

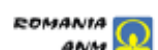
RUC, HRW, Mode-S, OPLACE, etc – LACE's DA systems

Mate Mile and many others



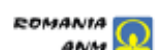
Outline

- LACE 1h RUC Kick-off meeting
- HRW AMV
- Mode-S in LACE
- OPLACE



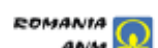
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LACE 1h RUC Kick-off meeting

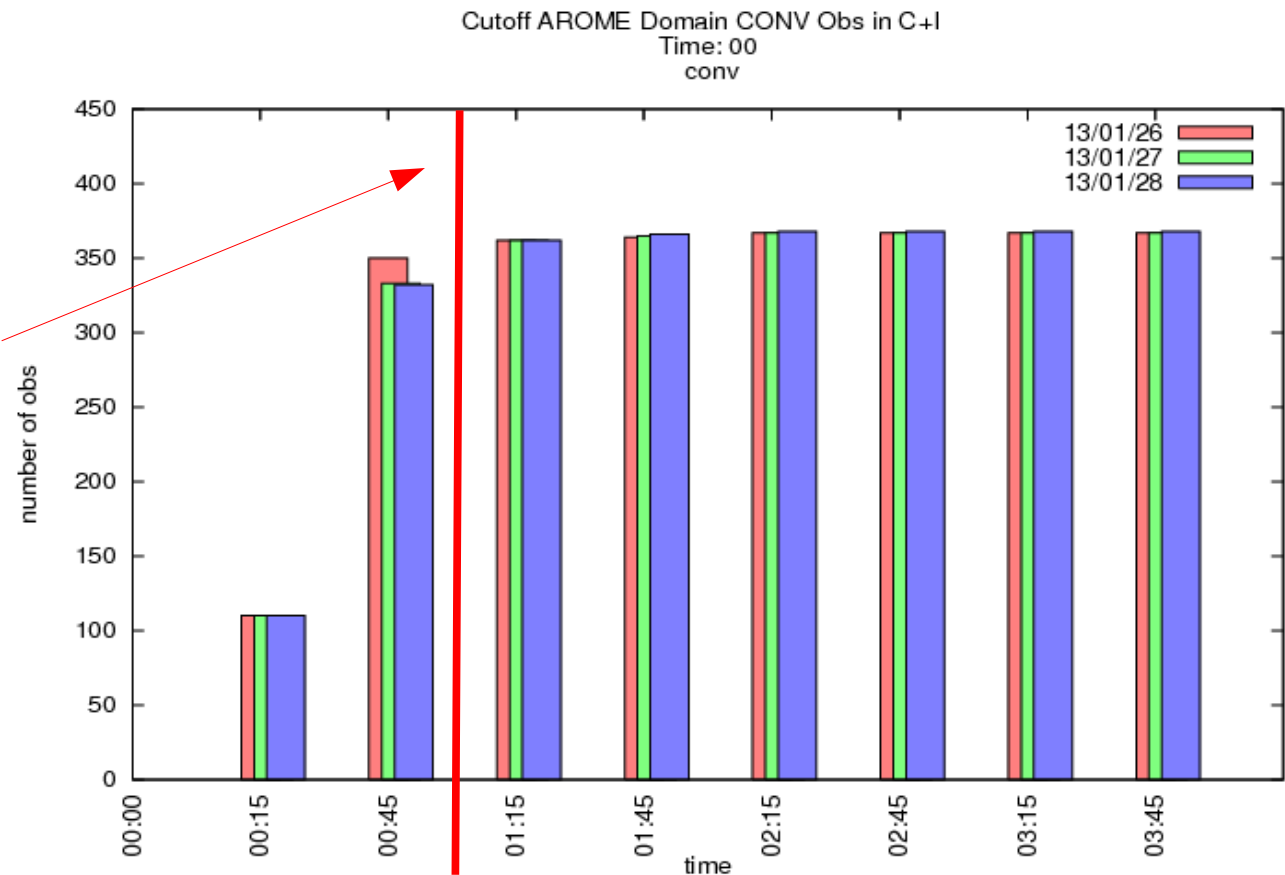
- A Kick-off meeting has been organized in order to identify relevant issues, challenges of DA system based on hourly updated analysis cycle.
- The goal is to provide reliable frequently updated short-range NWP forecasts focusing on parameters wind-gust, precipitation, temperature, low-level cloudiness and visibility with the highest priority.
- The key issues and challenges have been discussed during the meeting together with HIRLAM and Meteo-France colleagues as well.



LACE 1h RUC Kick-off meeting

- *Observation pre-processing:*
 - There is a need to speed up current OPLACE system for hourly updated analyses!
 - COPE?

