LACE Data Assimilation Activities

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Outline

- OPLACE
- RADAR activities
- Assimilation of IASI radiances in ALARO DA
- GNSS ZTD in AROME 3DVAR

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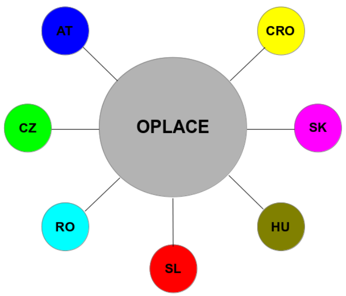

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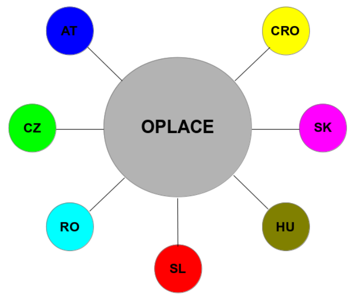
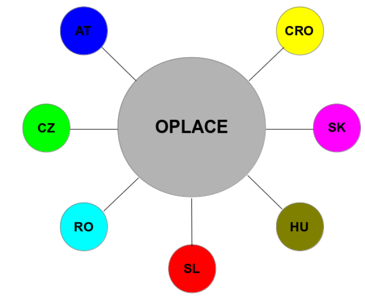
OPLACE



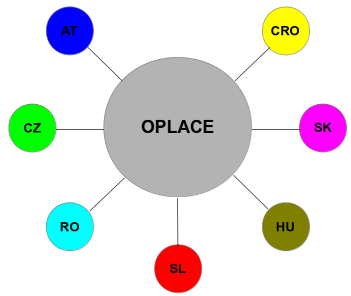
- Common LACE observation pre-processing system
- It is providing operational real-time data to LACE members for NWP and Verification purposes
- Contains observations coming through GTS (conventional) and EUMETCAST (satellite)
- Data is recently disseminated to Austria, Czech Republic, Croatia, Hungary, Romania, Slovakia and Slovenia (LACE members)

OPLACE



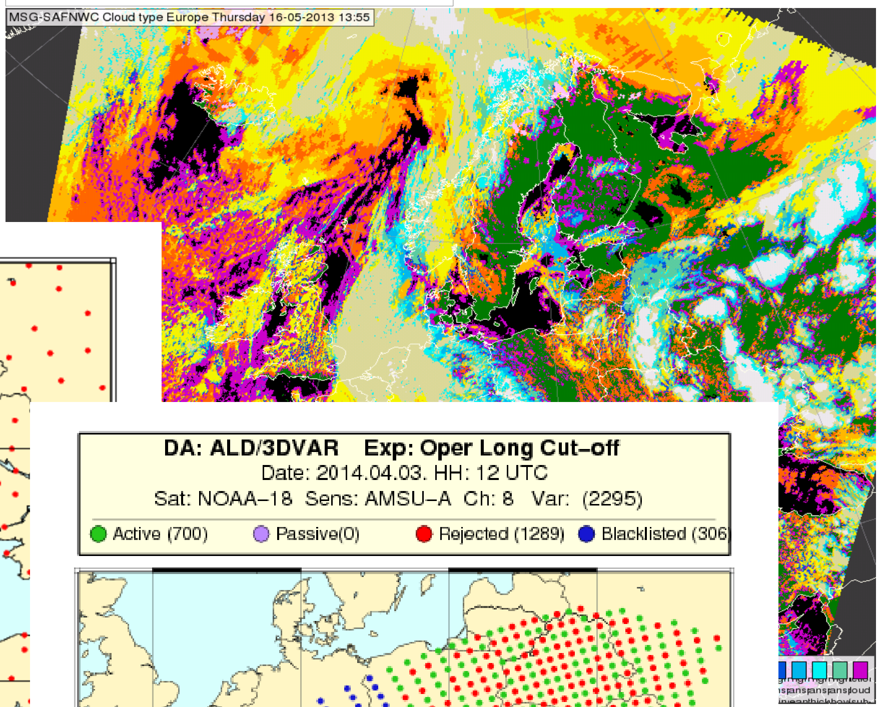
- OPLACE is based on OULAN, BUFR and GRIB softwares, converter tools
- It gathers 6 different types of observations and converts them to one of the DA (BATOR) readable format
  - Obstype1 – SYNOP – OBSOUL(ASCII)
  - Obstype2 – AMDAR – OBSOUL(ASCII)
  - Obstype3 – SATOB – BUFR
  - Obstype5 – TEMP – OBSOUL(ASCII)
  - Obstype6 – PROF – BUFR
  - Obstype7 – SATEM – BUFR, GRIB
- The system is maintained regularly and observations are monitored monthly in order to provide reliable and stable inputs for users

