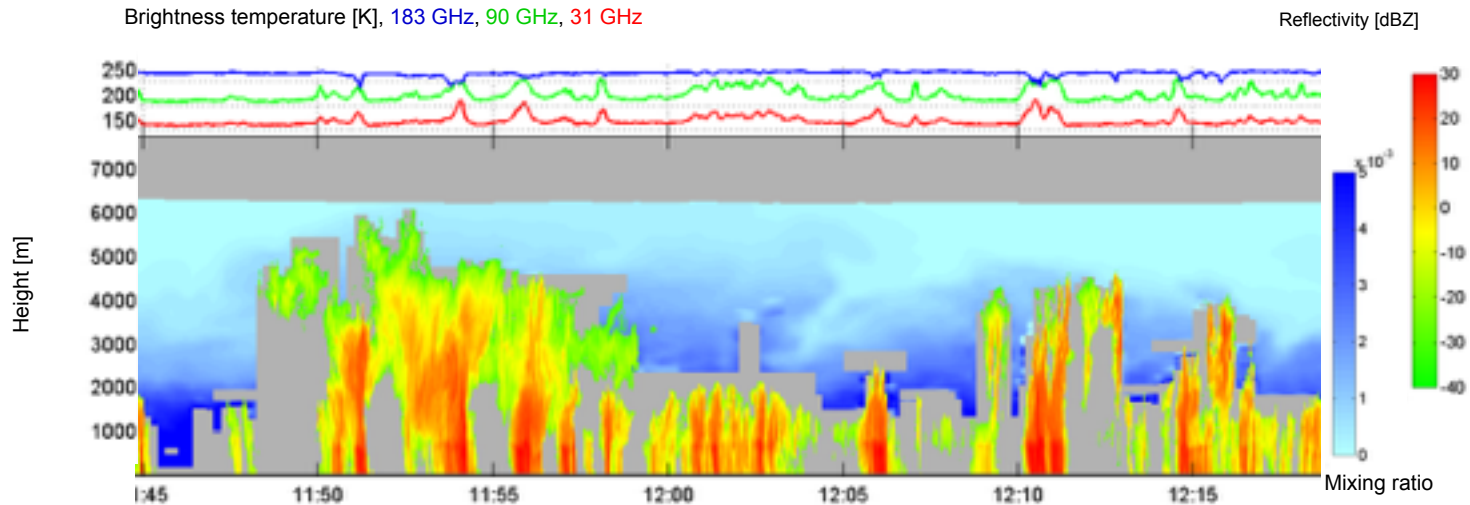


# Cloud Properties during NARVAL-North in Measurements and COSMO Simulations

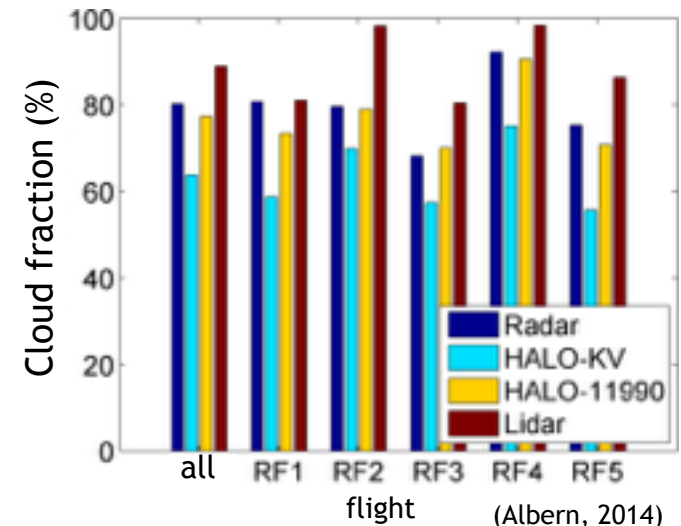
*Heike Konow<sup>1,2</sup> and Felix Ament<sup>1,2</sup>*

<sup>1</sup>Meteorological Institute, Hamburg University, <sup>2</sup>Max-Planck-Institute for Meteorology, Hamburg