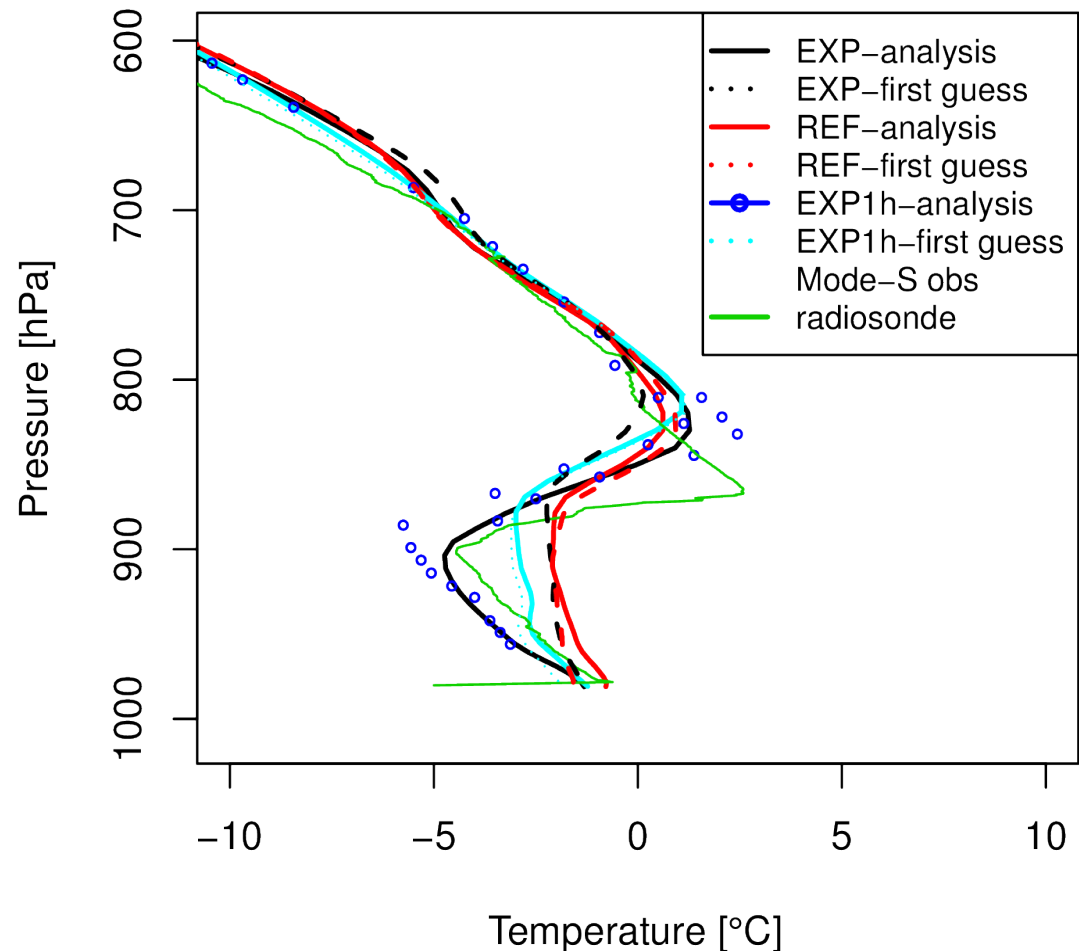
Roughly 1 hour is the current limit to get conventional observations inside C+I



LACE 1h RUC Kick-off meeting

■ *Extension of observational set:*

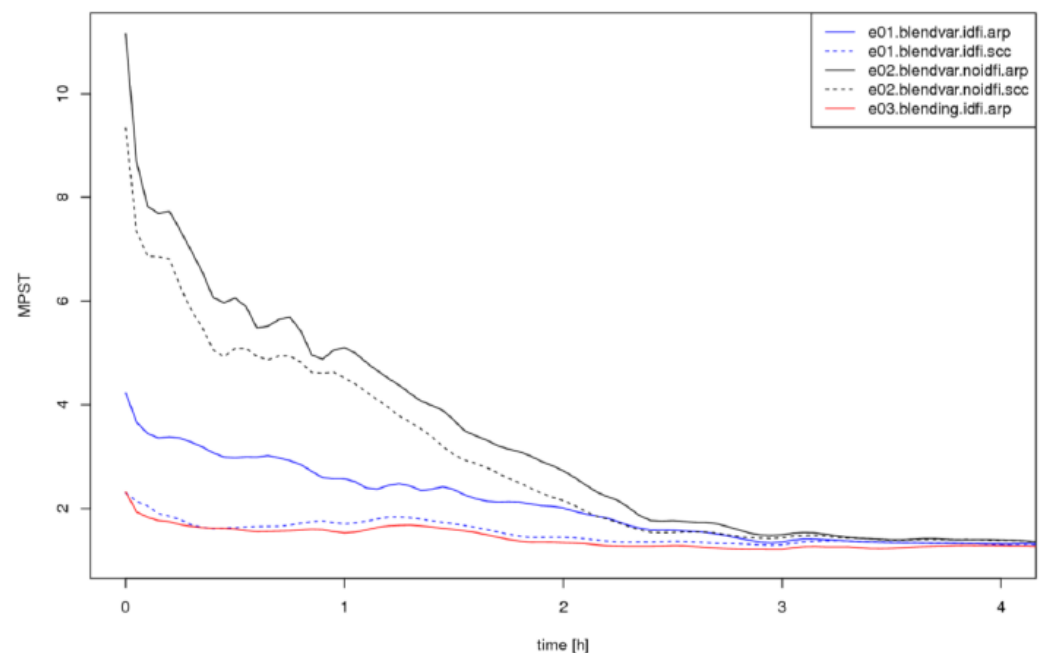
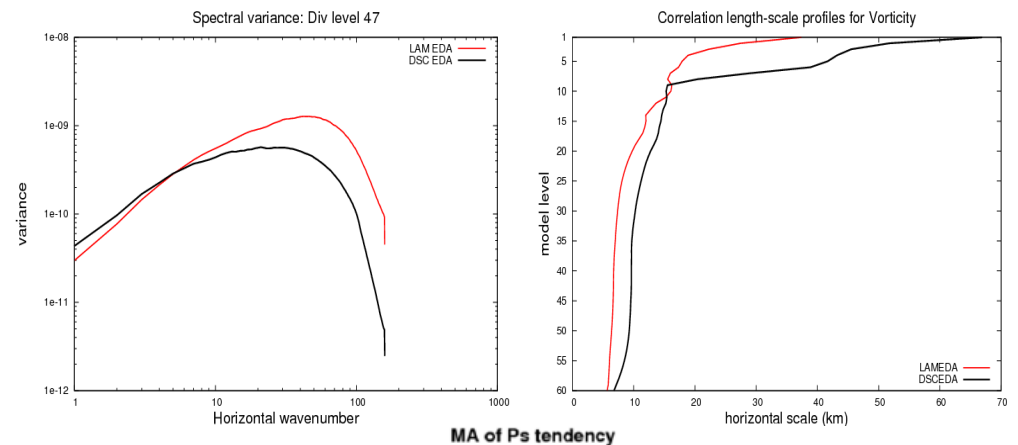
- Sufficient observation constraint is needed in every 1h RUC analyses otherwise DA is going to be failed
- High frequency observations become more important
- RADAR, GNSS, Mode-S, Meteosat products



