Regional Cooperation for
Limited Area Modeling in Central Europe

LACE
nwp central europe

Data assimilation status at DHMZ

Antonio Stanešić, Suzana Panežić, Ana Šljivić, Iva Dominović

ZAMG DHMZ Czech Hydrometeorological Institute OMSZ IMGW METEO ROMANIA SHMU ARSO METEO Slovenia

Current operational settings

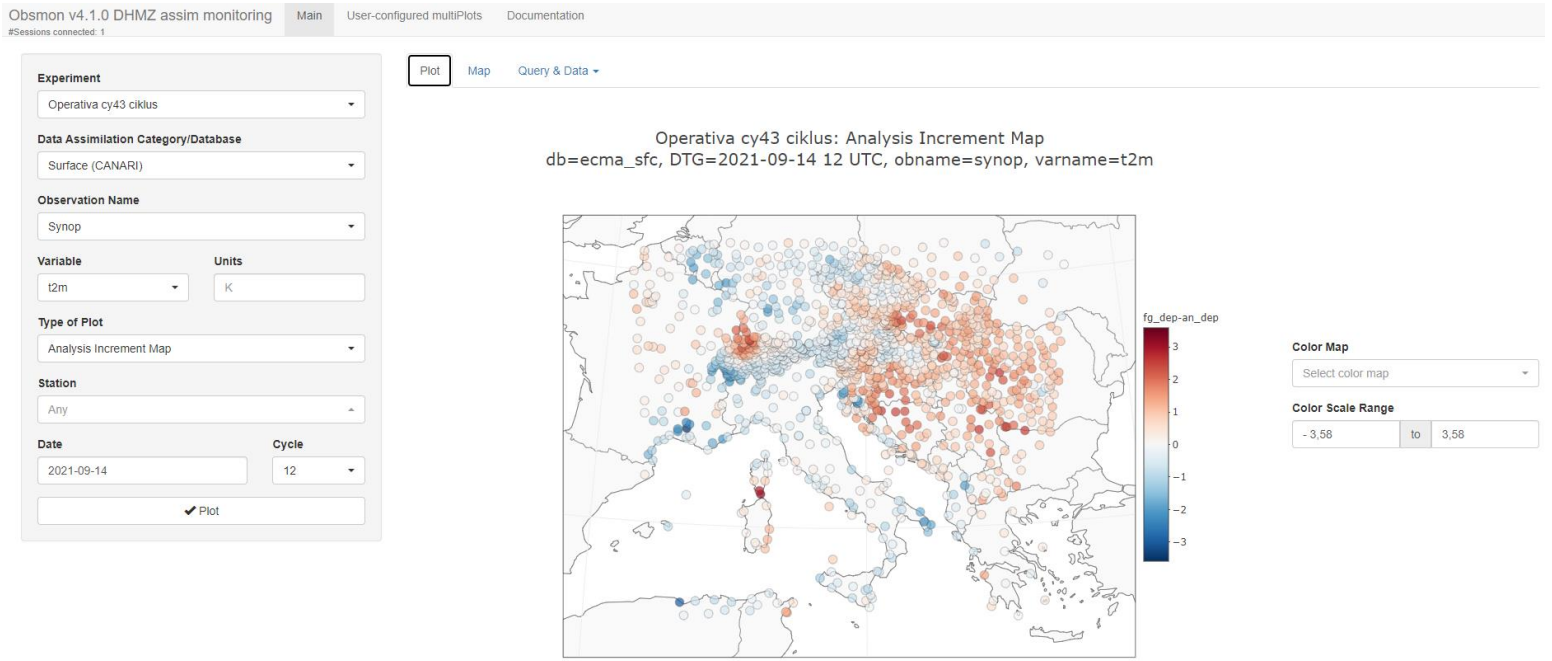
- No change from last year
- ALARO-0 (cy38t1)
  - Domain: Δx=4km, 73 vertical level, time step 180s, 432x480 GP, quadratic trunc.
  - 3h space consistent coupling
  - lagged LBC from ECMWF
  - 00, 06, 12 and 18 UTC +72h forecast
  - DFI initialization
- Upper air analysis
  - 3DVar (cy38t1)
  - 3h cycle no DFI
  - NMC B matrix
  - VarBC – 3h cycling; REDNMC=1.4
  - Assimilated observations – SYNOP,(Ps), TEMP(T, q, u, v), AMDAR(T, u, v), AMV, SEVIRI (ch 2,3), Mode-S MRAR SI
- Surface analysis
  - OI based on SYNOP (T2m, RH2m)
  - MESCAN correlation function

E-suite

- ALARO v1B, cy43t2-bf10 (same 4km geometry as before)
- DA + forecast running in parallel on local HPC; one run per day
- DA scripting system rewritten; DA scripts adopted to cca enviroment