OPLACE

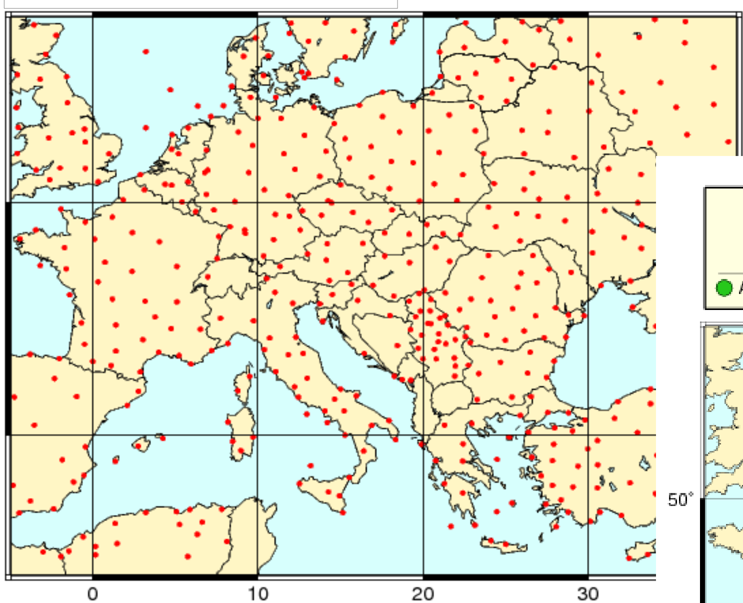


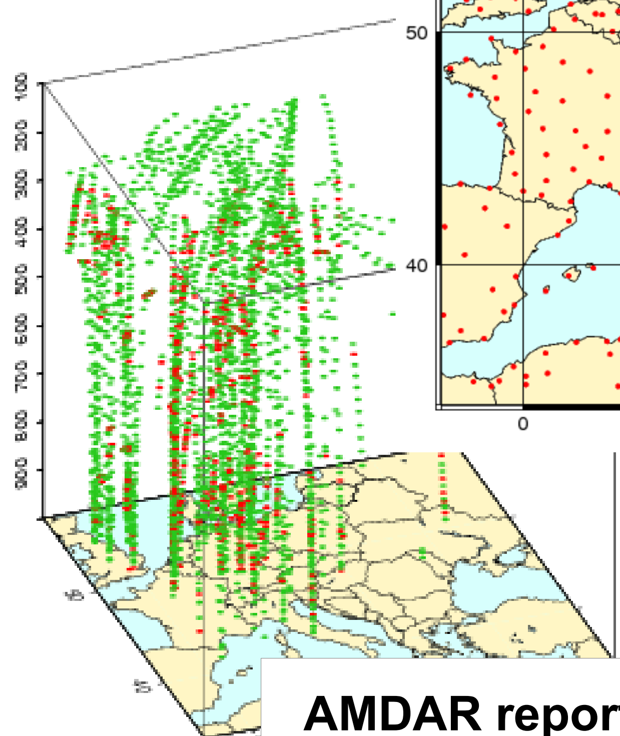
- Samples:

Meteosat Domain

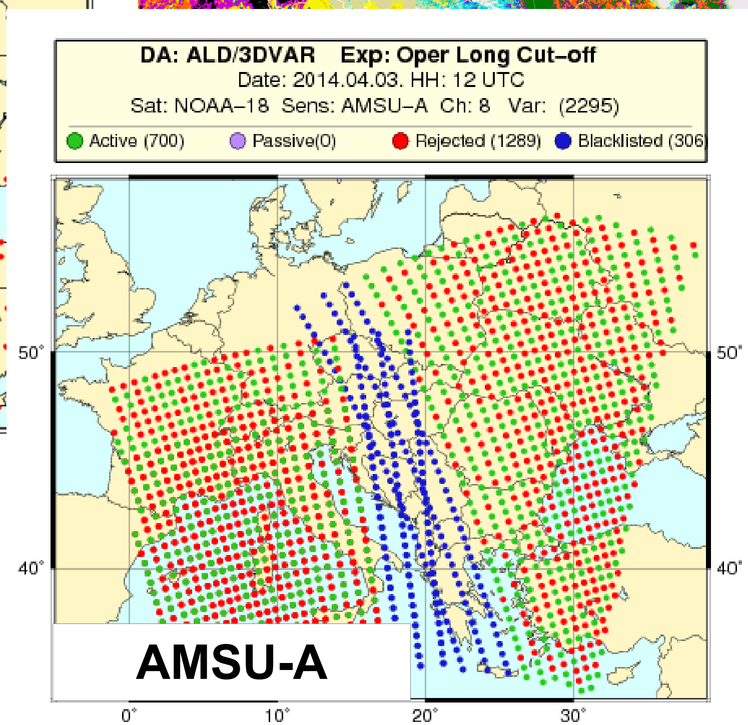


SYNOP stations





AMDAR reports



AMSU-A

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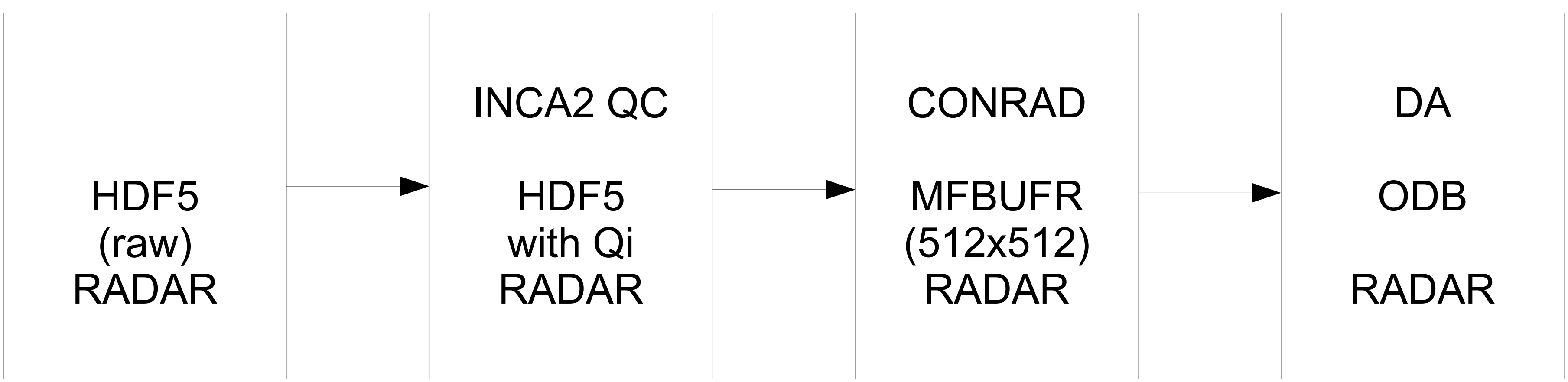
RADAR activities

- LACE collected RADAR data samples from all LACE member countries in HDF5 format
- Preliminary data collection for a given summer period of 2012
- Our primary aim is to learn and share proper RADAR data preprocessing and data assimilation experiences within LACE
- Secondary aim is to demonstrate the impact and test RADAR data with good coverage over Central Europe
- In future LACE countries would like to also contribute in OPERA RADAR data exchange.

RADAR activities

- The strategy for data collection
  - Collect raw HDF5 files from LACE member countries
  - Apply common Quality Control (INCA2 QC)
  - Convert controlled RADAR data to MF BUFR (CONRAD_RC)