LACE 1h RUC Kick-off meeting

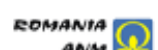
■ *Control noise accumulation:*

- In order to reduce spurious numerical noises and imbalances at initial time accurate initial conditions are needed.
- Space-consistent coupling and mesoscale EDA structure functions are beneficial.
- The need of further initialization e.g. with DFI will be investigated.



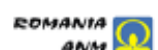
LACE 1h RUC Kick-off meeting

- Remember other challenges to be tackled
- Collaboration is more than welcome
- *If You are interested, more information can be found on LACE webpage (DA page → Workshop & Meetings)*



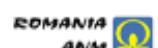
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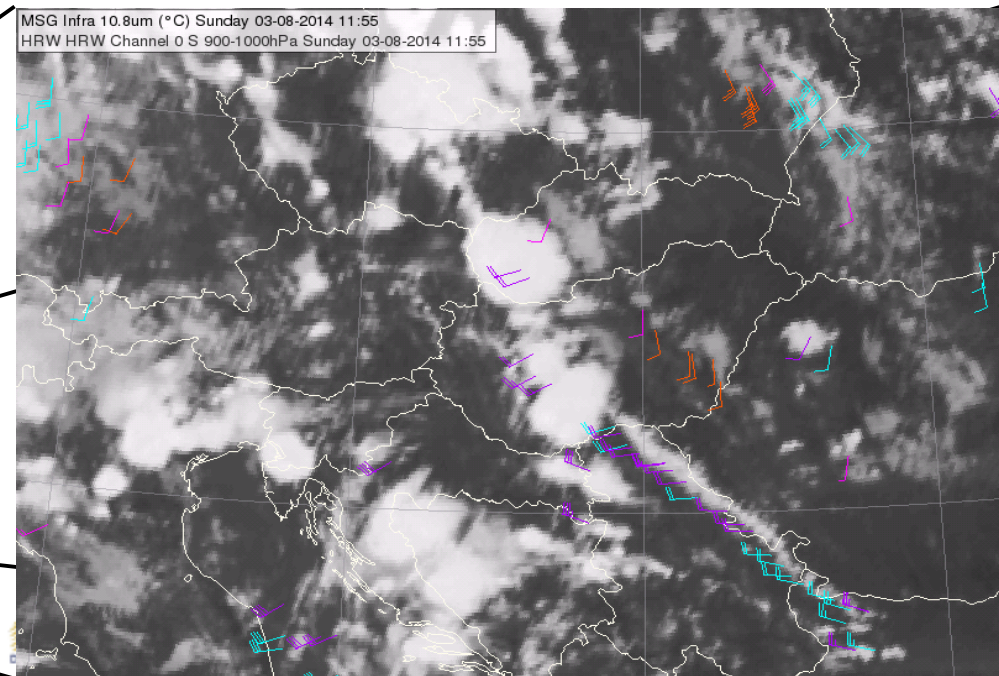
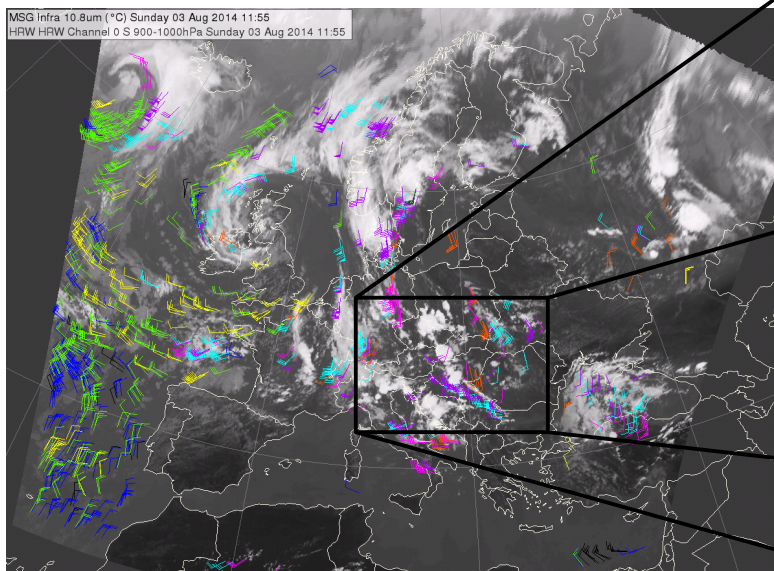
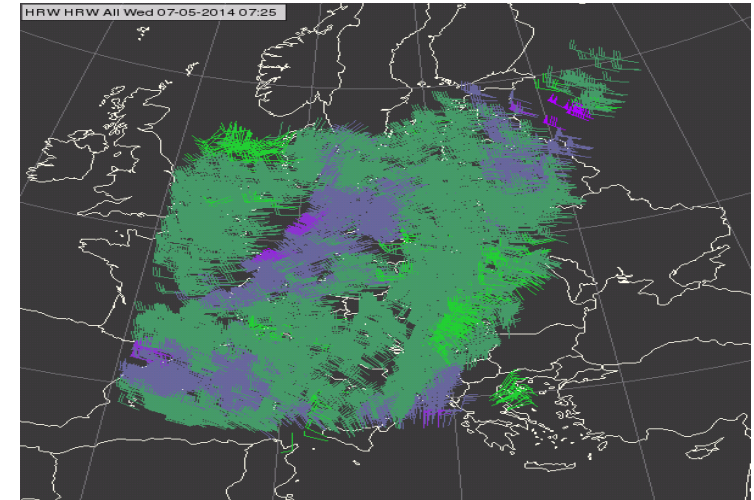
High Resolution Winds AMV

