Sea ice concentration and the variable ice surface emissivity

IOMASA activities at DMI

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Progress

- Forward modelling
- AMSR data
- SAR analysis

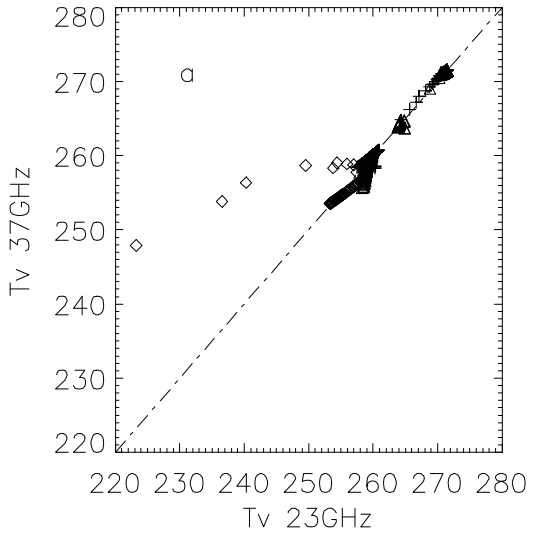
Simulated correlation between window and sounding frequencies

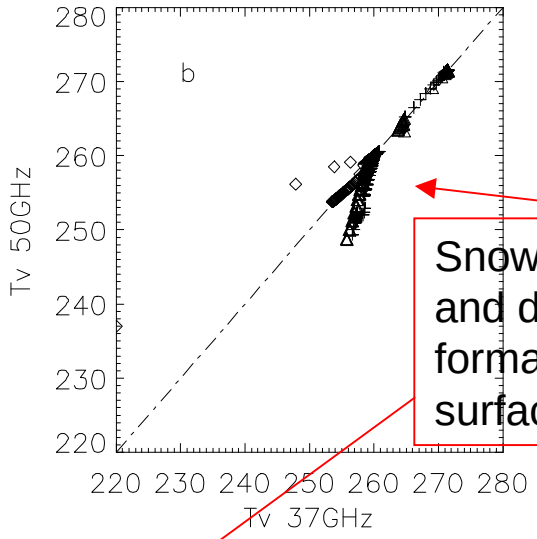
a) 23/37 GHz

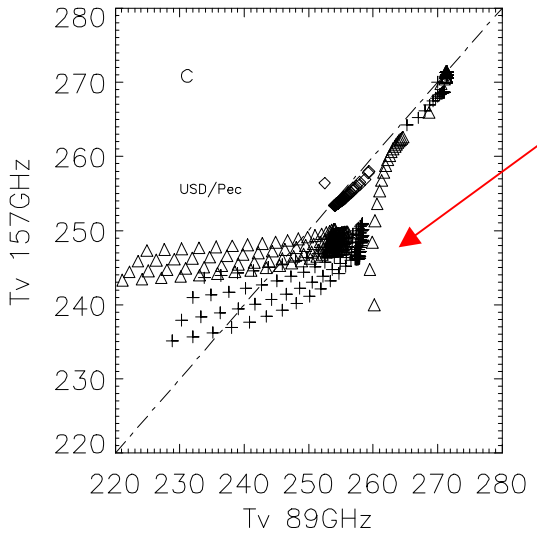
b) 37/50 GHz

