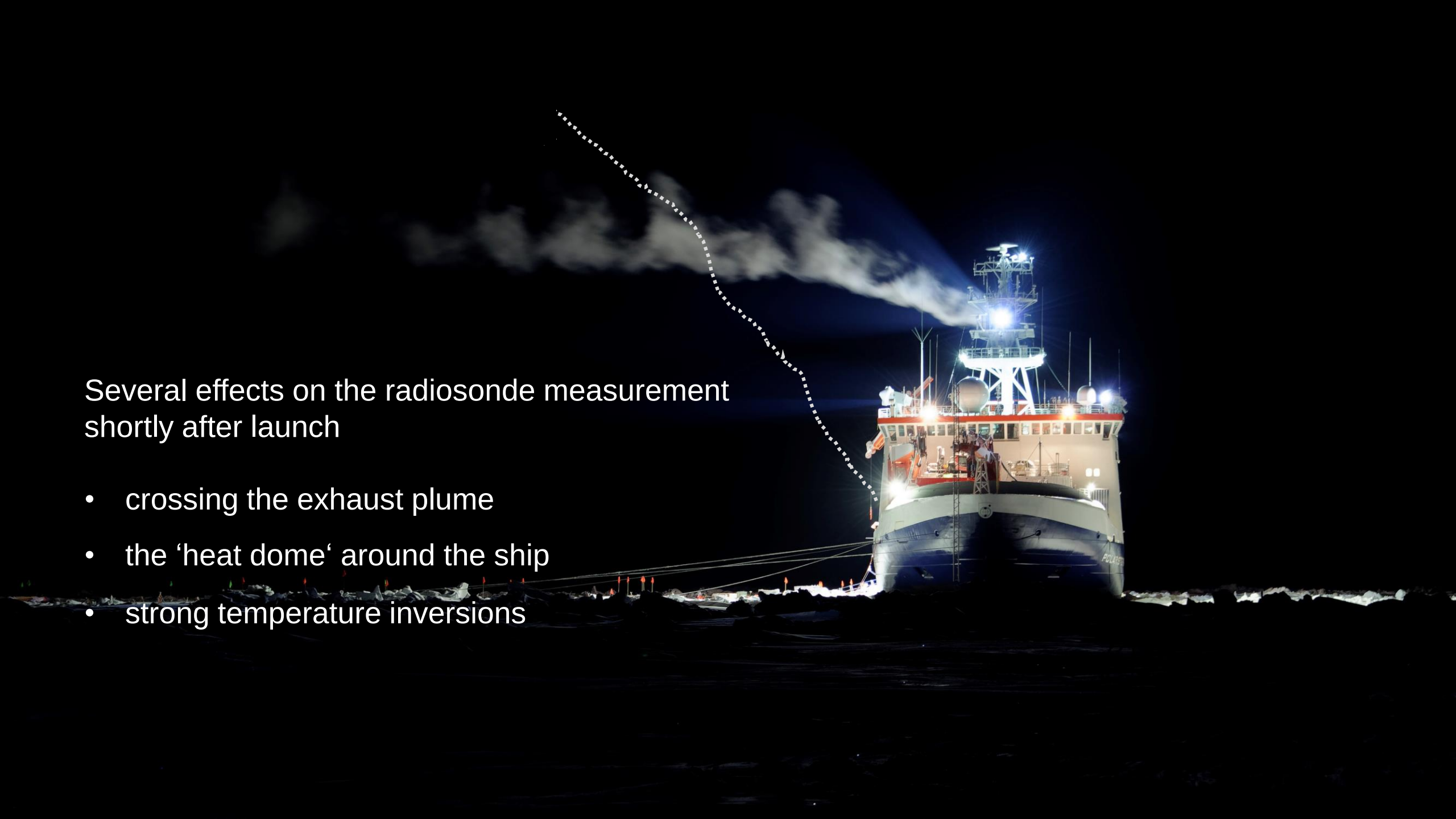


Temperature in January

- lowermost 500 m -



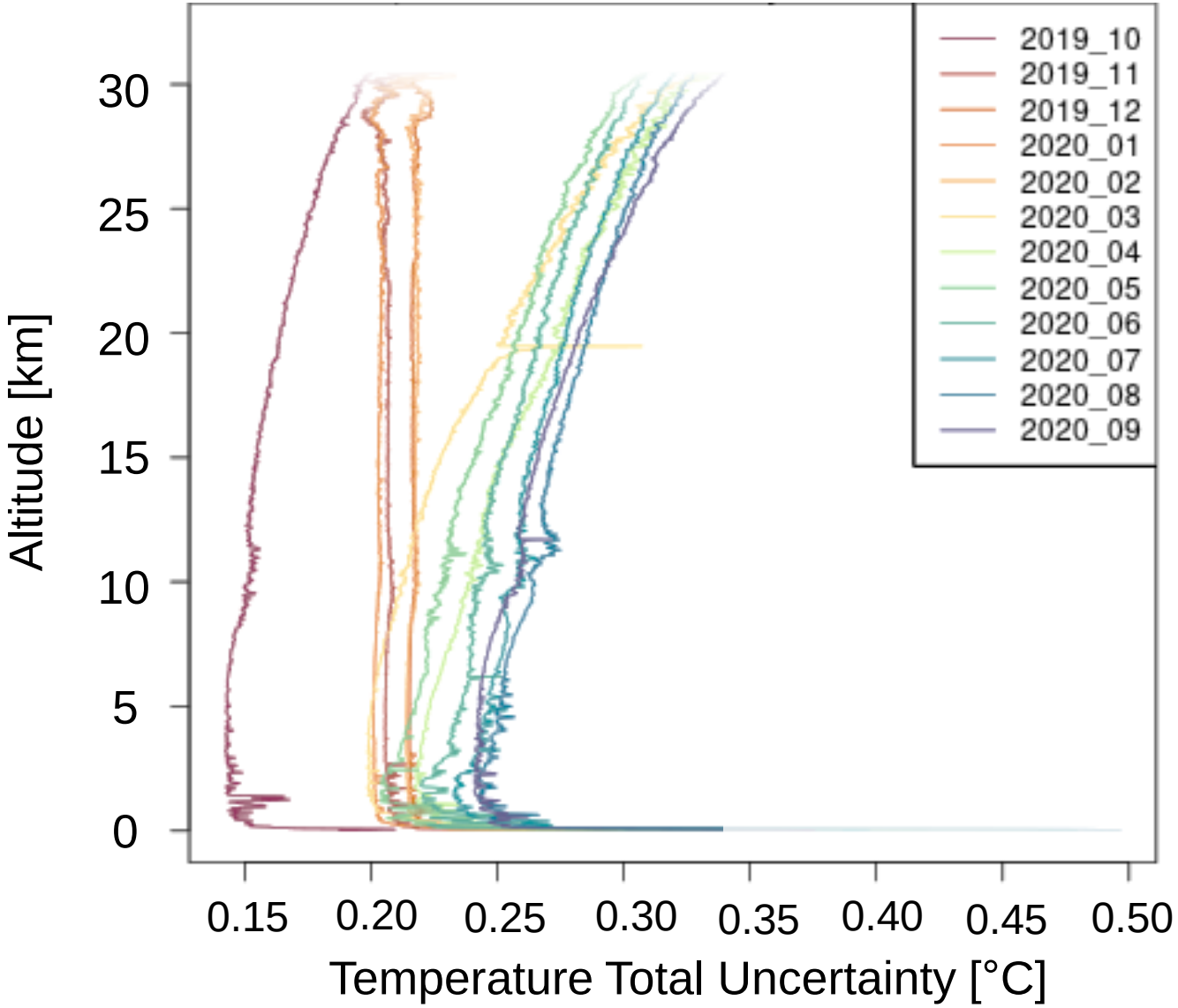




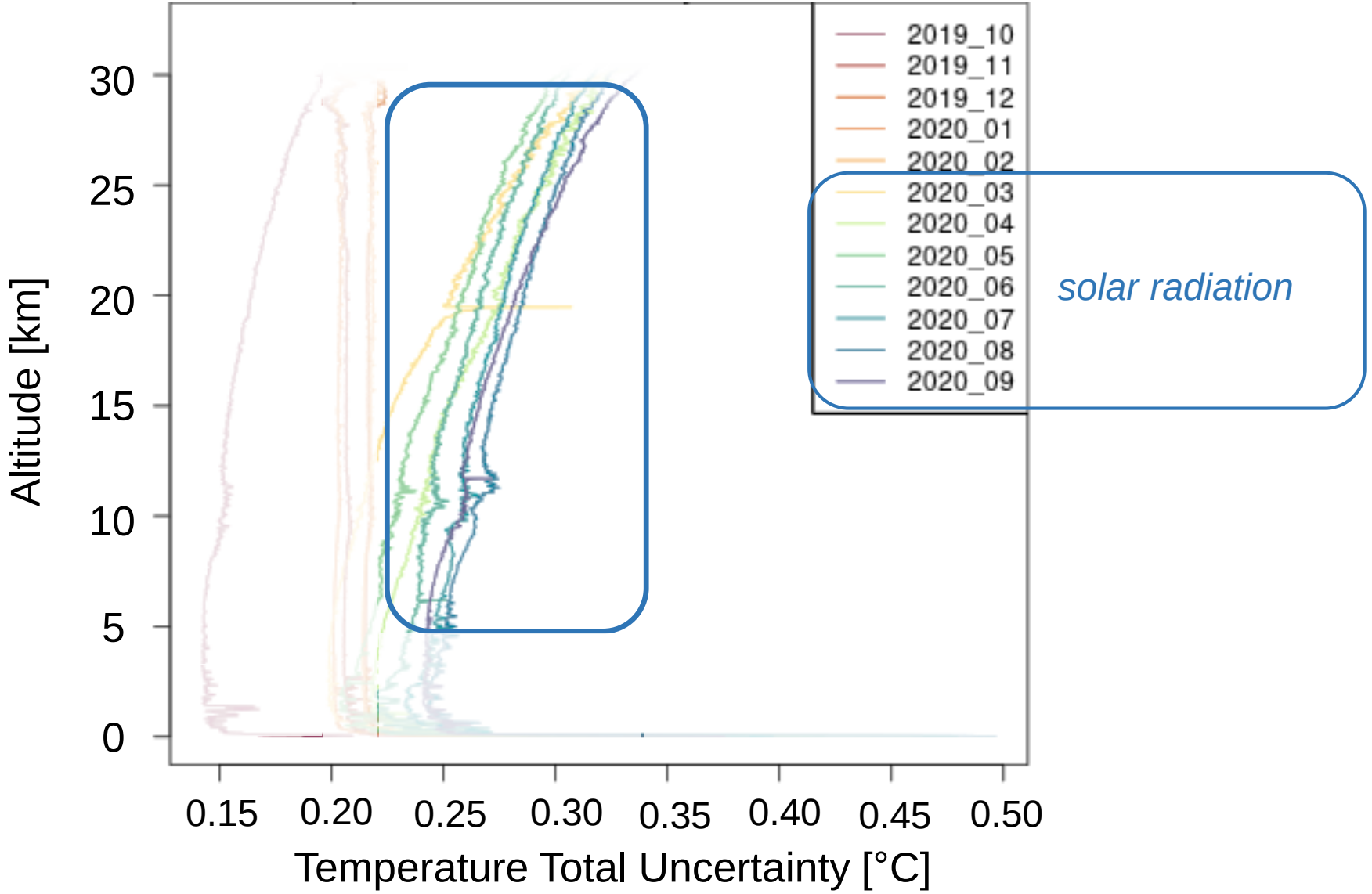
Several effects on the radiosonde measurement shortly after launch

