Mesoscale dropsonde patterns

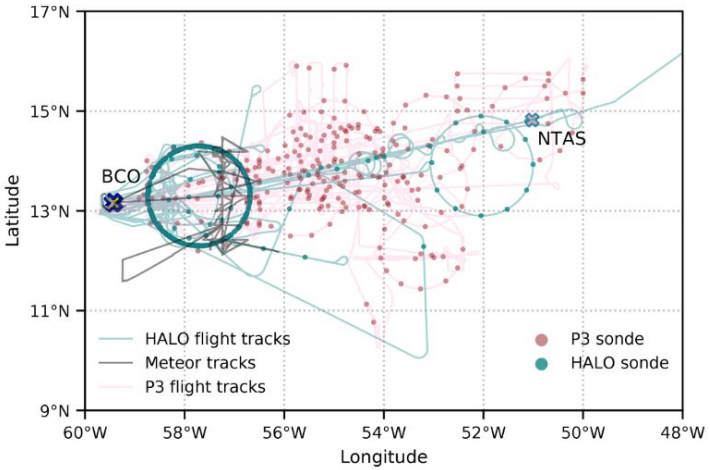
Fiona Paulus, Prof. Dr. Roel Neggers

Motivation

- Measure divergence, vertical velocity, temperature and humidity advection and large scale gradients in the Arctic
- important for air-mass transformations
- small domain ultra-high resolution LES (10m)

Method

- Mesoscale patterns of dropsondes
- has been tried in the subtropics
  (NARWAL & EUREC4A) not yet in the Arctic
- Regression method
  (spatial and temporal taylor expansion)