- EUMETSAT NWCSAF is to provide, develop and maintain software packages to be used with operational meteorological satellite data for Nowcasting and Very short range forecasting purposes.
- NWCSAF package v2013 contains advanced retrieval algorithm of AMV so called HRW (High Resolution Winds) using Meteosat images.
- Through its configuration file, the retrieval options can be tuned easily due to the user (NWC or NWP) requirements.

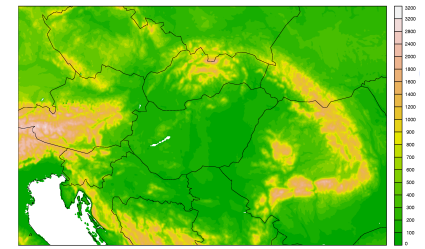


High Resolution Winds AMV

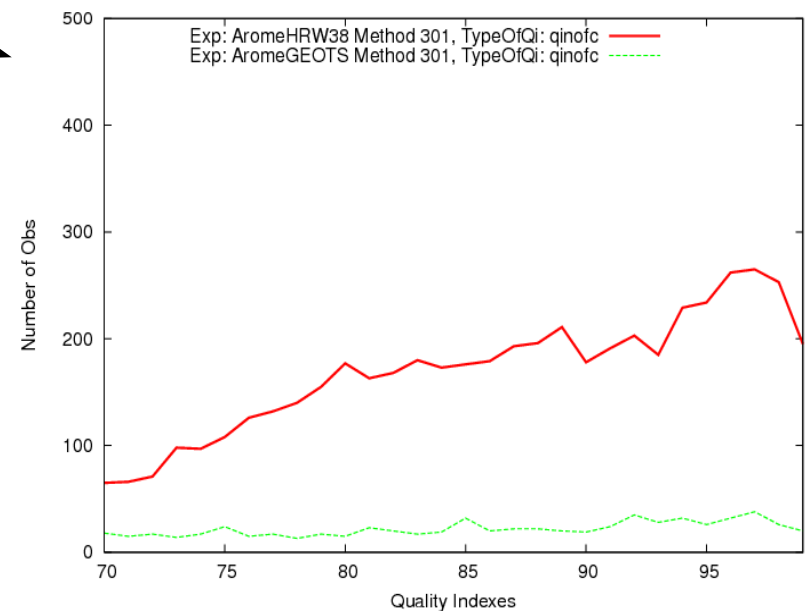
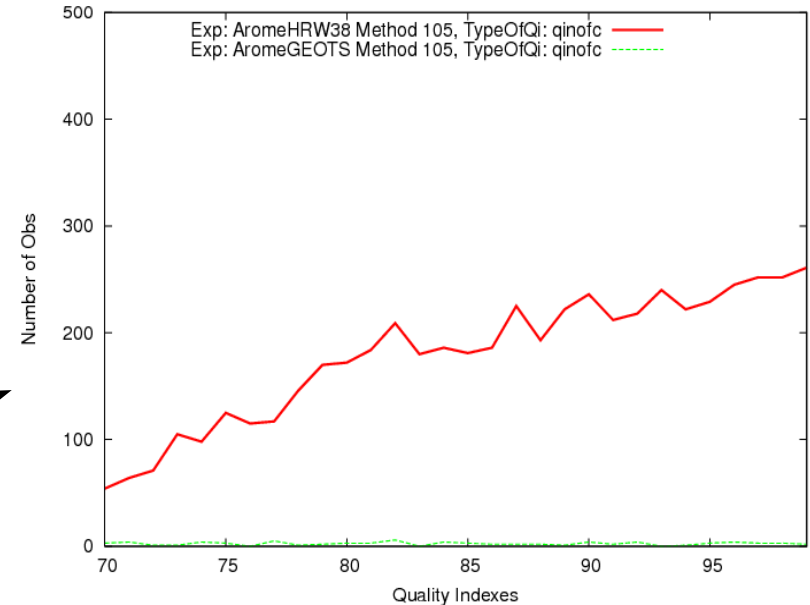
- HRW AMV BUFR output format is defined similarly as EUMETSAT MPEF (Geowind) AMV
- HRW algorithm computes the AMVs by default without the use of wind guess in the definition of tracking area.
- Advanced CCC height assignment method is also included.
- *Available on OPLACE*