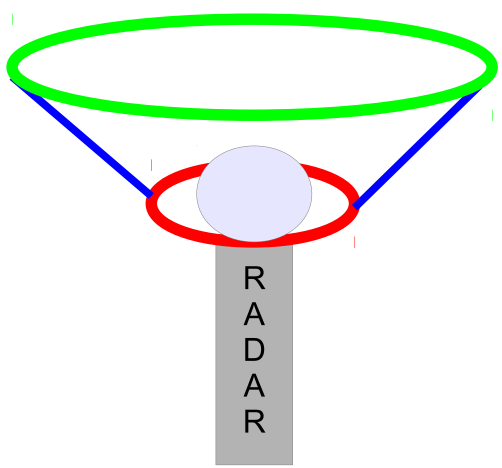


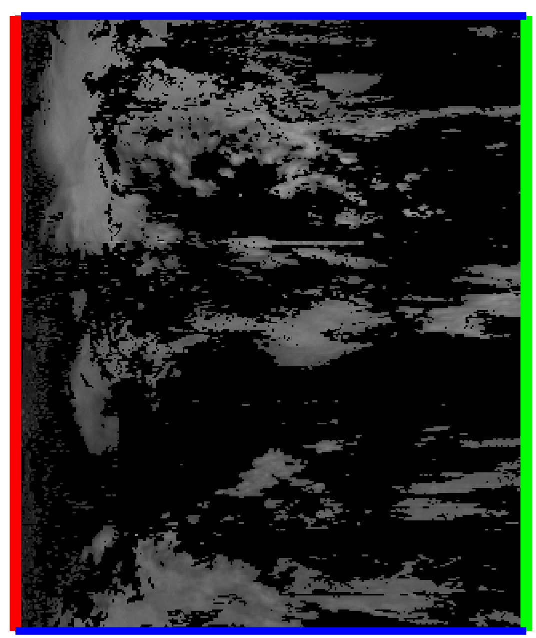
RADAR activities

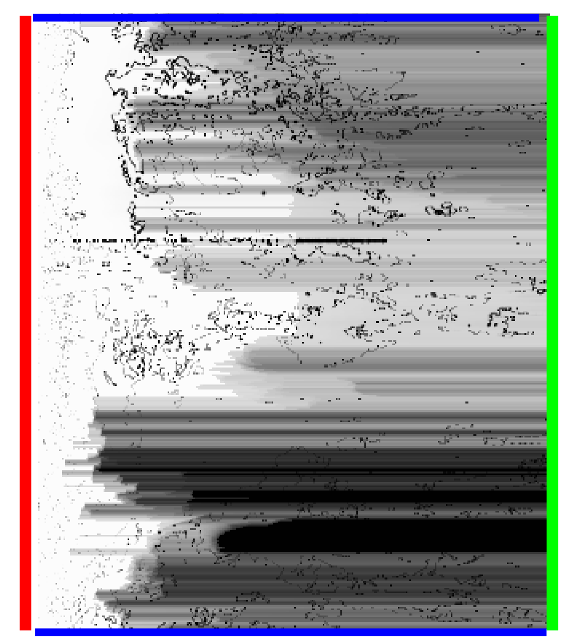
- INCA2 QC contains 7 quality indexes to measure RADAR data quality.

  Q1 – Laplace filter; **Q2** – RLAN filter; **Q3** – Attenuation; **Q4** – NWCSAF Quality index (CT,CTTH); **Q5** – Beam Blockage; **Q6** – Radar climatology based Qi; **Q7** – All Qi-s

- Example of an original RADAR reflectivity scan projected into 2D plain:

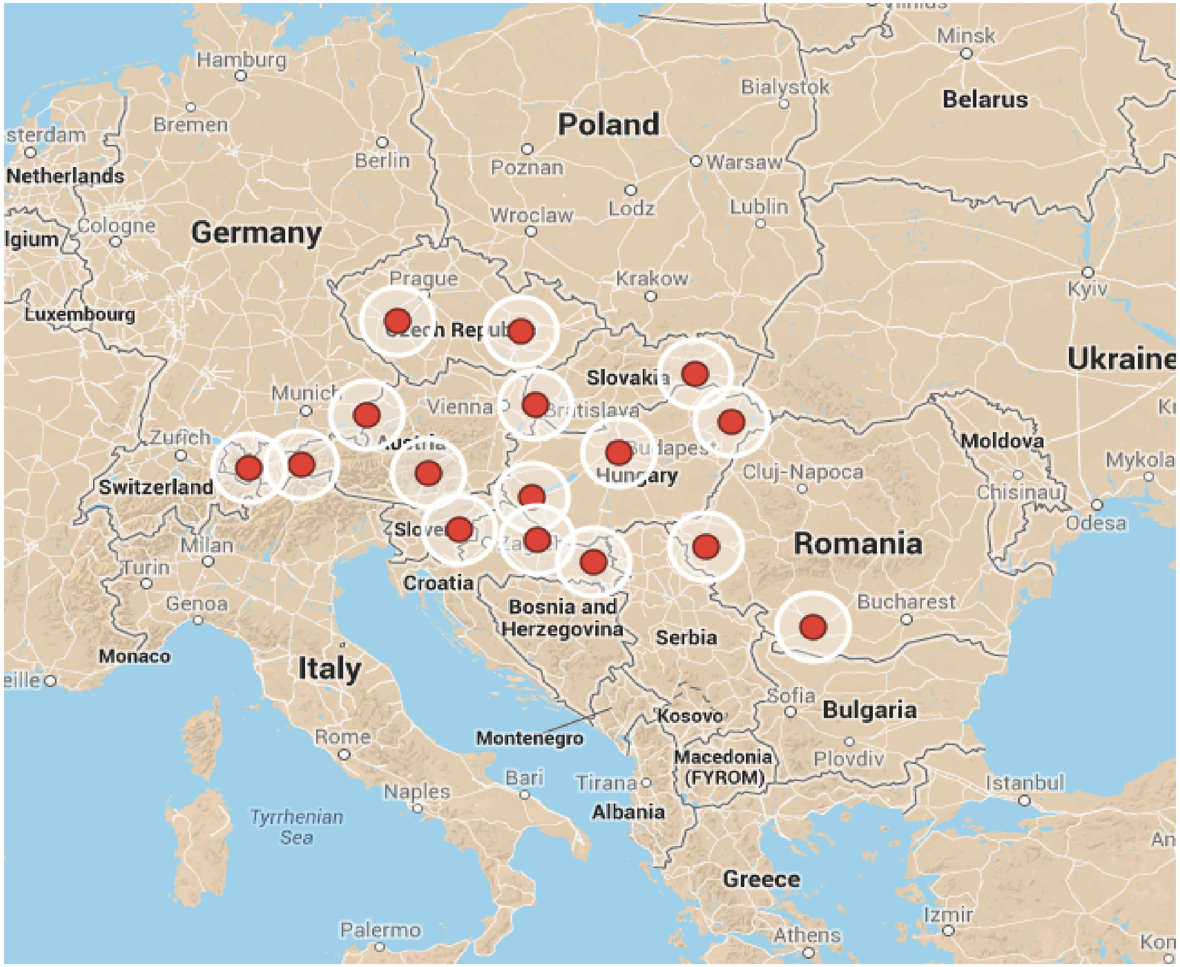






RADAR activities

- LACE members and RADAR stations



(RADAR stations for data samples of summer period 2012)