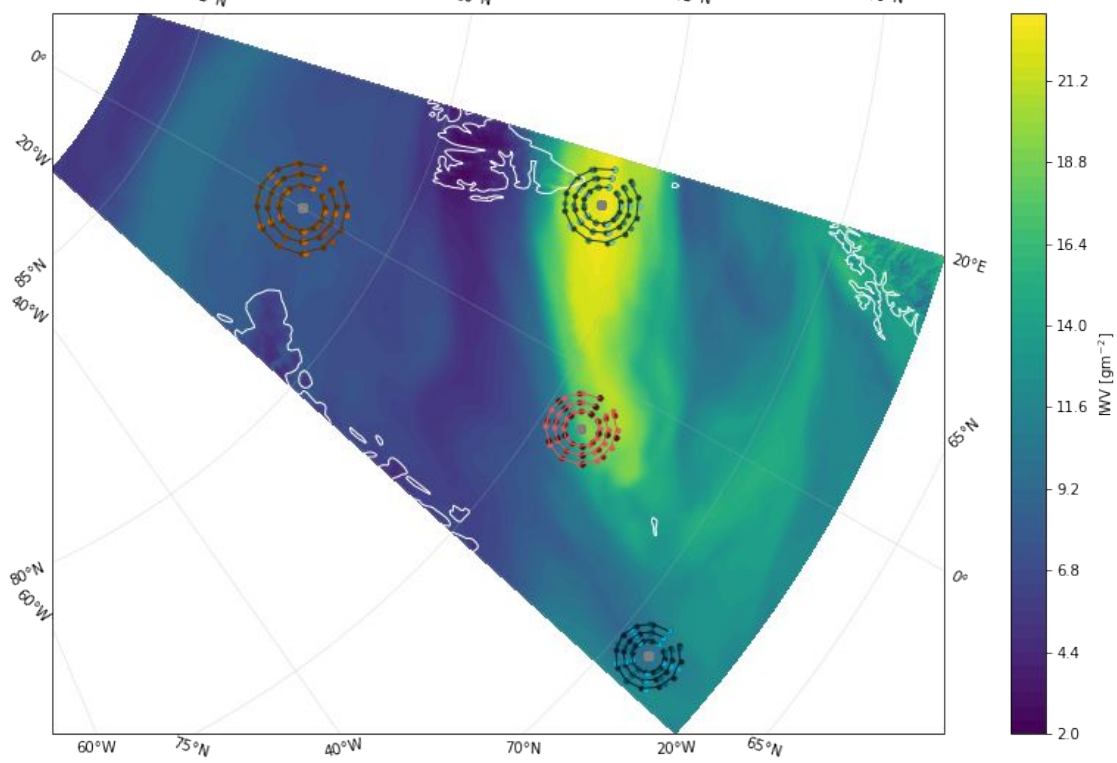


George et.al.: JOANNE: Joint dropsonde Observations of the Atmosphere in tropical North atlaNtic meso-scale Environments

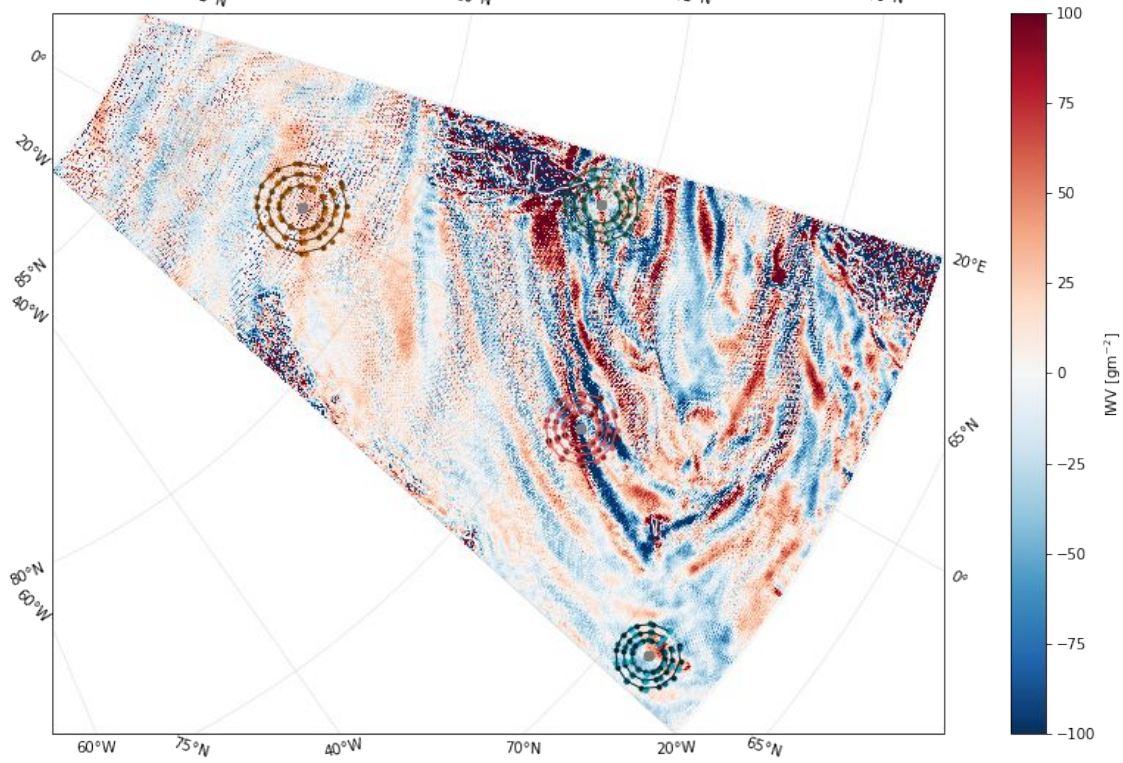
Testing the method for HALO-(AC)³

- Method tested with ERA5 before the campaign
- moved to ICON, higher resolution (0.05°)
  → more difficult test (higher variability at small scales)
- Moisture intrusion: stronger vertical velocity, perturbations expected 06.06.2017