- crossing the exhaust plume
- the ‘heat dome‘ around the ship
- strong temperature inversions

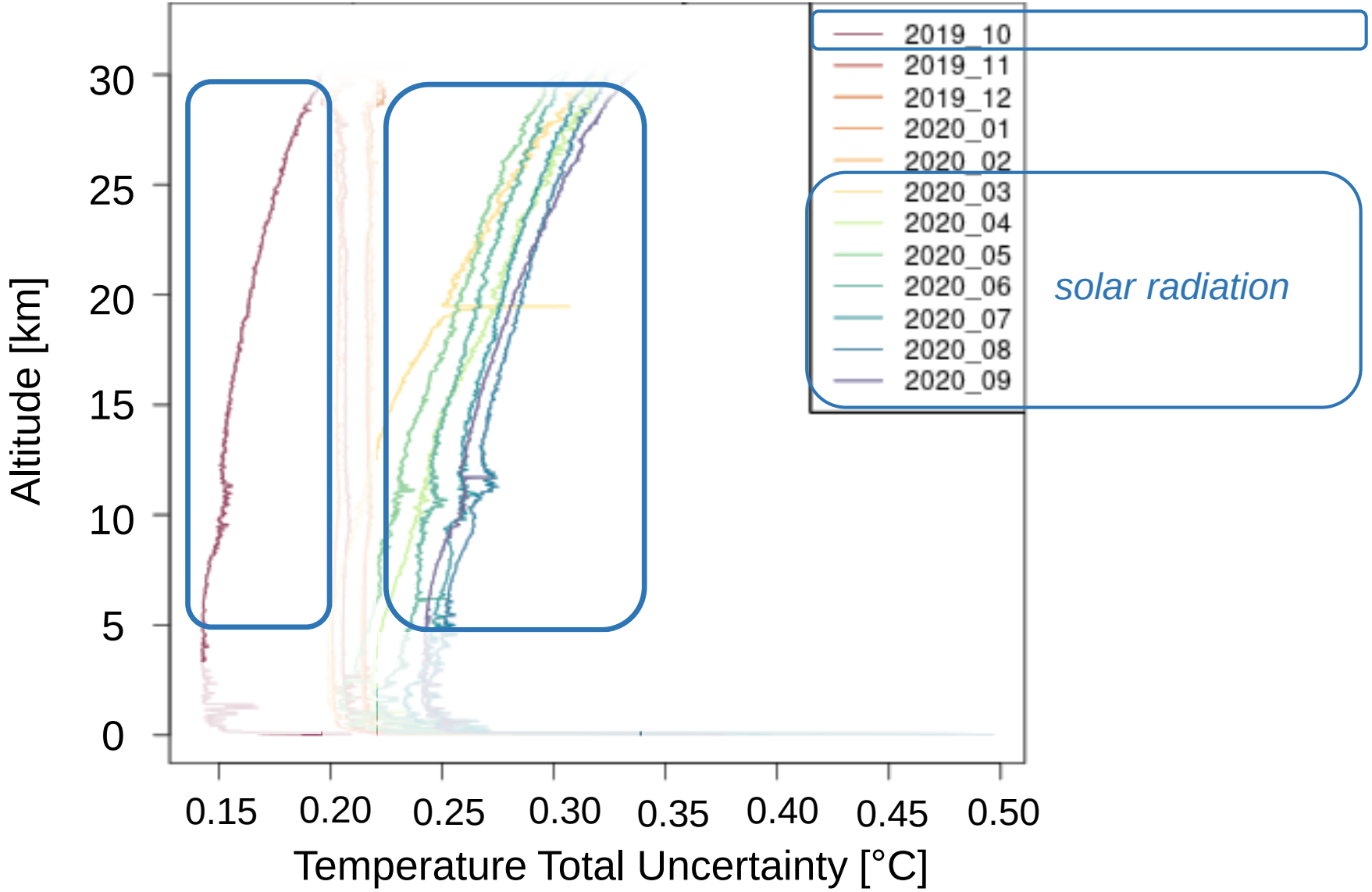
Monthly Mean Temperature Uncertainty Profiles