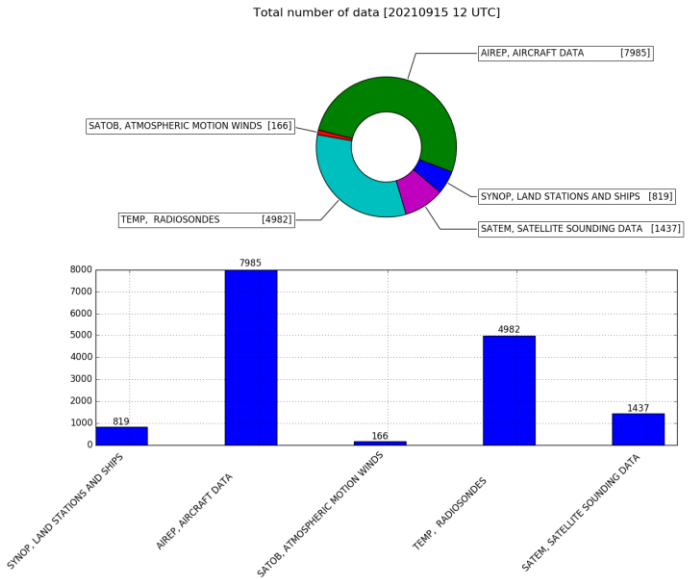
Monitoring

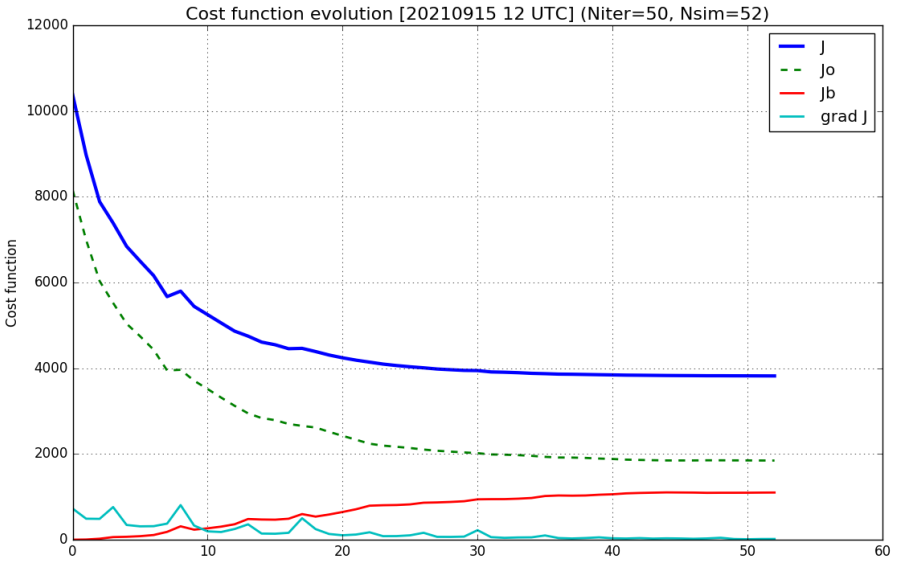
- Obsmon frontend (with shiny server) and backend installed
- Regular monitoring of DA e-suite established
- In search of best Obsmon configuration for daily monitoring



Monitoring

- Tools for monitoring number od observations and convergence from NODE (uses arpifs_listings module)



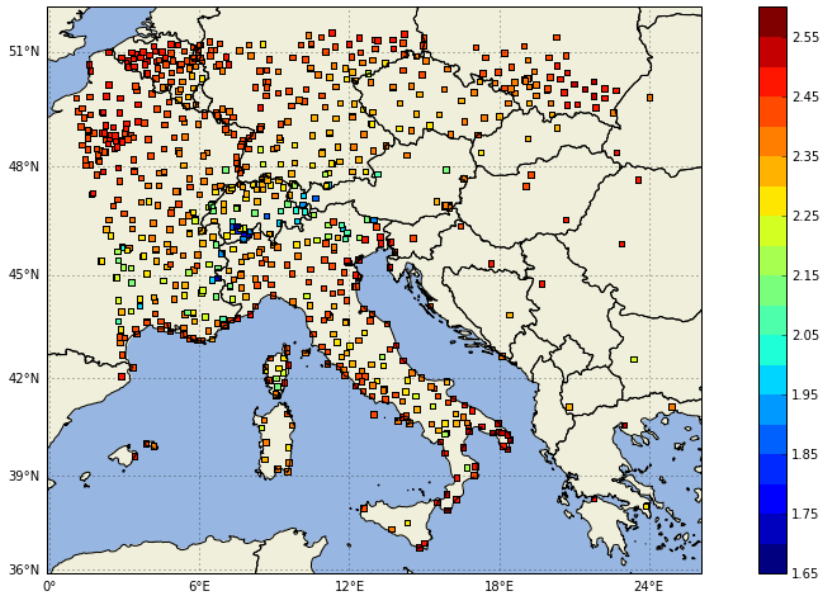


Monitoring

- Python and odb_legacy based set of tools for exploring ODB database (can be used in jupyter notebook)

```
In [31]: #Plot obsvalue
         ecma_exp.plot_map()

Out[31]: <cartopy.mpl.geoaxes.GeoAxesSubplot at 0x7fffd364a250>
```