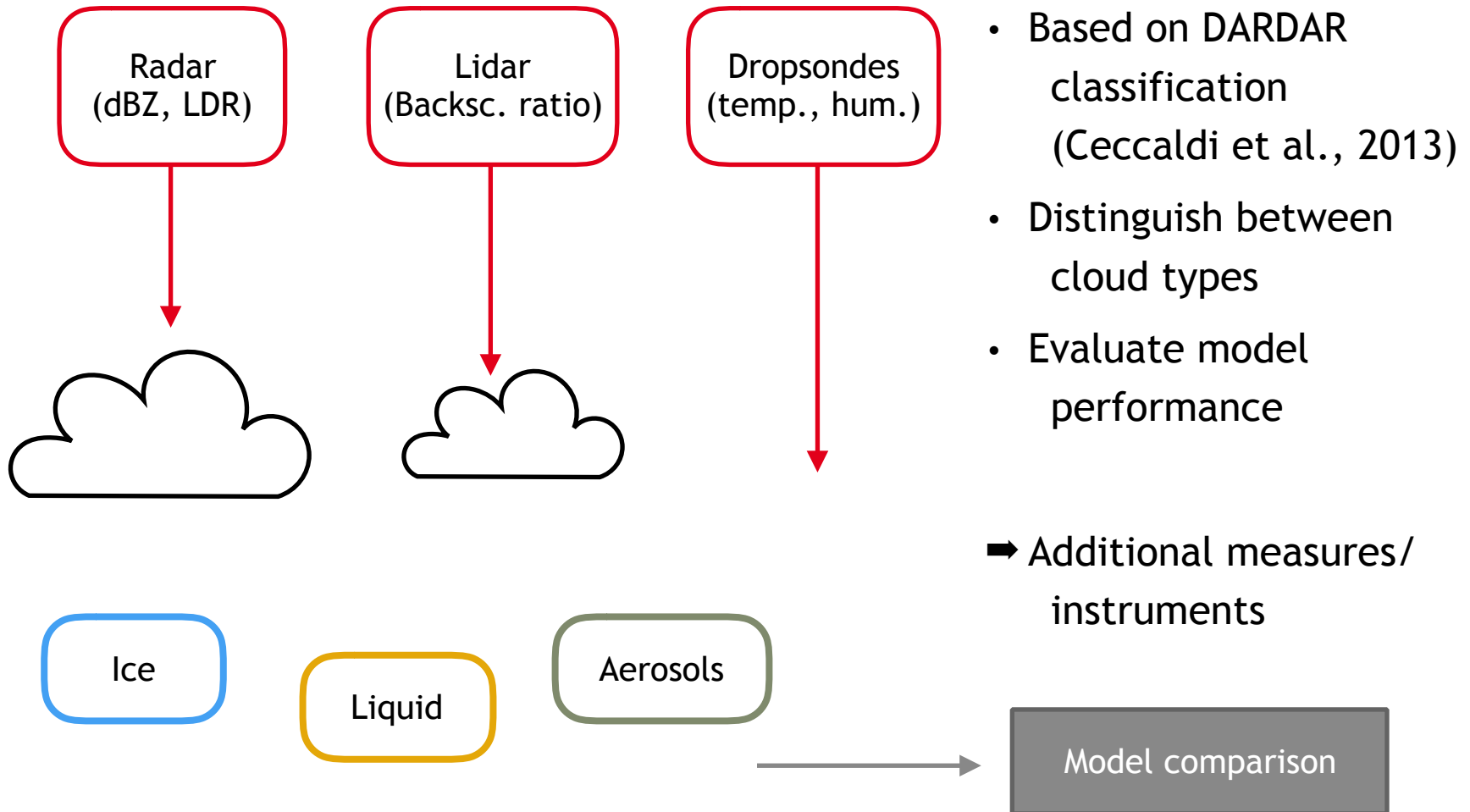
# Cloud fraction from observations



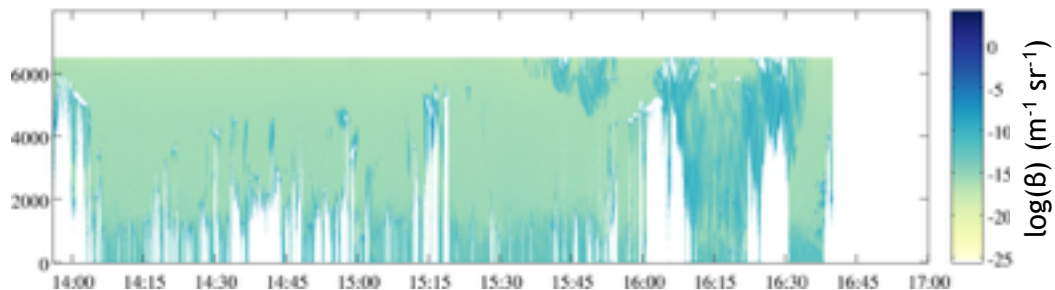
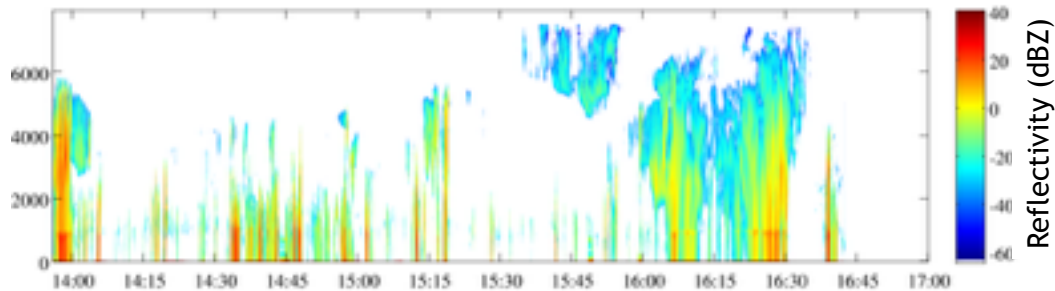
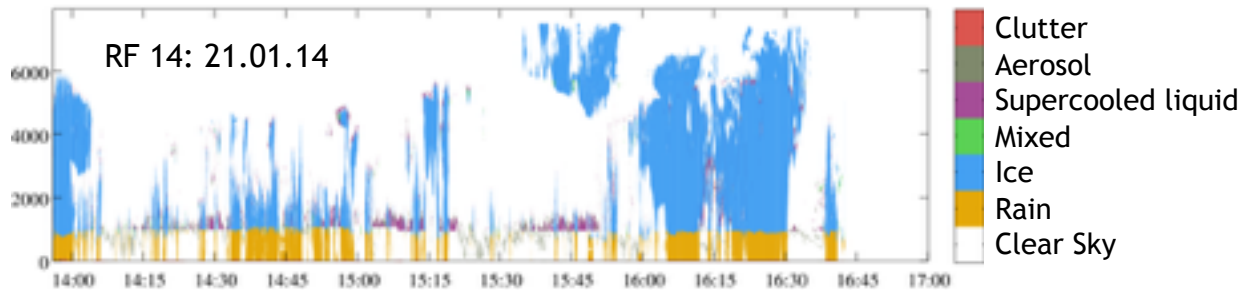
- Sensors (Radar, Lidar, Radiometer) detect different features of clouds and surroundings
