Regional Cooperation for
Limited Area Modeling in Central Europe

LACE
nwp central europe

Data assimilation work in Hungary

Mate Mile, Viktoria Homonnai, Mate Mester, Aniko Varkonyi, Zsofia Kocsis
Visitors: Patrick Benacek (Cz, 2017), Michal Nestiak (Sk, 2018)

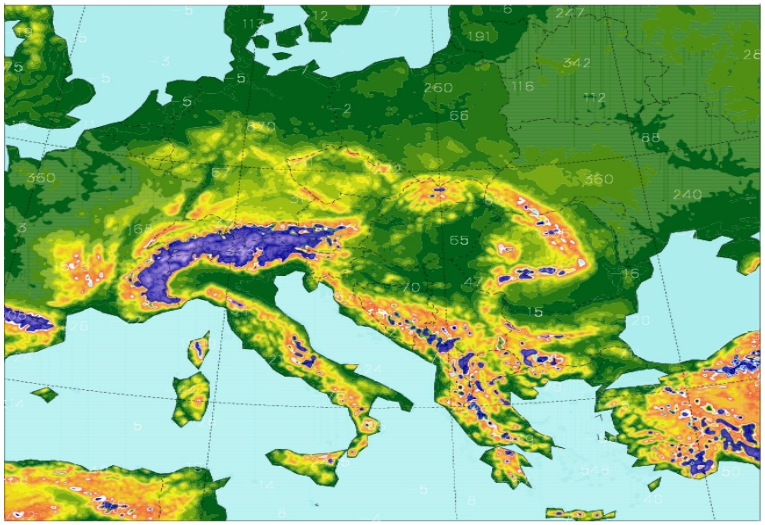
DHMZ SHMU OMSZ ZAMG ROMANIA ANM

Outline

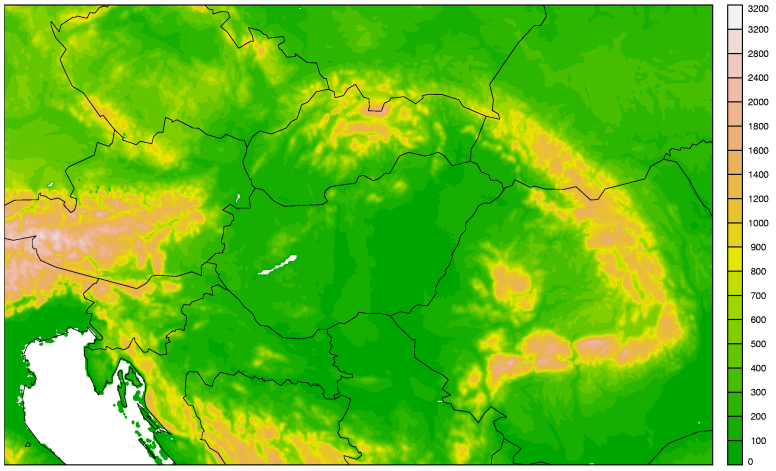
- Status of operational DA systems
- Implementation of cy40t1 and GNSS ZTD assimilation
  - OI_main and SURFEX issues – not really solved
  - GNSS ZTD
- On-going radar assimilation
- Other future plans

Operational NWP and DA systems

- **ALARO**
  - 8km horizontal resolution
  - 49 vertical levels
  - 300s timestep
  - cy38t1_bf03
  - SMS environment
  - 4 runs/day up to 60 hours
  - Coupled to IFS global
    - 3-hourly frequency
    - Time-lagged coupling for forecast
    - Direct coupling for DA cycle