Monthly Mean Temperature Uncertainty Profiles

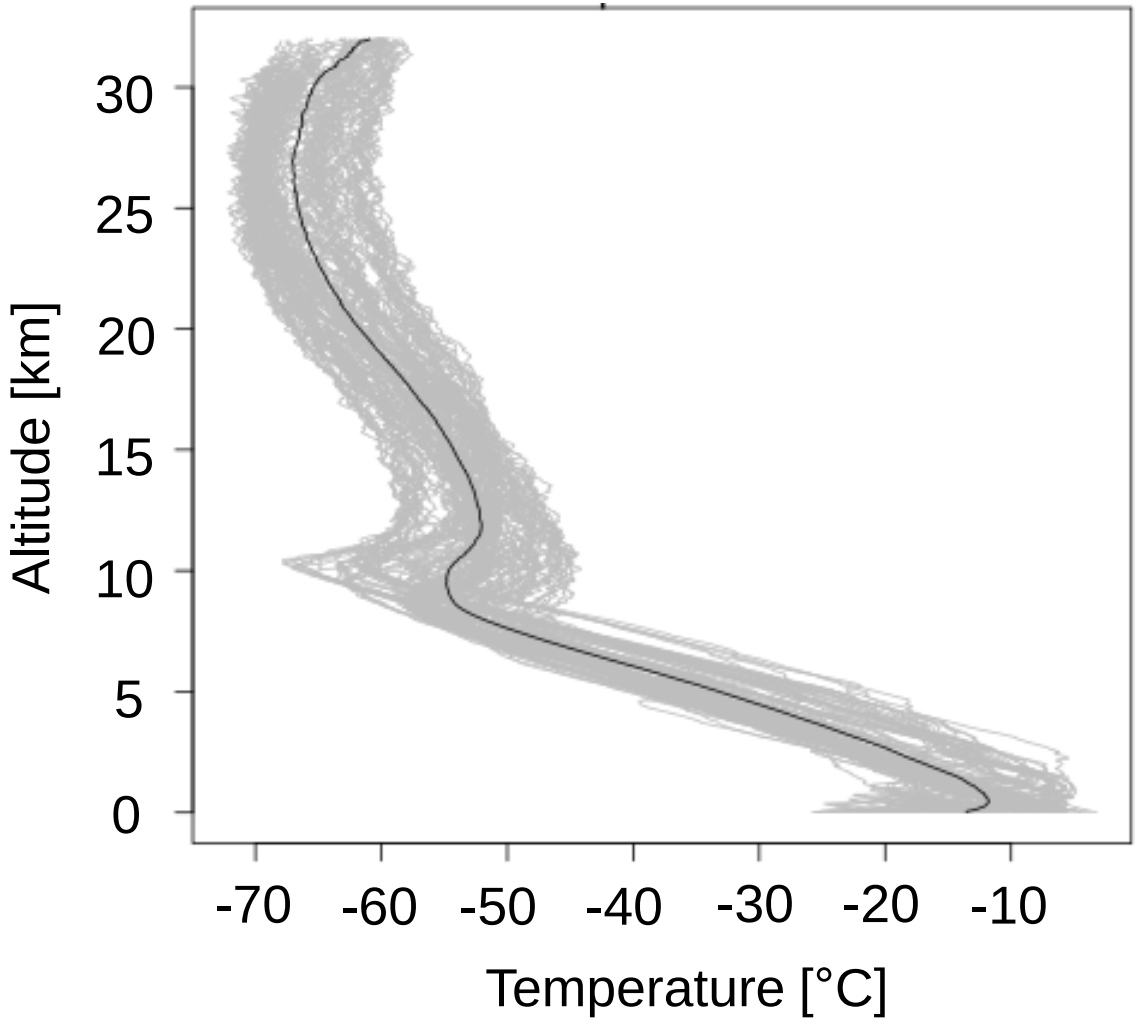


Monthly Mean Temperature Uncertainty Profiles

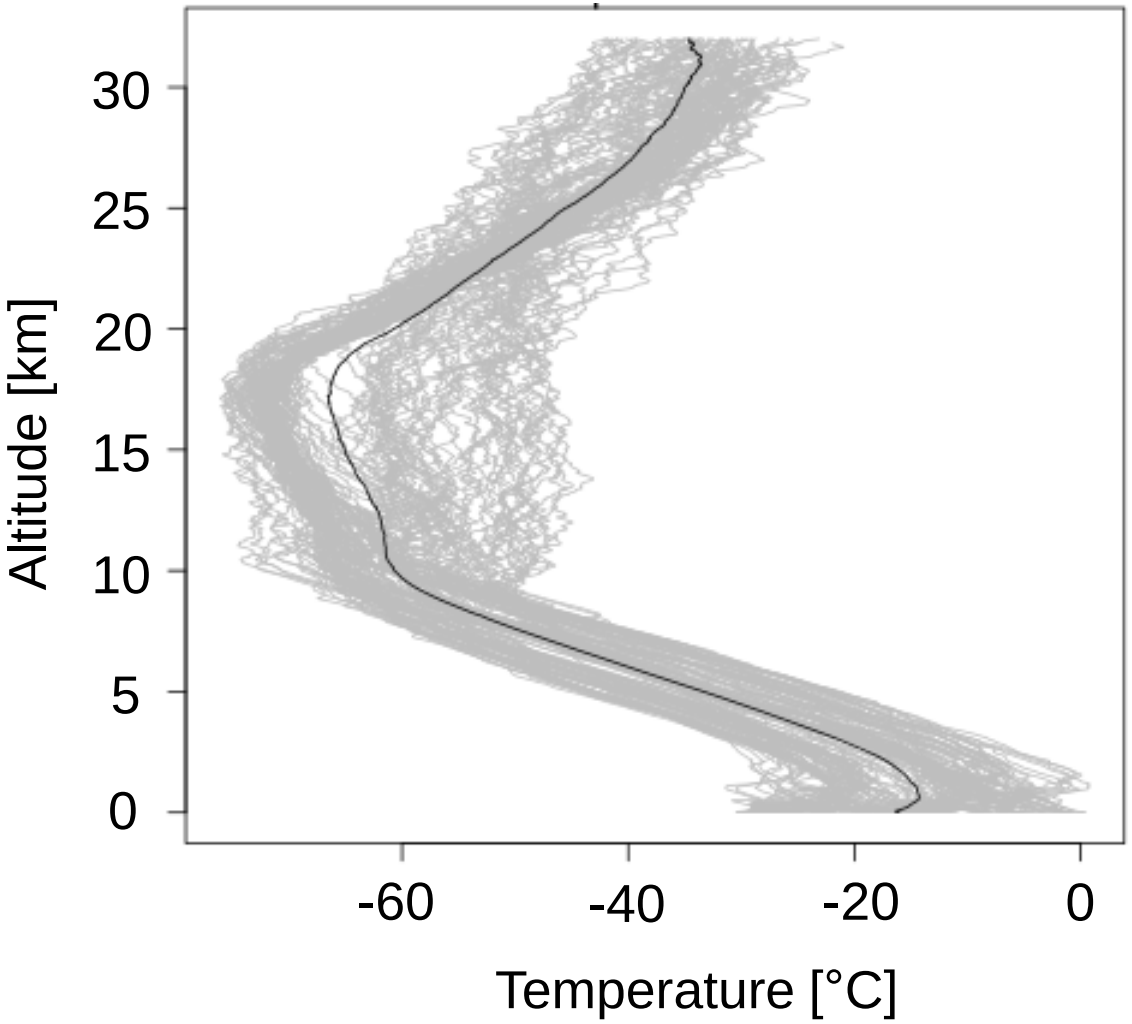