- Cloud frequency differs with instruments by up to 20 %
- Combination of sensors provide complementing insights



# First approach to HALO target classification

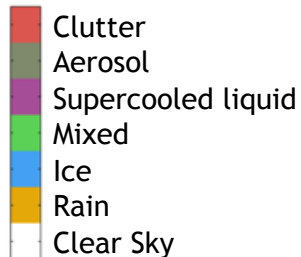
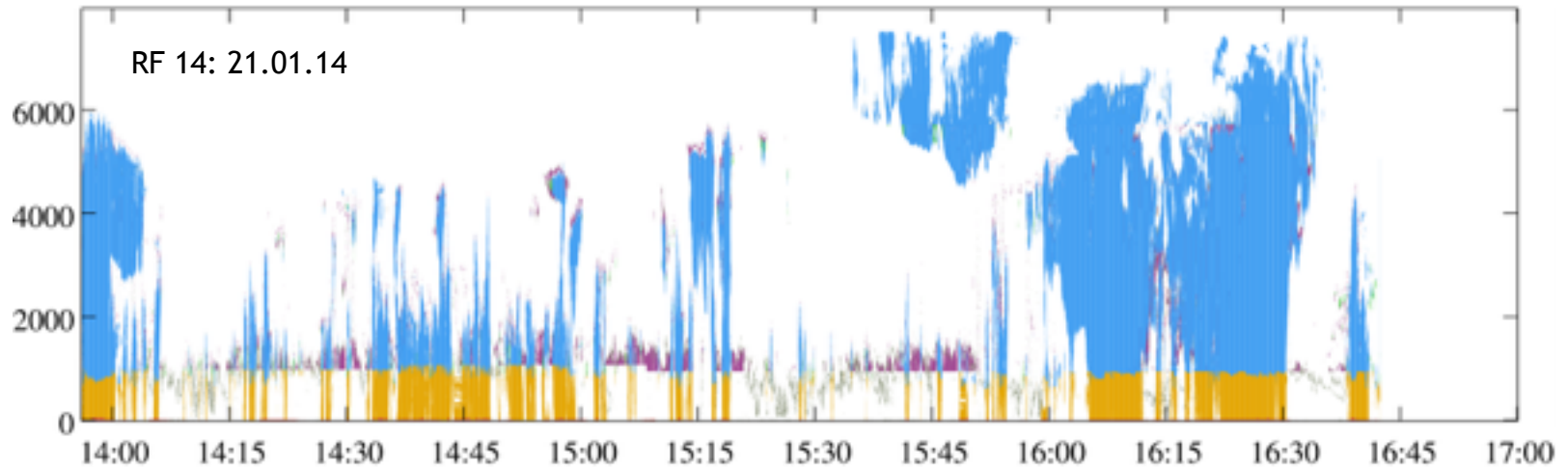