National stations OBSOUL

- New procedure for creating national OBSOUL files (problems with intermediate database from which national stations data were extracted)
- new procedure completely bypasses the intermediate database and creates OBSOUL files directly from database for automatic stations and database for the synop stations
- Several bugs were corrected (e.g. double record when station was designated as automatic and synop at the same time) and 5 new stations were added: 14238,14426,14440,14461,14473

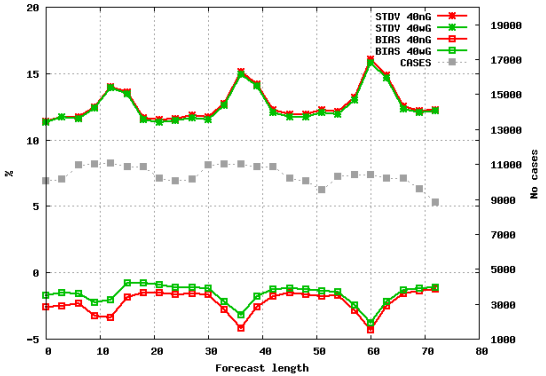
Cycling of GFL fields

- Cycling of 12 GFL fields was implemented in DA e-suite cy43
- Impact on 72h forecast was investigated for the period from November 23 to December 10 2020
- Experiments:
  - REF – reference exp
  - REF+GFL – reference exp with GFL cycling

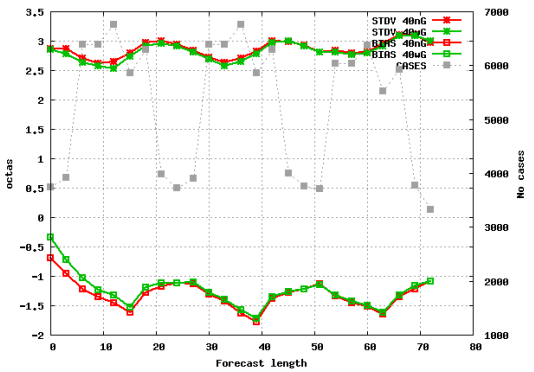
Cycling of GFL fields

- better scores for the REF+GFL setup for: 2m relative humidity, cloud cover, and most of the upper-air fields, mainly during the first 20 hours of the forecast