Temperature in …

October 2019

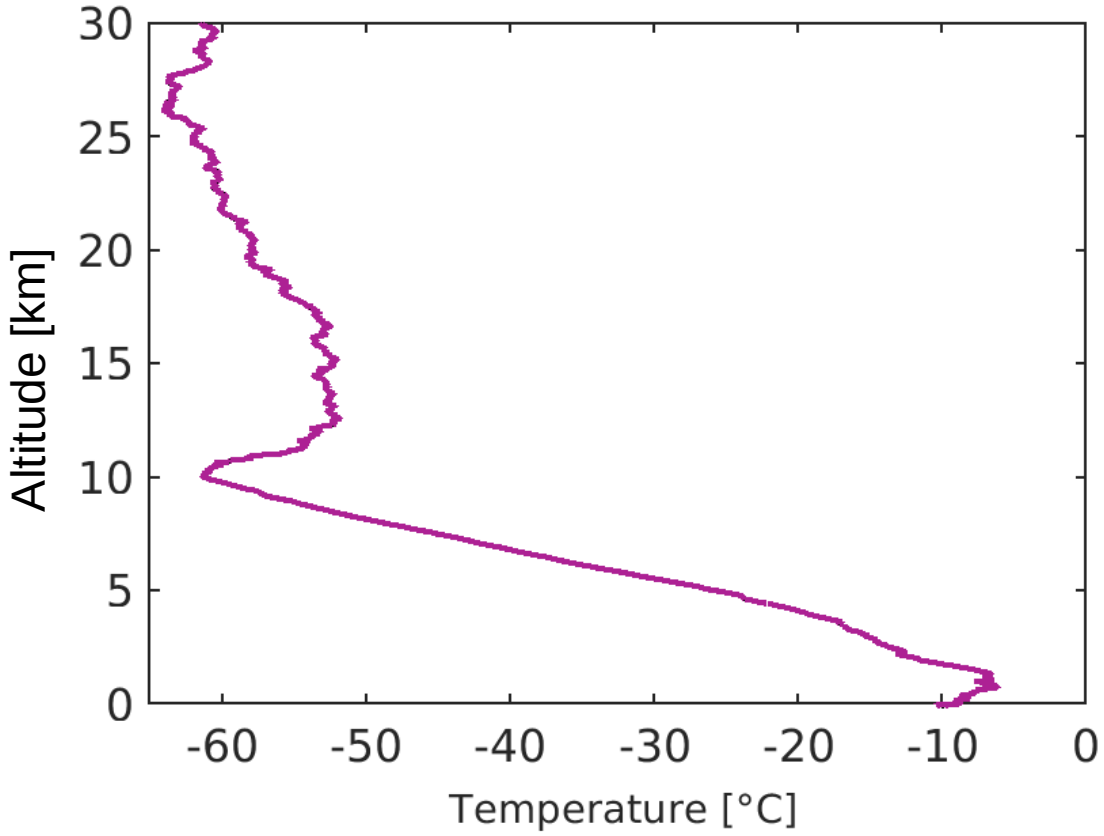


April 2020

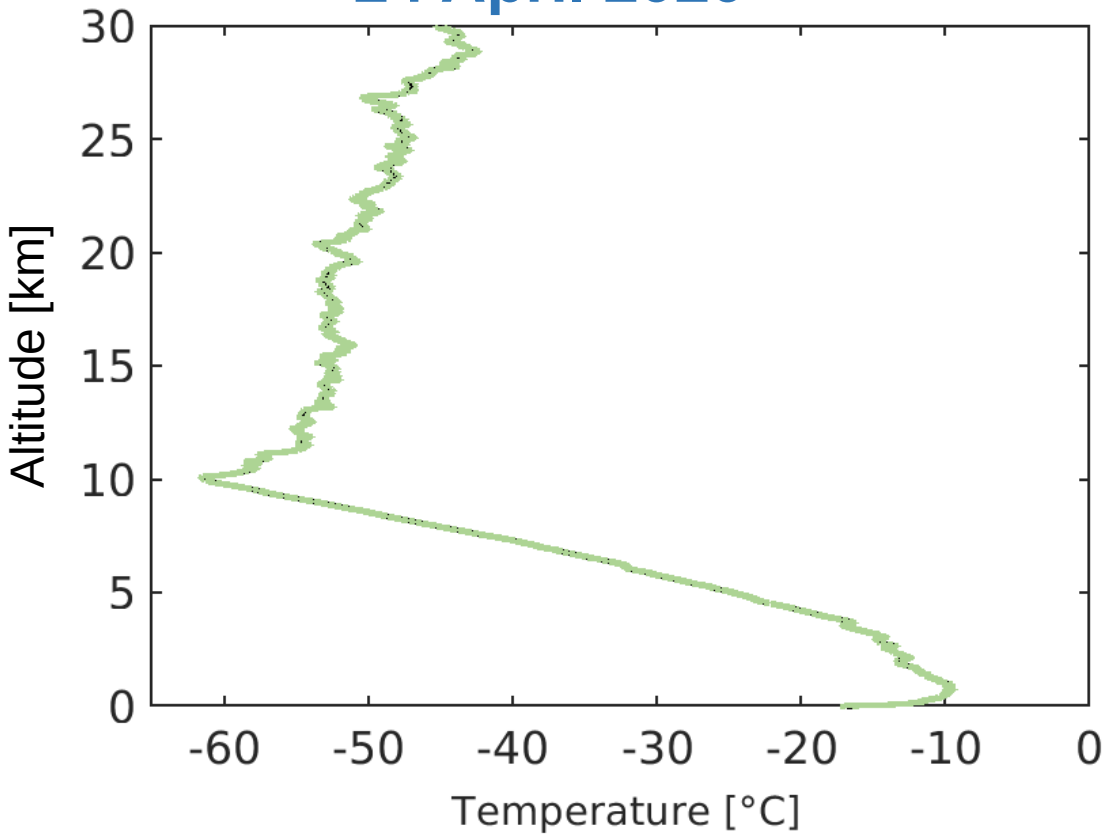


Example: Individual Temperature Profiles