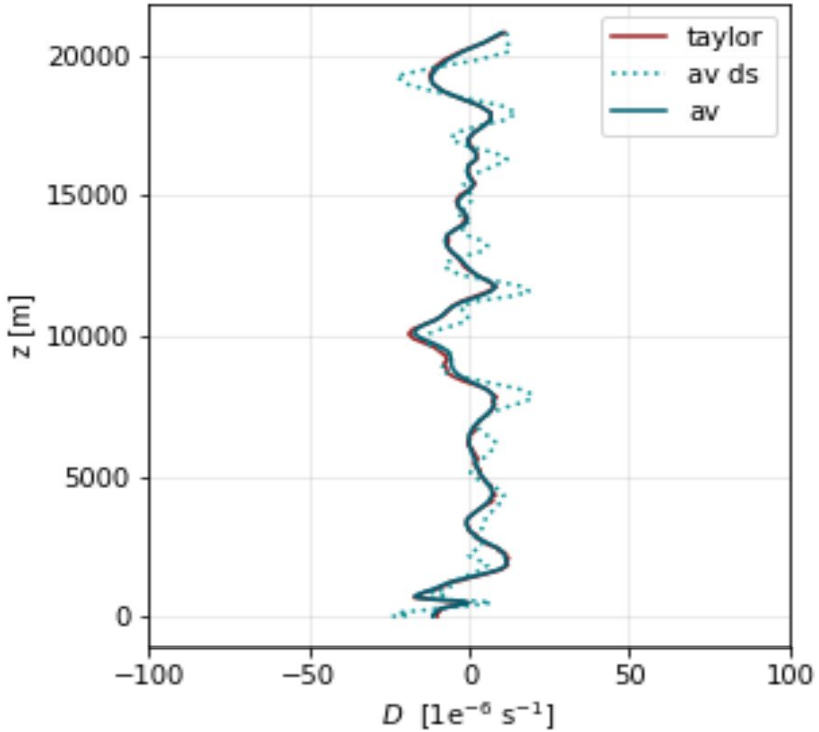
Testing the method for HALO-(AC)³ - IWV field



Testing the method for HALO-(AC)³ - Divergence field



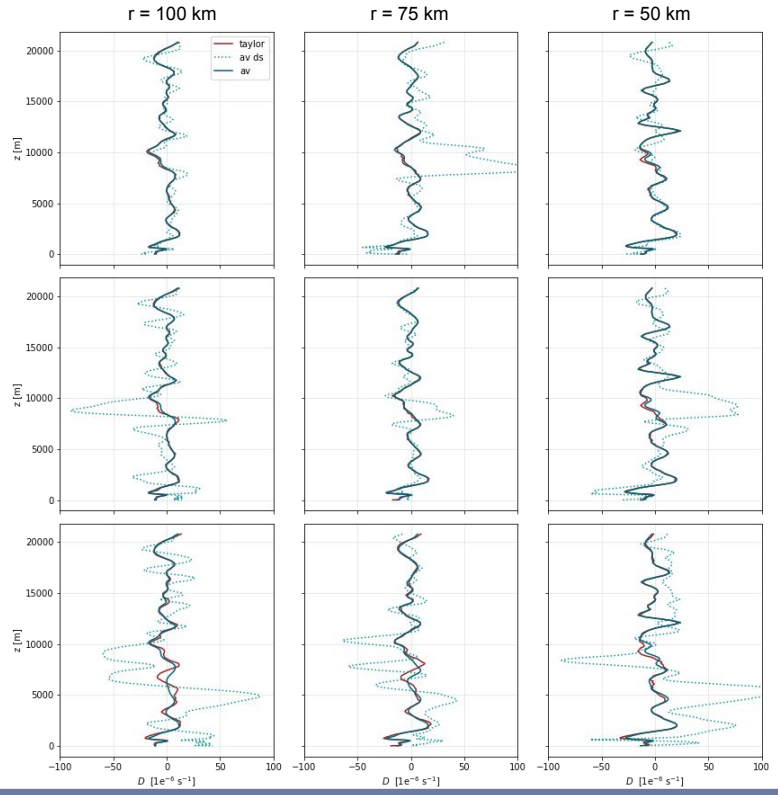
Testing the method for HALO-(AC)³ - Vertical profiles