RH2m



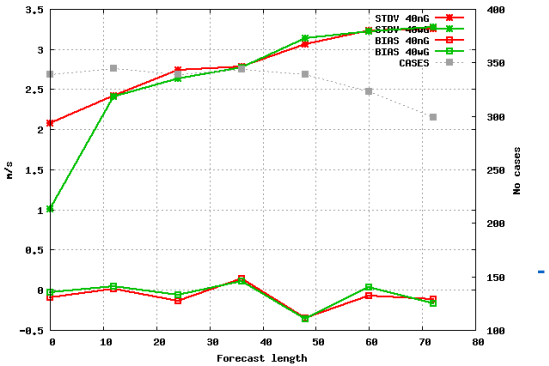
Cloud cover



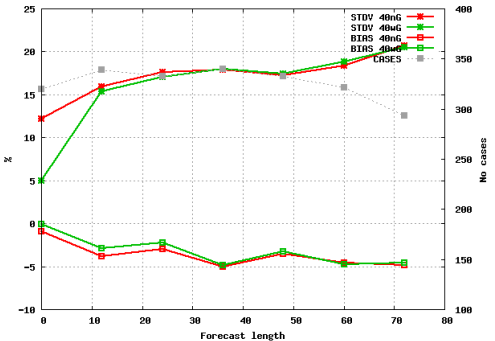
REF

REF+GFL

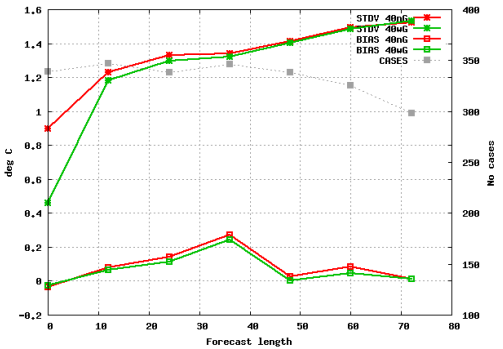
T 850hPa



RH 850hPa



Wind speed 850hPa



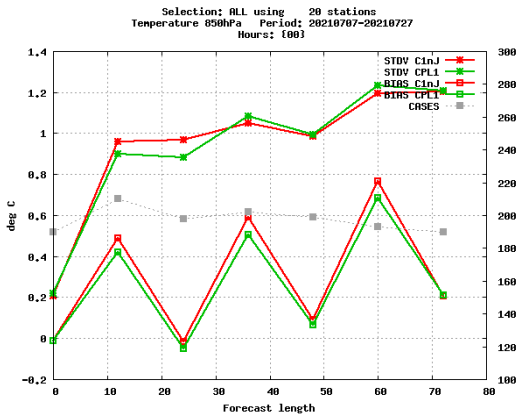
MG

ARSO METEO Slovenia

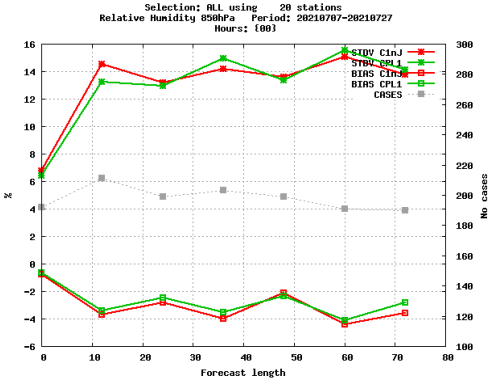
Jk method

- Jk method was tested for two periods
  - DA cycle from November 23 to December 10 2020 (winter)
  - DA cycle from June 07 to June 27 2021 (summer)
  - REF – reference exp; Jk – with Jk method
  - Small differences for surface; mainly better results for upper air temperature and relative humidity in first 20 – 30 hours

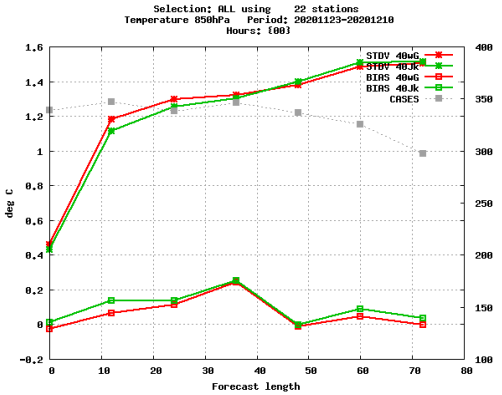
T 850hPa summer



RH 850hPa summer

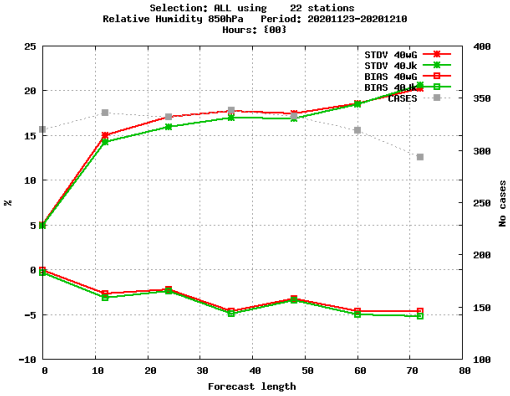


T 850hPa winter



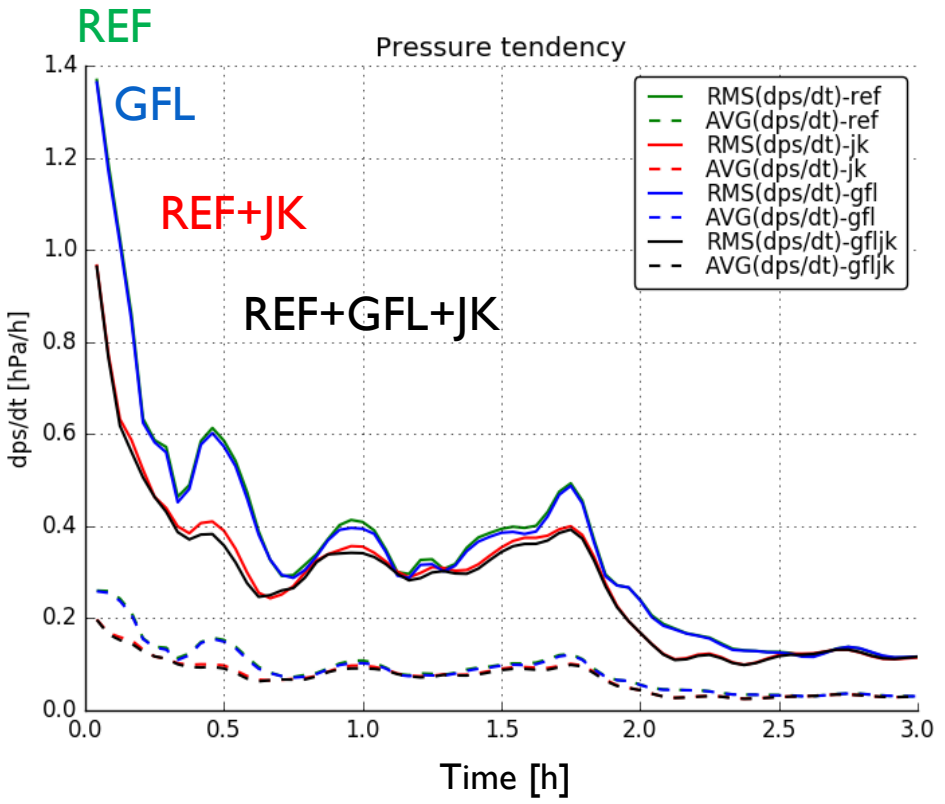
RH summer

RH 850hPa winter



Cycling of GFL fields & Jk

- Impact of cycling GFL fields and of Jk on dynamical spinup was tested
- Negligible impact of GFL cycling
- Positive impact of Jk