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Assimilation of IASI radiances

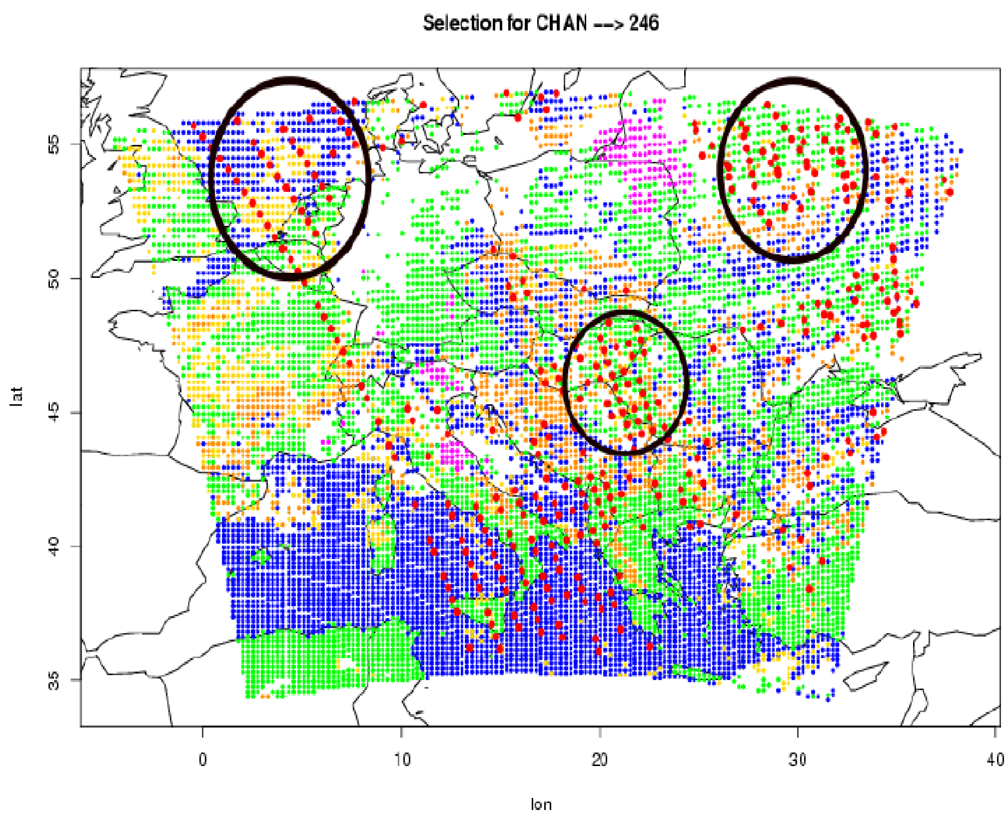
- An impact study was made with ALARO 3DVAR and IASI radiances from METOP-B.
- Satellite bias was corrected using VARBC scheme where regression coefficients have been initialized from global model ECMWF (warmstart)
- A problem with IASI data rejection (in quality control) was found due to the cloud contamination. This problem is related with cloud detection scheme used for hyper-spectral satellite instrument like IASI, AIRS and CrIS.
- Cloud detection algorithm (McNally and Watts (2003)) is based on the assumption that OMG departures are unbiased (and works well on this condition).

