Recent changes in the ALADIN operational suite

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Služba za meteorološka istraživanja i razvoj operativnih prognostičkih modela

Outline

- Current operational suite
- Input from the global models
- How the ALARO0 baseline performed in the testing?
- Forecast performance
- Conclusions

Operational suite

The operational model version used is AL38T1 with ALARO0 physics for 8 and 4 km forecasts. Operational forecast run for:

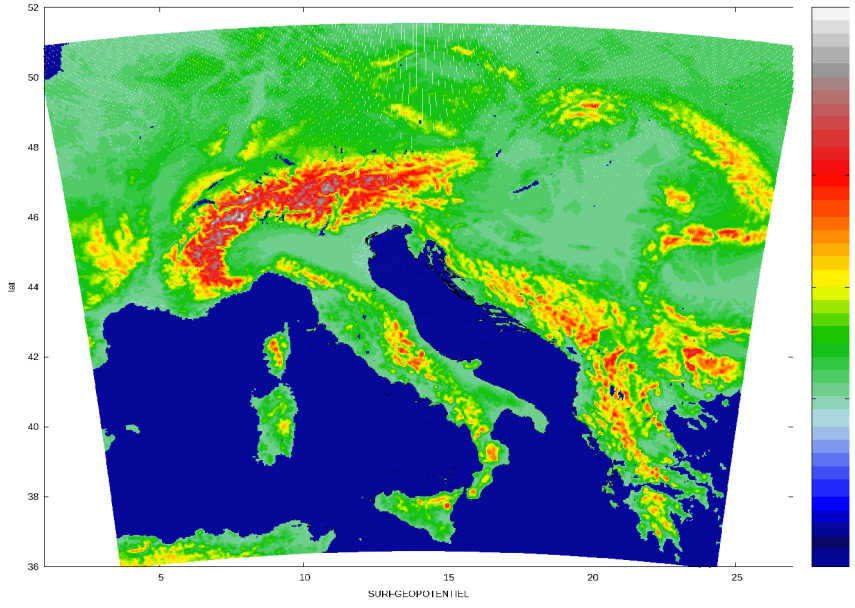
- 8 km resolution, 4 times per day, 3DVAR upper air analysis and surface OI, 6 h cycling, to 72 hours, coupled to IFS, 37 levels.

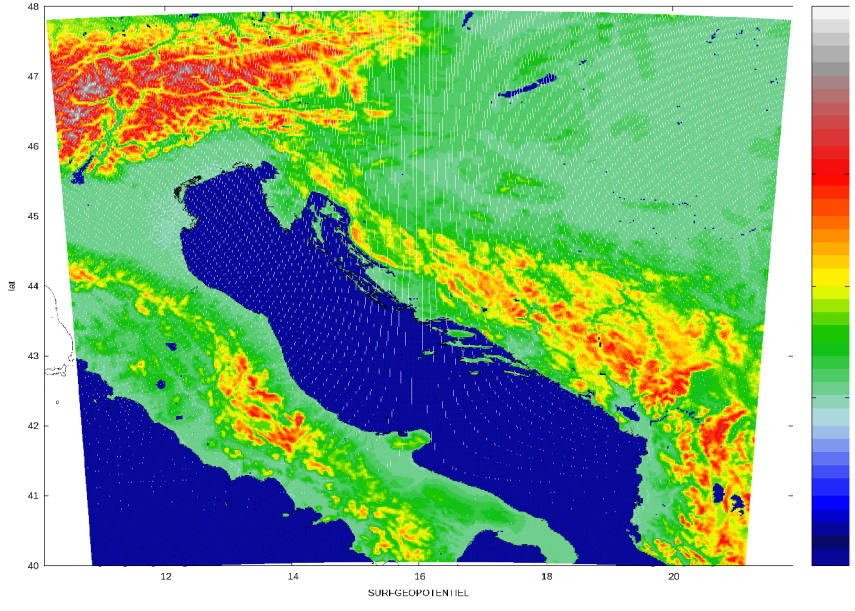
- 4 km resolution, 00 UTC up to 72 hours, surface OI, 6h cycling, coupled to IFS, 73 levels, to do: 3DVAR.

- 2 km dynamical adaptation, hourly, up to 72 hours,

- 2 km non-hydrostatic, 06 UTC up to 24 hours

Article to appear in Cro. Met. Jour. (accepted)



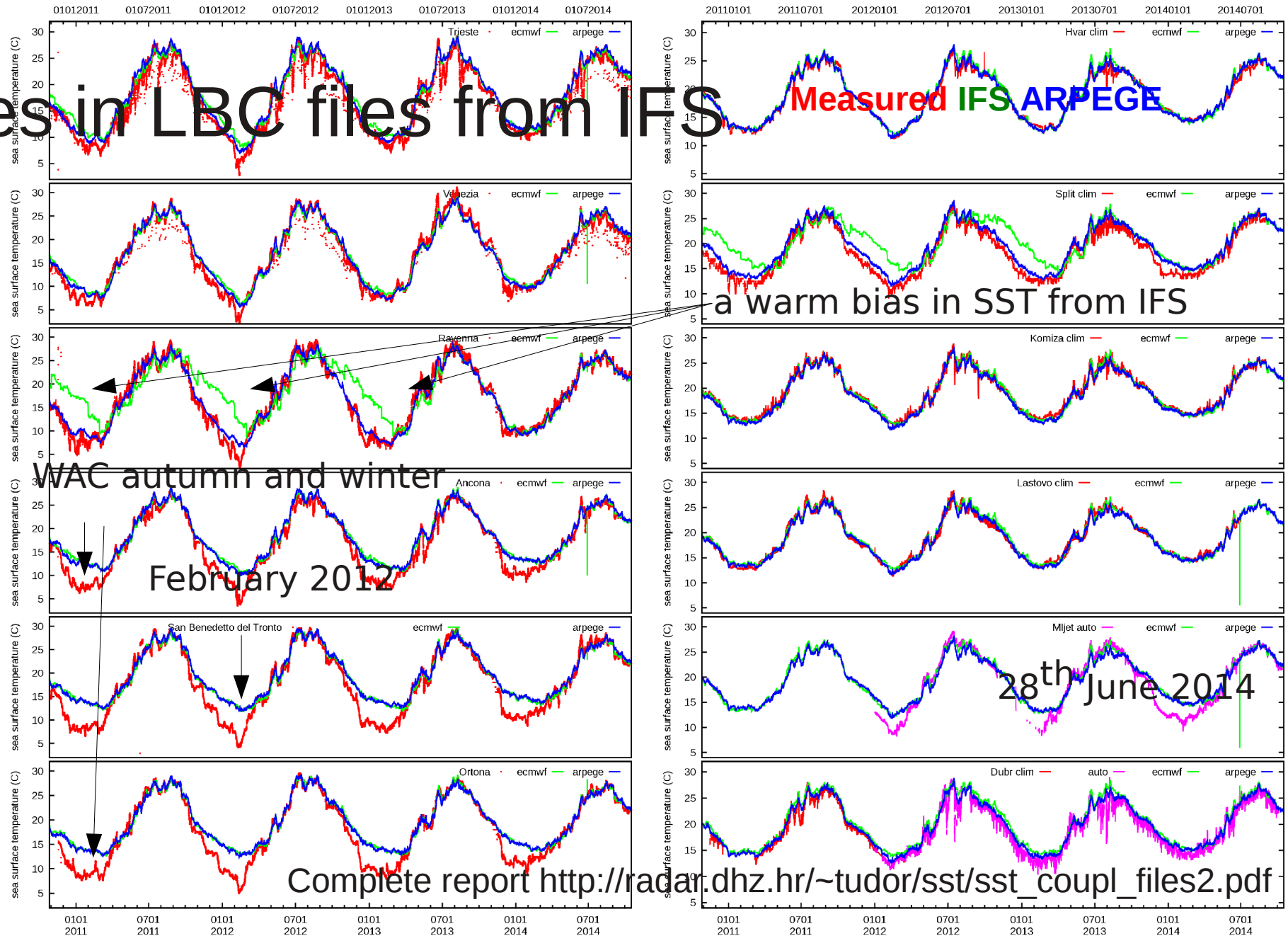


SST issues in LBC files from IFS

Two sets of SST fields provided in the coupling files (IFS and ARPEGE) compared the SST measured on stations.