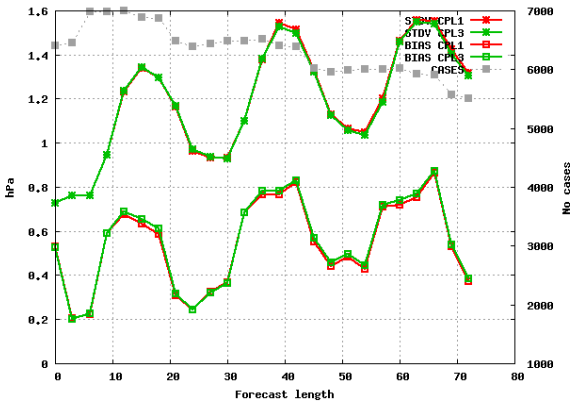
Hourly coupling in DA cycle

- Hourly coupling to IFS instead of current 3-hourly was tested inside DA e-suite cy43
- 72h forecasts initialized from 3 or 1 hourly DA cycle were calculated for period of two weeks (20210713 – 20210727)
- Small, rather neutral differences

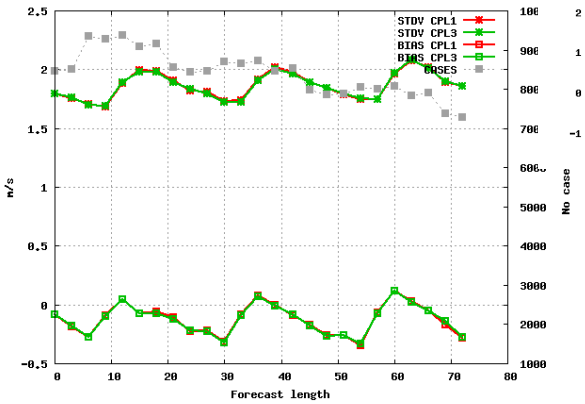
3h CPL

1h CPL

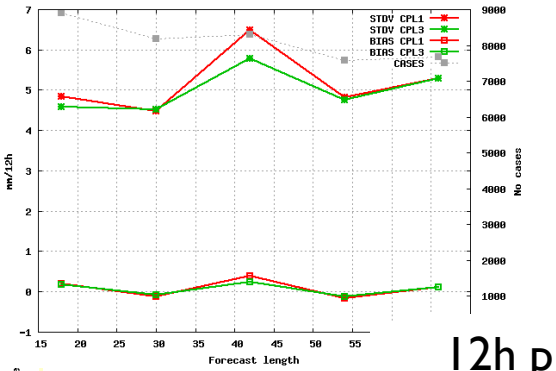
mslp



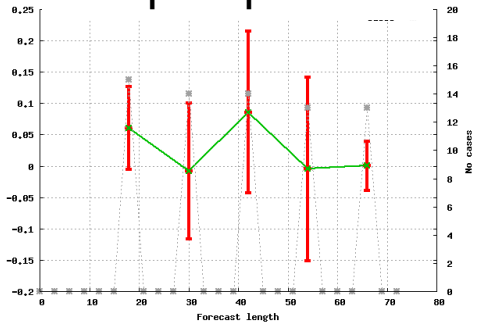