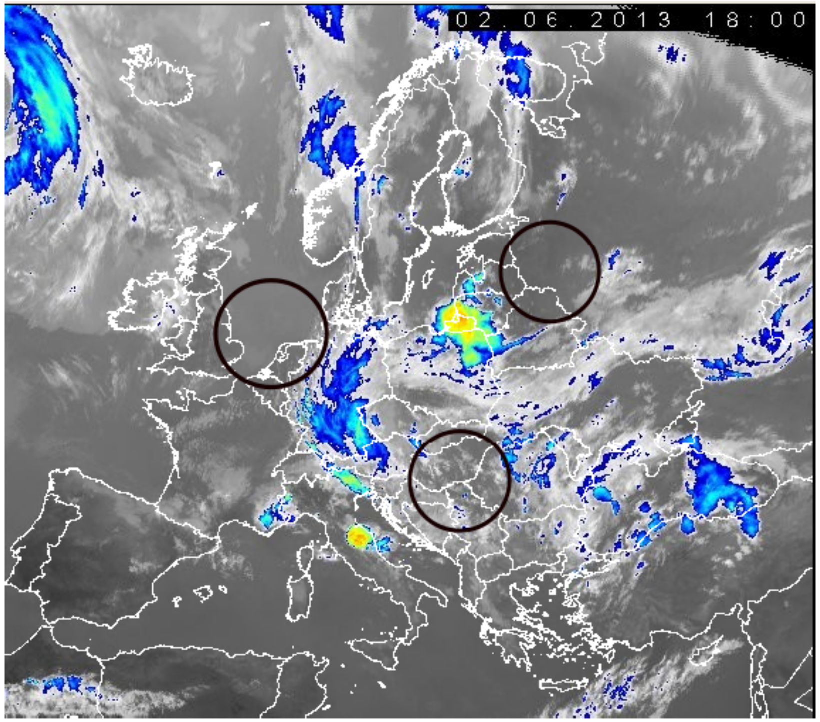
Assimilation of IASI radiances

- But especially the low/middle tropospheric peaking channels have usually larger bias which leads to data rejection in passive assimilation
- In order to avoid such data rejection in the system the following tuning of cloud detection scheme was made:
  - Defining large extension of clear sky days in our domain (5-9 June 2013)
  - Estimate OMG departures for each IASI channel
  - Change BT threshold (according to the detected biases) to ensure clear radiances pass through quality control
  - IASI bias correction using fast adaptivity(NGB=500) for that particular clear sky days
  - BT thresholds were switched back to default values
- With this tunning of cloud detection scheme the low/middle peaking channels have not been rejected and regression coefficients were updated already at the beginning of VARBC calculation.

Assimilation of IASI radiances

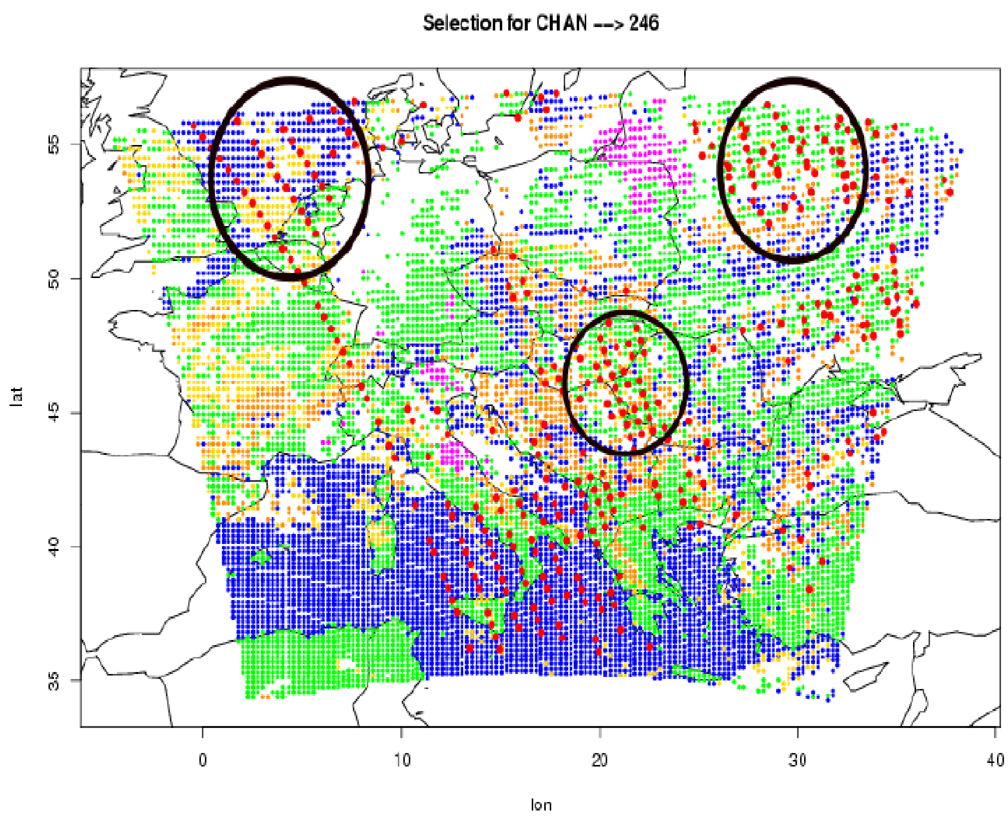
- To verify the functionality of the modified cloud detection scheme, the clear sky pixel selection from a random day was compared with cloud-type (CT) product of SAF/NWC.