# First approach to HALO cloud classification



- Complementing information from Radar and Lidar measurements
- Allows for basic distinction of cloud types

# First approach to HALO cloud classification



- Mainly ice and supercooled clouds
  - Some strange effects (i.e. supercooled above ice)
- ➔ Further algorithm refinement needed

# COSMO Model Setup

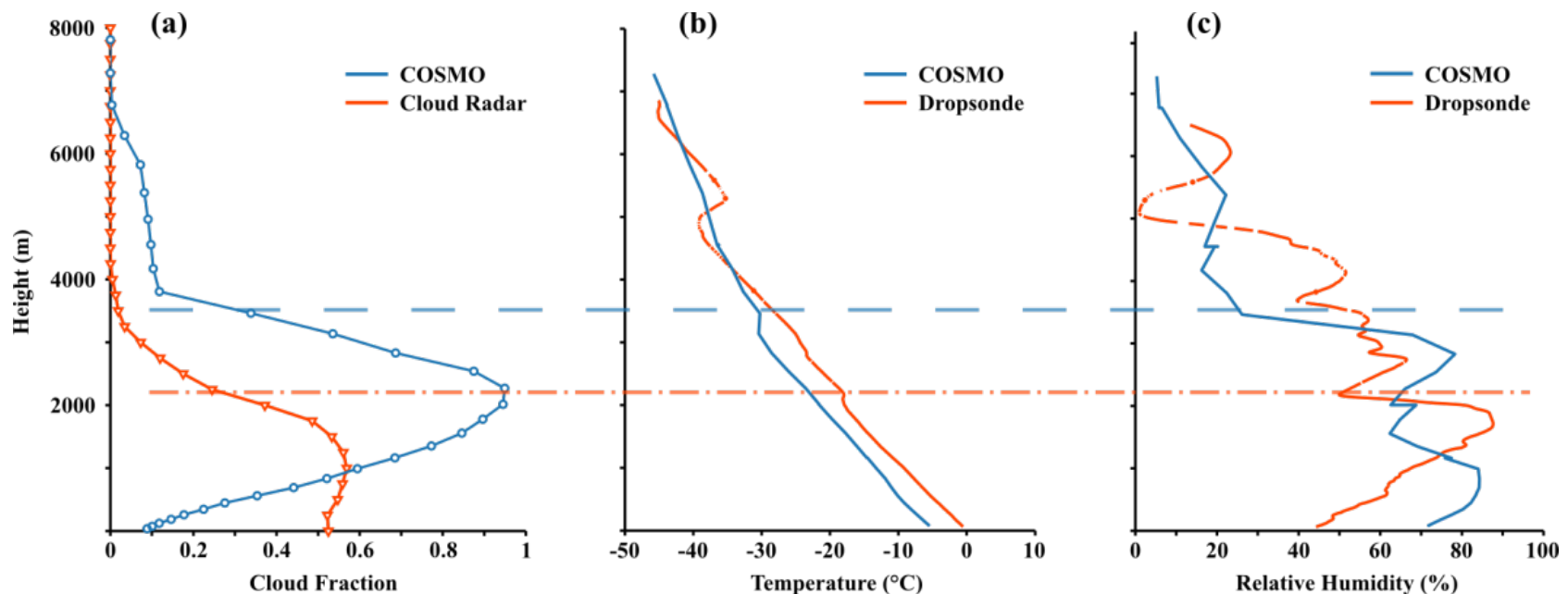


- 2.8 km, 7 km, nested in ECMWF analyses
- Deep convection resolving
- 50 vertical layers
- Output every 15 minutes
- Model runs for each flight individually