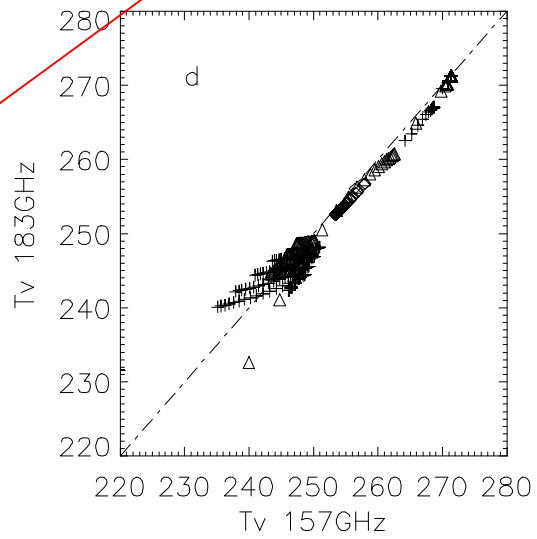
c) 89/157 GHz

d) 157/183 GHz







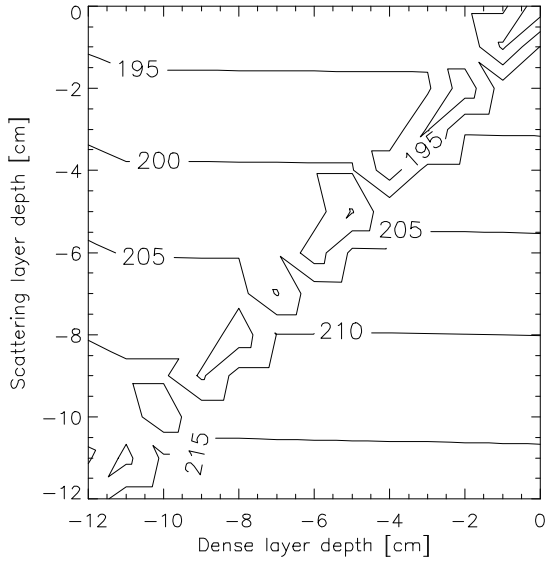


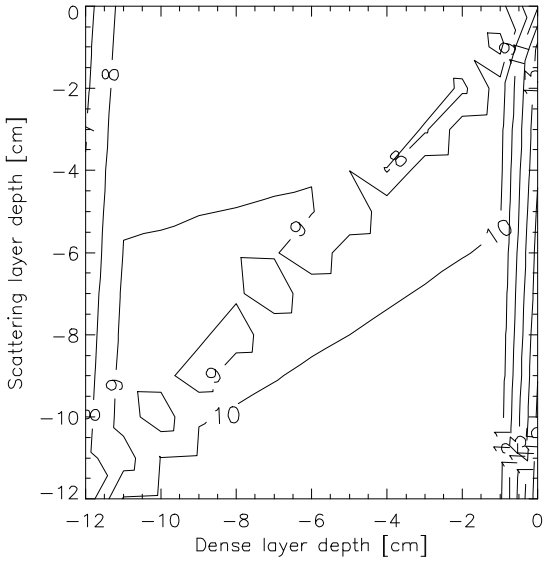
Snow surface density and depth hoar formation above the ice surface

Depth of crusts and scattering layers in the snow-pack

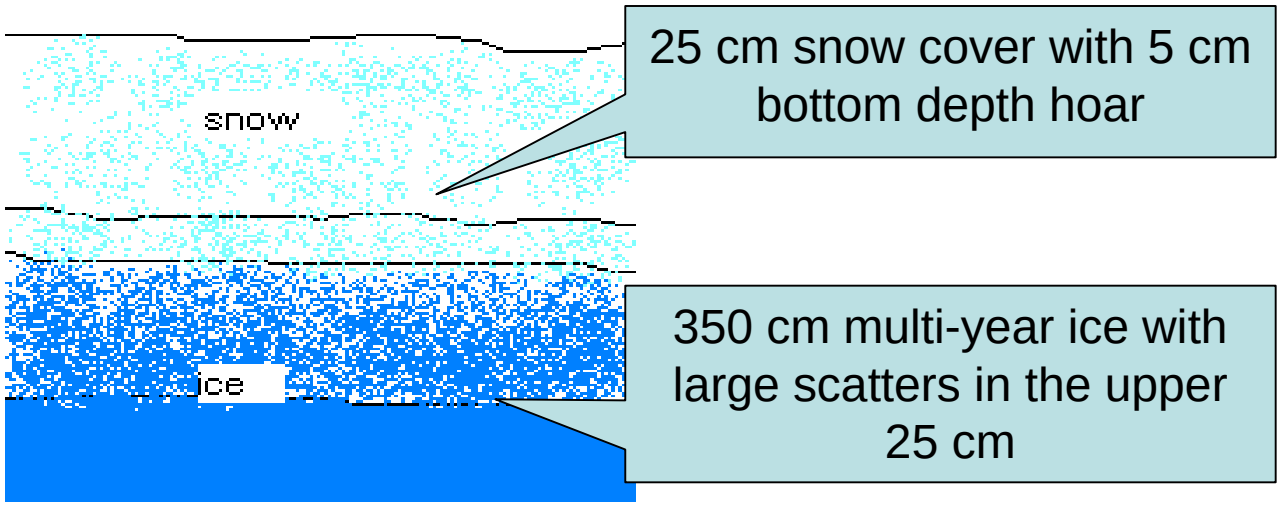
Depth of the scattering layer is important for Tb at frequencies where extinction in the snow is important (>89 GHz).