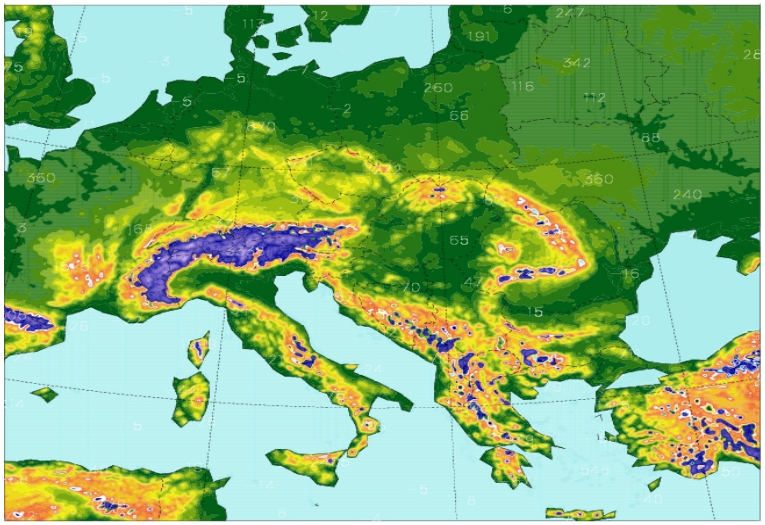


- **AROME**
  - 2.5km horizontal resolution
  - 60 vertical levels
  - 60s timestep
  - **cy40t1_bf05**
  - Script environment
  - 8 runs/day up to 48/36 hours
  - Coupled to IFS global
    - 1-hourly frequency
    - Time-lagged coupling for forecast
    - Mixed coupling in DA cycle

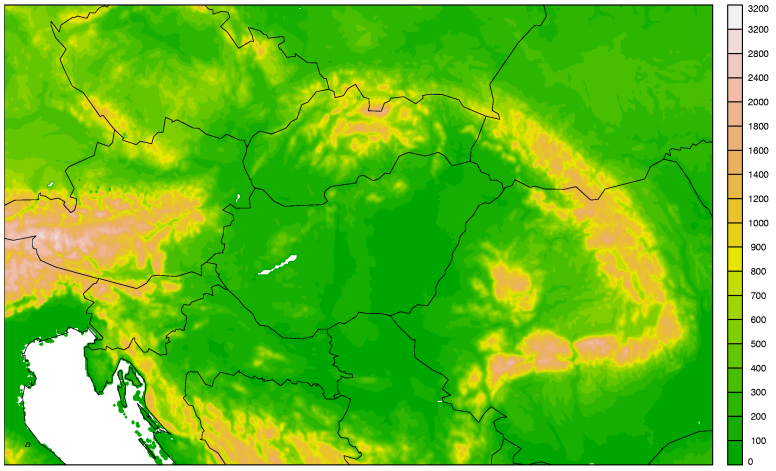


Operational NWP and DA systems

- **ALARO**
  - With digital filter initialization
  - CANARI
  - 3DVAR
  - 6-hour DA cycle
  - Observations: SYNOP, AMDAR, TEMP SEVIRI, Geowind AMV, NOAA-18 AMSU-A, MHS
  - ALADIN EDA B matrix



- **AROME**
  - Without digital filter initialization
  - OI_main
  - 3DVAR
  - 3-hour DA cycle
  - Observations: SYNOP, AMDAR, TEMP, **GNSS-ZTD**
  - AROME EDA B matrix