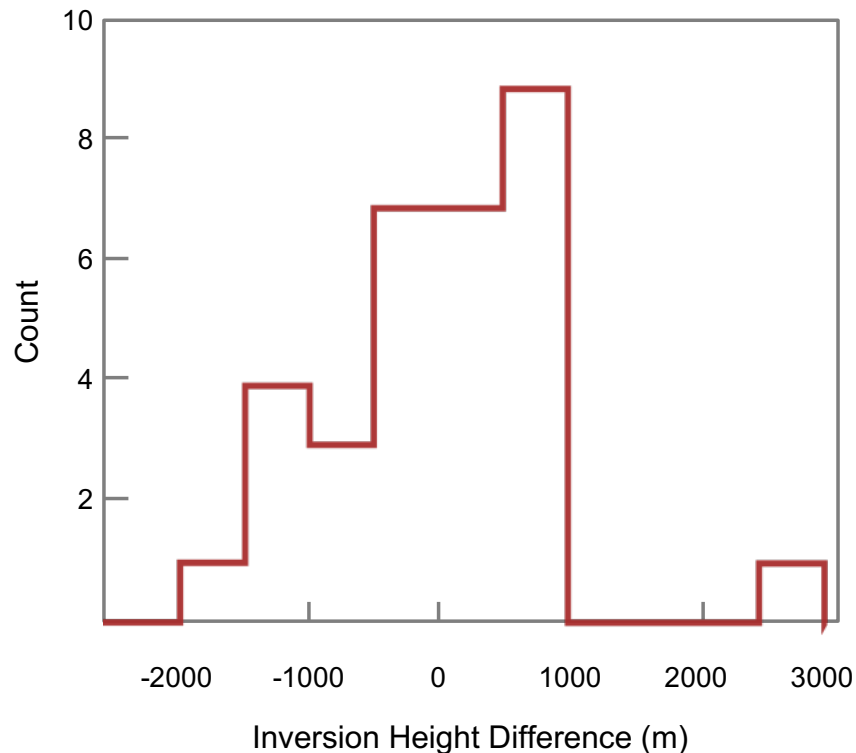
# Cloud fraction and inversion height

## 09. January, Cold air convection

- Cloud fraction overestimated by model
- Cloud top too high
- Precipitation in radar close to ground detected as clouds
- Inversions in model higher than measured
- Accumulation of humidity below inversions in both observations and model



# Inversion heights



all flights;

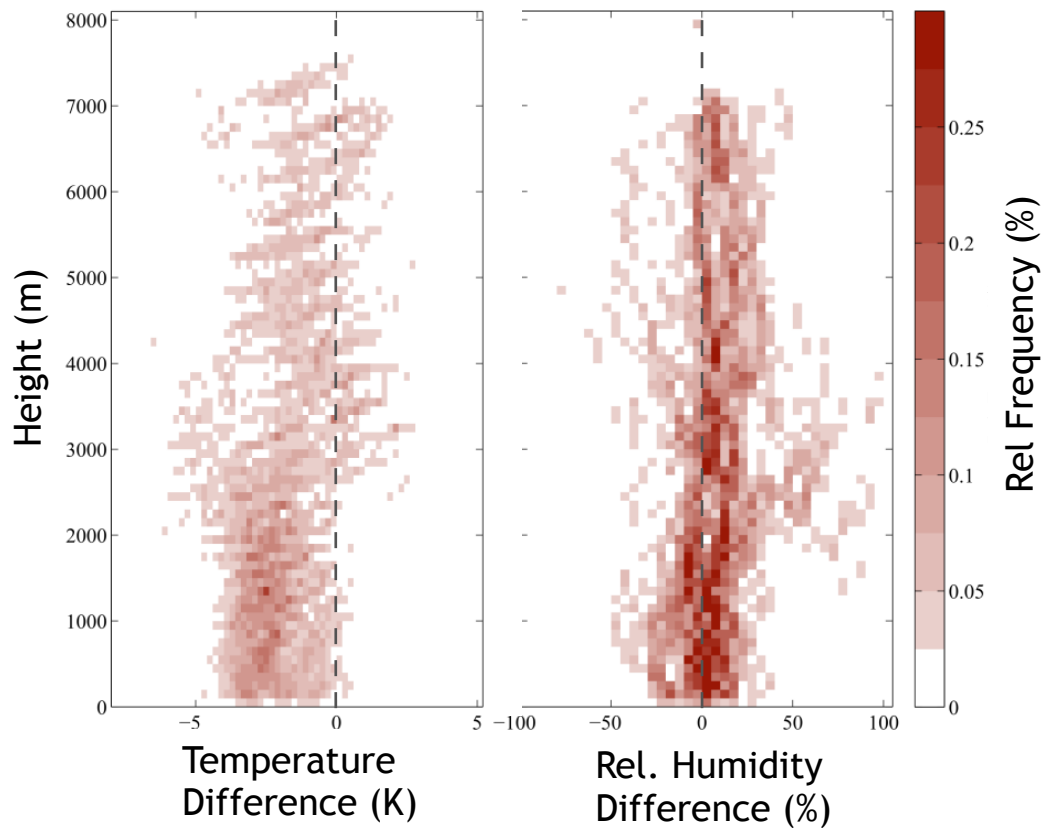
40 dropsondes in cold air convection considered;