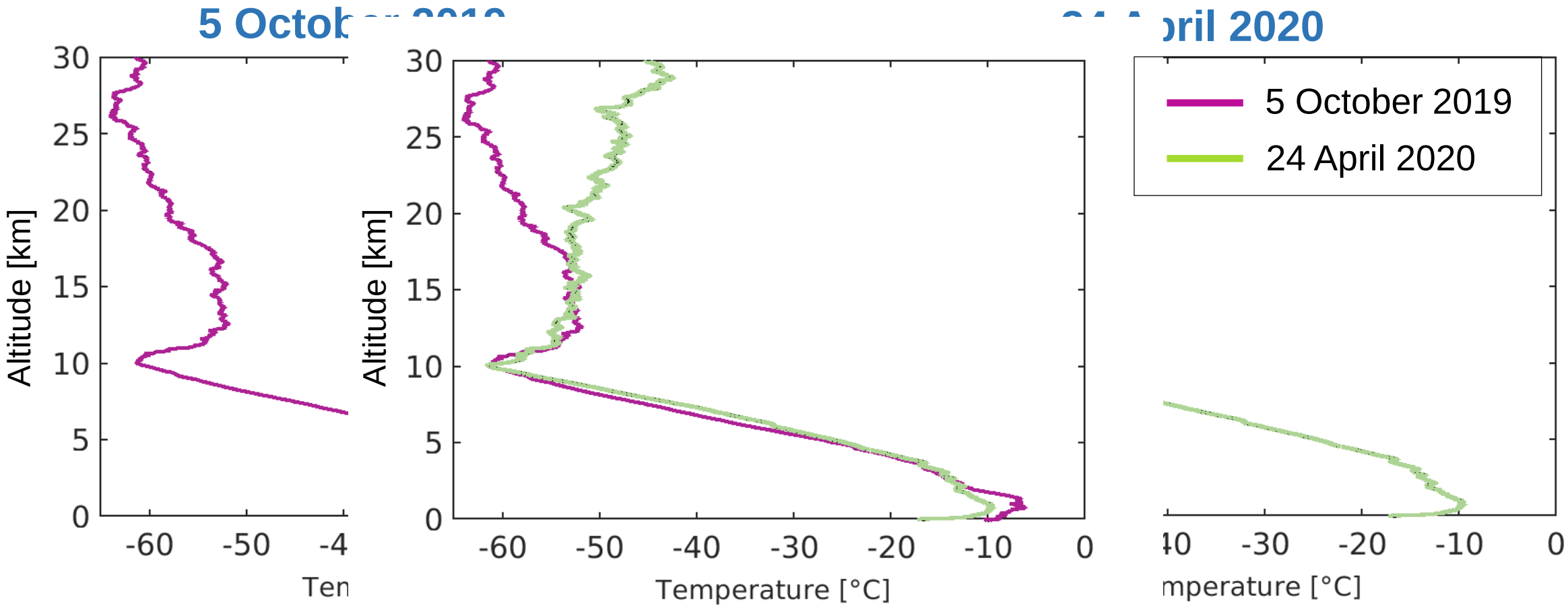
5 October 2019



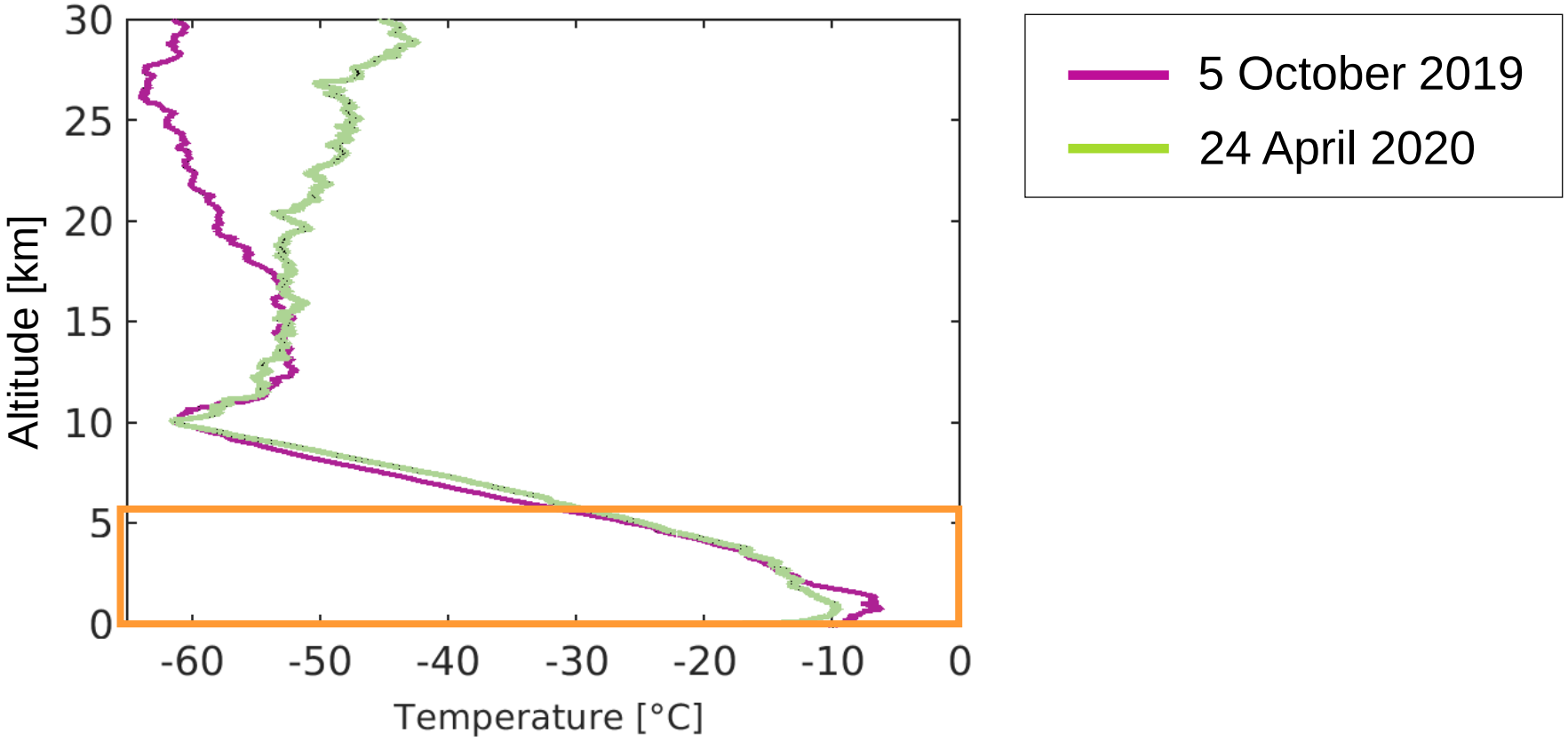
24 April 2020



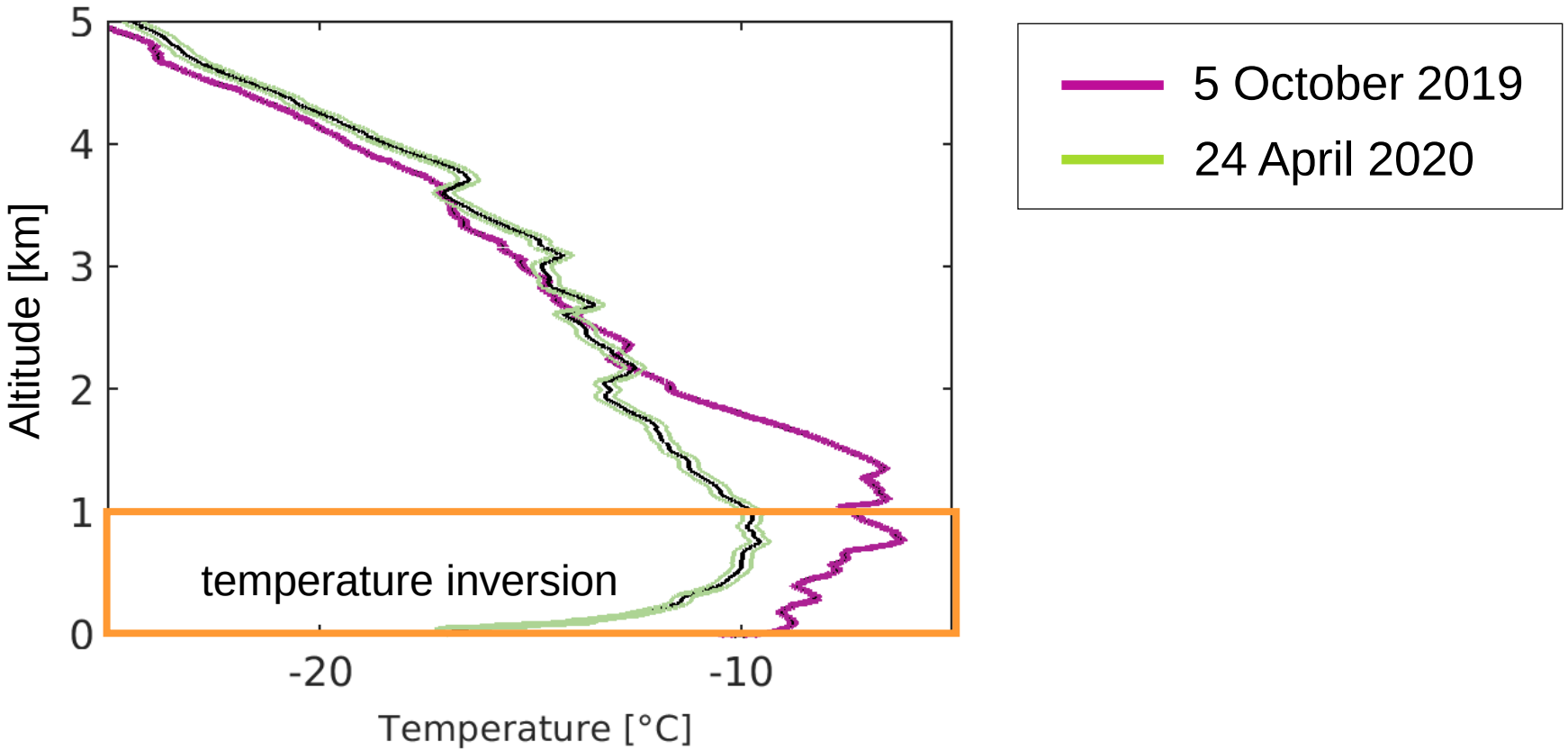
Example: Individual Temperature Profiles