Depth of a dense layer is particularly important when it modifies the large dielectric contrasts of the system i.e. the air/snow and snow/ice interface.





Model experiment using a coupled thermodynamic and backscatter model

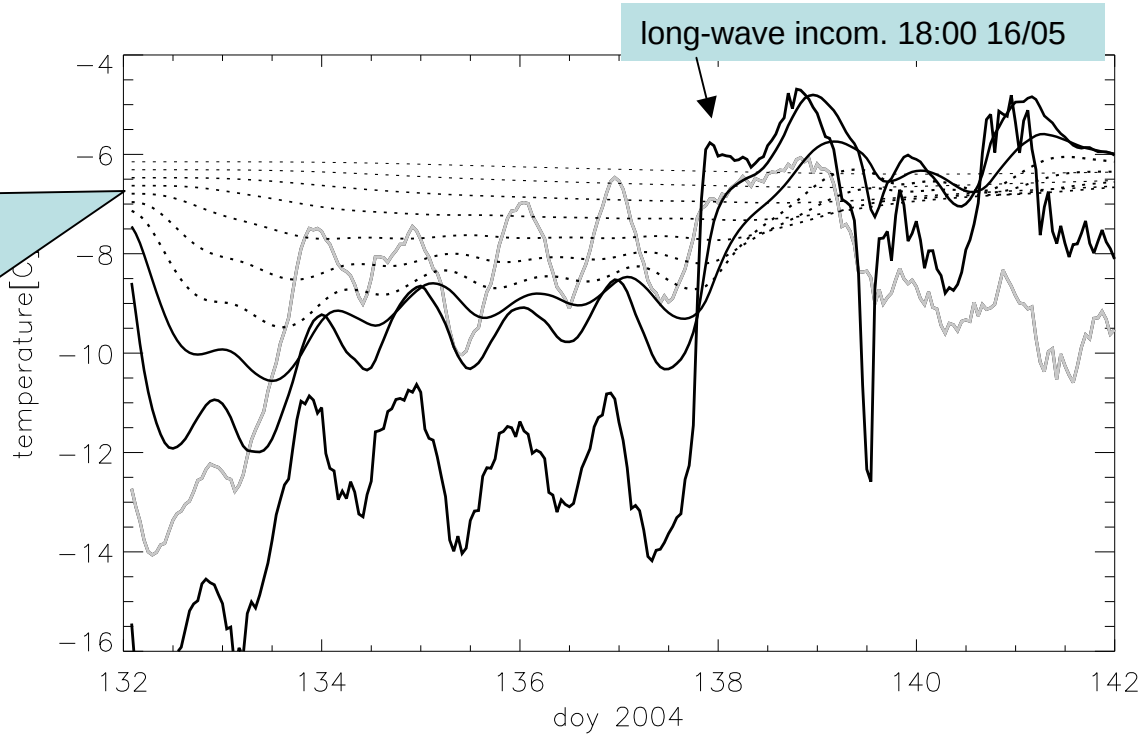


Data collection at sea ice camp in Lincoln sea May 2004