82°N00°E
12 dropsondes
r=100km

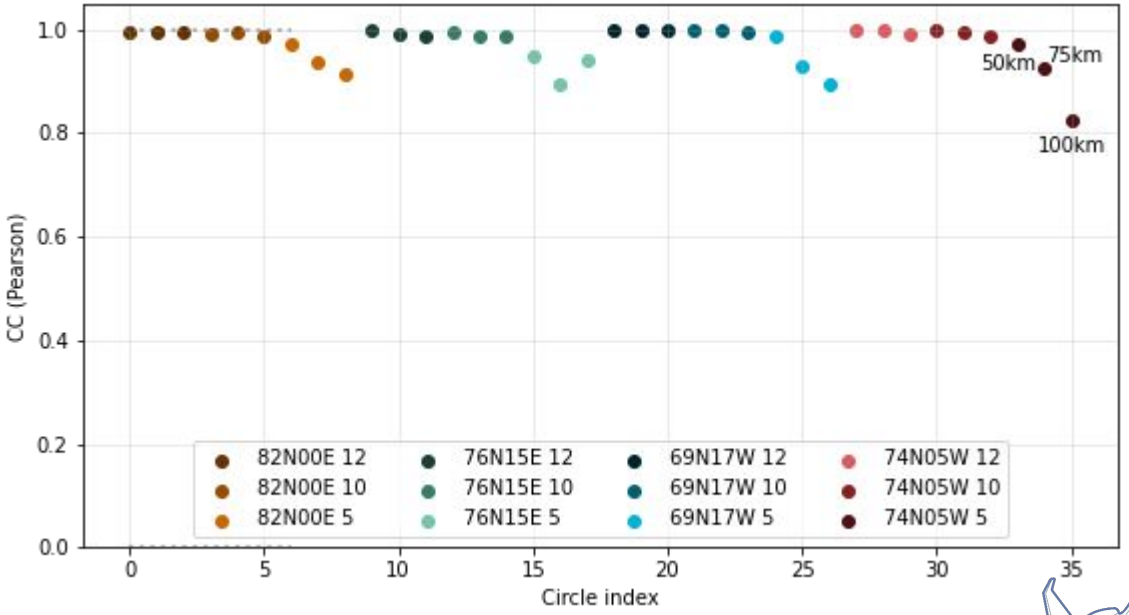
Testing the method for HALO-(AC)³ - Vertical profiles

Average divergence (blue) and divergence calculated with regression method (red) fit quite well