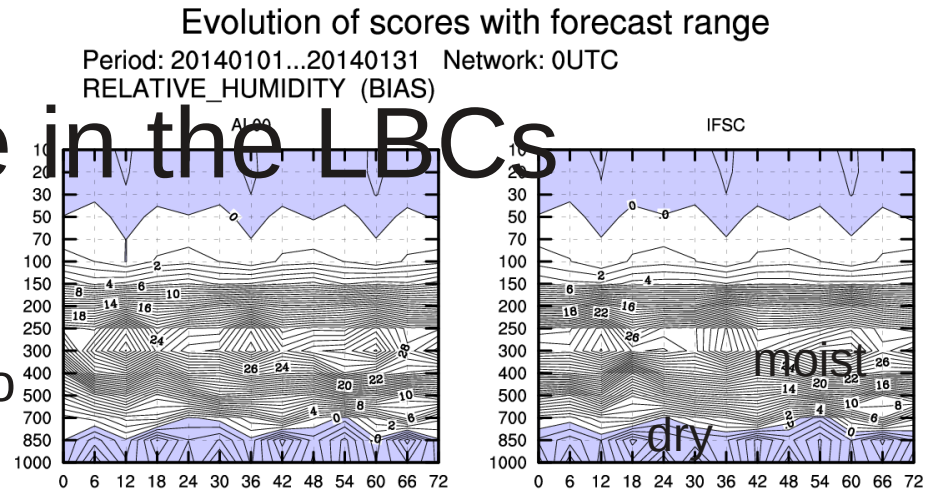
Several of these unnatural features in SST have been fixed.

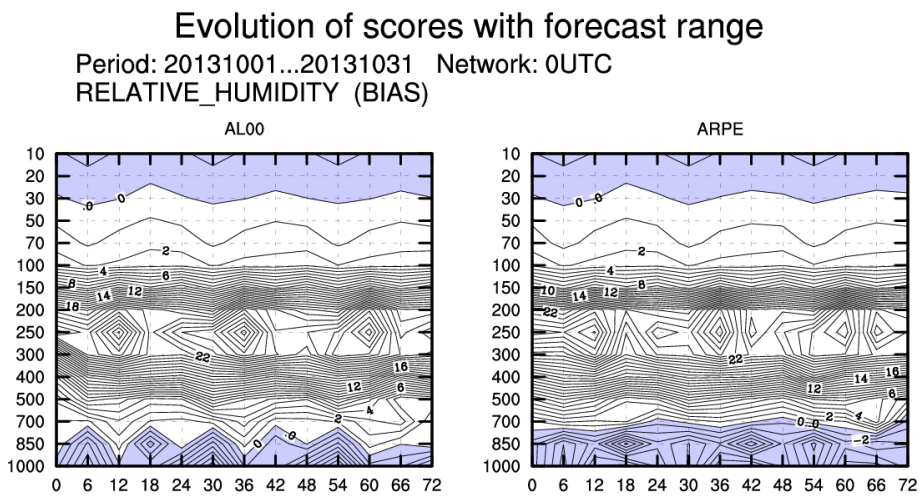
Remaining large discrepancies in measured and model SST for certain regions and seasons.



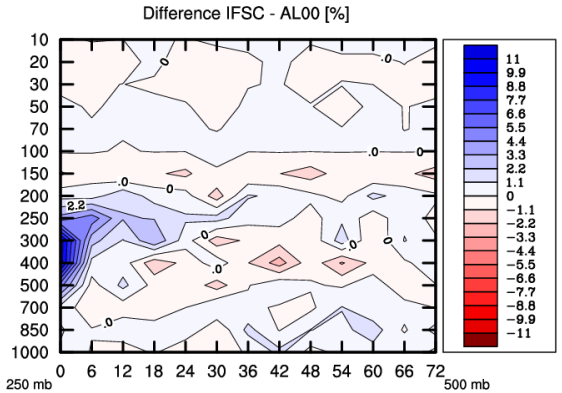
Change in the LBCs

- Verification scores similar to the model that provides LBCs
- Difference in initial conditions due to data assimilation soon dominated by advection through boundaries

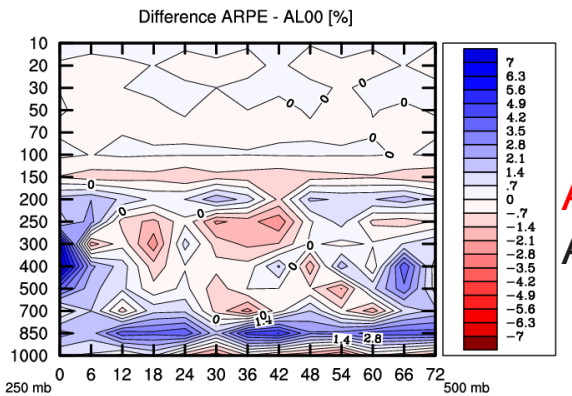




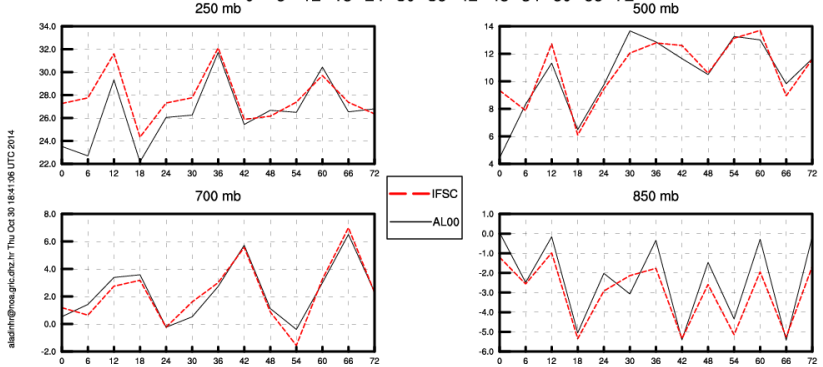
IFS - ALADIN

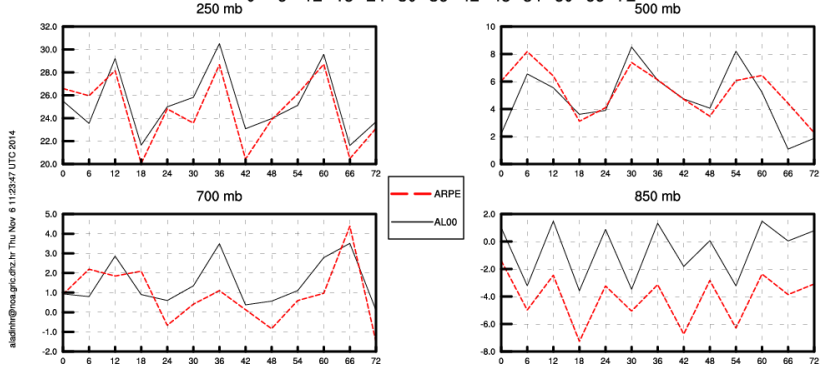


All too moist above 850 hPa, Too dry below ALADIN very similar to LBCs



ARPEGE ALADIN





Article to appear in Cro. Met. Jour.