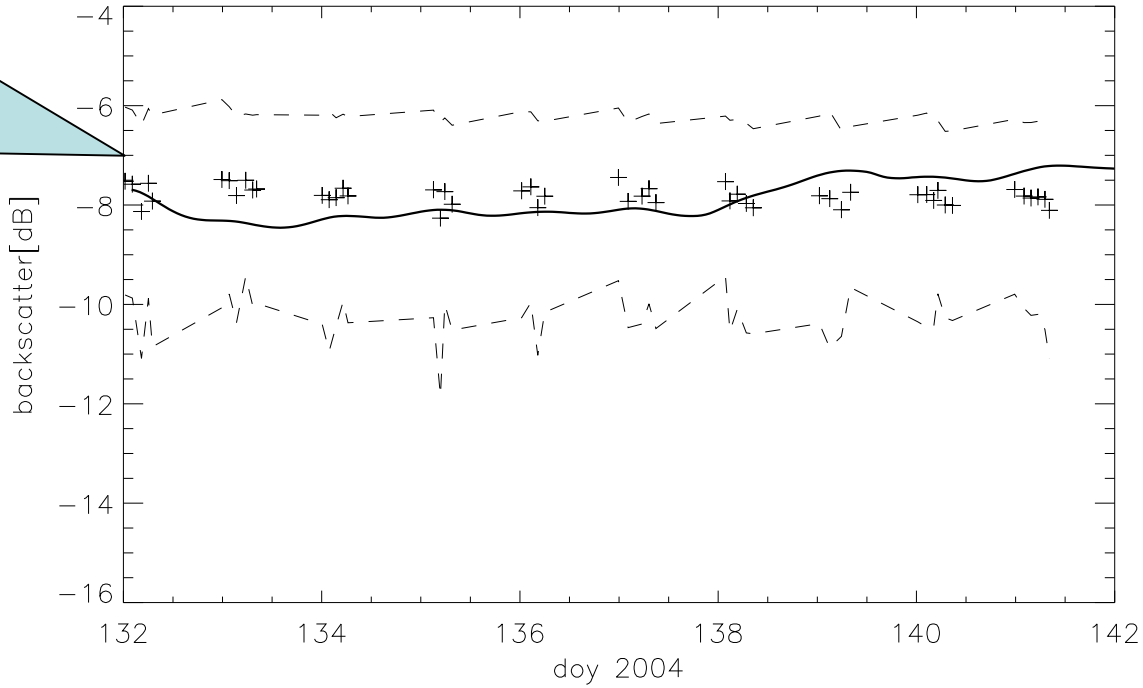
-The coupled model is initiated by the snow and ice profile (5cm intervals).

-The model is forced by meteorological input data.

Simulated temperature in the upper 1m snow & ice
10cm intervals
__ snow temp
- - - ice temp
__ air temp