High Resolution Winds AMV

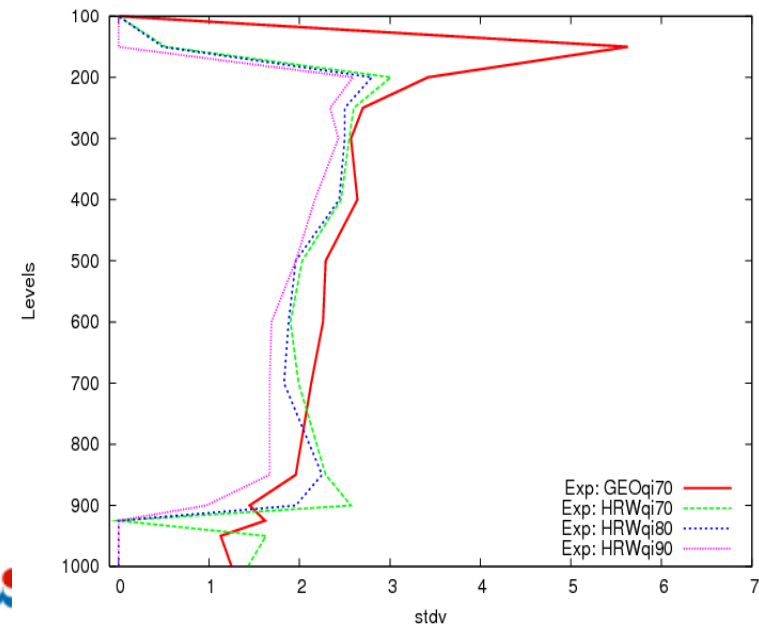
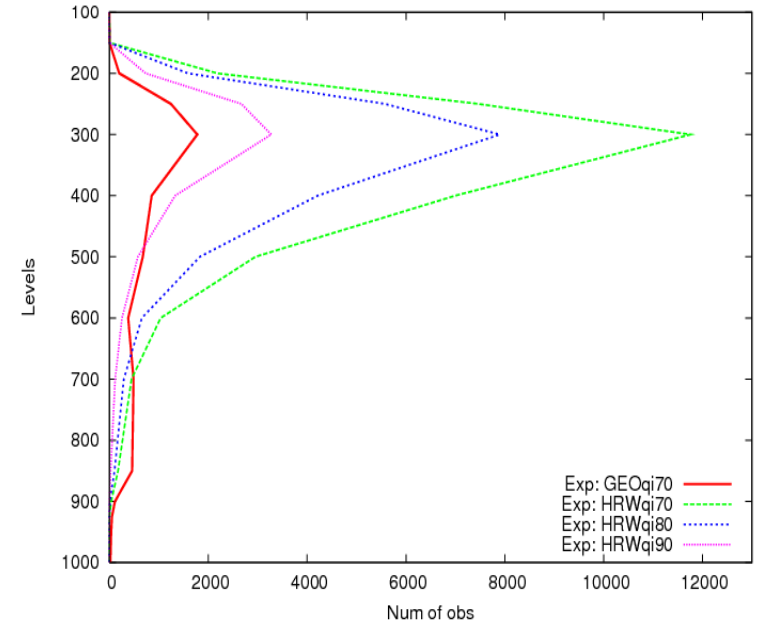
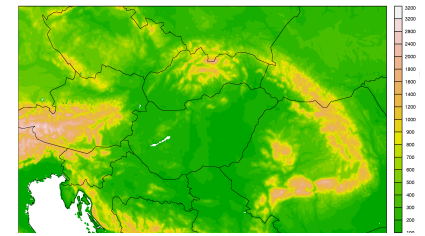


- The number of HRW and Geowind AMVs have been determined over a relatively small domain and on a 10 days period.
 - Method105(WV062)
 - Method301(IR108)
- HRW provides increased number of AMVs and usually more with higher QIs