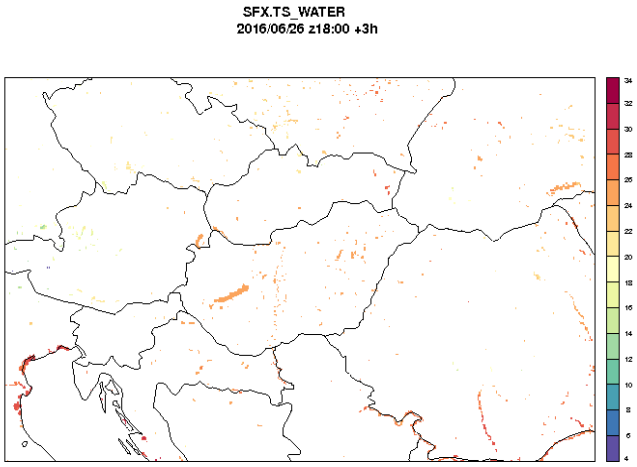


Operational NWP and DA systems

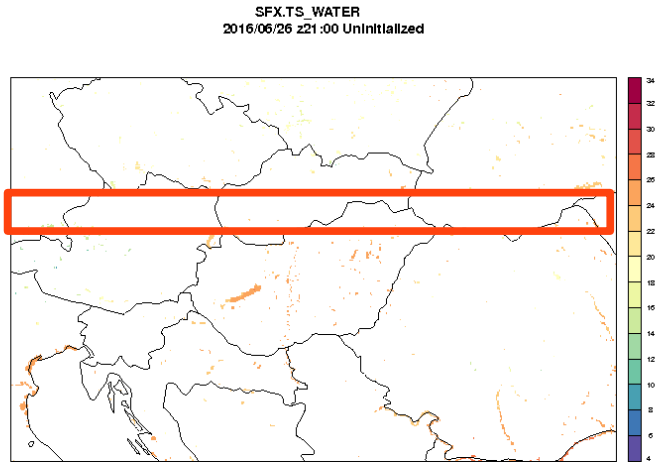
- **New supercomputer has just arrived**
  - 20nodes
  - 40 cores each
  - Main goal is to run AROME-EPS
    - EDA for IC perturbations
  - We are interested in AROME-RUC

OI_main issues in cy40t1

- **Last year Mate gave you a very detailed description of undefined temperature of small lakes and the caused problems.**
- At the very first AROME forecast, the model integration exploded with “wind too strong” error message.
- It was due to OI_main surface analysis and undefined SFX.TS_WATER values of small lakes.



SFX.TS_WATER values of surface first-guess



SFX.TS_WATER values of OI_main analysis

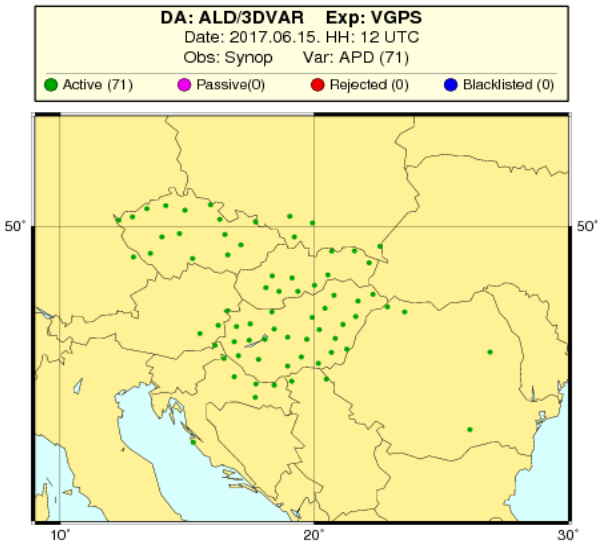
OI_main issues in cy40t1

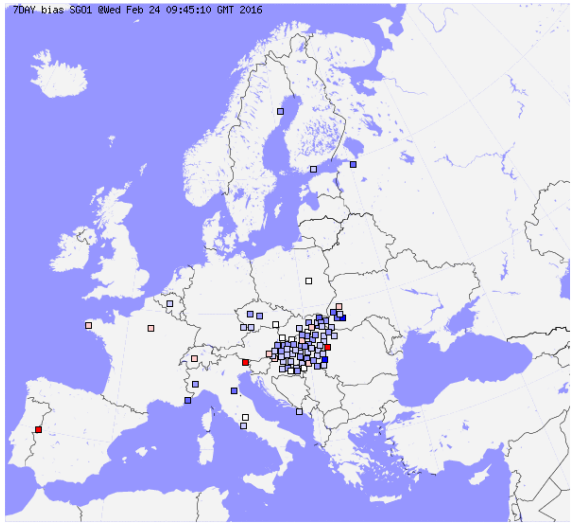
- Description of the problem:
  - In cy38t1 the offline OI_main determines lake surface temperatures of small lakes (LSM>0.5) from interpolation of bigger lakes (LSM<0.5) taking into account all domain points.
  - In cy40t1 the inline OI_main is doing the same, but considering only lake point of a computation block according to requested parallelization.
  - See A-level parallelization band in previous example where the related block didn't include big enough lakes for interpolation and small lake points remained undefined. For B-level parallelization boxes instead of bands might go wrong.
- Météo-France confirmed this error and two possible solution were recommended.
  - Using TG2 for small lake surface temperature initialization (quick and not too wise solution, search for a cy42 bugfix)
  - Using climatology for the small lake temperature initialization
- **We run OI_main surface assimilation with one node (8 cores) → that makes the problem unvisible**

