Humidity Assimilation, SMHI

- Overview
- Assimilation of AMSU-B radiances over sea
- Assimilation of AMSU-B radiances over sea ice
- Assimilation TIWV retrievals

Humidity Assimilation, SMHI

Overview

The role of SMHI in IOMASA: humidity assimilation over the Arctic region

We are doing this in two ways which are to be compared at the end of the project

1. Direct radiance assimilation of AMSU-B
2. Assimilate a retrieval of TIWV developed at University of Bremen

Direct radiance assimilation is in itself split up in two parts:

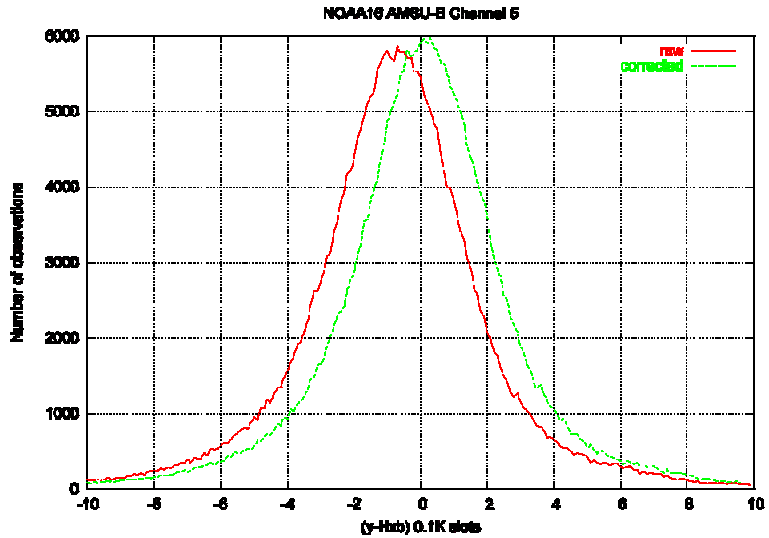
- We begin with direct assimilation of AMSU-B over sea:
  - Easier
  - Already done at many NWP centres
- Use of direct radiances over sea ice.

AMSU-B radiances over sea

- Data is collected via EARS

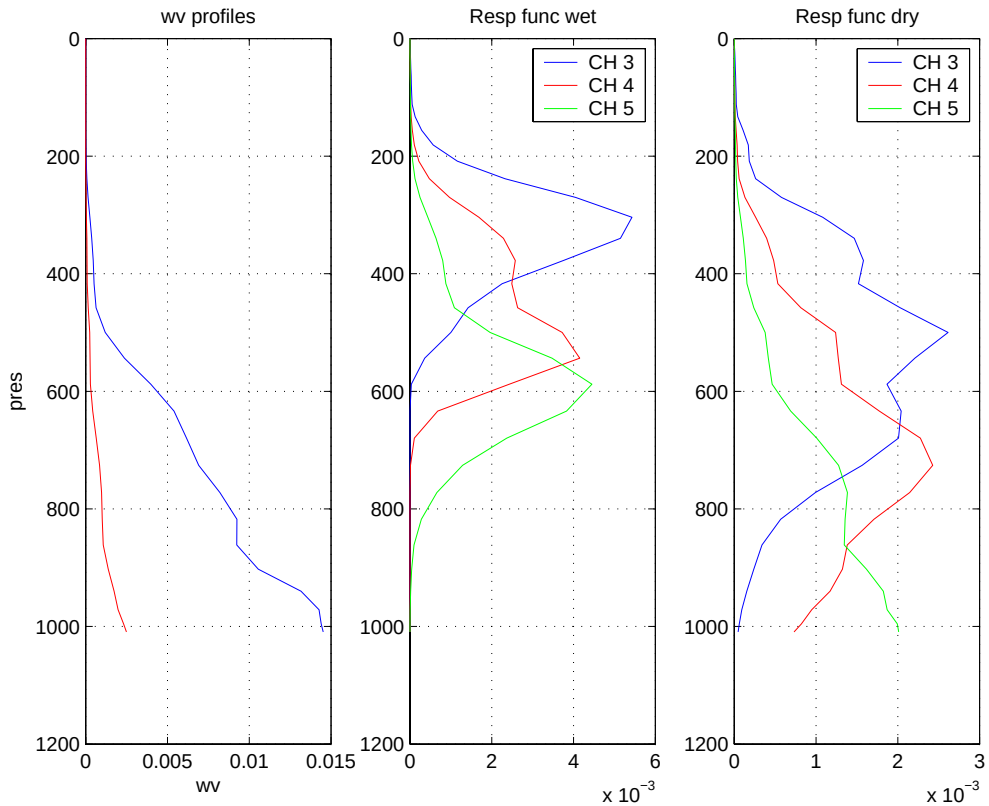
- Quality control:
  - AMSU-B is ‘contaminated’ by cirrus clouds and rain.
    AAPP code provides algorithms to spot such radiances.
  - First guess check in the HIRVDA code.
  - Variational quality control during the actual analysis.