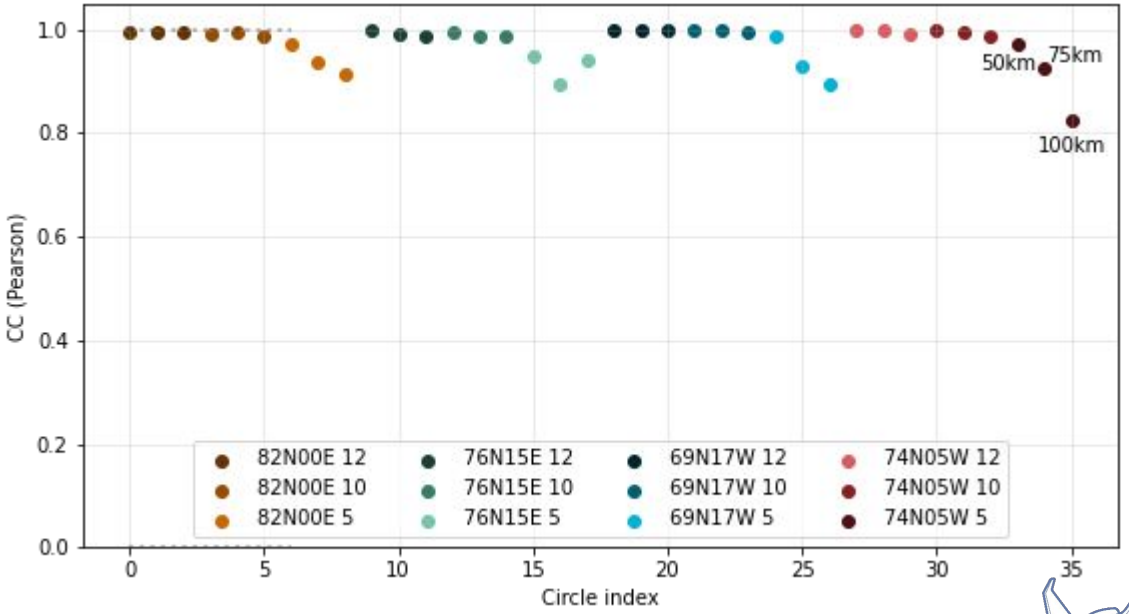
Testing the method for HALO-(AC)³ - Correlation

Correlation coefficient between average divergence and divergence calculated with the recursion method