Alaro0 baseline: Prognostic convection

Computes the contribution of the unresolved condensation and feeds it to the same micro-physics scheme that is used for the resolved condensation. Prognostic equations for:

cloud liquid water and ice,

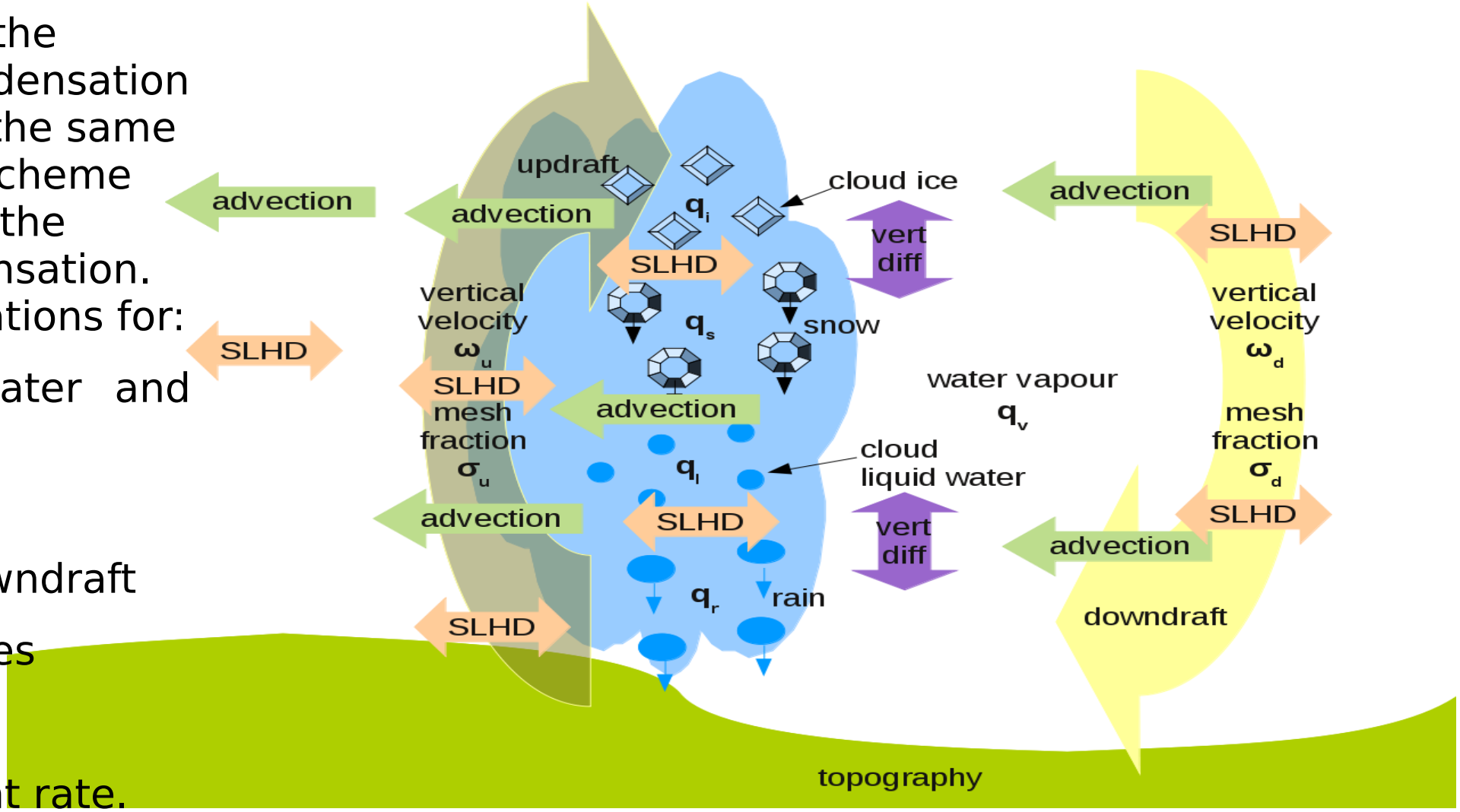
rain, snow,

updraft and downdraft

vertical velocities

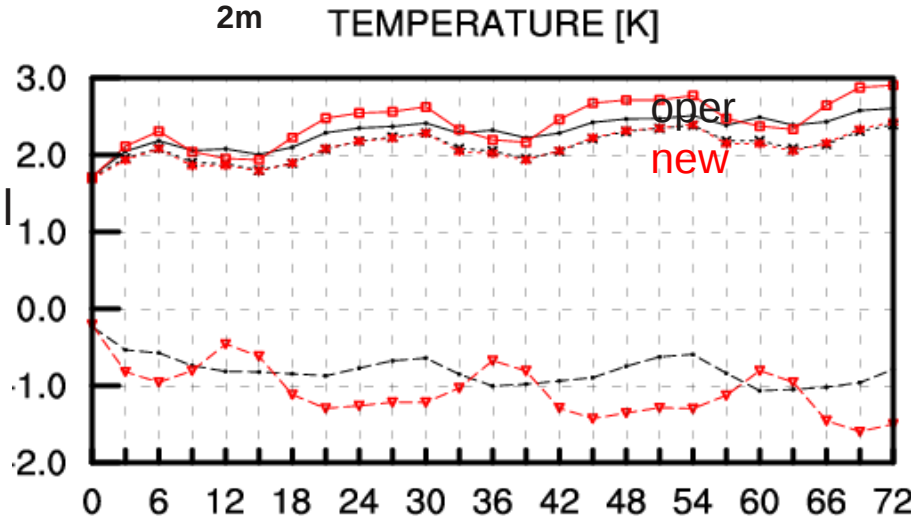
mesh fractions

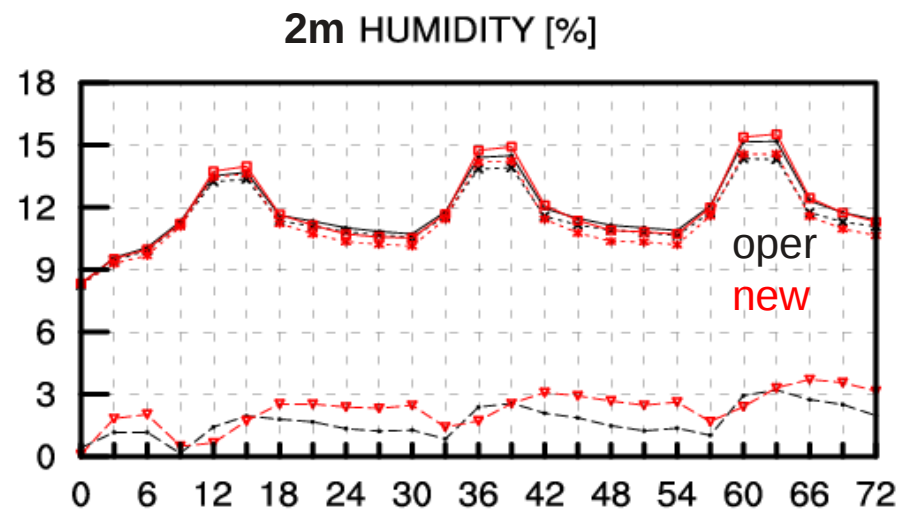
and entrainment rate.



