VarBC spin up and assimilation of Slovenian GNSS ZTD observations

B. Strajnar
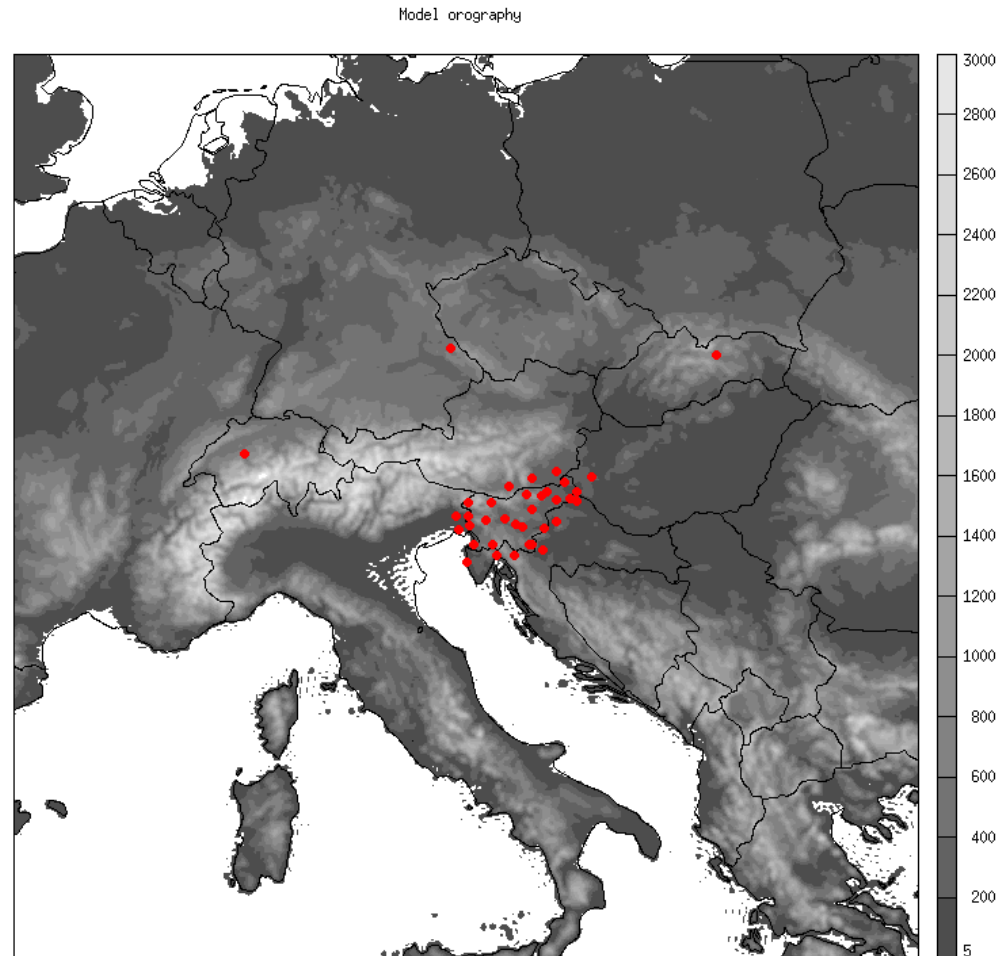
Outline

▶ Cooperation with national provider

▶ Improved data set

▶ VarBC spin-up

▶ Impact experiments

▶ Conclusions

Cooperation with national provider

- ▶ Slovenian data (18 stations) not available through E-GVAP.
- ▶ ZTD solution computed by Geodetic Institute of Slovenia for around ~30 stations provided to ARSO (last few years)
- ▶ provided to ARSO in real time
- ▶ using Pivot software and provided to ARSO (last few years)

Model orography

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

Old data set (Pivot)

▸ Earlier DA evaluations: clearly detrimental impact on humidity stations) not available through E-GVAP.

▸ ZTD solution computed by Geodetic Institute of Slovenia using Pivot software and provided to ARSO (last few years)
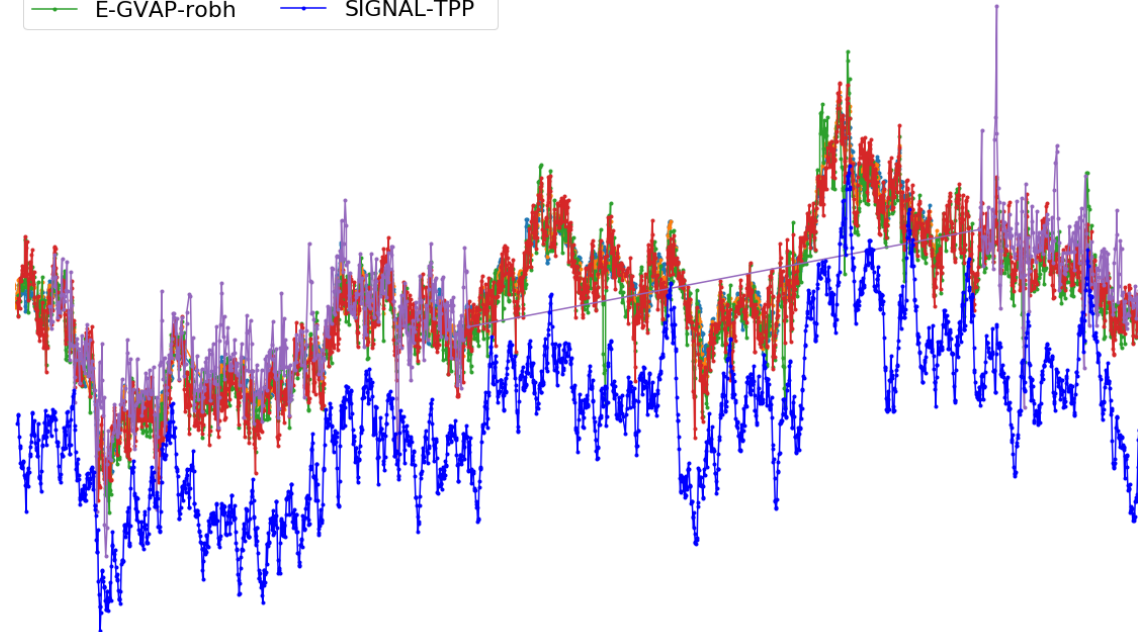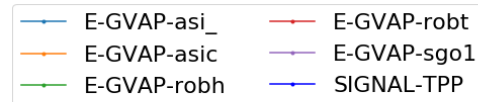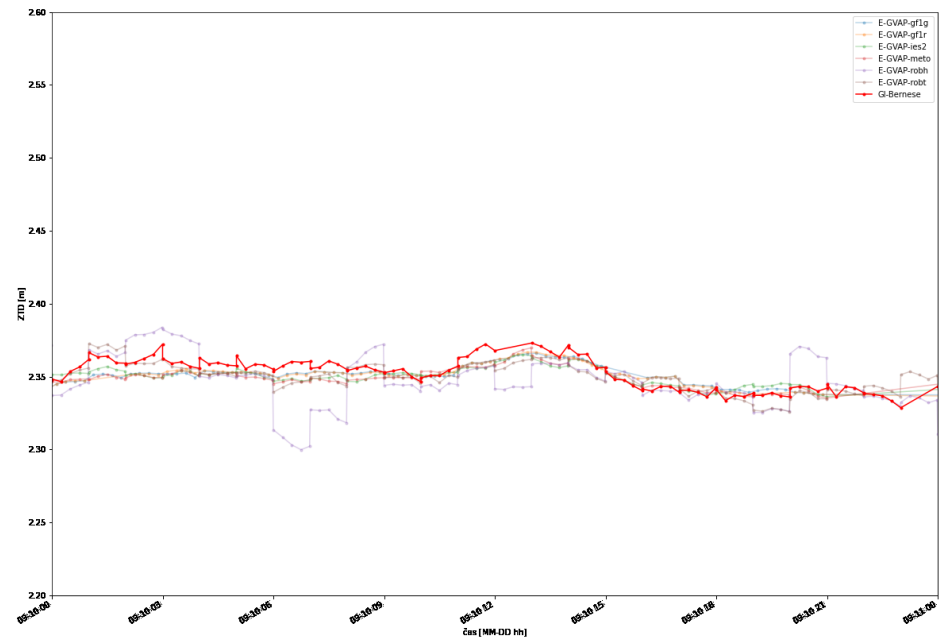
New data set (Bernese)