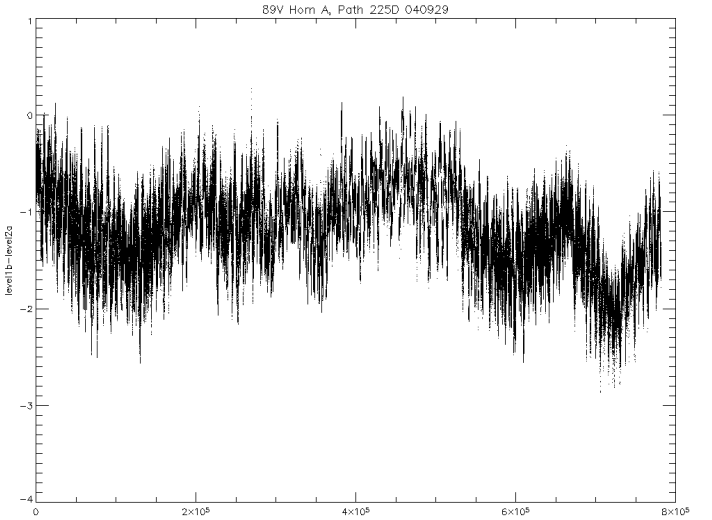


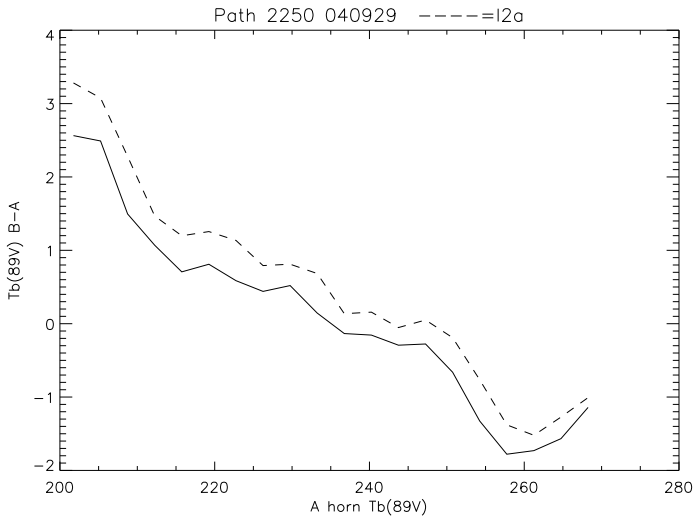
Comparison between simulated and measured backscatter (SeaWinds).
+ measured
___ simulated
- - - meas. std.