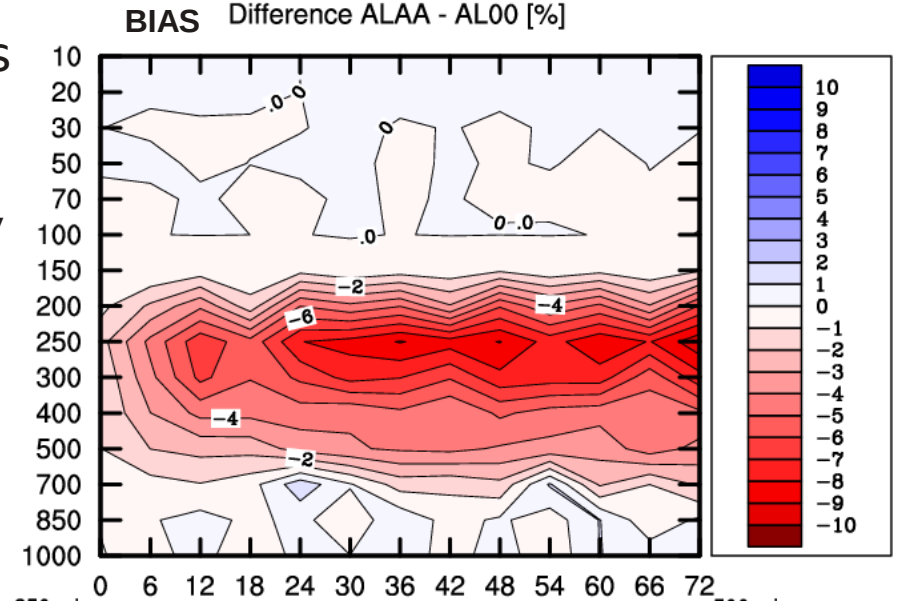
Pre-operational testing during 2014 - January

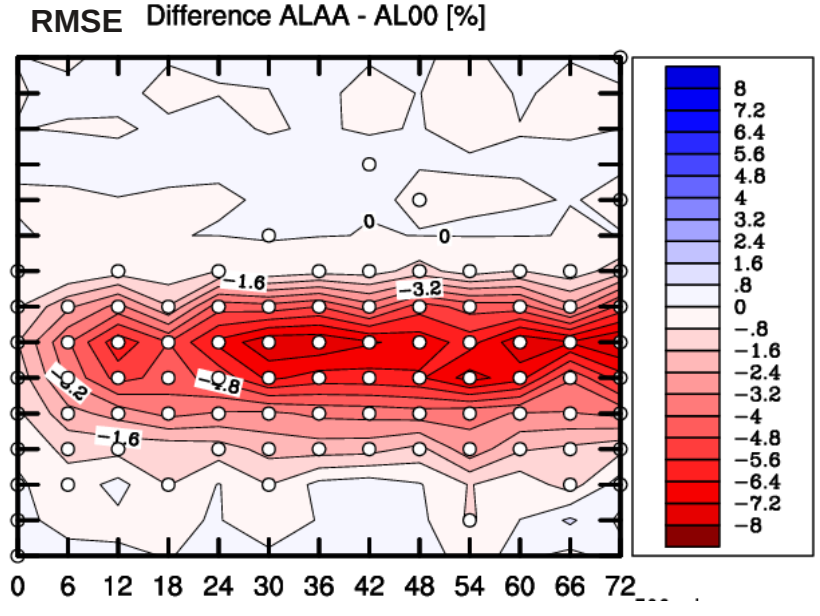
Standard deviation (short dash) RMSE (full line) and bias (long dash)





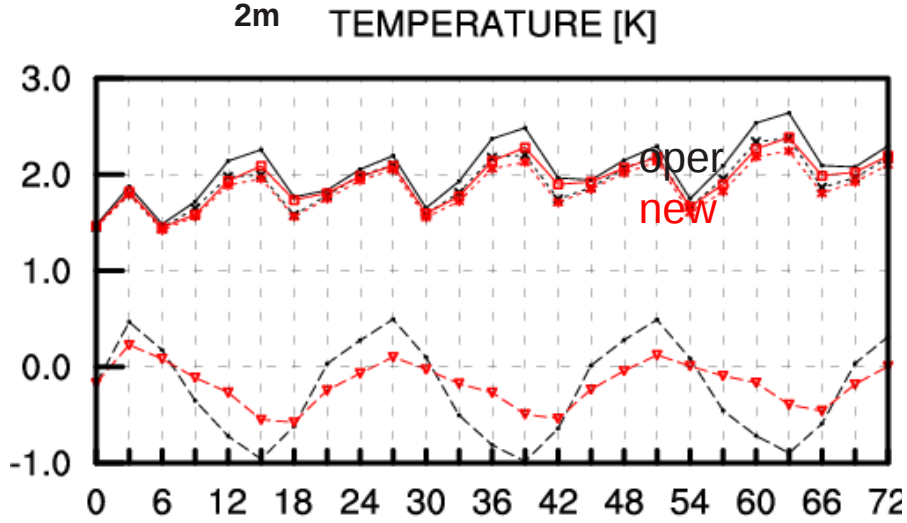
The dependency of the difference in RMSE and bias between ALARO0 (ALAA) and operational forecast (AL00) for relative humidity on the vertical (pressure coordinate) and forecast hour (from 0 to 72 hours) averaged for 31 forecasts starting from 00 UTC.

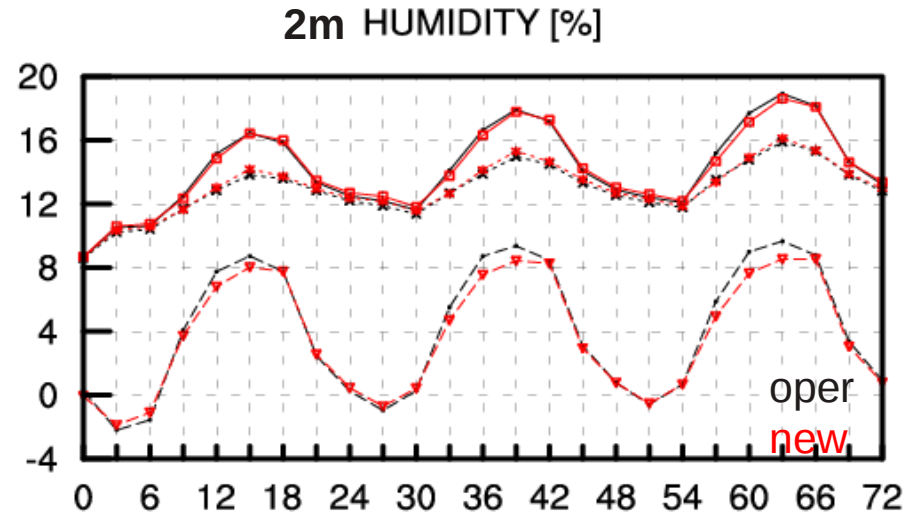




Pre-operational testing during 2014 - May

Standard deviation (short dash) RMSE (full line) and bias (long dash)