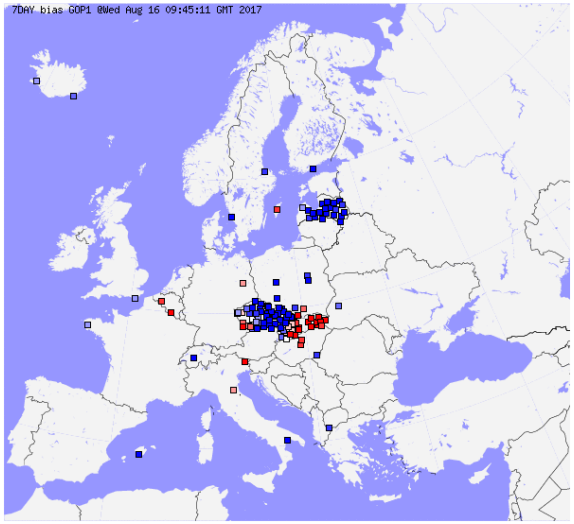
GNSS ZTD

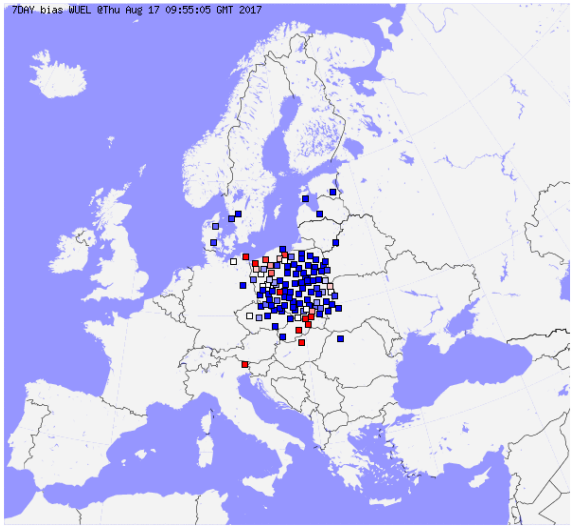
Operational usage since 5th of September 2018

- Hungarian, Czech and Polish data (via E-GVAP)
- Networks available (bottom)
- Used observations after pre-selection (right)
  - Whitelisting and VarBC tuning was not easy (see Patrick's stay report from 2017)
  - 3-hourly VarBC cycle is needed