- GIS used Bernese geodetic software, 1 month of data provided (September 2019) for evaluation.

- GIS solution now within the spread of E-GVAP.
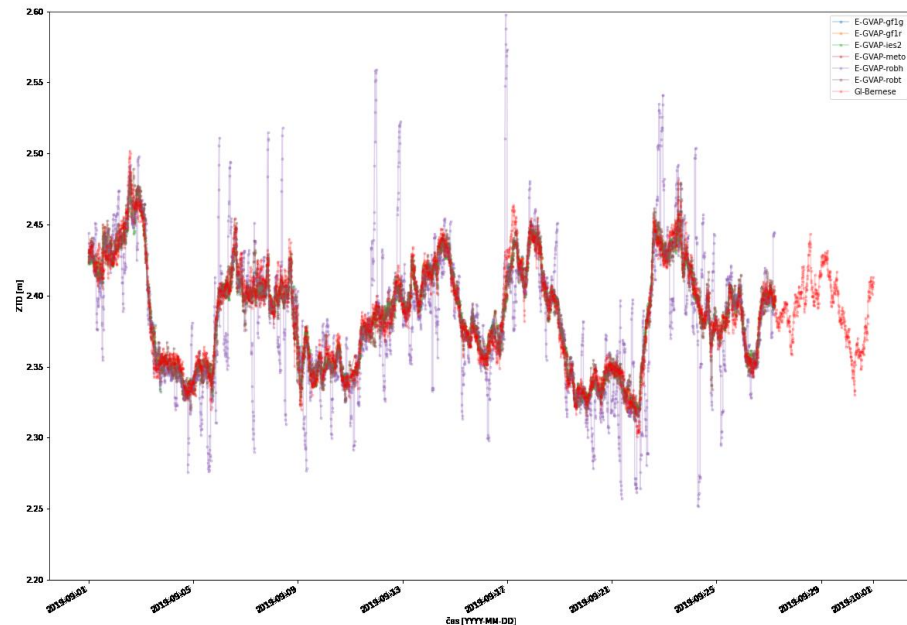
Evolution of ZTD estimate for Ljubljana (GSR1).

New data set (Bernese)

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Evolution of ZTD estimate for Ljubljana (GSR1).

VarBC spin-up

- ▶ REF: A one-month assimilation cycle with ALADIN/SI(4.4 km)
- ▶ EXP: same setup using SIGNAL network, cold start of VarBC, using predictors 0 (constant) 1 (1000-300 hPa thickness), 4 (total column water) – default in cy43t2
- ▶ Non-negligible bias observed in REF (passive assimilation)