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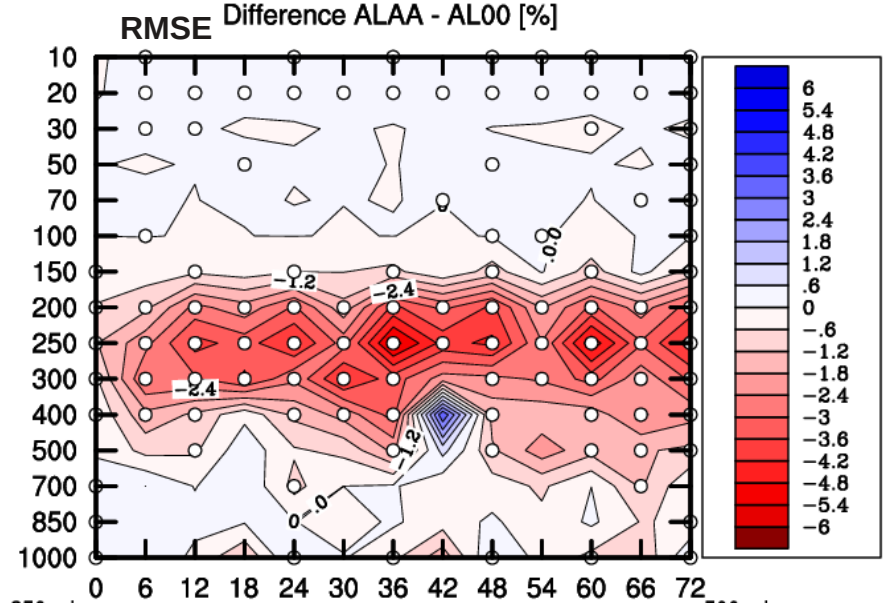
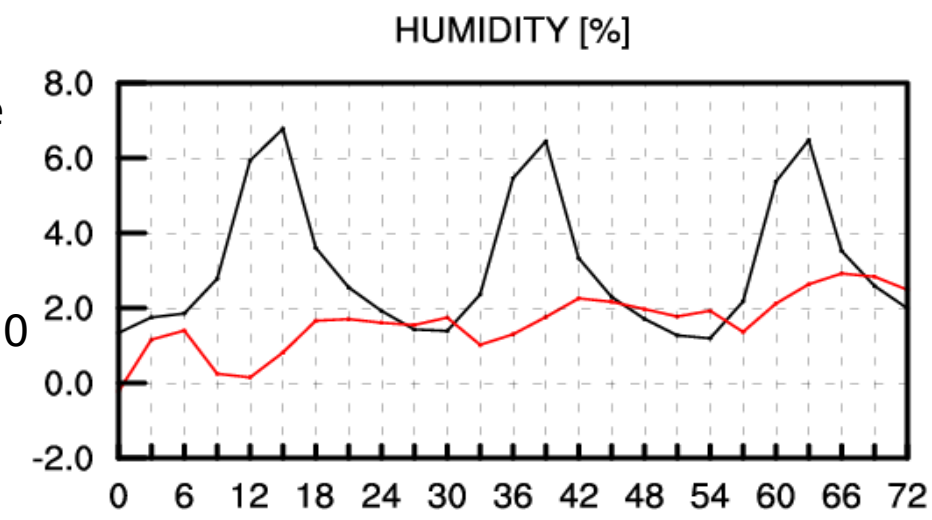
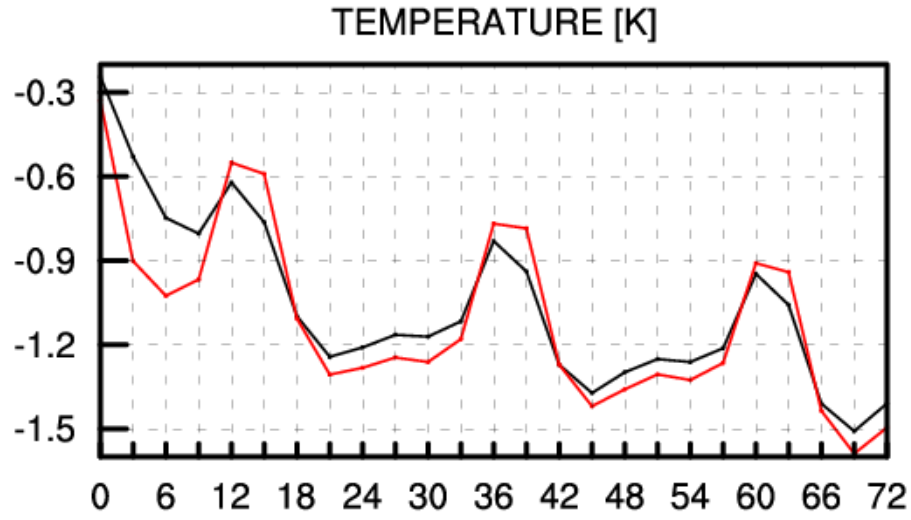
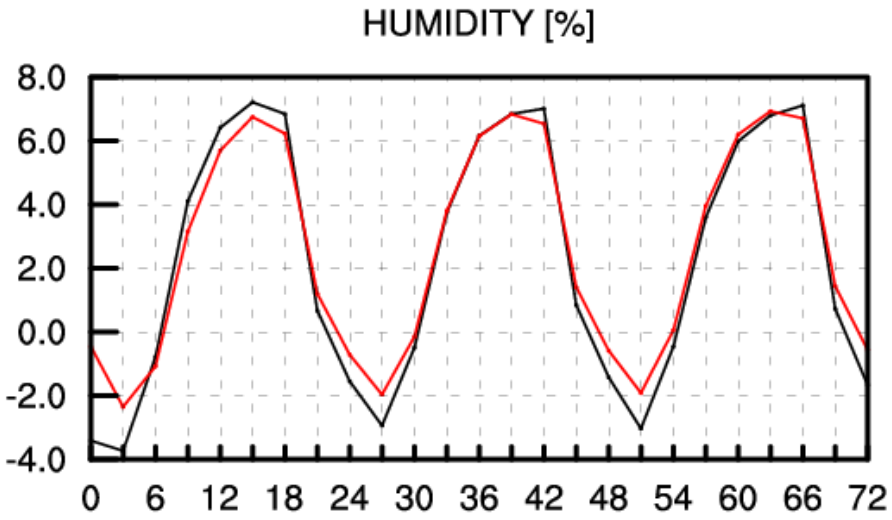


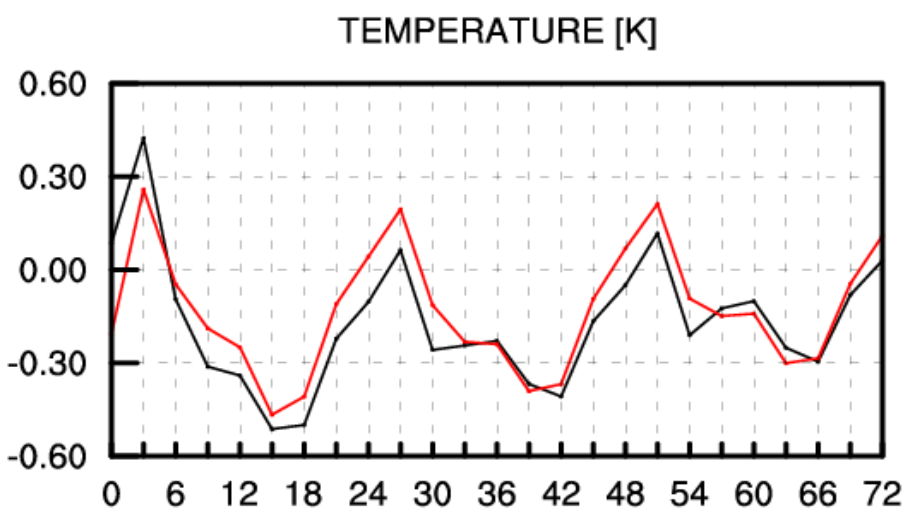
4 km

Bias computed for the 4 km resolution forecast (black) and 8 km (red) using ALARO0 for 2m relative humidity and temperature dependency on forecast time (from 0 to 72 hours) for 31 forecasts starting from 00 UTC during January and May 2014.