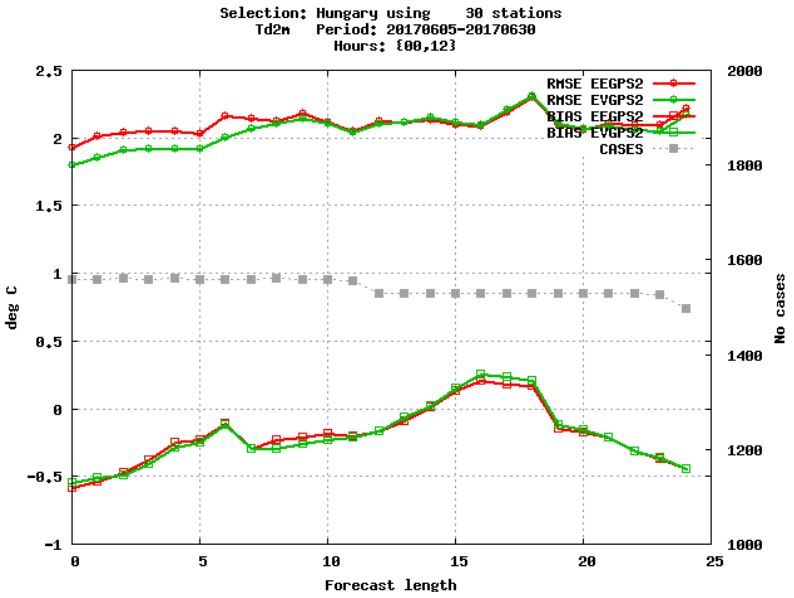


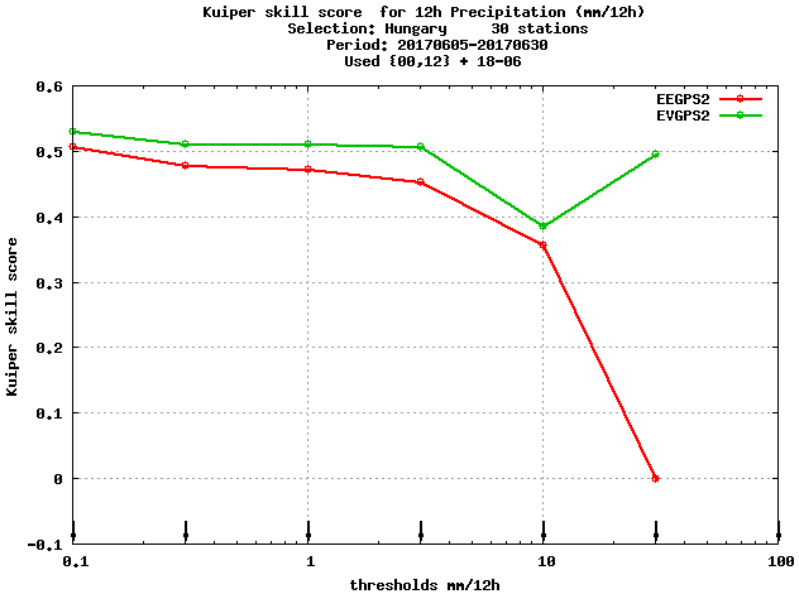


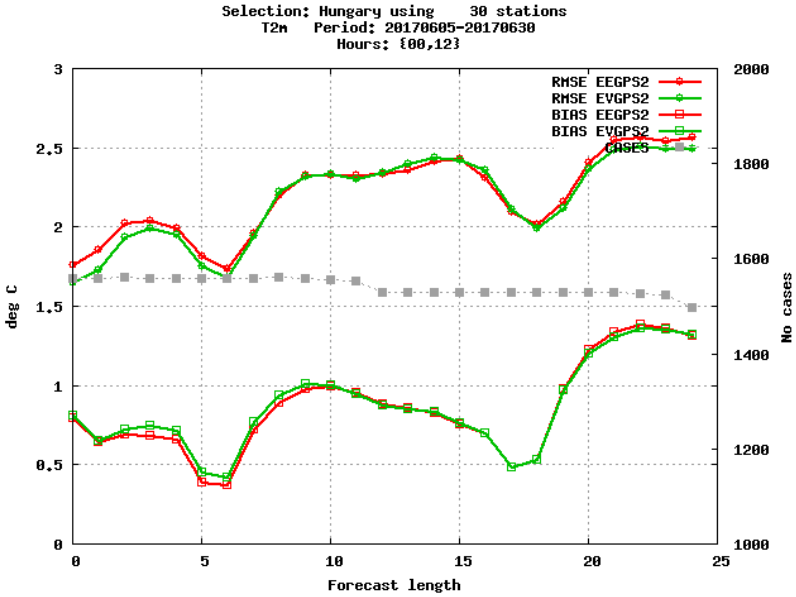
GOP1 – E-GVAP bias

GNSS ZTD

- **Positive impact on summer period** (especially in the first 12 hours)