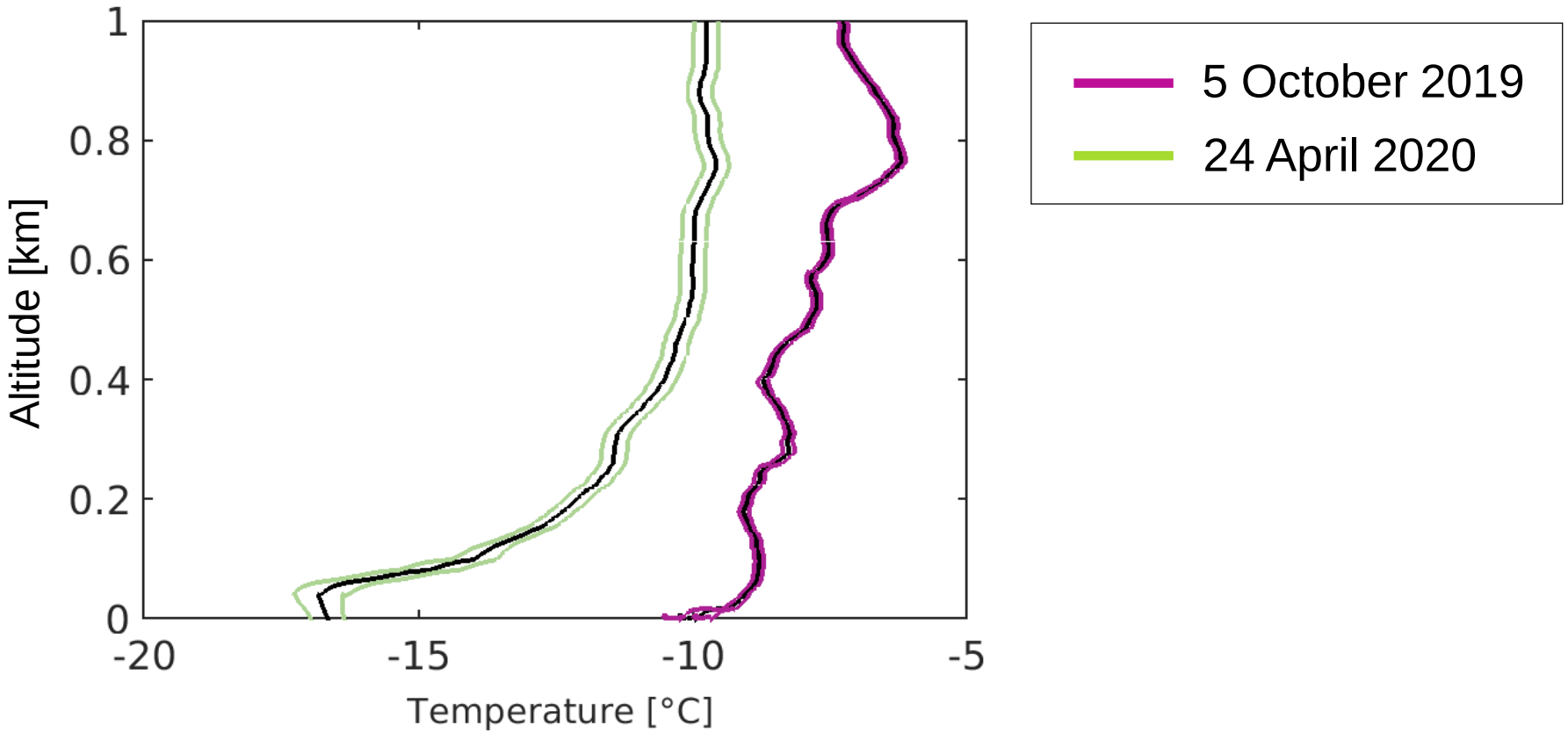
Example: Individual Temperature Profiles



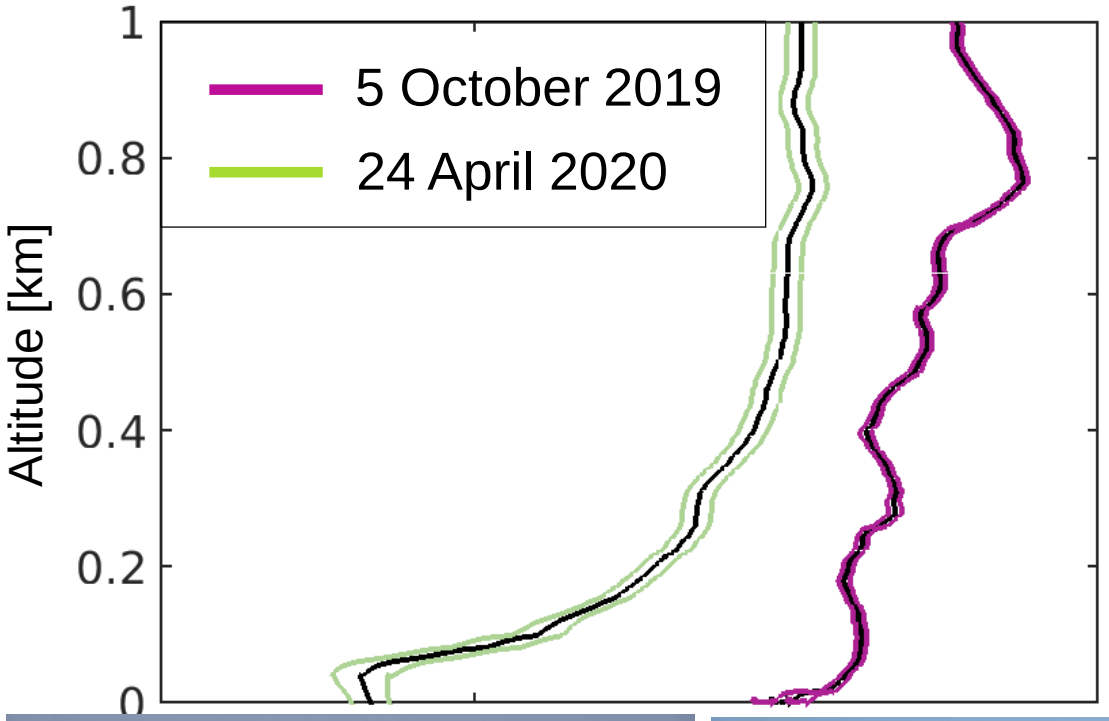
Example: Individual Temperature Profiles