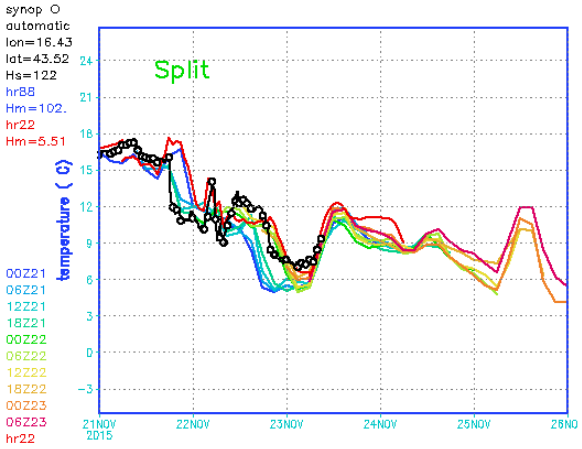


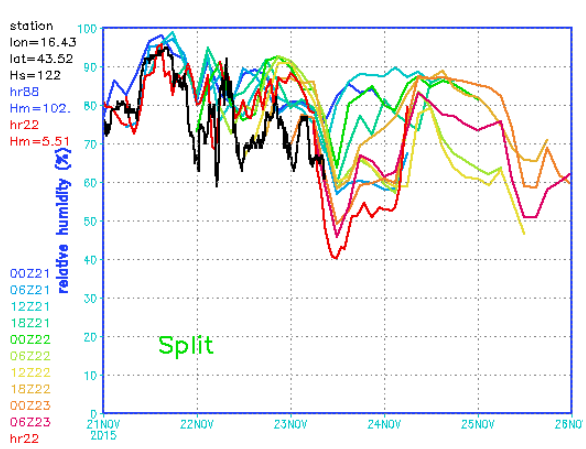


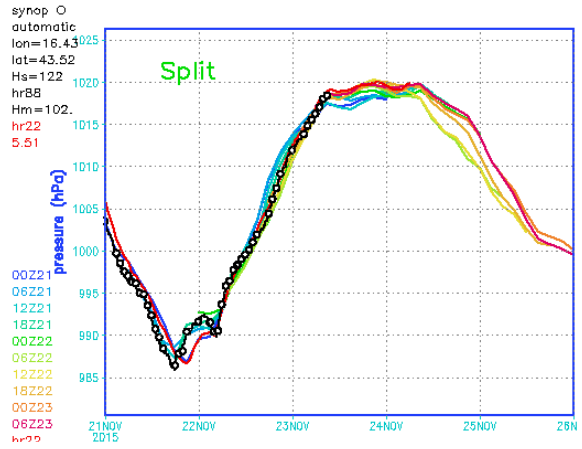


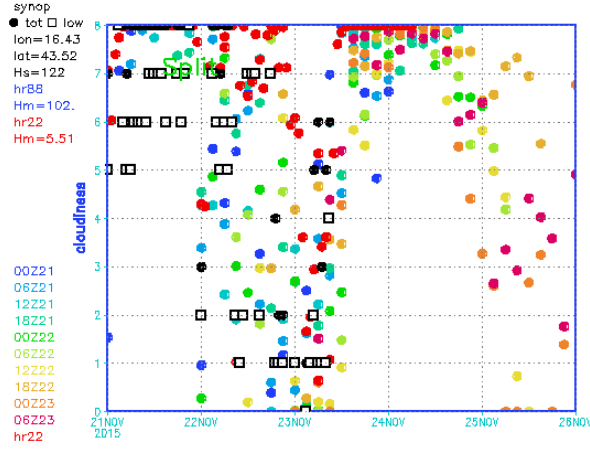


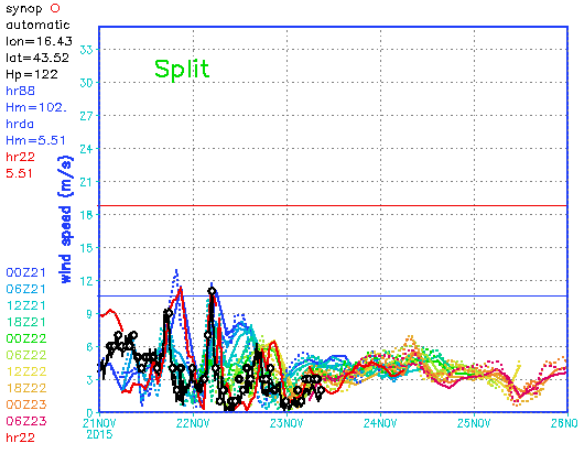
Split Marjan measurements (black) and forecasts (different colours - starting analyses)