MEAN of background departures
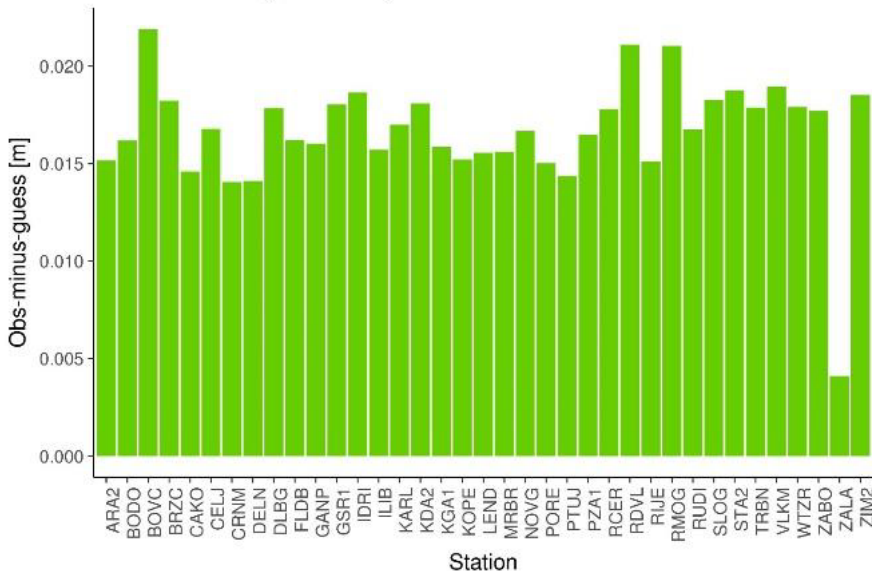
STD of background departures
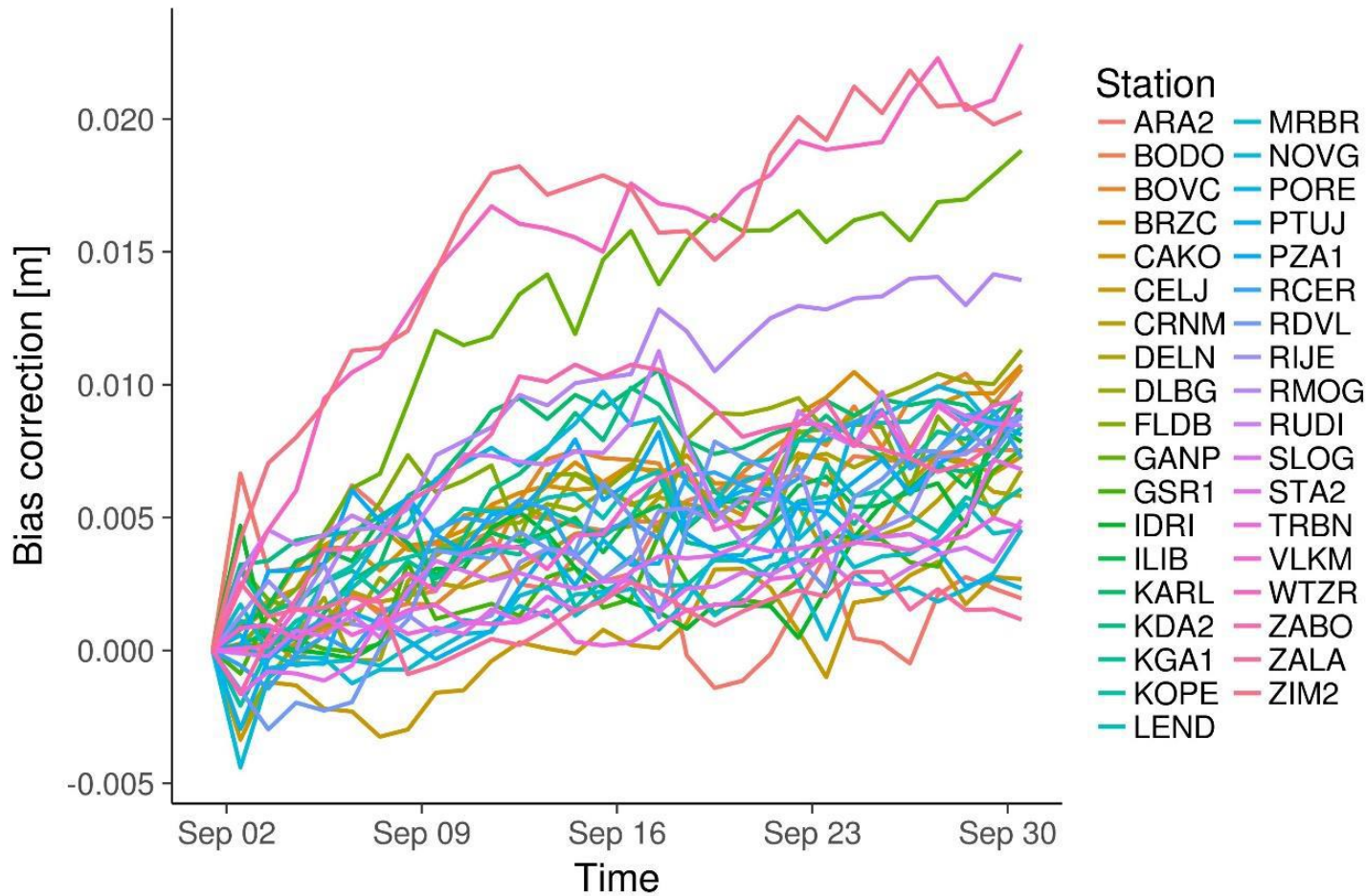
Mean: OMG 0,016 m
Std.: 0.012 m
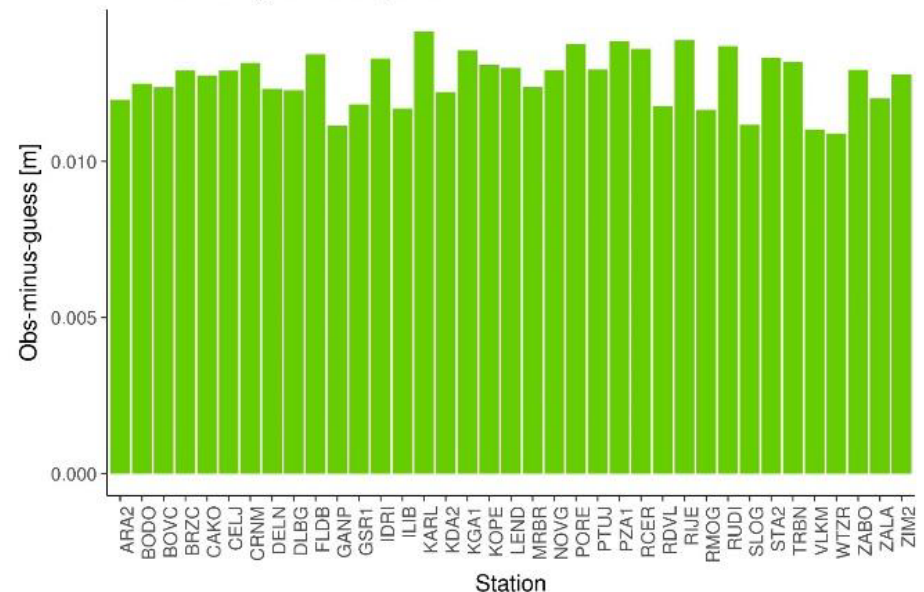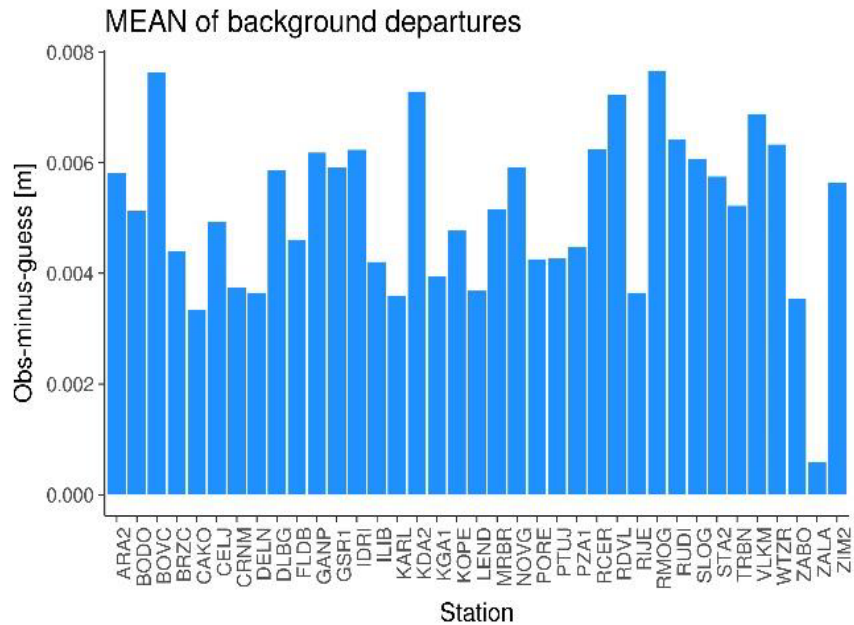
Normal values of ZTD: 2.3 m (dry) + 0.1- 0.3 m (wet)