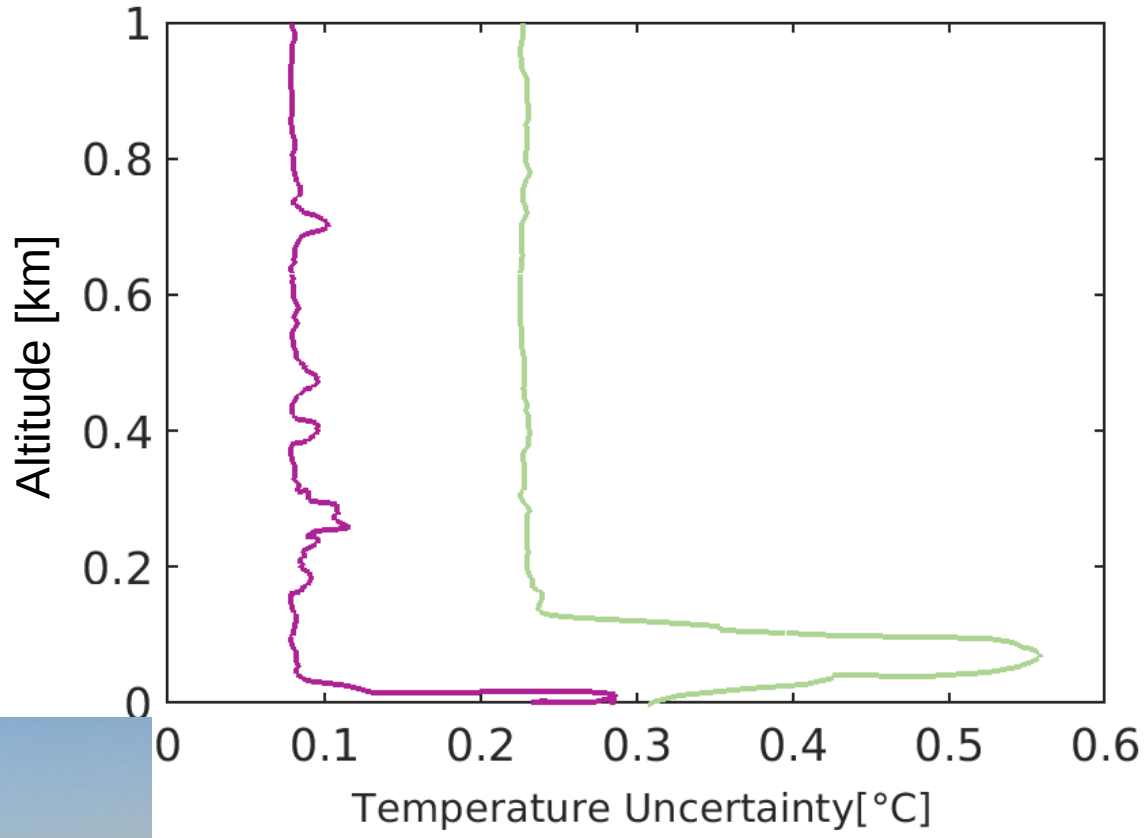


Example: Individual Temperature Profiles



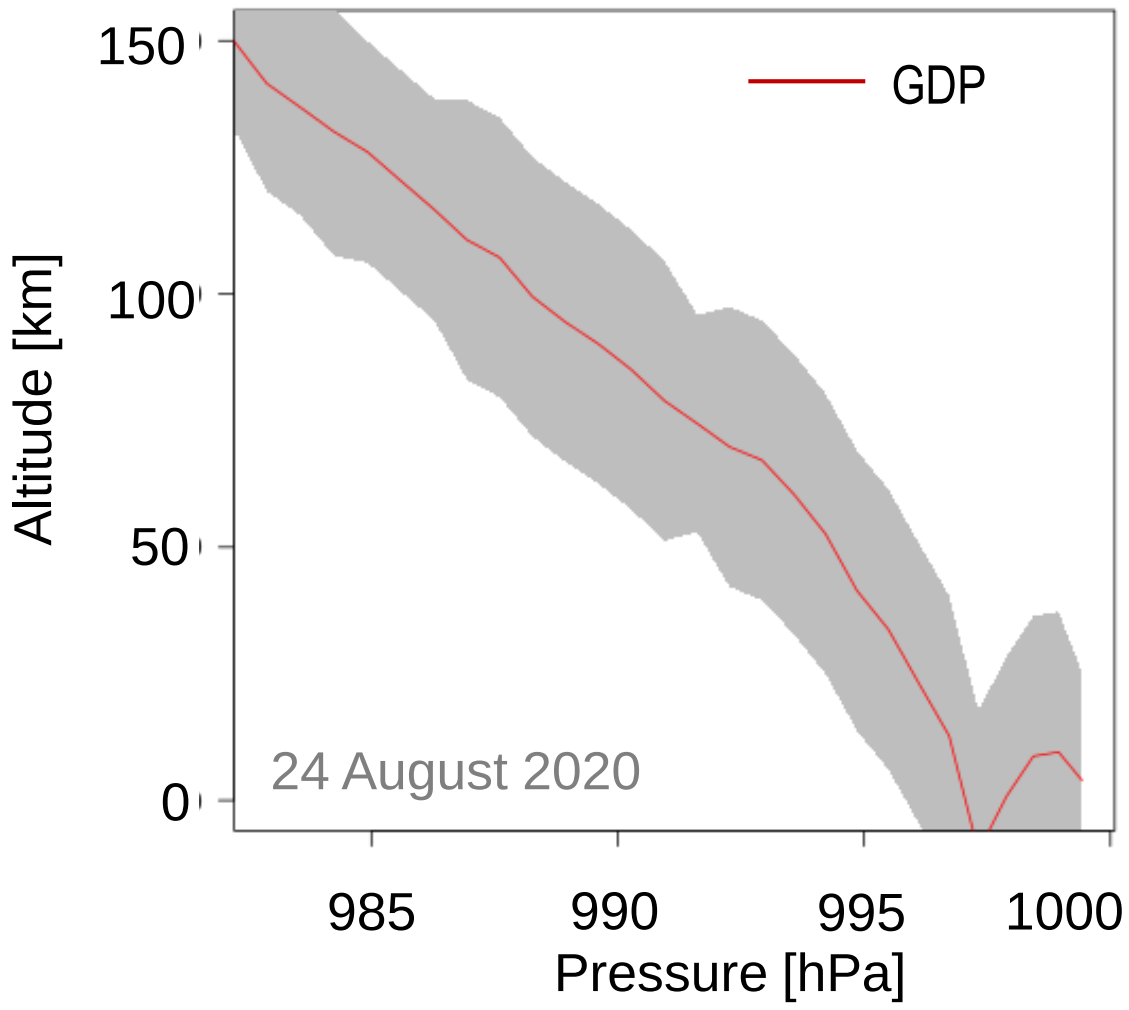
Example: Individual Temperature Profiles