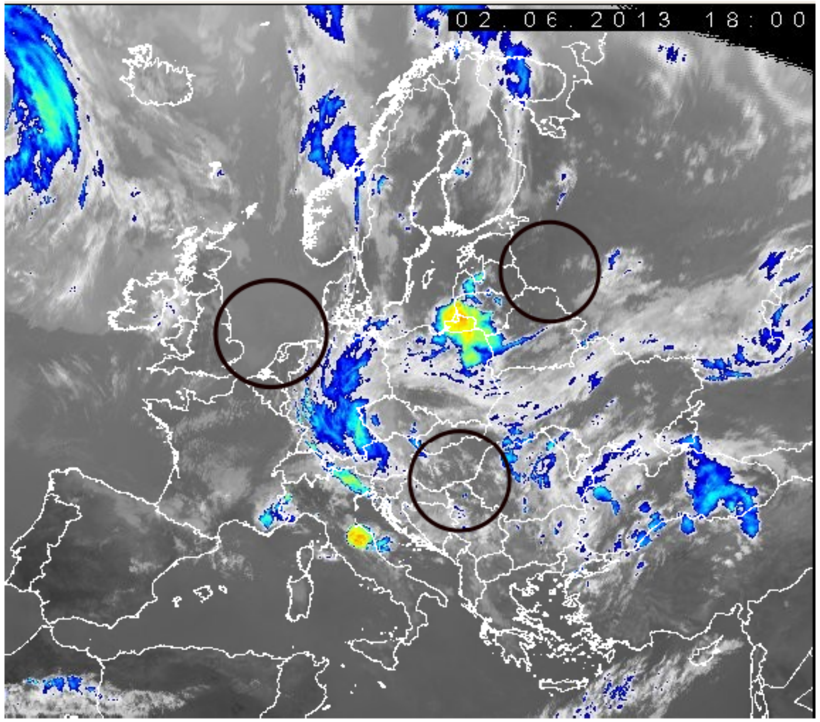




Assimilation of IASI radiances

- For middle peaking channel 246
  - Over clear sky conditions pixels are selected (red dots)
  - Data contaminated by high/mid level clouds are rejected (white/pink points)
  - Middle peaking channel was also selected over very low cloud (orange points)





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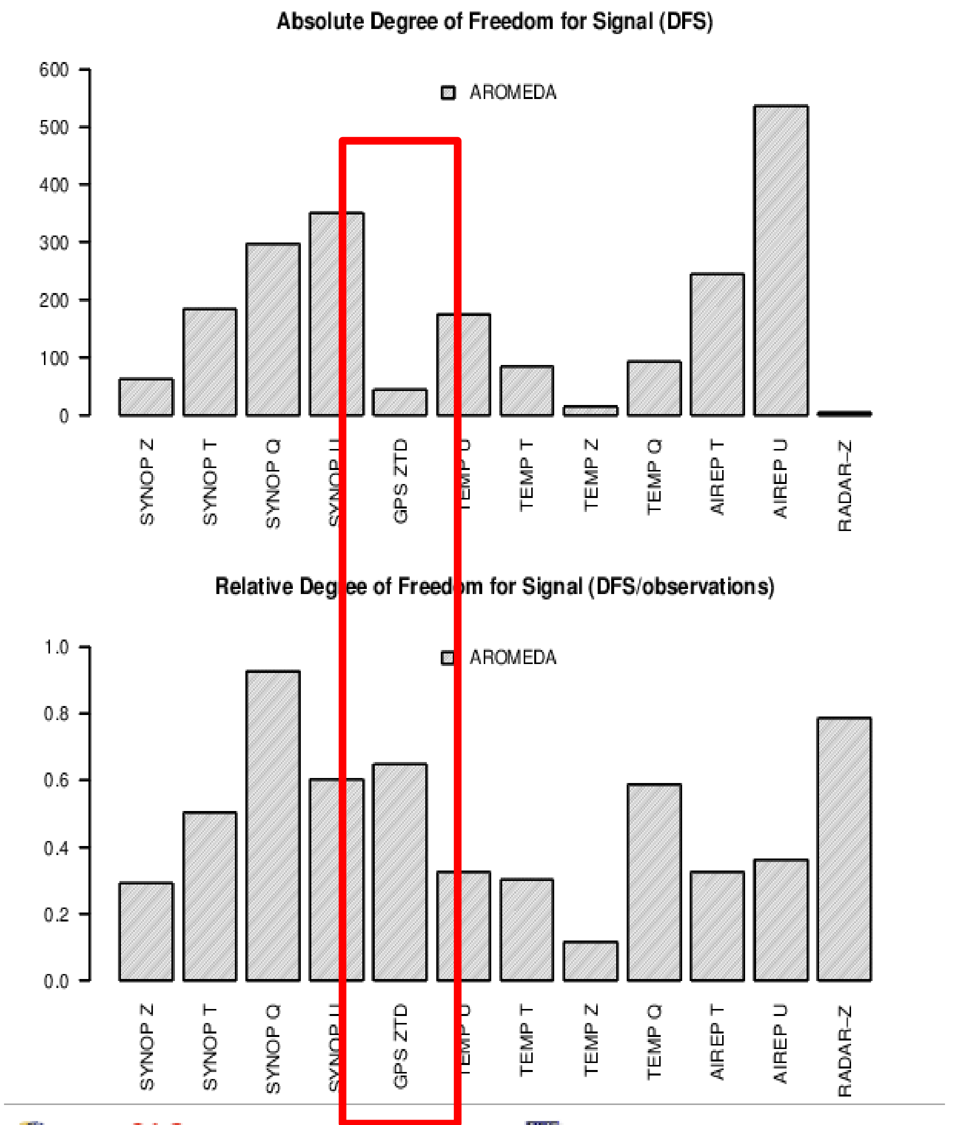
- Rather new EGVAP network so called SGOB was introduced last winter which covers Hungary with dense ground-base GPS receiver stations
- In addition to AROME 3DVAR from cy36t1, offline pre-processing and static bias correction were used (Poli et. al. 2007., Yan et. al. 2008.)
- Inside AROME domain 67 GPS stations were selected