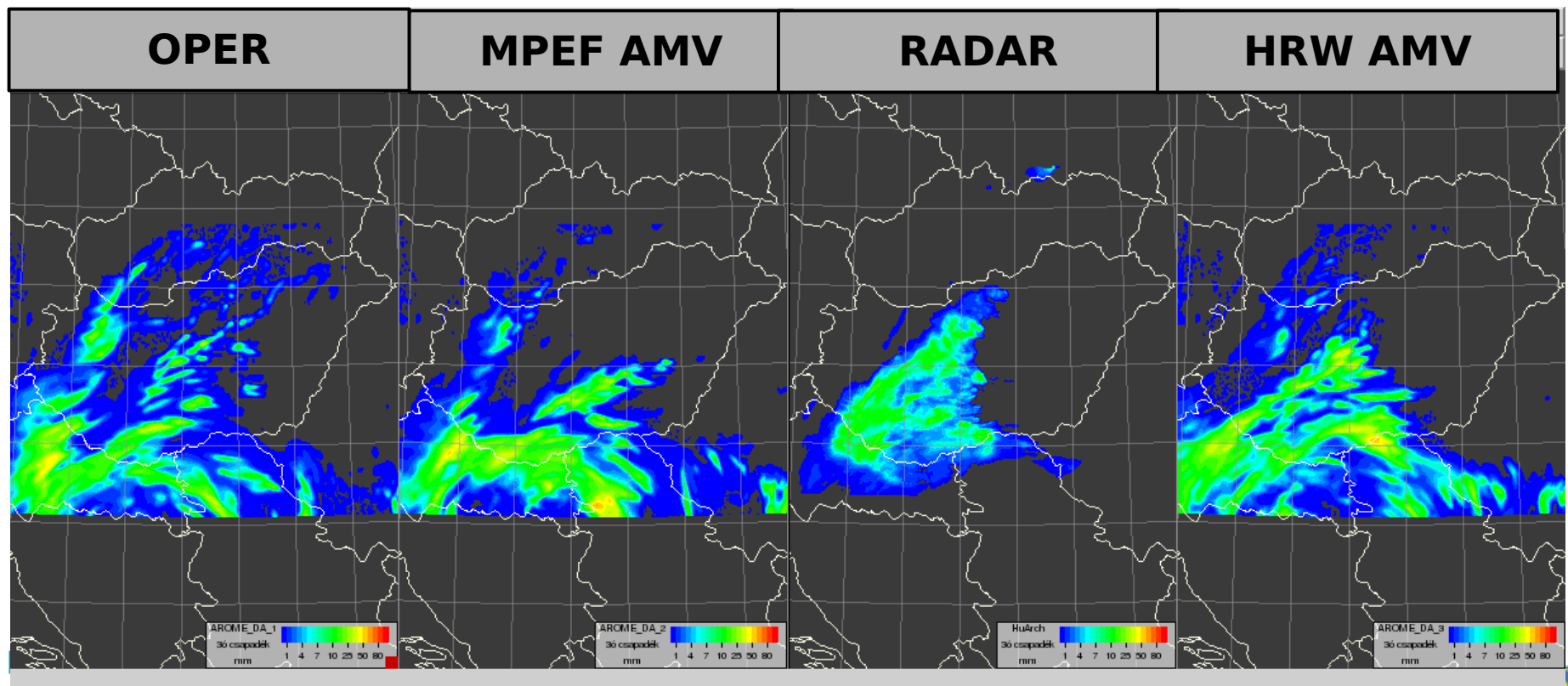
High Resolution Winds AMV

- Observation monitoring:
 - **GEOqi70** - using MPEF AMV above 70%
 - **HRWqi70** - using HRW AMV above 70%
 - **HRWqi80** - using HRW AMV above 80%
 - **HRWqi90** - using HRW AMV above 90%
- The bigger part of the HRW is retrieved around 300 – 400 hPa
- OMG statistics are similar or better compared to Geowind



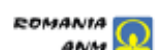
High Resolution Winds AMV

- Due to preliminary experiments, neutral impact was obtained with HRW assimilation on traditional scores
- Improvement can be seen on convective and heavy precipitation case studies (especially on the distribution of precip. objects)
- AROME 6h accum. precipitation forecast at 6th of August 2014.



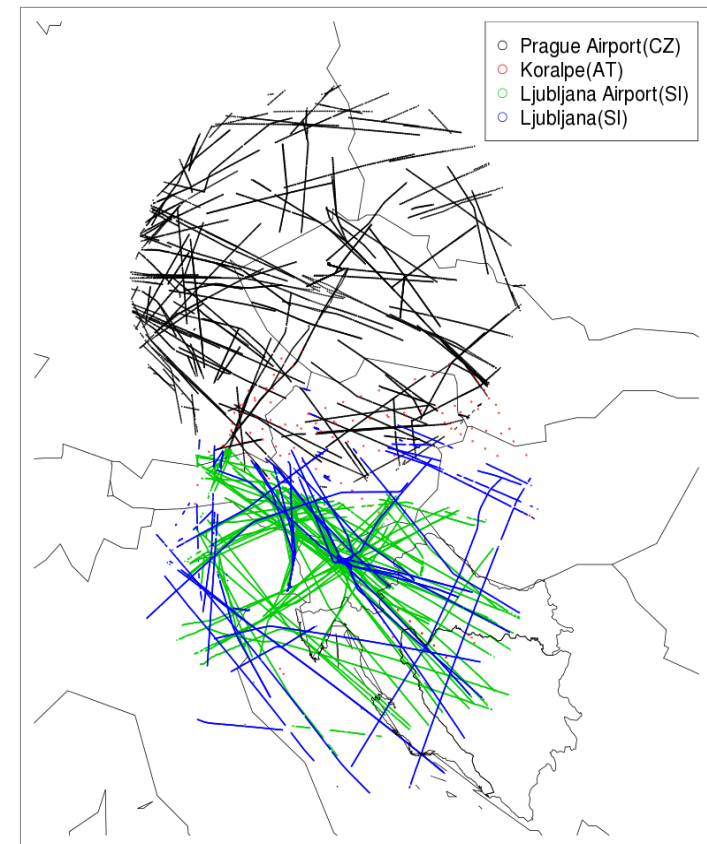
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Mode-S in LACE

- In Slovenia, Mode-S MRAR is operationally assimilated since last June.
- MRAR has similar quality than AMDAR and therefore used as obstype number 2 during data assimilation.
- Quality control is very important (whitelist approach)
- Mode-S network is growing inside LACE, recently reports are collected from 4 RADARs (2 from Slovenian, 1 from Czech Rep. and 1 from Austria)