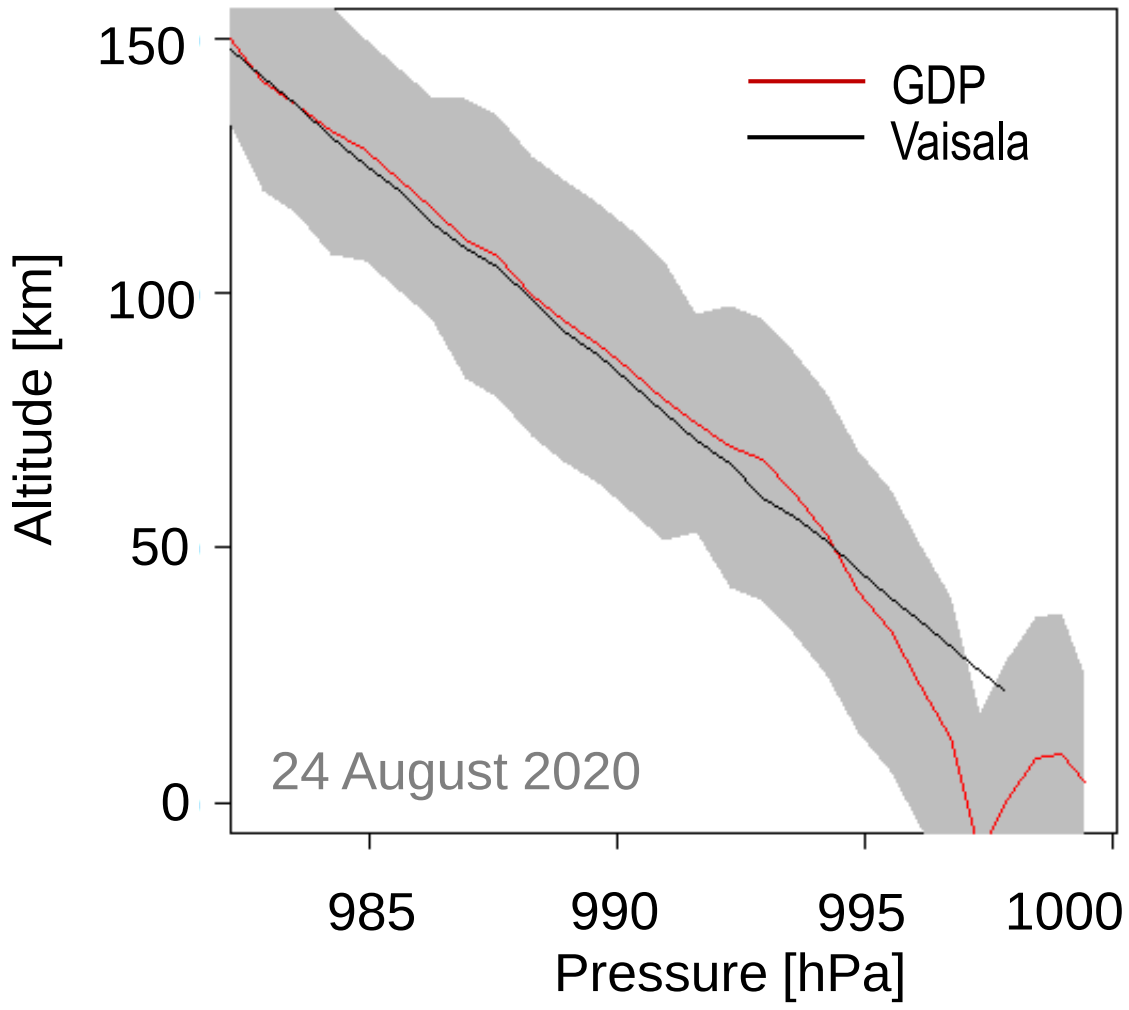
Many scientists are interested in the Arctic boundary layer.

Altitude issue after the launch …



- altitude (from GNSS) not steadily increasing, sonde seems to drop down
- large uncertainty in altitude
- in some cases even altitude < 0 m

Altitude issue after the launch …



- altitude (from GNSS) not steadily increasing, sonde seems to drop down
- large uncertainty in altitude
- in some cases even altitude < 0 m

…Scientists working on boundary layer processes are likely to prefer the „easy“ Vaisala data product

At the North Pole

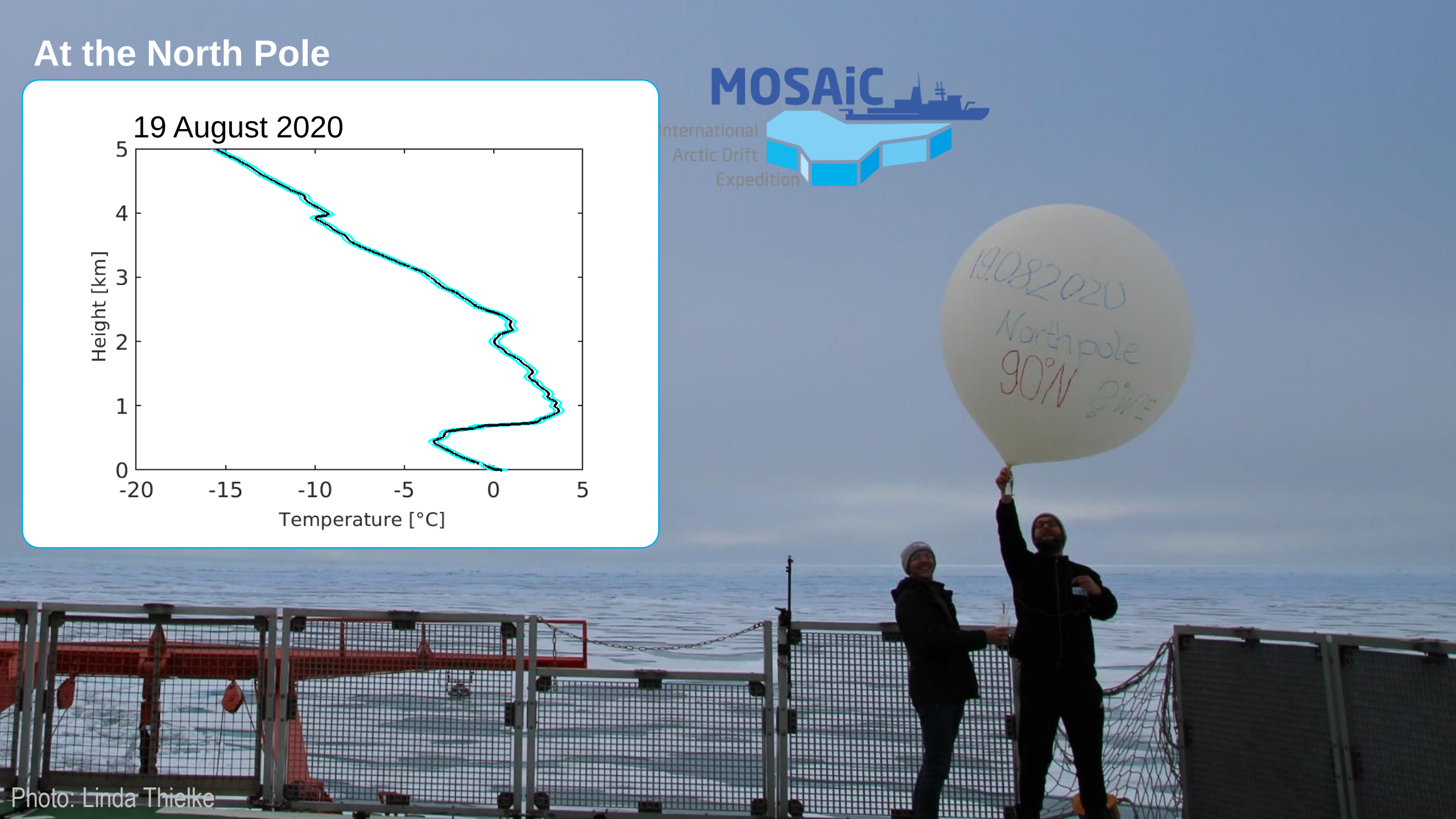


Photo: Linda Thielke

GRUAN MOSAiC

International Arctic Drift Expedition

1 year of radiosonde data from the Central Arctic [October 2019 – September 2020]

GDP available at the PANGAEA data repository

https://doi.pangaea.de/10.1594/PANGAEA.943870

Subject to MOSAiC data moratorium until end of 2022, open access from 1 January 2023.

Photo: Linda Thielke