10m wind speed



12h precipitation



12h precipitation



Time [h

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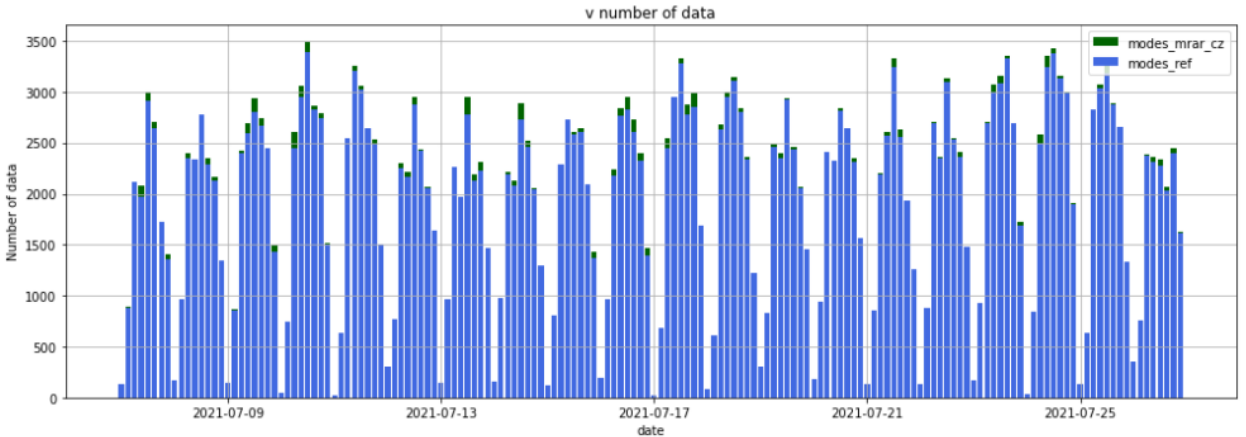
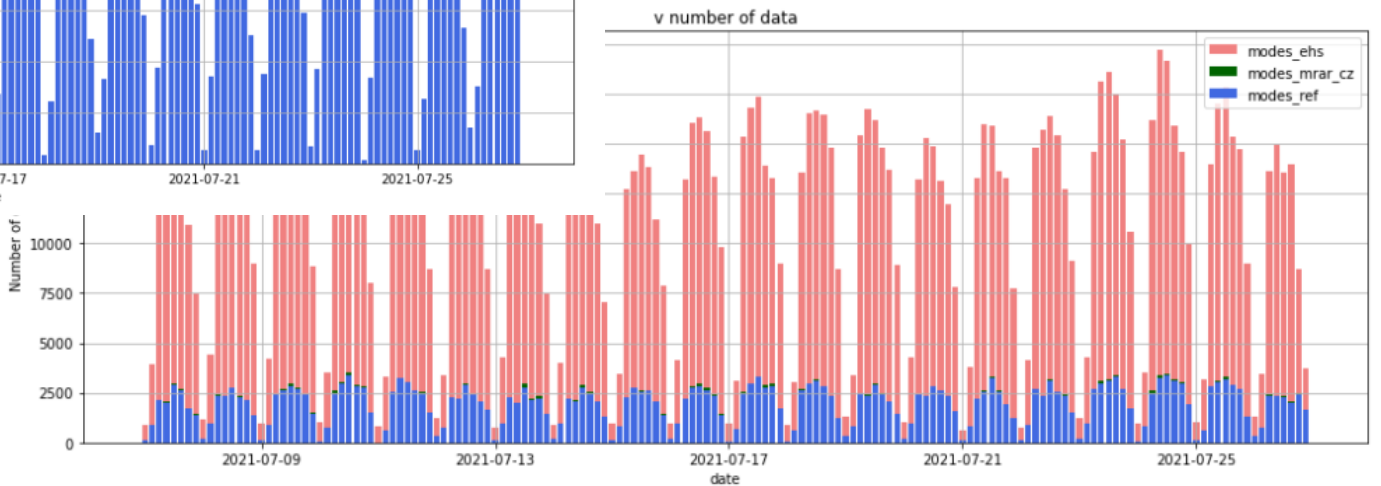
MODE-S MRAR CZ / EHS

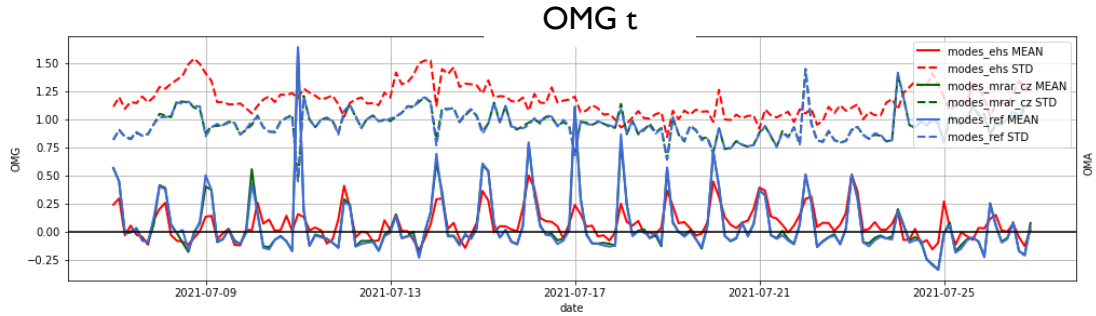
- MODE-S MRAR CZ and MODE-S EHS data was included in DA e-suite cycle in period 20210707 - 20210727
- MSRF – reference (AMDAR+MODES-MRAR SI); MSZC – MSRF + MODE-S MRAR CZ; MEHS – MSZC + MODE-S EHS