VarBC spin-up

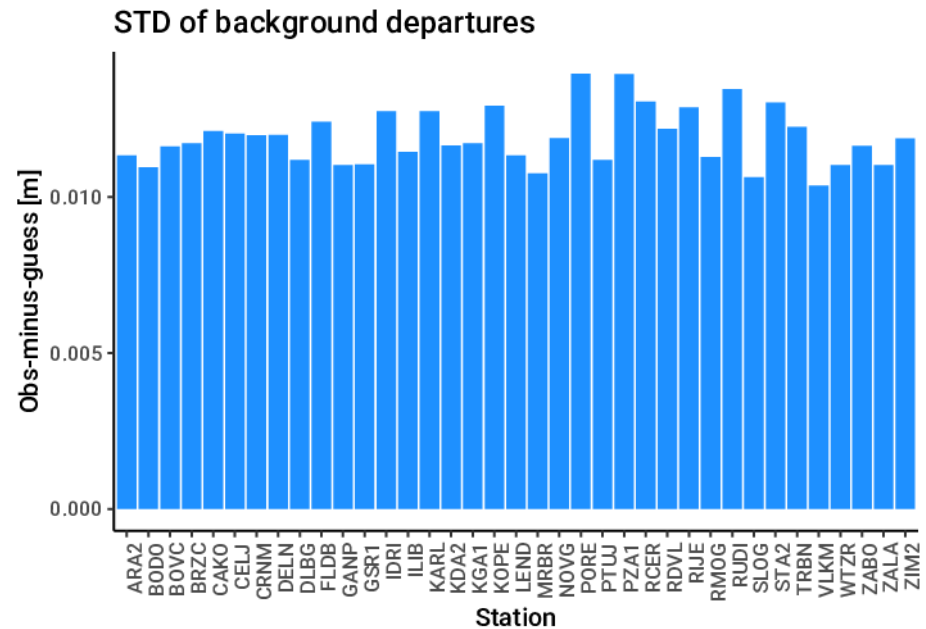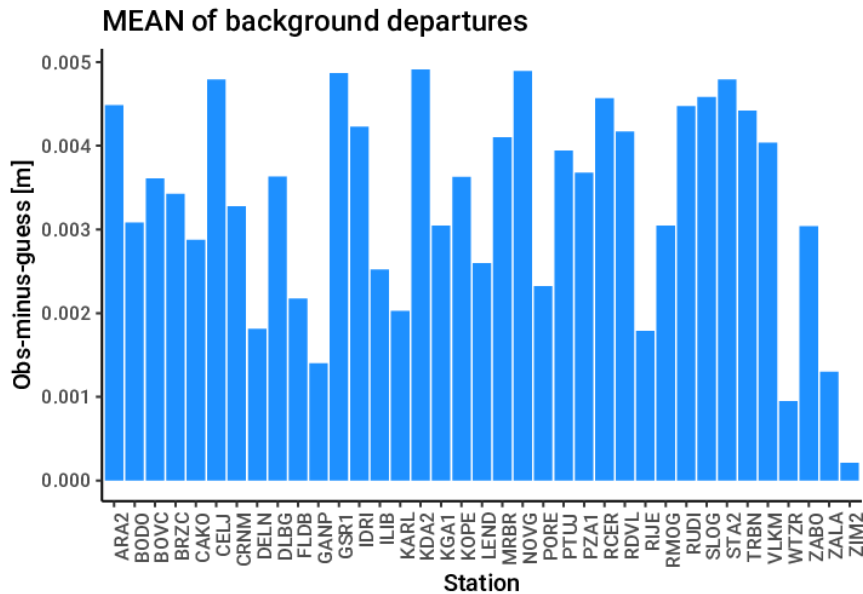Bias correction evolution