Mode-S in LACE

■ Reminder:

| | MODE-S MRAR <i>Meteorological routine air report</i> | MODE-S EHS <i>Enhanced surveillance (reports)</i> |
|---------|--|--|
| name | MODE-S MRAR <i>Meteorological routine air report</i> | MODE-S EHS <i>Enhanced surveillance (reports)</i> |
| data | <ul style="list-style-type: none"> ▫ (BDS 4,4) – met. routine air report wind speed, direction, temperature, turbulence, humidity ▫ (BDS 4,5) – met. hazard report (turbulence, wind shear, microburst, icing) | <ul style="list-style-type: none"> ▫ (BDS 4,0) selected vertical intent (selected altitude) ▫ (BDS 5,0) track and turn report - roll angle, true track angle and rate, ground speed and true air speed ▫ (BDS 6,0) heading and speed report indicated air speed and mach, barometric altitude rate, magnetic heading |
| type | Direct data | Indirect (temperature) data |
| rep. by | around 5 % of all Mode-S equipped aircraft (depends on transponder configuration) | all Mode-S equipped aircraft |

Strajnar 2012, Hrastovec and Solina 2013

de Hann 2011, de Haan and Stoffelen 2012

Mode-S in LACE

- Mode-S MRAR has good and clear impact on winter period (especially for inversions)
- During summer period Mode-S is also able to improve wind and precip. forecasts
- More details:

Strajnar et. al., 2015
Impact of new aircraft observations Mode-S MRAR in a mesoscale NWP model