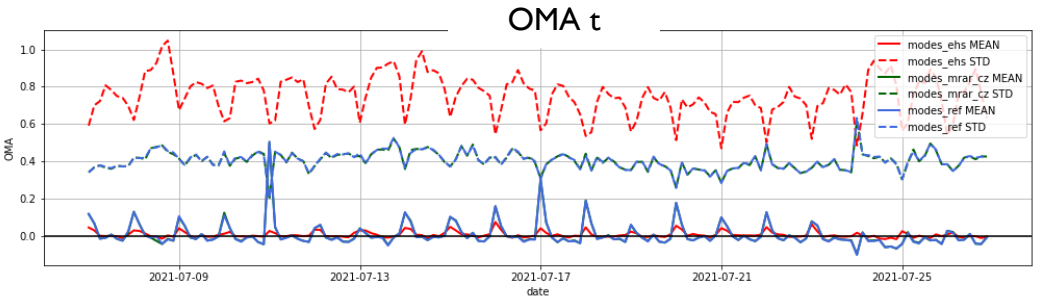


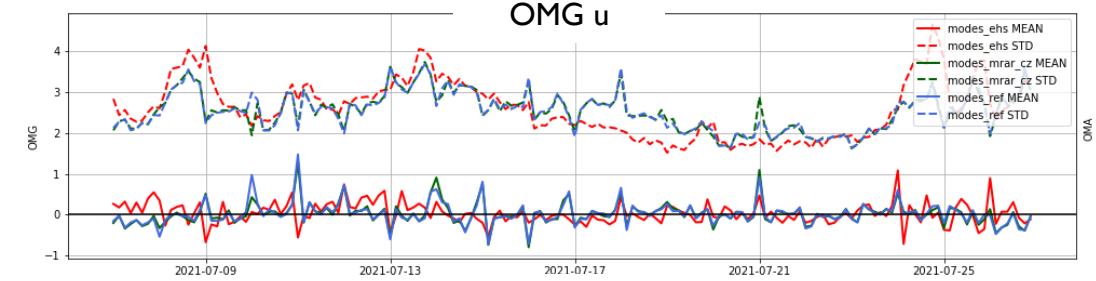


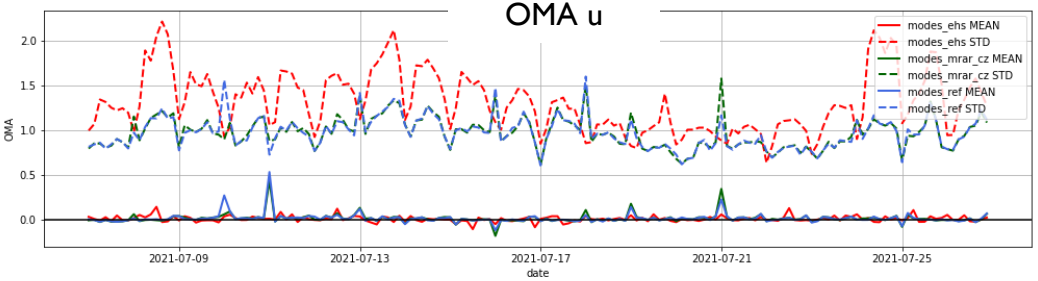
MODE-S MRAR CZ / EHS

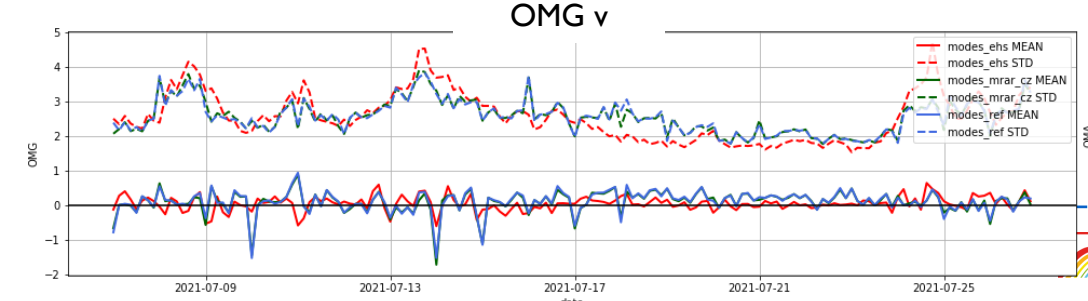
- MSRF – reference; MSZC – MSRF + MODE-S MRAR CZ; MEHS – MSZC + MODE-S EHS