- Bias correction of radiances with linear regression. We use 7 predictors. Exactly the same as for AMSU-A.



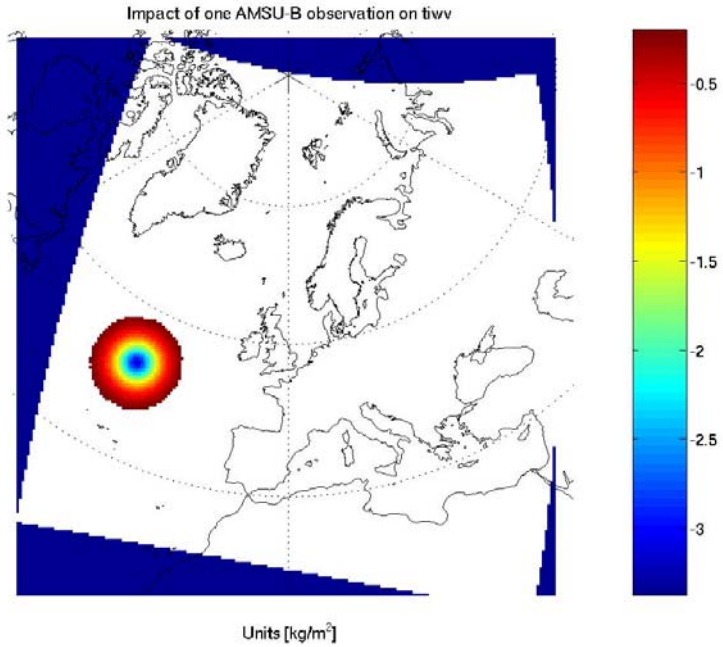
AMSU-B radiances over sea

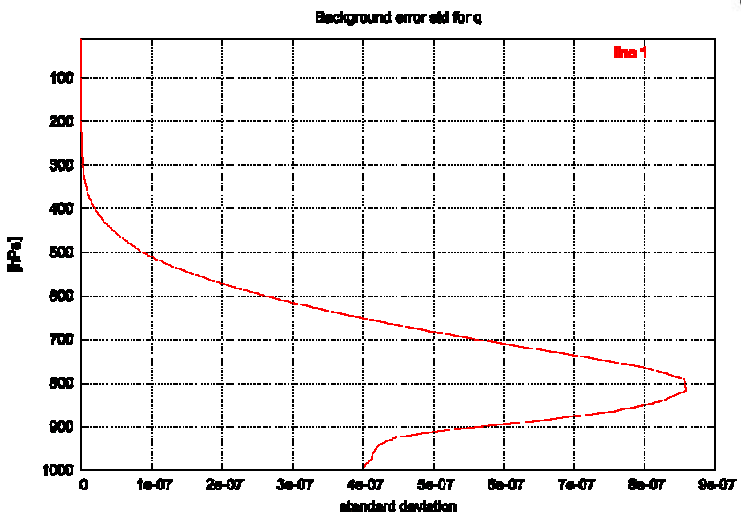
- Dry radiances is a problem: The surface contributes a lot to the observation value.
- We need to analyze T_{skin} in order to use dry radiances.
- T_{skin} will be adjusted during minimization inside HIRVDA.
- Fortunately, such code already exists and has been run with AMSU-A. The AMSU-B code is very close to AMSU-A in HIRVDA. So it should be easy to use for AMSU-B as well.
- The non-linearity of the response functions will require inner/outer loops with intermediate re-linearisations to assure convergence to the most optional solution