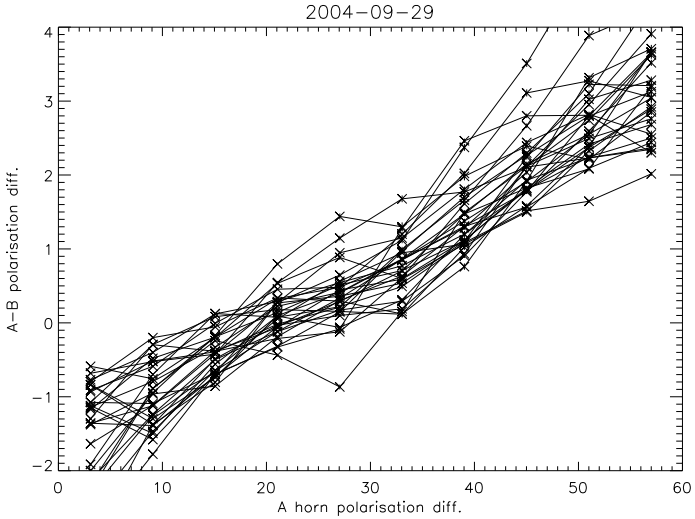


AMSR-E 89 GHz

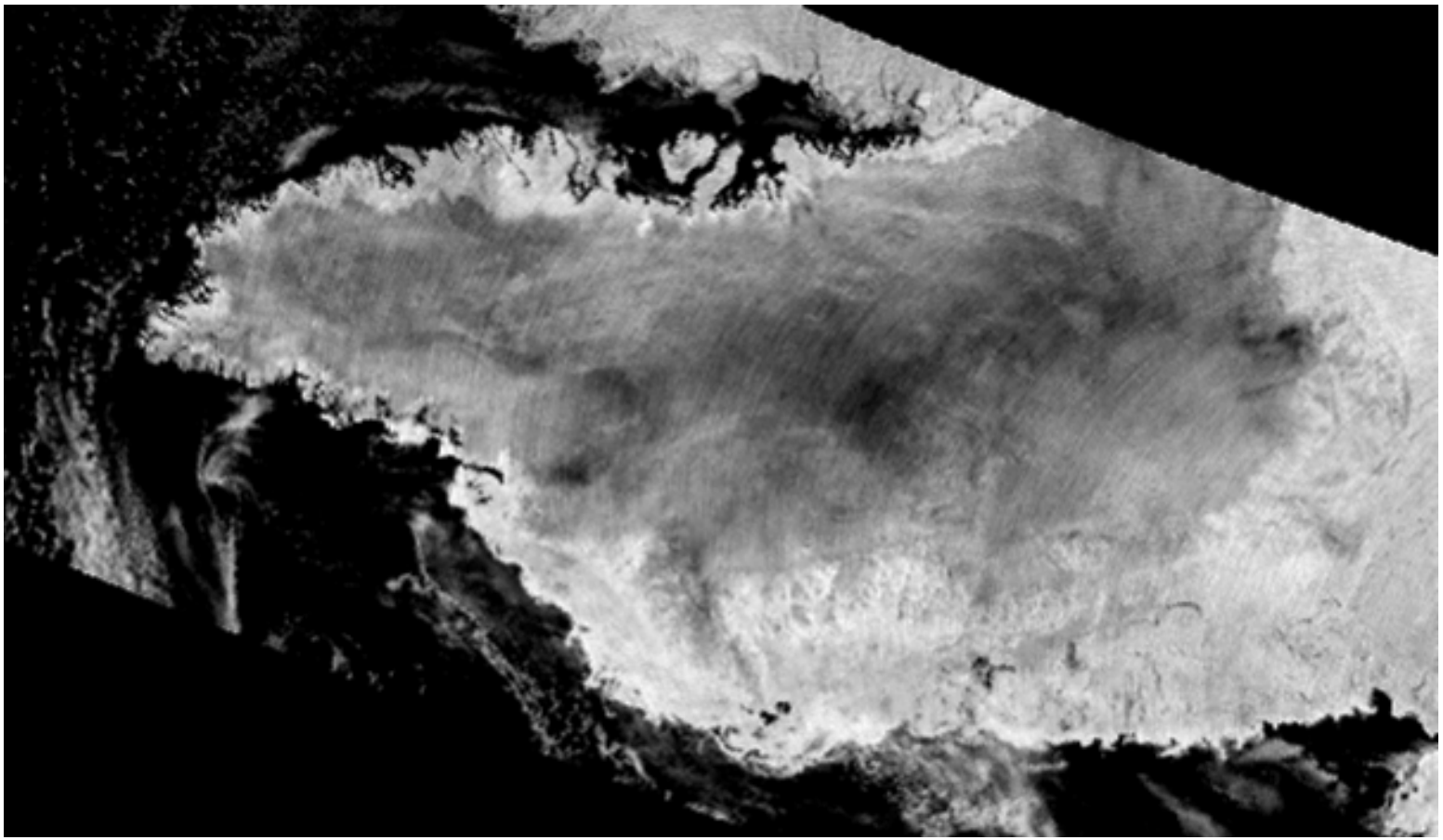
- BUFR data available from NESDIS (2-3h delay)
- BUFR and HDF L1 data match within 0.5 K (max deviation)
- L1 and L2 difference larger -> RSS is doing something to data
- Calibration mismatch between A and B horn in level 1 **and** 2
- Low pol. obs. match well