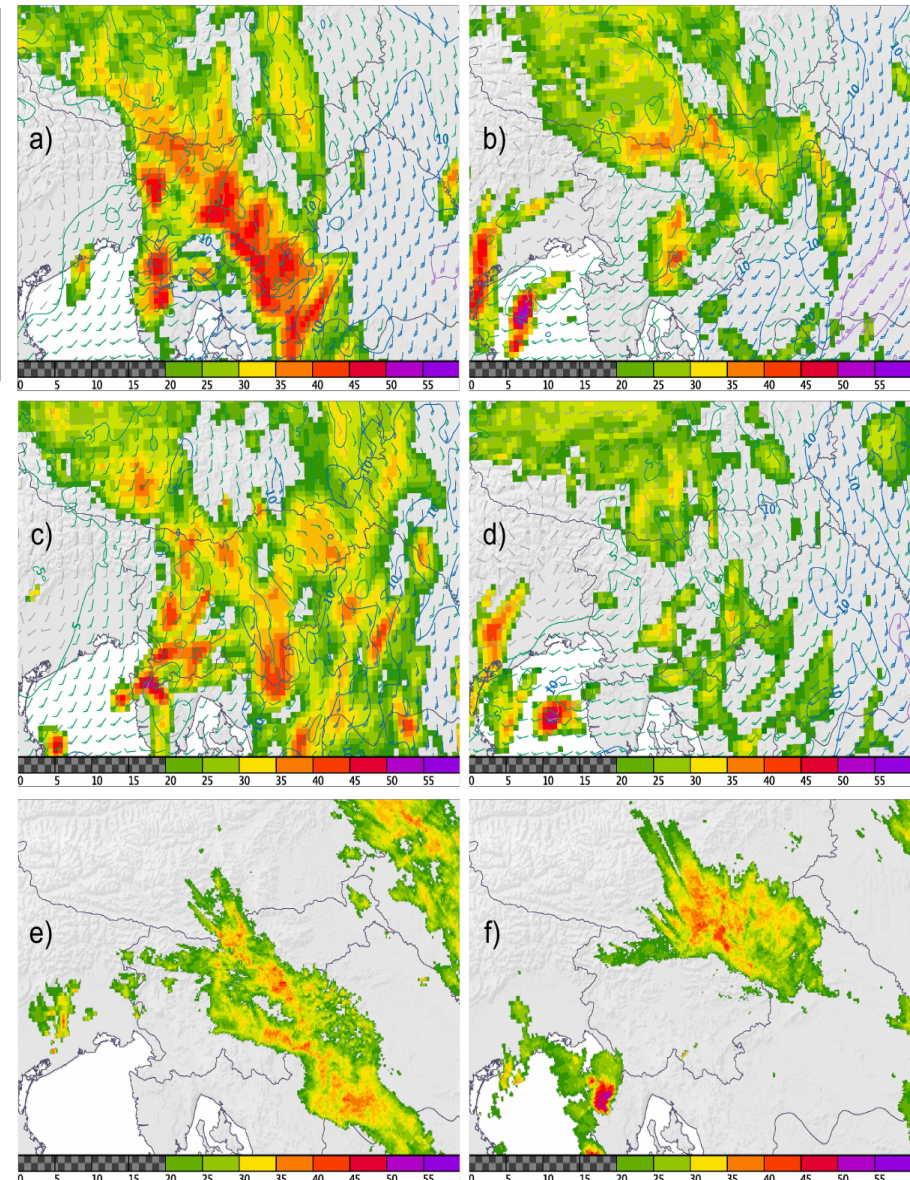
With Mode-S

Without Mode-S

RADAR

2013-07-24 12 UTC

2013-07-24 15 UTC



Mode-S in LACE

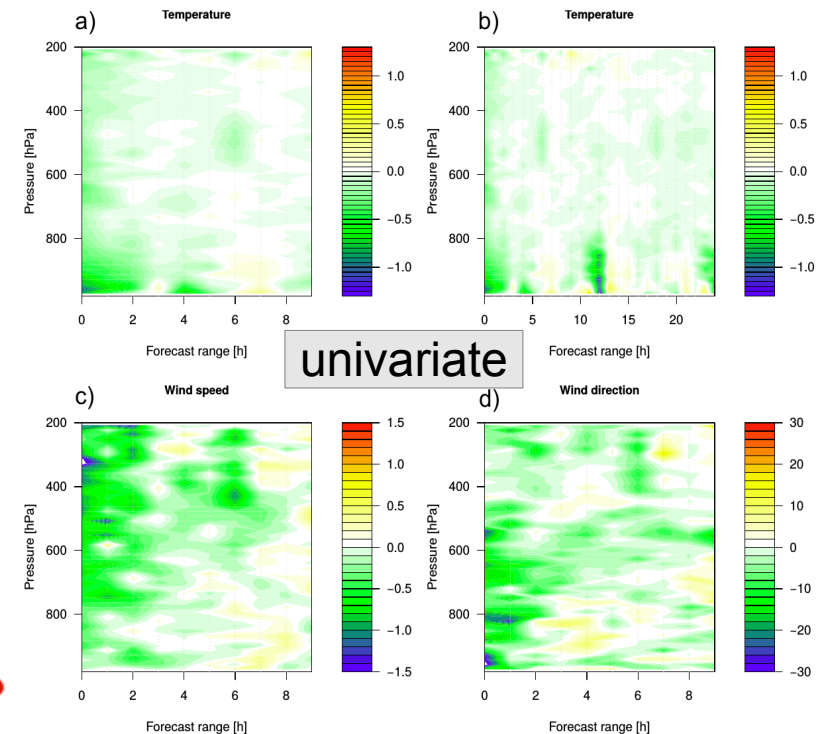
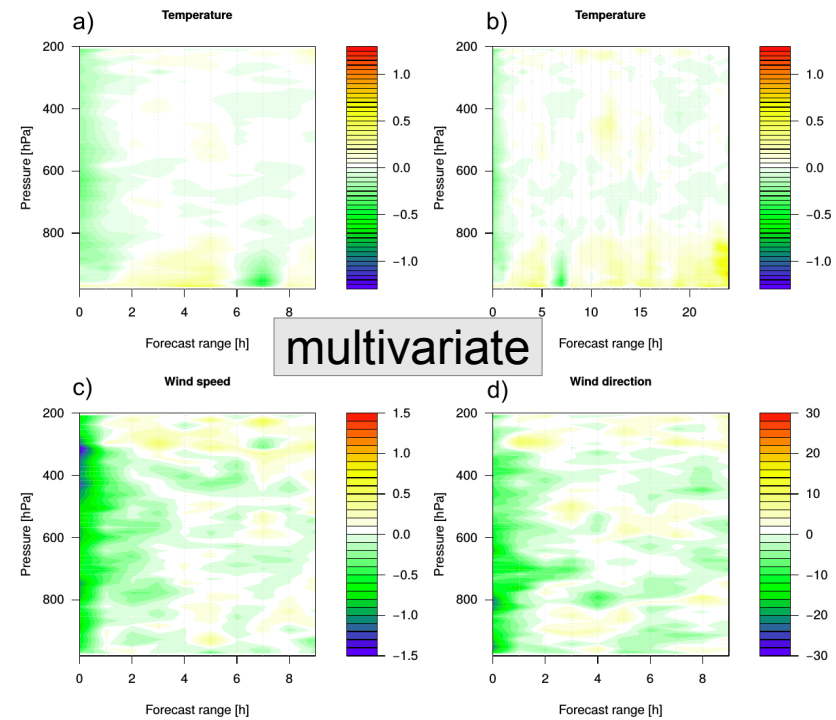
- In Slovenian ALARO DA system, humidity is mostly corrected through multivariate link of balance operator (lack of humidity obs)
- During summer period this link was found to be sensitive to forecast performance which has to be further studied

$$\zeta = \zeta$$

$$\eta = \mathbf{MH}\zeta + \eta_u$$

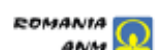
$$(T, p_s) = \mathbf{NH}\zeta + \mathbf{P}\eta_u + (T, p_s)_u$$

$$q = \mathbf{QH}\zeta + \mathbf{R}\eta_u + \mathbf{S}(T, p_s)_u + q_u$$

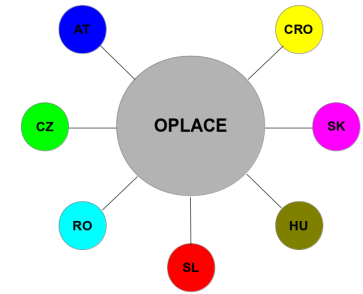


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OPLACE BUFR migration issues



- Migration from TAC to TDCF has been tackled to provide reliable and up-to-date observations to OPLACE users.
- Regarding BUFR SYNOP observations, quality of the reports was found to be correct and BUFR reports are considered as primary source of SYNOPs. TAC SYNOP reports are still handled secondarily.
- Regarding BUFR TEMP, quality issues were identified due to encoding mistakes (and similar information was also received through EUMETNET EUCOS based on global center's and ECMWF experiences). Therefore BUFR TEMP reports are experimentally implemented to OPLACE until the quality of the data stabilizes.
- WIGOS AMDAR BUFR migration has been also tackled and fixed at the beginning of 2015 in OPLACE.
- As a next step BUFR reports are going to be available for OPLACE users beside OBSOUL(ASCII) format.

Thank You for your attention!

Thank You for colleagues who
contributed!

Questions?