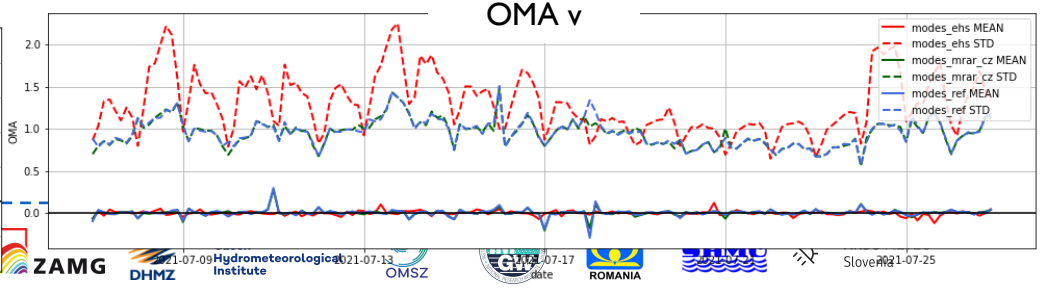








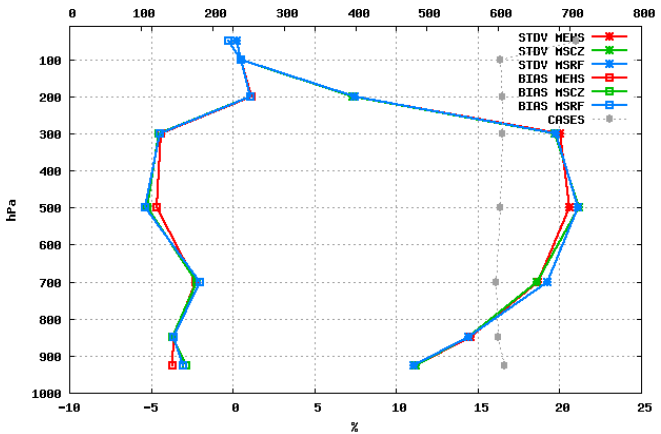




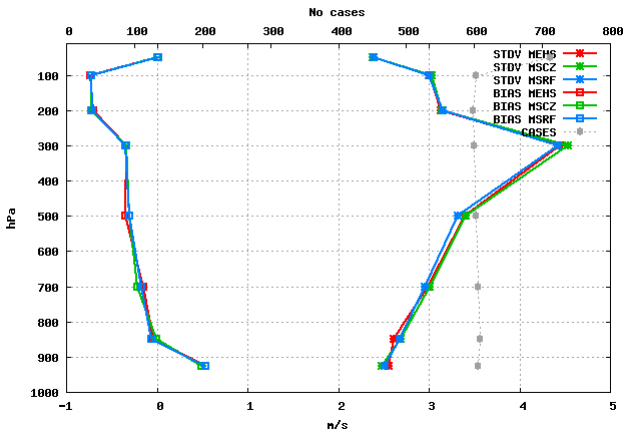
MODE-S MRAR CZ / EHS

- 72h forecasts initialized from 3 or 1 hourly DA cycle were calculated for period of 20 days (20210707 – 20210727)
- MSRF – reference; MSZC – MSRF + MODE-S MRAR CZ; MEHS – MSZC + MODE-S EHS
- Negligible differences between MSRF and MSZC
- Small differences between MSRF and MEHS

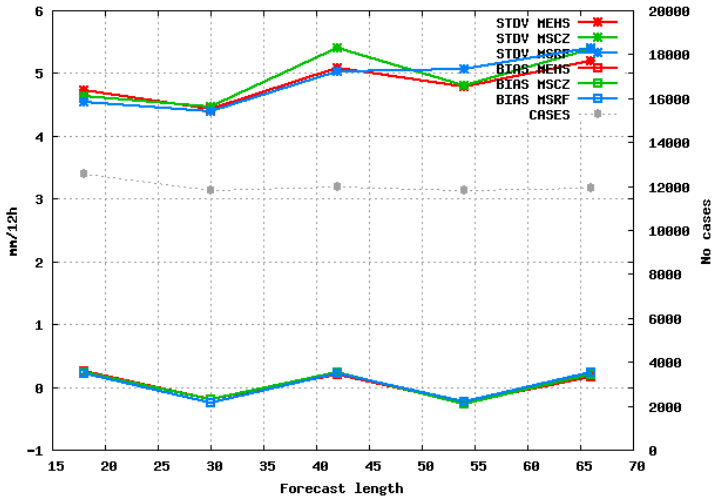
Rel. humidity



Wind speed

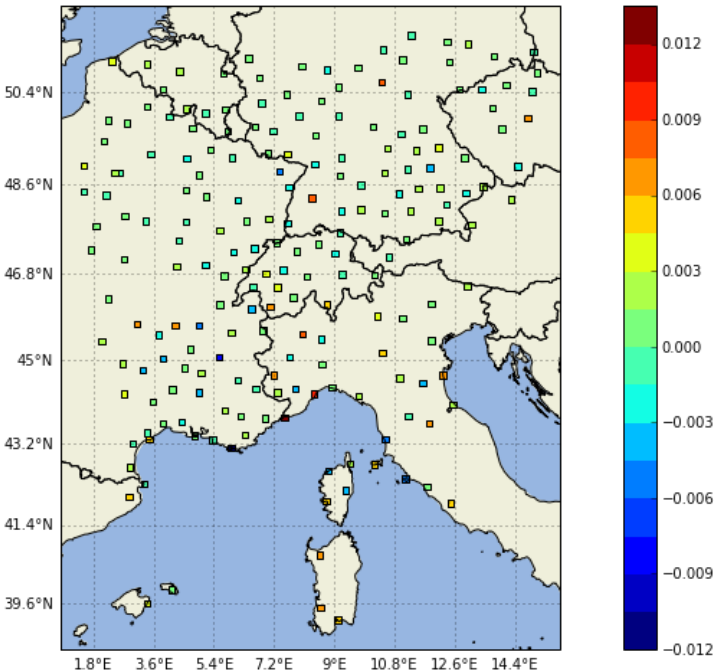


12h precipitation



GNSS DA

- Technical test with GNSS data in cy43 was performed with the MF whitelist. For further testing a more suitable whitelist will be set up and data will be evaluated



RADAR DA

- performing technical test of Radar DA in DA e-suite cy43 -> HOOF, Bator, Screening, Minimizaton

Time [h]

Plans for 2022

- Migration to new HPC & e-suite to operations
- Invest in diagnostic tools
- New B and V matrix (ensemble method); Tune B
- Optimization of Jk method (test various tuning parameters)
- Radar data assimilation – further sensitivity studies with the emphasis on the investigation of the drying effect
- Assimilation of GNSS observations – tests of bias correction methods, impact studies

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Thank you for your attention.

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