OMG in EXP: active assimilation
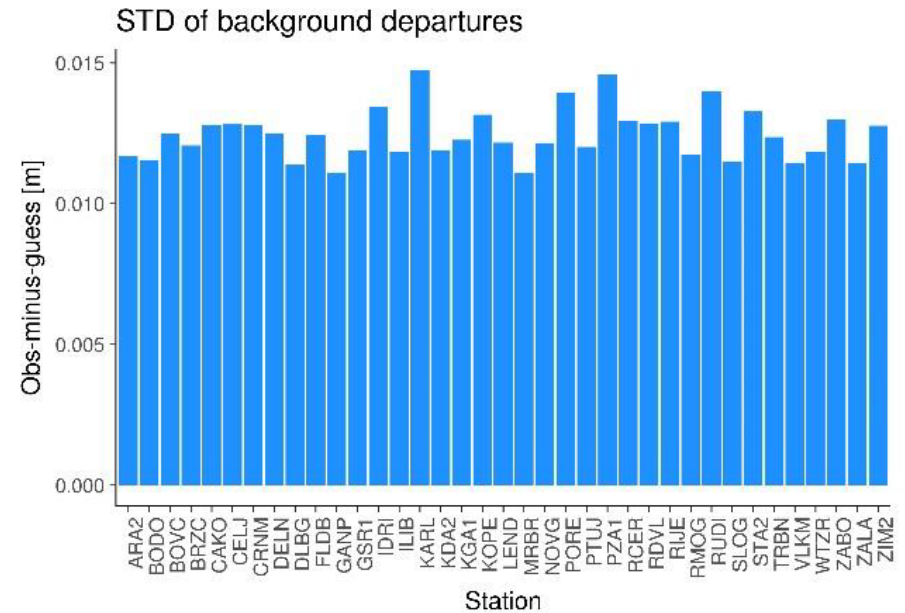
Mean: OMG 0,005 m (3-times less than in REF)
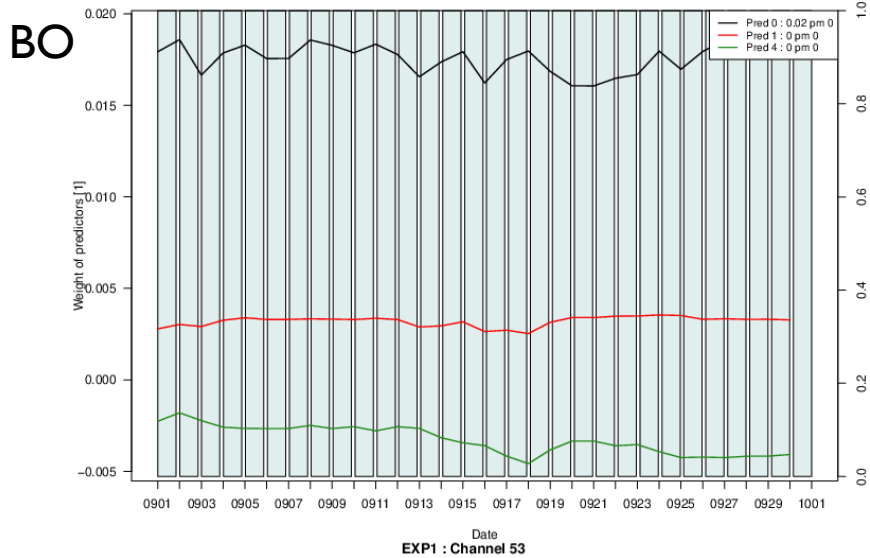Std.: 0.012 m (remains the same)

Recycled VarBC
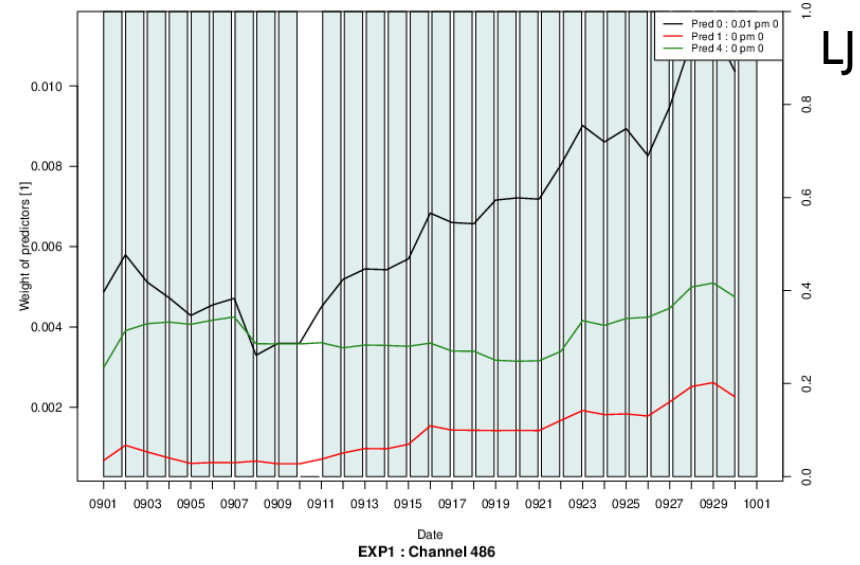
▸ EXP2: same as EXP but recycled VarBC (warmed up by EXP)

Mean: OMG 0,003 m (5-times less than in REF)
Std.: 0.011 m (slightly drops)
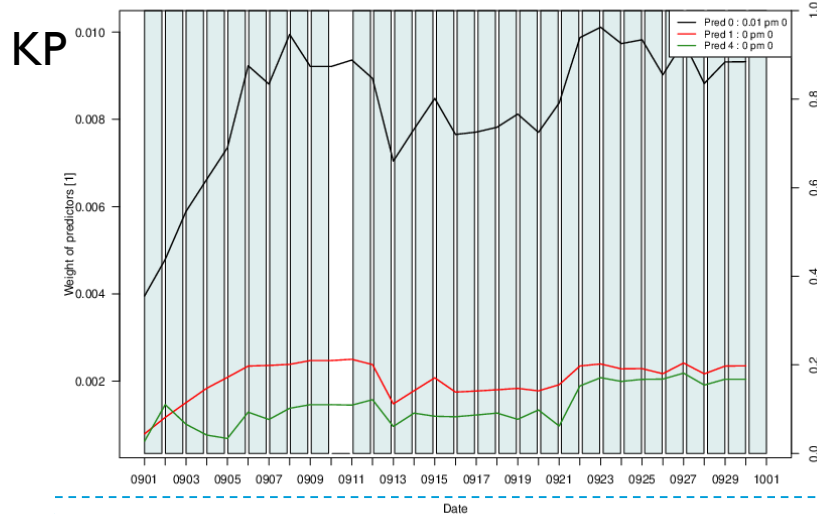
Evolution of predictors – EXP1