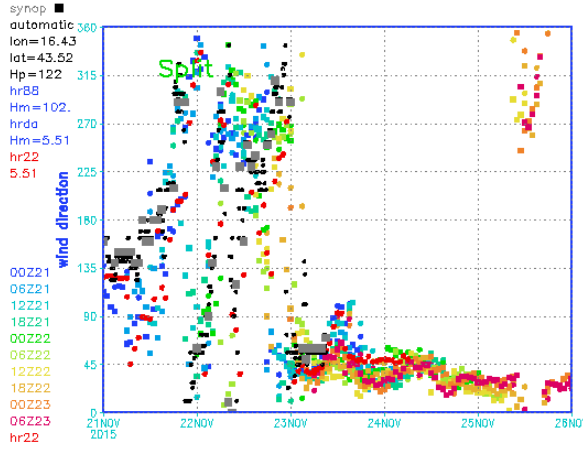


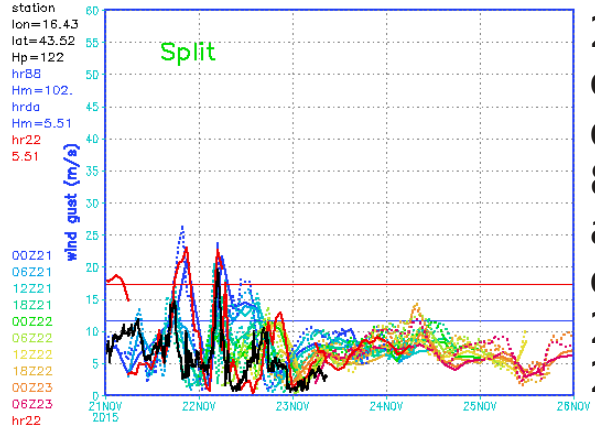






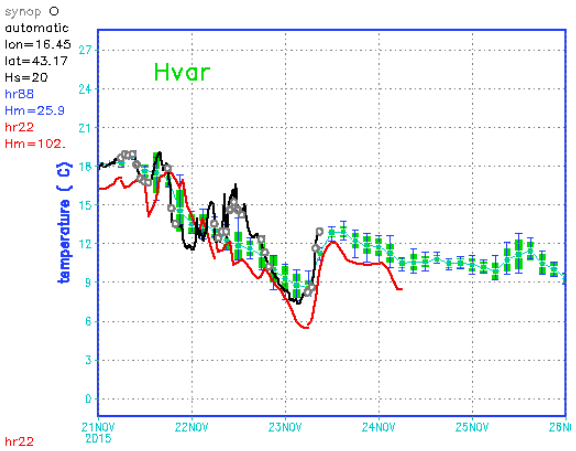


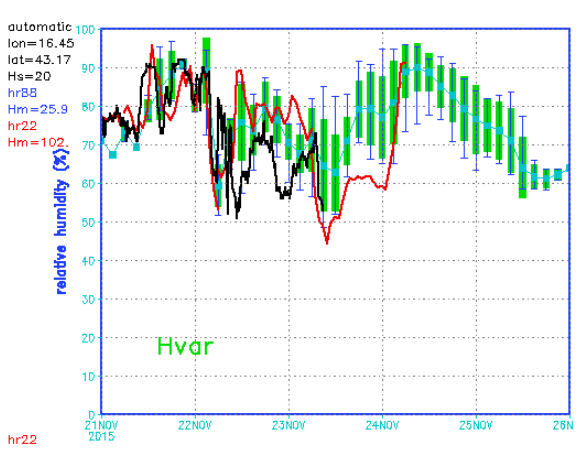


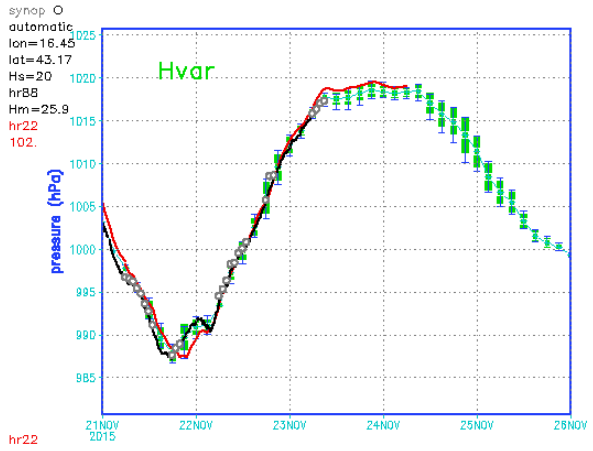


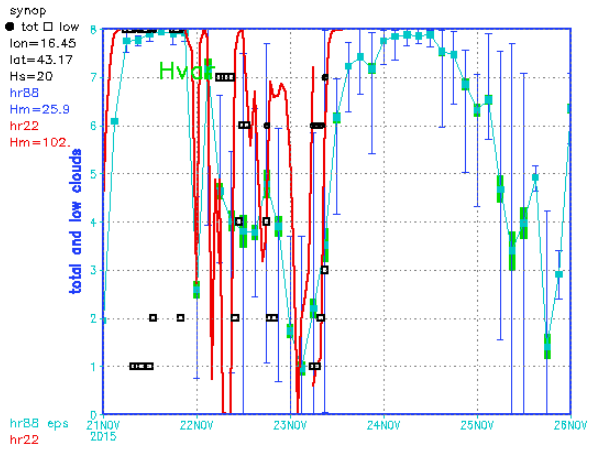
2 m T and RH, MSLP, cloudiness and wind speed, direction and gusts
8 km (full lines, squares), analyses times in the same colour on the left,
2 km DADA (dotted, circles)
2 km NH (red lines, circles).