- Inversion height difference in almost half of the cases less than 500 m
- Inversion height overestimation by model more frequent

*Cosmo - Dropsonde*



# Temperature and humidity differences



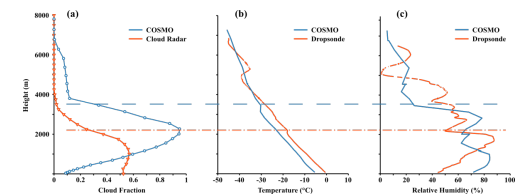
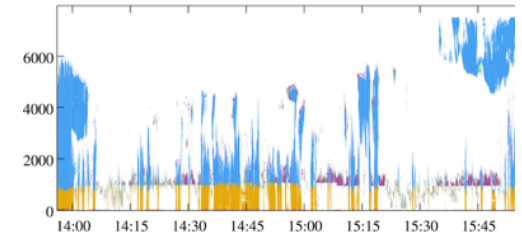
*Cosmo - Dropsonde*

- Overall, temperature in model lower than measured in all heights
- Relative humidity difference small in most heights
- Between 2000 m and 4000 m, more cases with higher humidity in model than in dropsonde measurements

# Conclusions

First target classification promises to be useful tool for further investigation and model evaluation  
→ Further refinement needed to eliminate processing artifacts