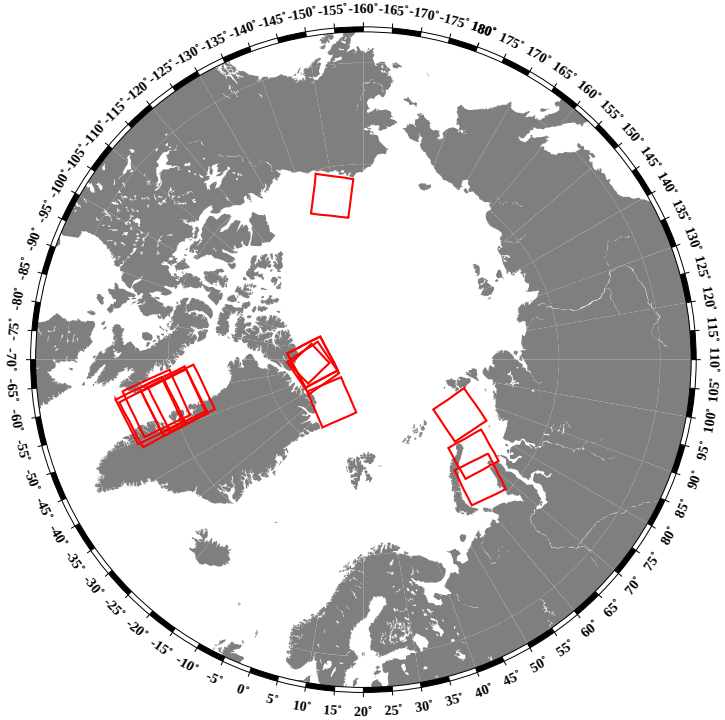
The result



Horn A is dead -> Problem solved! ☺

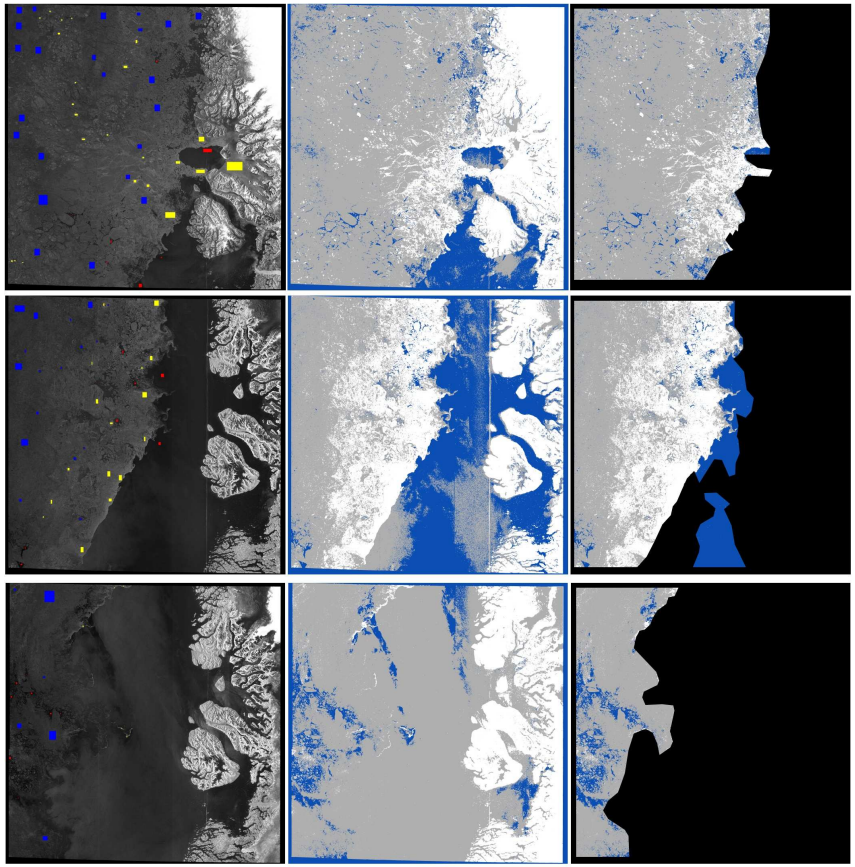
SAR validation data

- 15 scenes processed
  - New scenes N of Greenland+ Kara Sea
- Ordered data
  - 2003.05 -> 2004.02: still processing at ESA
  - 2003.12 -> 2004 10: proceeding well
- 20-30 scenes in queue (some duplicates)
- West Greenland starting