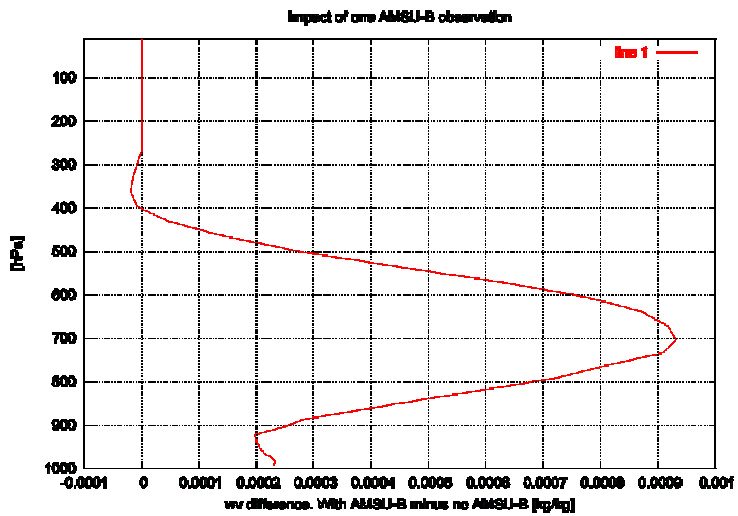


AMSU-B radiances over sea

1 obs experiment / code check results







AMSU-B radiances over sea ice

- The AAPP algorithms used for AMSU-B over sea for cirrus and rain only works over sea: We need other information about clouds.

- The OSI-SAF cloud mask will be tried for this purpose

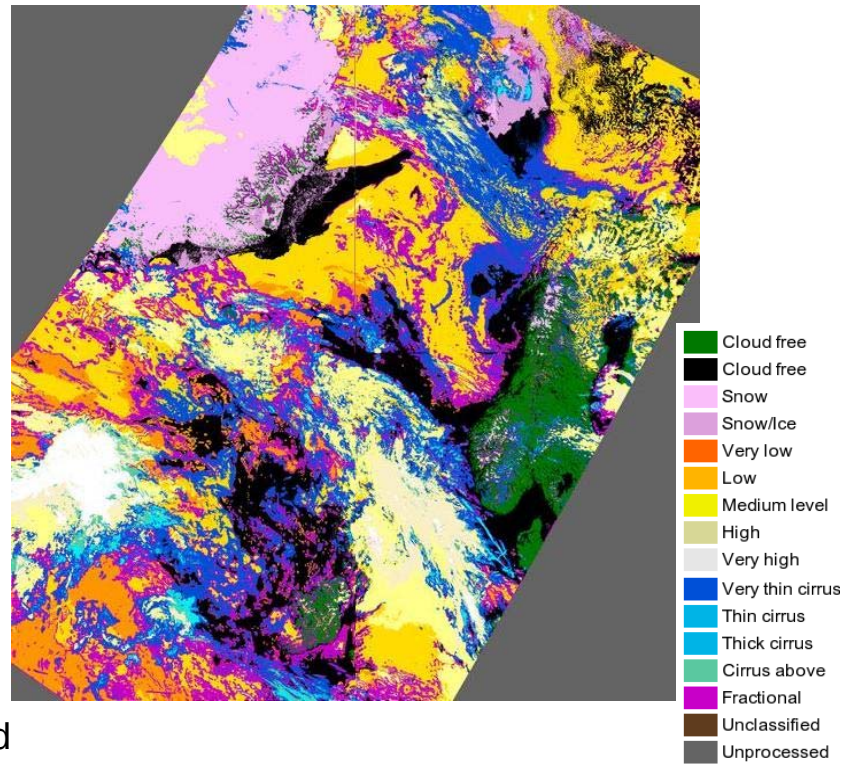
- This work has though progressed slower than expected:
  - The code package that collocates AMSU-B/NWP/OSI-SAF clouds is just ready.