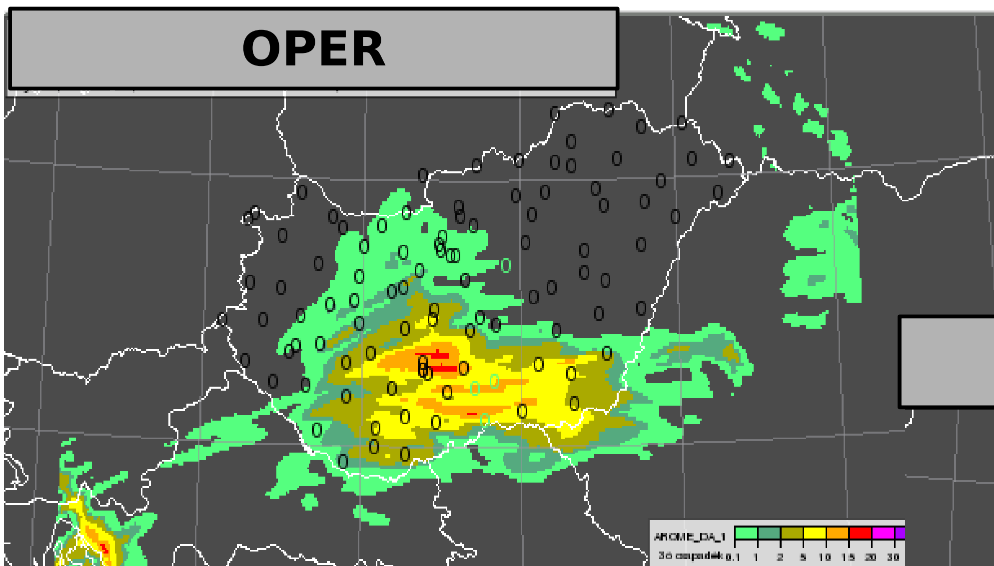
GNSS ZTD in AROME 3DVAR

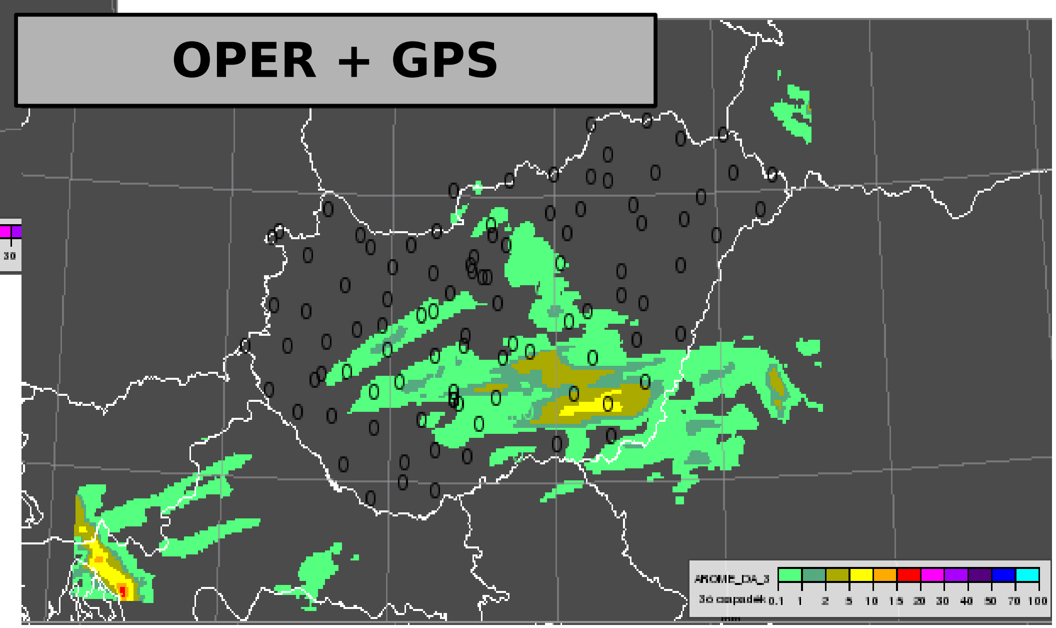
- ZTD observations from trusted, selected 67 stations were employed in AROME 3DVAR for winter period of 2014.
- DFS shows relative importance of ZTD data (third highest contribution)
- Long term study results indicate mainly neutral and slightly positive impact on AROME forecasts.



GNSS ZTD in AROME 3DVAR

- A bit more details can be found on Hungarian poster!
- One case study → Overestimated precipitation was reduced by ZTD assimilation





Thank You! Questions?