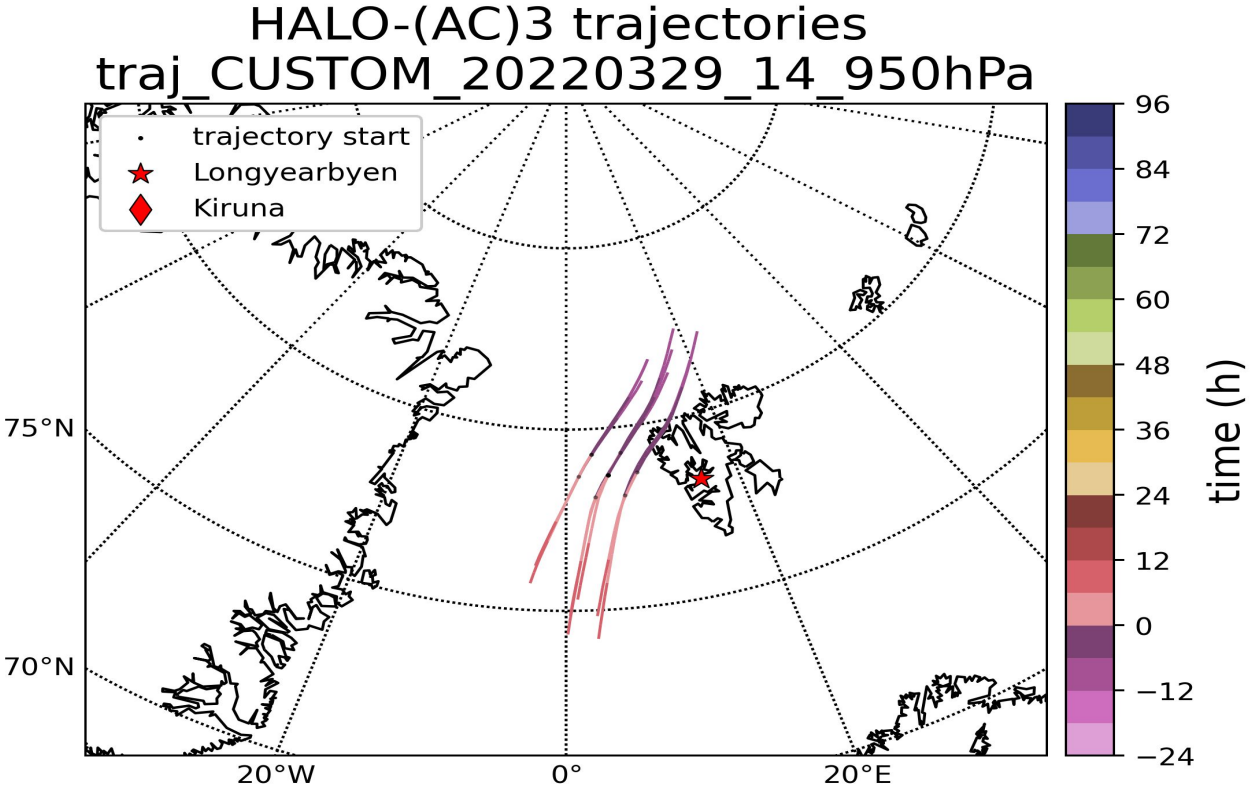


Testing the method for HALO-(AC)³ - Correlation

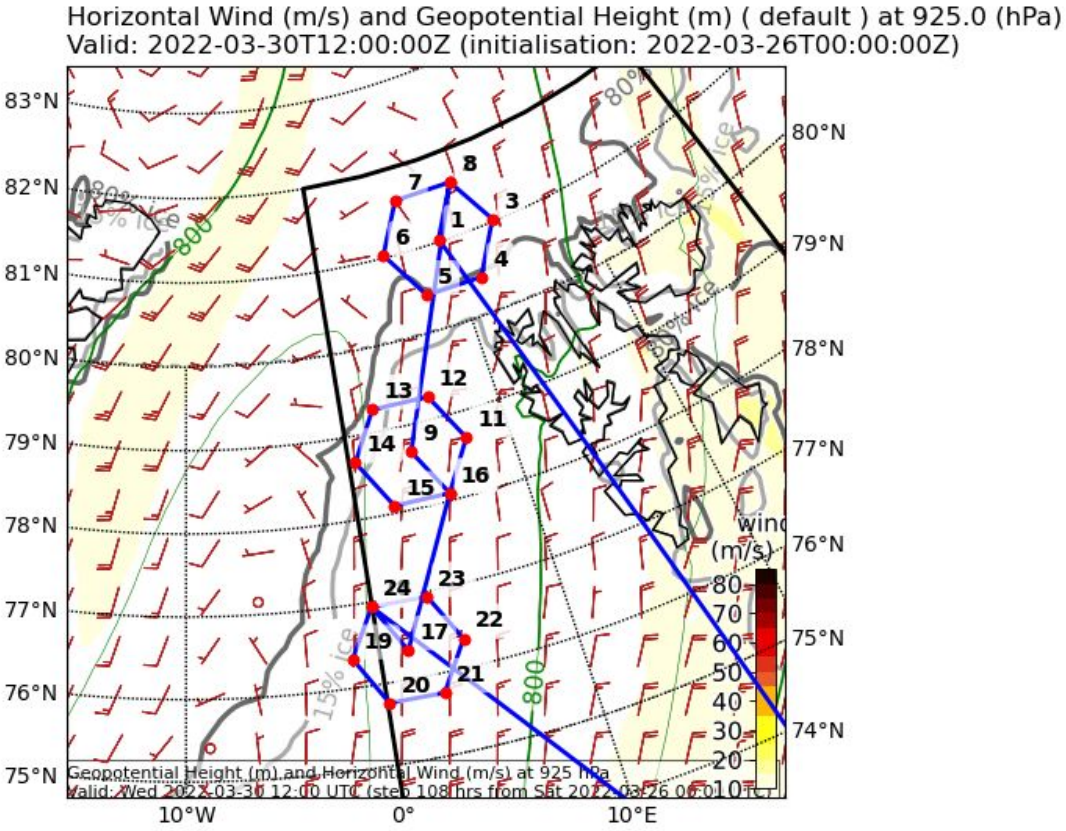
Recursion method works well for more than 10 dropsondes. For a small number of dropsondes and large radii the method is less reliable



Towards a flight plan: Lagranto trajectories (thanks Benjamin!)



The idea: Overnight tracking of a CAO air mass with HALO



Boundary layer deepening