- If this approach is successful we will have a quality screened set of observations who can be used to calculate innovation vectors. These can then be used to calculate coefficients for bias correction and observation error covariances.

- The plan is then to assimilate the radiances with T_{skin} and emissivity as free parameters.

- For experiments, an apropriate AVHRR cloud mask can be used.

- For operational purposes AVHRR would have to be available through EARS…



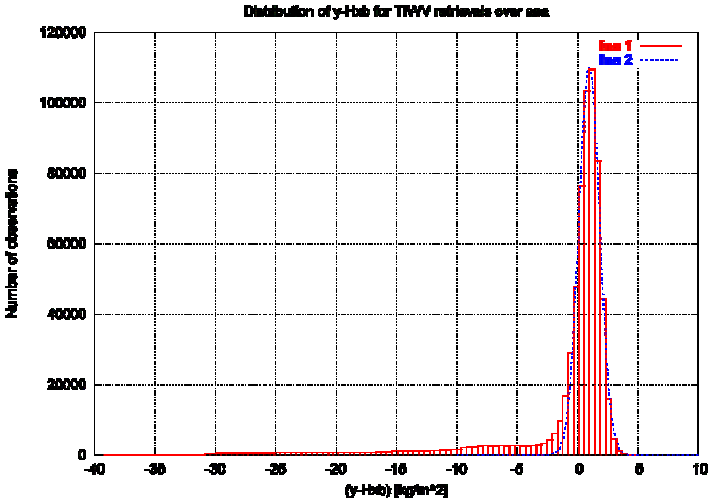
TIWV retrievals

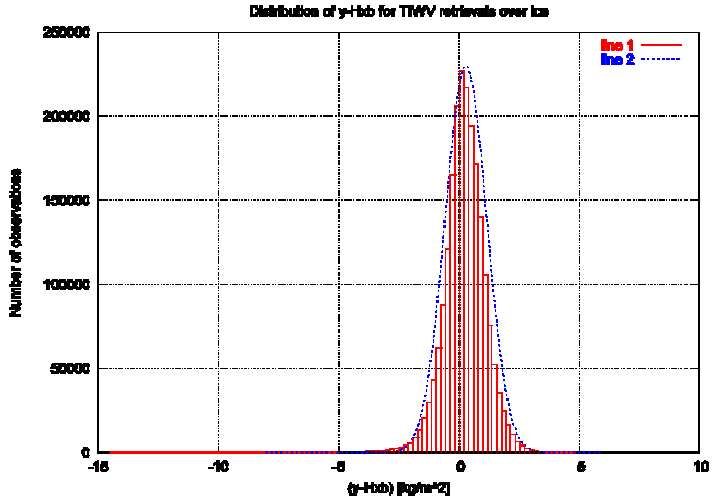
- Data is collected via ftp from DTU
- So far we have worked with data from June and December 2004
- TIWV is just a quantity for HIRVDA. So pieces of code that already handled information about TWV content could be used to get the IOMASA retrieval used by the system.
- We have defined a simple ASCII format for the TIWV retrievals as input to HIRVDA.

TIWV retrievals

Distrubution of innovation vectors

December 2004





- Distribution over ice during winter looks promising
- Skewed towards negative values over sea.

TIWV retrieval assimilation

1 obs experiment / code check results