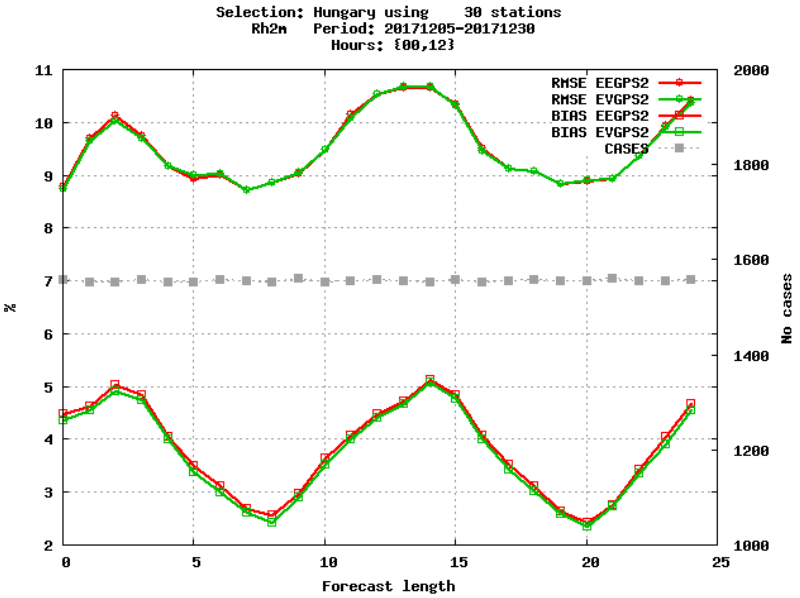


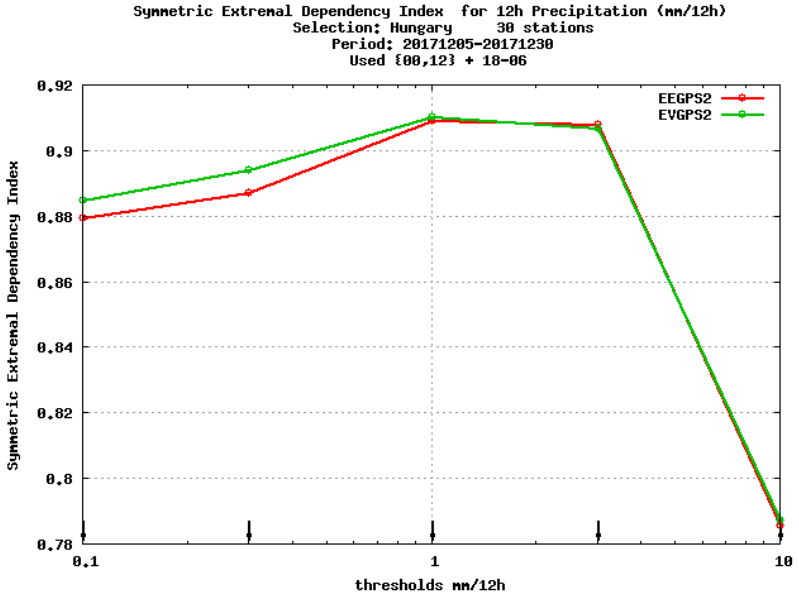


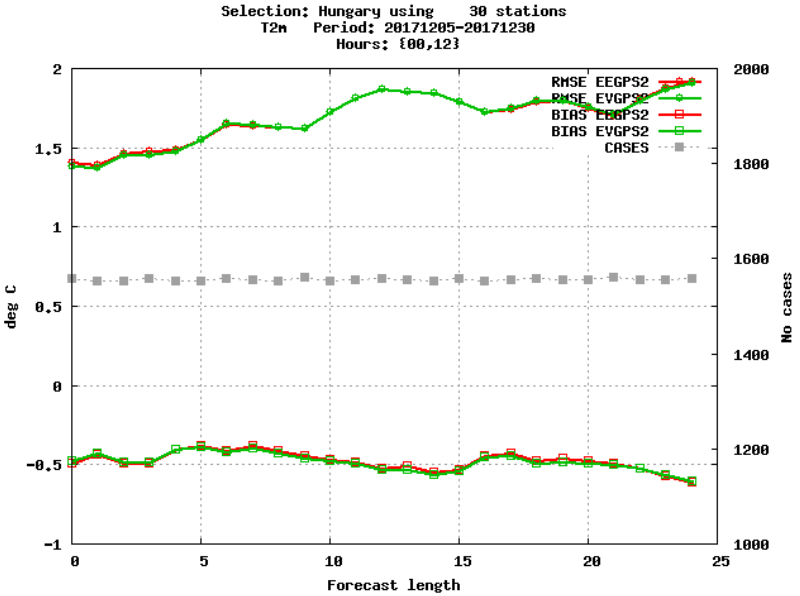


GNSS ZTD

- **More neutral impact on winter period**

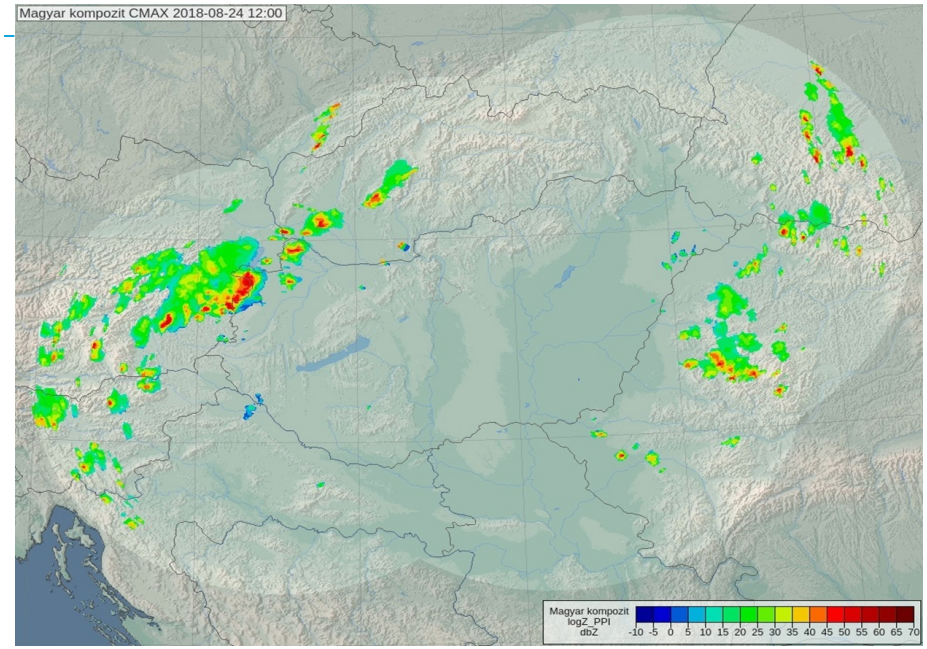


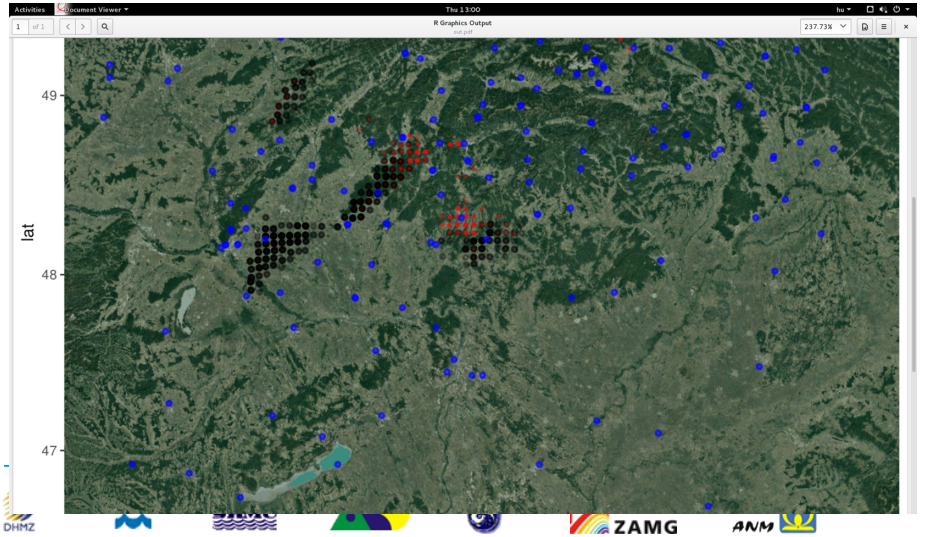




Radar assimilation

- Mate Mester had a LACE stay in Ljubljana this spring
  - Working on pre-processing
- We hosted another LACE stay of Michal Nestiak
  - Test of pre-processor and back-phased BATOR changes
  - More details in Michal's presentation





Plans for 2019 (and after)

- Radar assimilation
  - We would like to push it further with Mate Mester (he is going to 50% worktime but still able to travel for LACE stay)
- B-matrix recalculation for 90 levels
  - There were instabilities with 60-levels AROME → we would like to change to 90-levels with different model top. B-matrix should be recalculated. (Viktoria Homonnai)
  - On the new machine we can run AROME-EDA for sampling (Katalin Javorne Radnoczi)
- 1-hour rapid update cycle (Aniko Varkonyi)
  - First we are just interested in the impact of changing the DA frequency/window
  - Probably more runs will be suitable on the new machine
- HRW AMV
  - Mate Mile left us a suite with AMV data assimilation which works technically
  - Zsofia Kocsis is going to test it