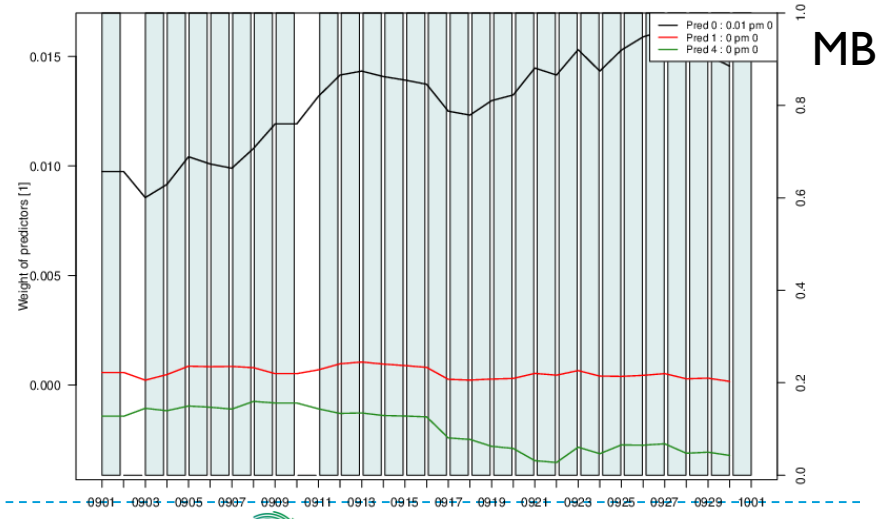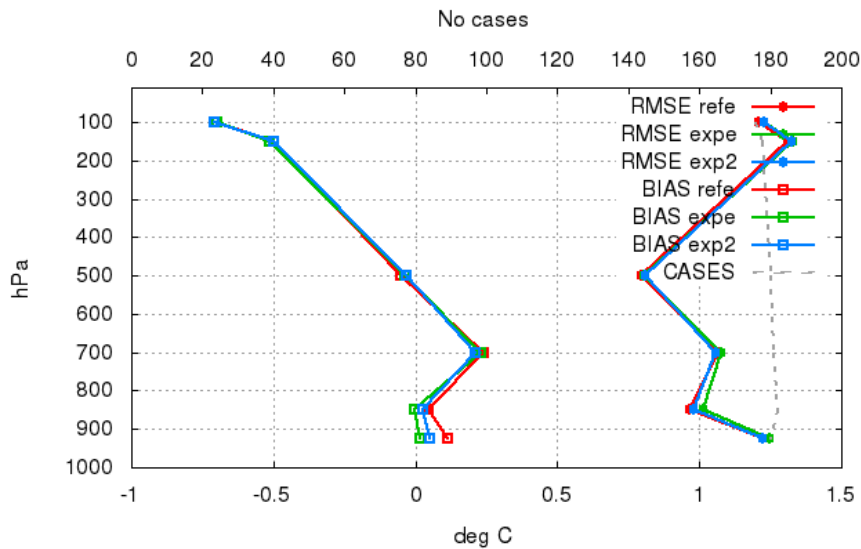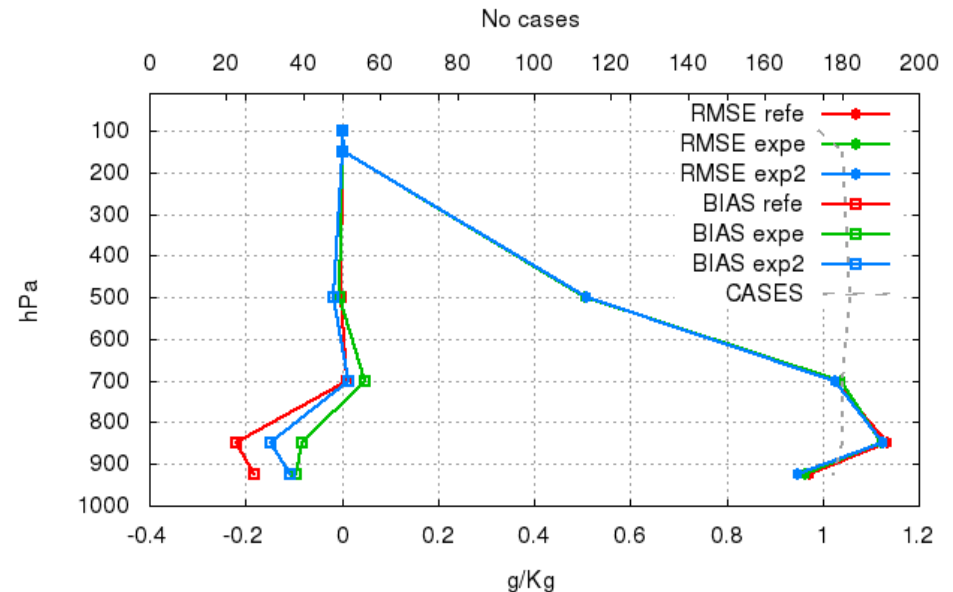# Impact on forecast – upper air

- ▸ 2 production runs per day, 24h forecasts
- ▸ On average over domain, scores are neutral (small dataset)
- ▸ Over Slovenia, reduction of bias (T, RH) when using 3 closest radiosonde stations

3 stations Selection: SlsurroundingsTEMP
Temperature Period: 20190901-20191001
Statistics at 00 UTC Used {00,12} + 12 24

3 stations Selection: SlsurroundingsTEMP
Specific humidity Period: 20190901-20191001
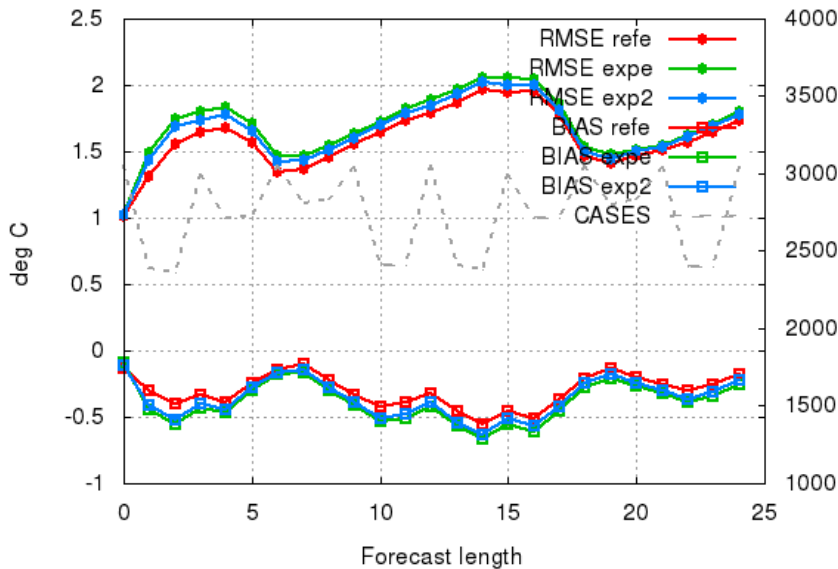Statistics at 00 UTC Used {00,12} + 12 24