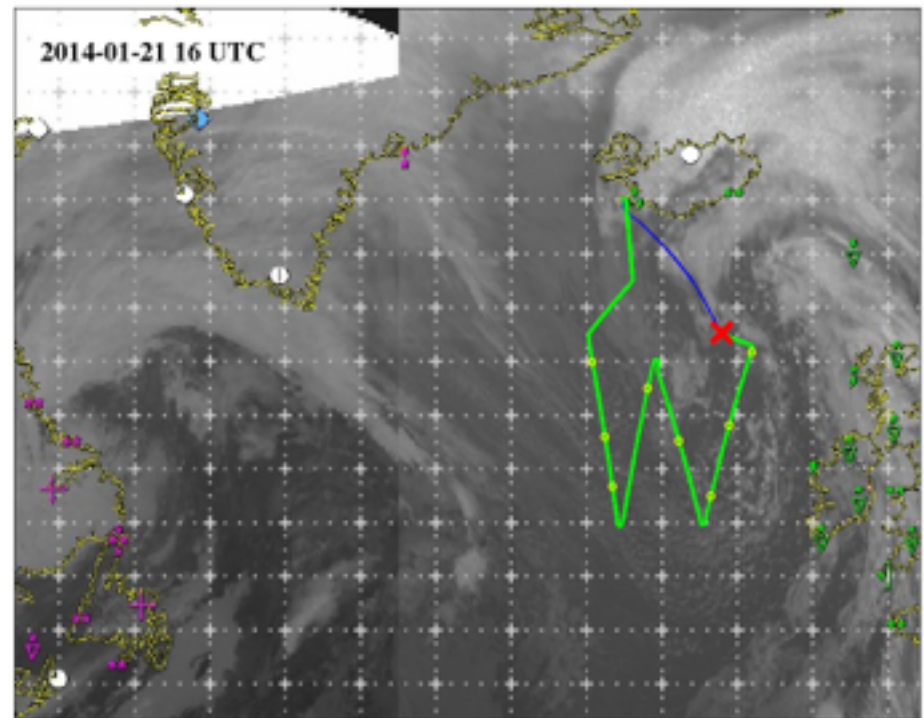
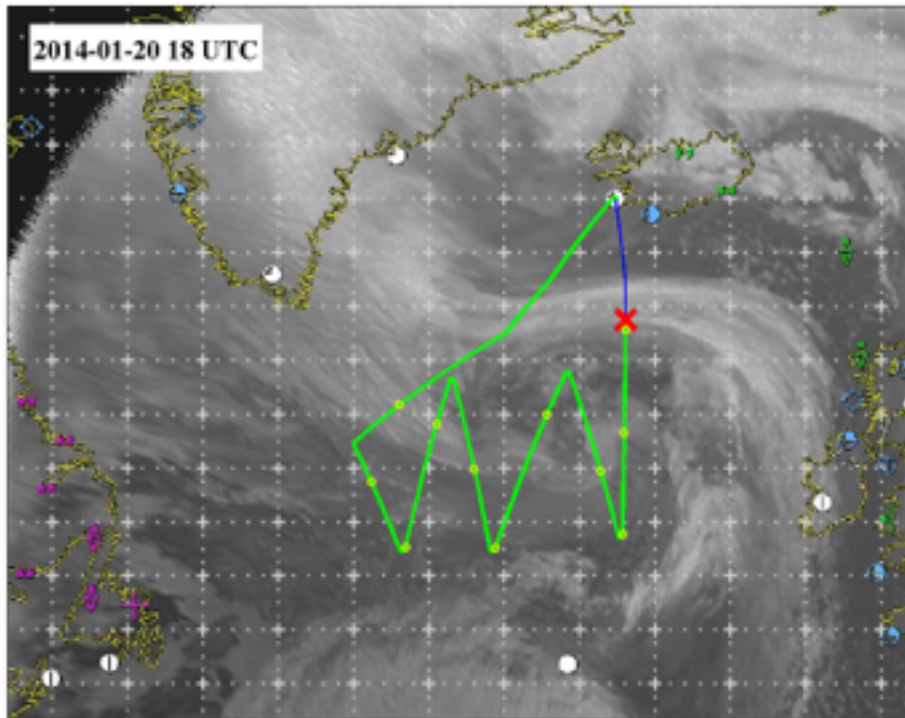
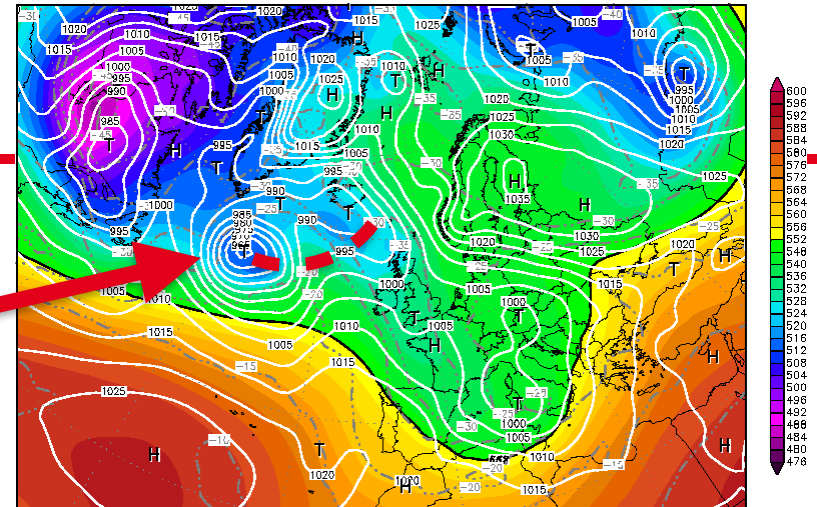
Inversions in COSMO overall higher and stronger than measured by dropsondes → clouds higher than measured





# Case Studies

- 20. and 21. January 2014
- Cold sectors of aging cyclone on two consecutive days



# Case Studies: 12. January 2014

Mature cyclone with cold air convection south of Iceland