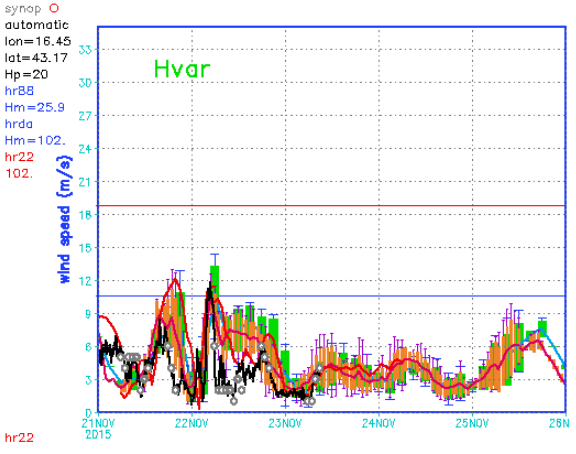
Hvar measurements (black) and forecasts

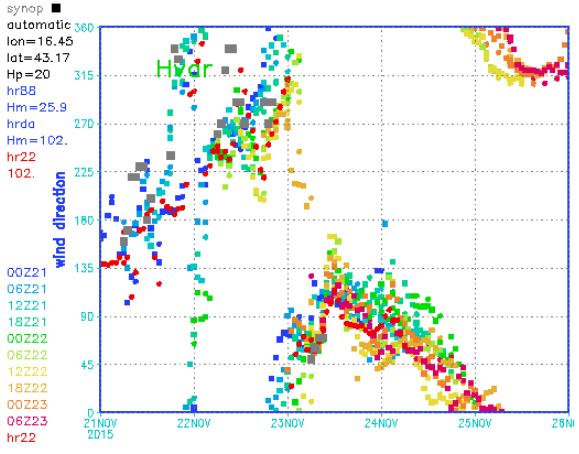


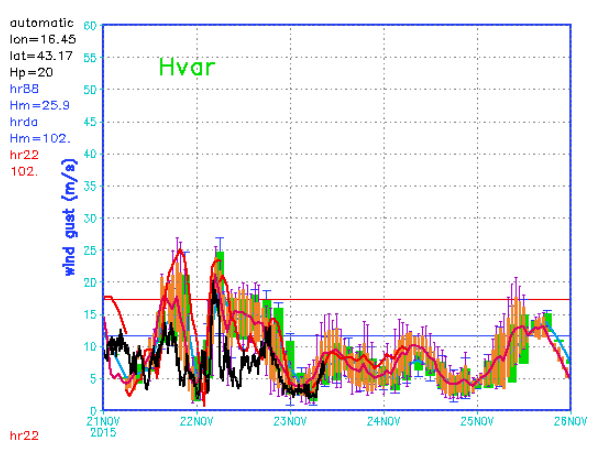








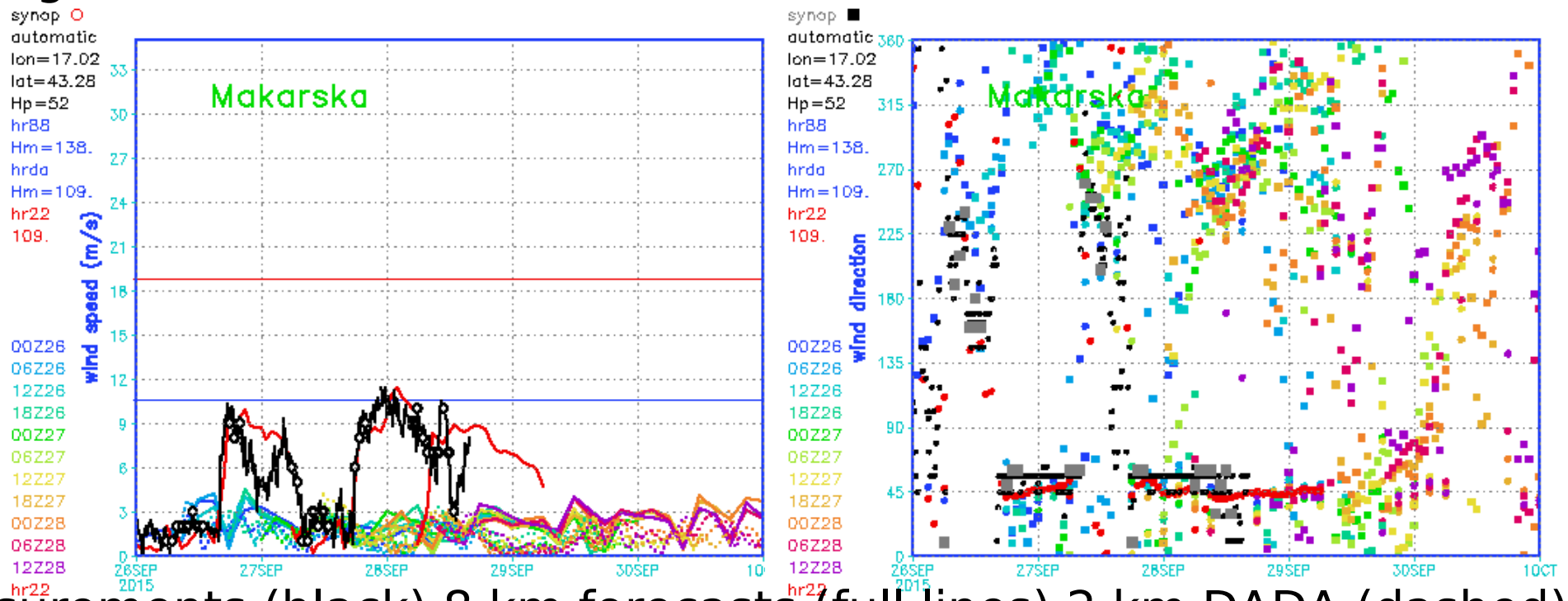




2 m T and RH, MSLP,
cloudiness and wind speed,
direction and gusts
8 km (green bars),
2 km DADA (dotted, circles)
2 km NH (red lines, circles).

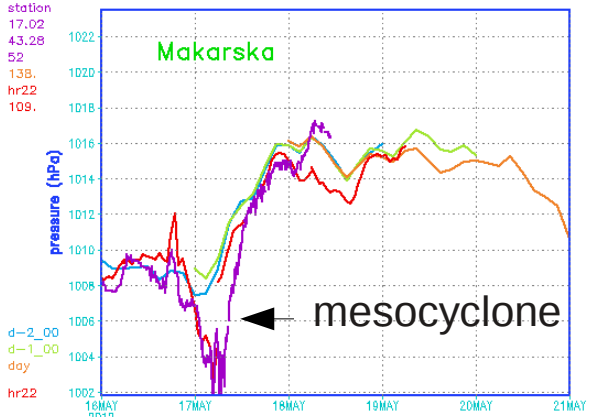
When is 2 km NH forecast better?

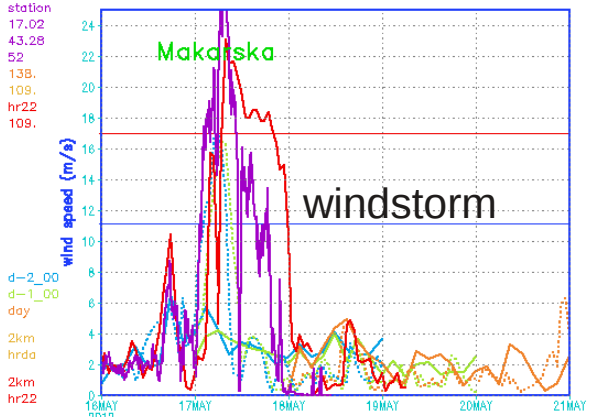
Severe bura events in Makarska can be missed by dynamical adaptation but correctly predicted by non-hydrostatic forecast using the full physics package.

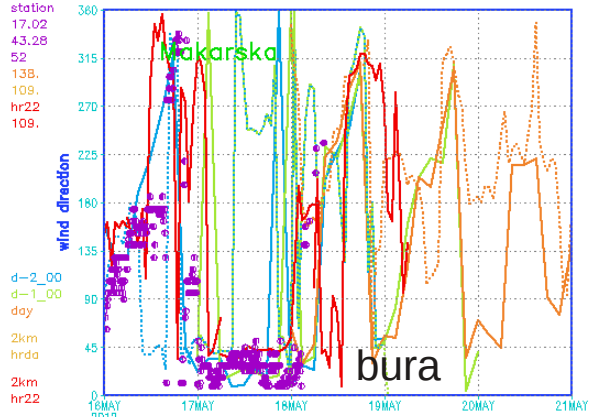


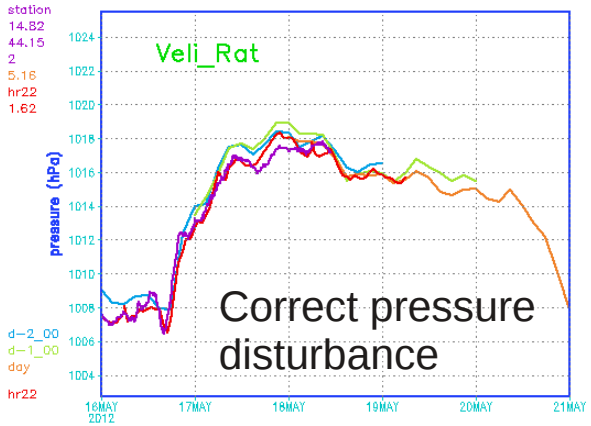
Measurements (black) 8 km forecasts (full lines) 2 km DADA (dashed) and 2 km NH (red).

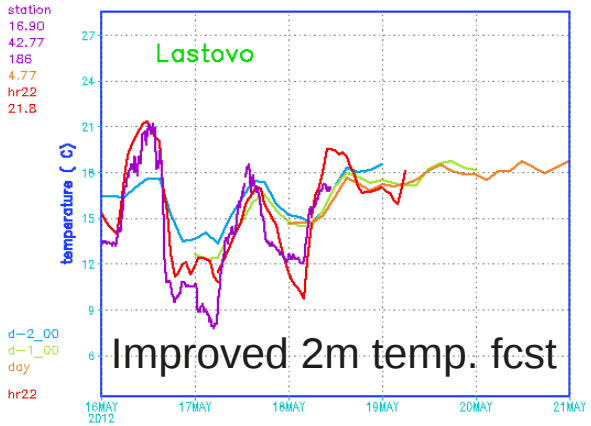
Operational NH forecast in 2 km











Conclusions

- Components of ALARO0 used in previous operational forecast
- Novelties: prognostic convection, sedimentation of cloud condensates.
- LAM forecast depends on the data used for forecast LBCs
- Humidity bias reduced in ALARO0 baseline
- Some features forecasted only in 2 km NH run