Impact on forecast surface

▸ Clear degradation of specific humidity and also temperature
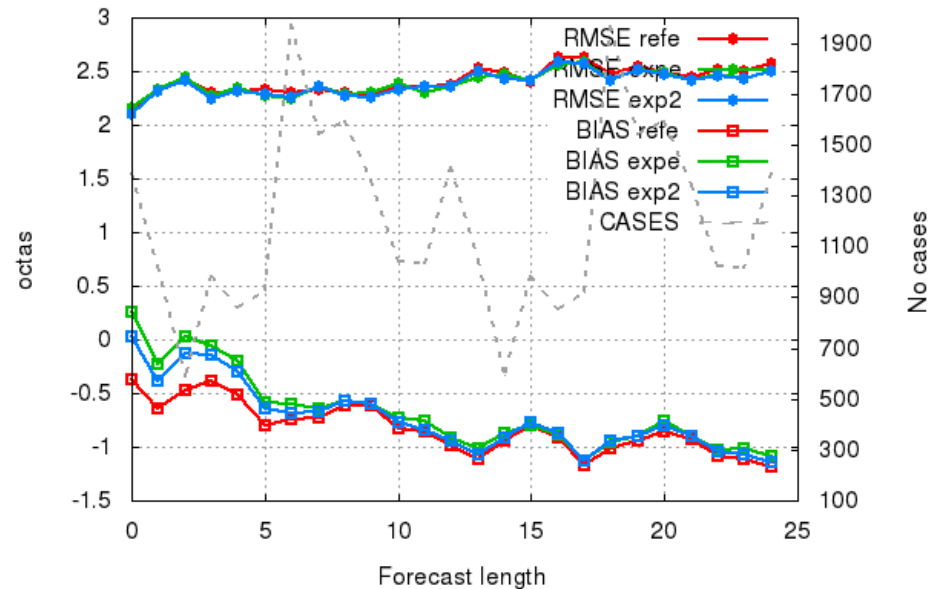
▸ More moisture, more clouds

Selection: Slsurroundings using 49 stations
Q2m Period: 20190901-20191001
Hours: {00,12}
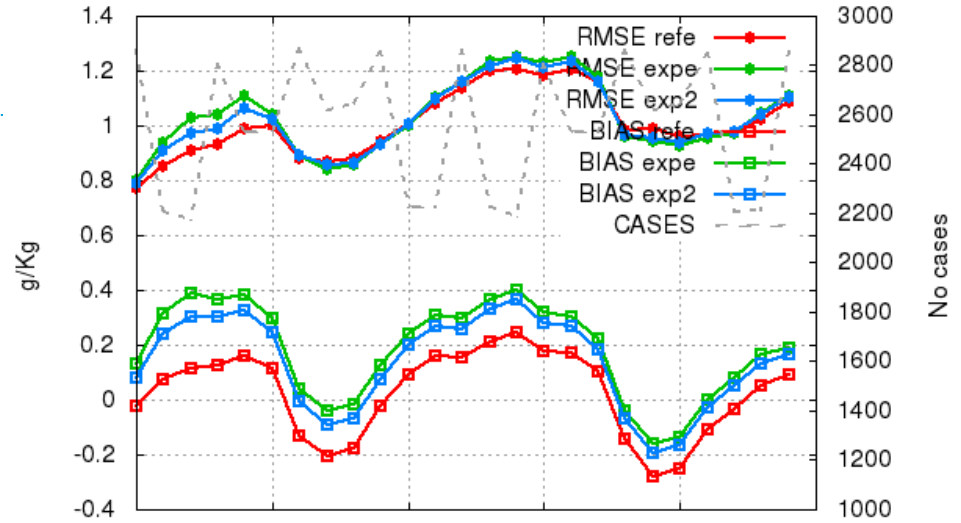
Selection: Slsurroundings using 52 stations
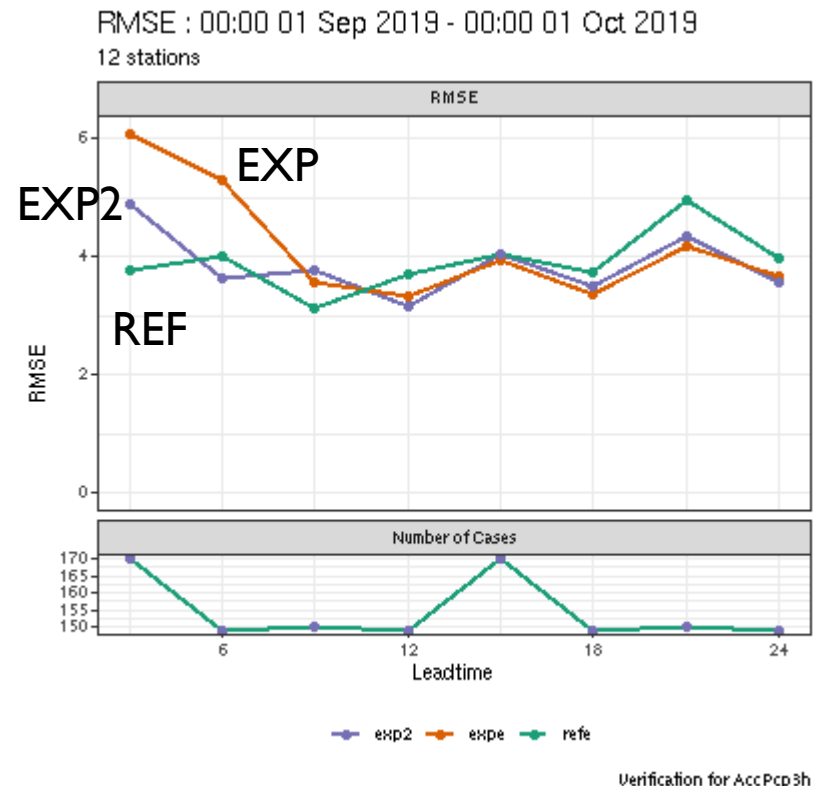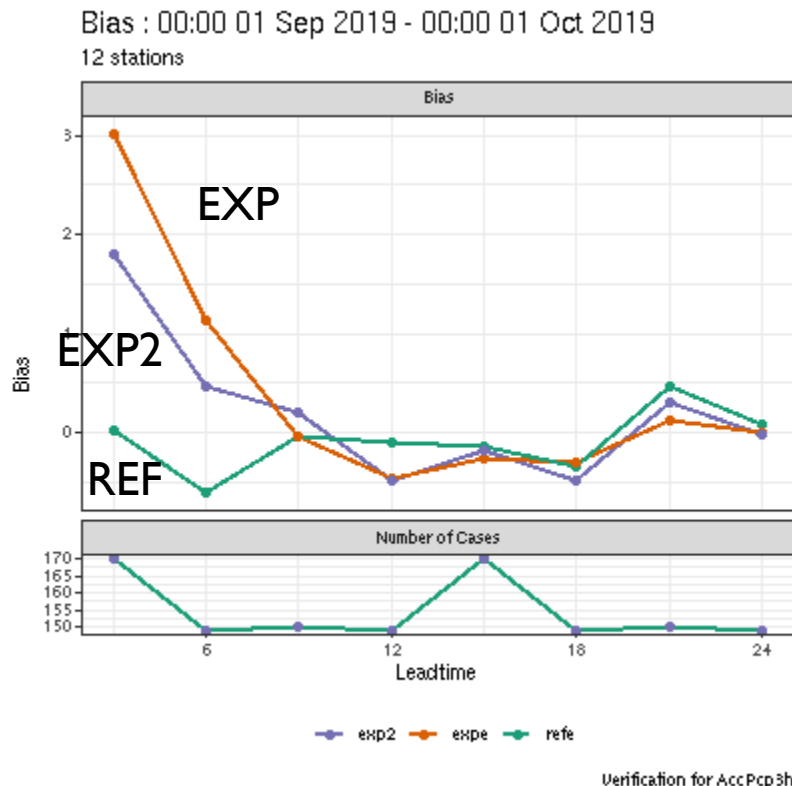T2m Period: 20190901-20191001
Hours: {00,12}