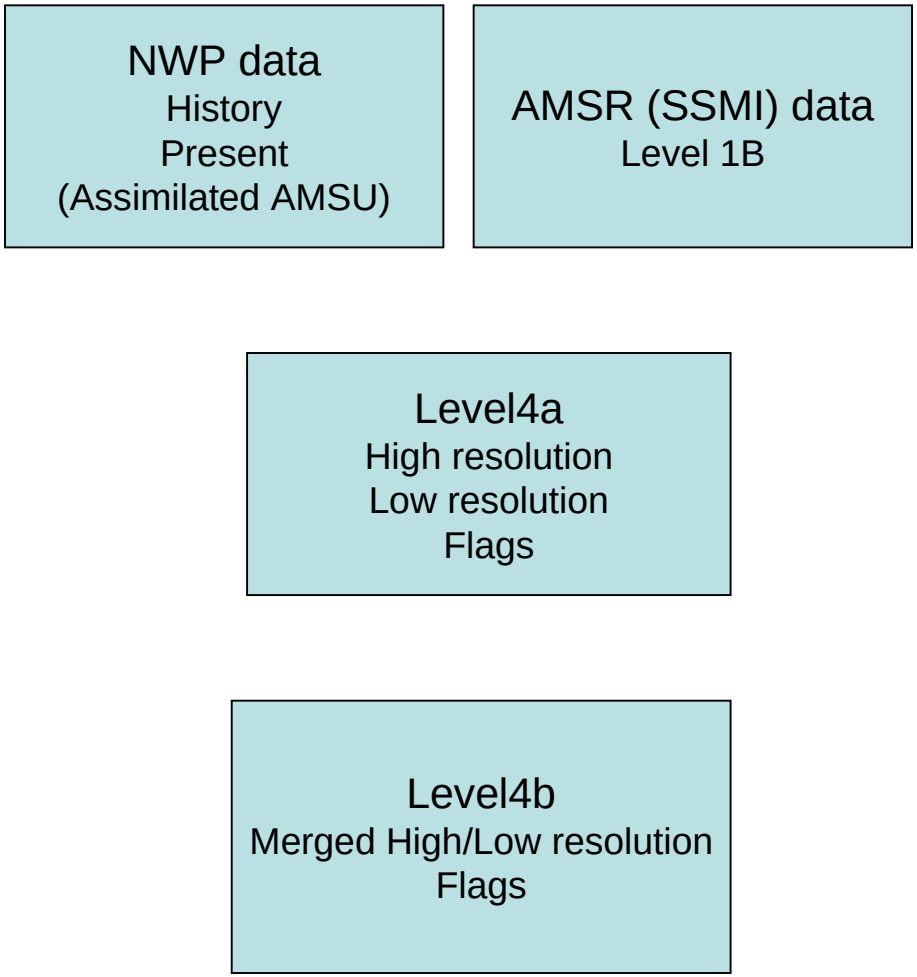
SAR validation data

- Examples of results:
  - Original data with training areas
  - Resulting classification
  - Masking of unreliable areas
- Accuracy test
  - Two independent operators:
    - Ice/water 2.1 %
    - Ice/ice 3.1 %



Ice concentration system

- Combine virtues of 89 GHz and low resolution Algorithms
- Atmospheric data from other space platforms should be integrated via assimilation in NWP model
- Flags to describe surface and/or atmospheric conditions:
  - R-factor
  - Emissivity anomaly from thermodynamic model
- No general merging method exists for all applications:
  - Make an optimal level4a dataset based on comparison to SAR data
  - do our best with level4b



To do – final stage of project

- Analysis of SAR vs. radiometer IC
- Selection of a ‘high’ and ‘low’ frequency algorithm(s)
- IC system with atmospheric correction
- Flagging system using additional data book-keeping and modelling.
- Reporting

AMSU vs hirlam twv