Selection: Slsurroundings using 39 stations
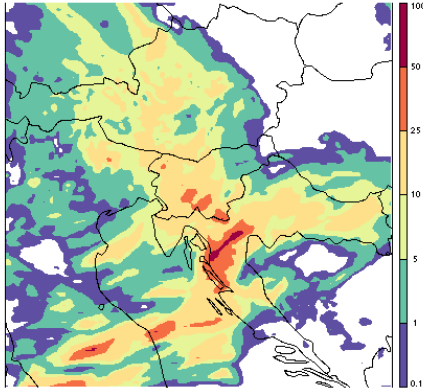Cloud cover Period: 20190901-20191001
Hours: {00,12}

Impact on forecast - precipitation

▸ To much precipitation at **3** and **6** h range
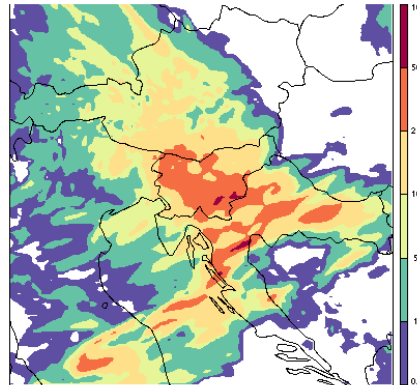
▸ EXP2 converges towards REF.
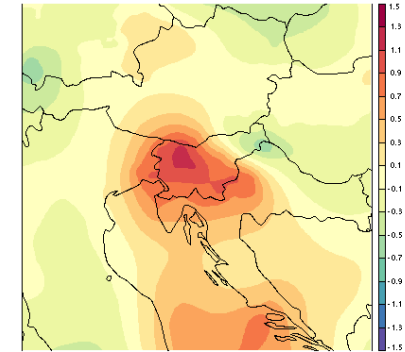
Heavy precipitation case (+6h forecast)

EXP2

REF

Q increment in EXP2

EXP - REF

OBSERVATIONS
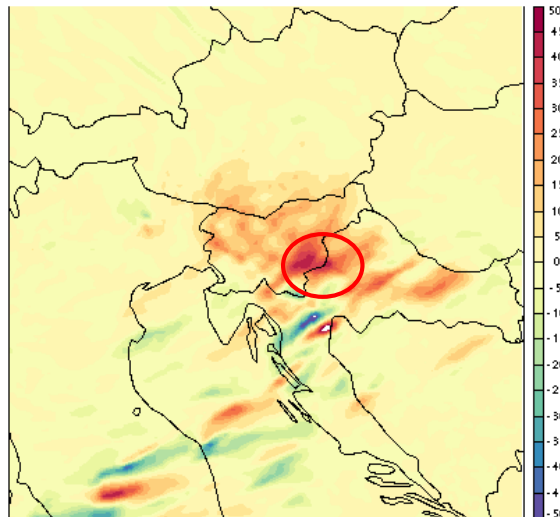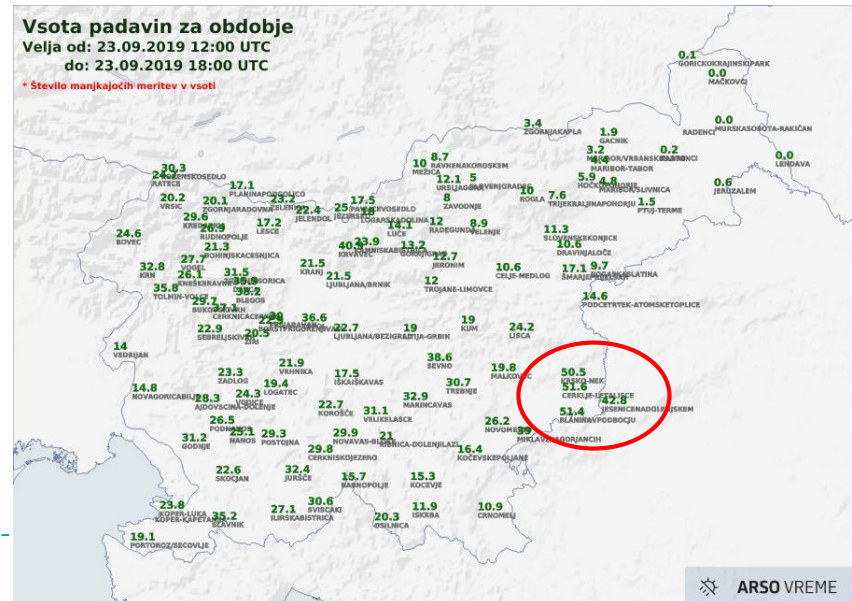
Conclusions

▸ Revised data set very close to E-GVAP, similar behavior expected

▸ ZTD have large impact on humidity and precipitation (should obs. error be tuned?)

▸ Bias correction – VarBC seems to need longer period (3-5 months?)

▸ Should the static BC also be used and then variational?

▸ Cycling of VarBC (3h or 24h); how to technically handle?

▸ Continuation depends on agreement with GIS & E-GVAP