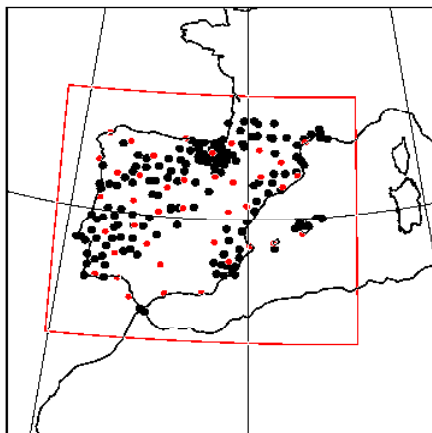


Assimilation of GNSS ZTD with HARMONIE

M. Lindskog (SMHI), J. Sánchez (AEMET), S. Thorsteinsson (IMO), J. Bojarova (Met.No)

Design of Parallel Experiment

- One month parallel experiment (1-30 /09/2012) investigating the impact of GNSS data on HARMONIE NWP forecasts.
- Model domain over Iberia and with 2.5 km horizontal resolution and 65 vertical levels.
- One control run assimilating only conventional types of observations and one additional run with assimilation also of GNSS data in addition.
- The GNSS run has been optimized with respect to bias correction, error statistics and thinning distances.
- Further evaluation and optimization planned, both over IBERIA and other domains.

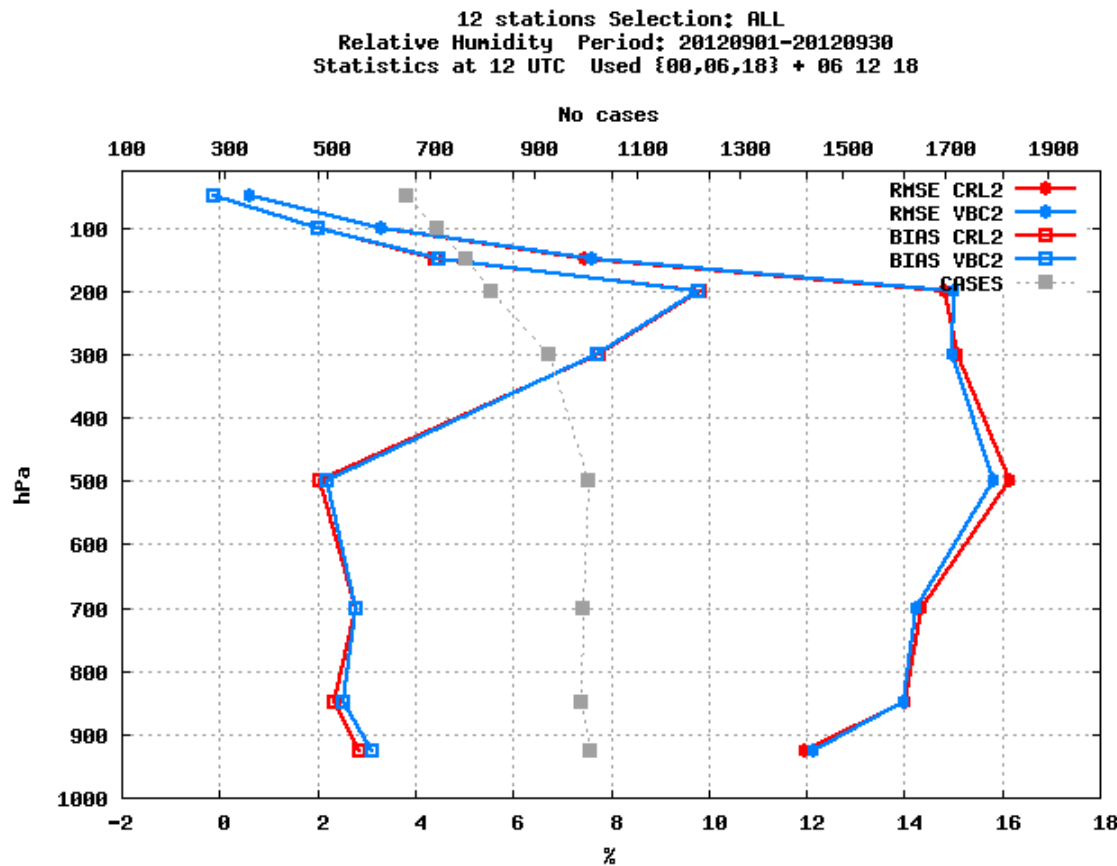


Model domain (red frame) and GNSS observations before (black dots) and after (red dots) thinning of data.

Assimilation of GNSS ZTD with HARMONIE

Verification scores against observations: Relative Humidity

BIAS and RMSE of +6,+12 and +18 h [Period: Sept 2012](#) [Valid Time: 12UTC](#)



Good impact, mainly on humidity, under 500hPa.

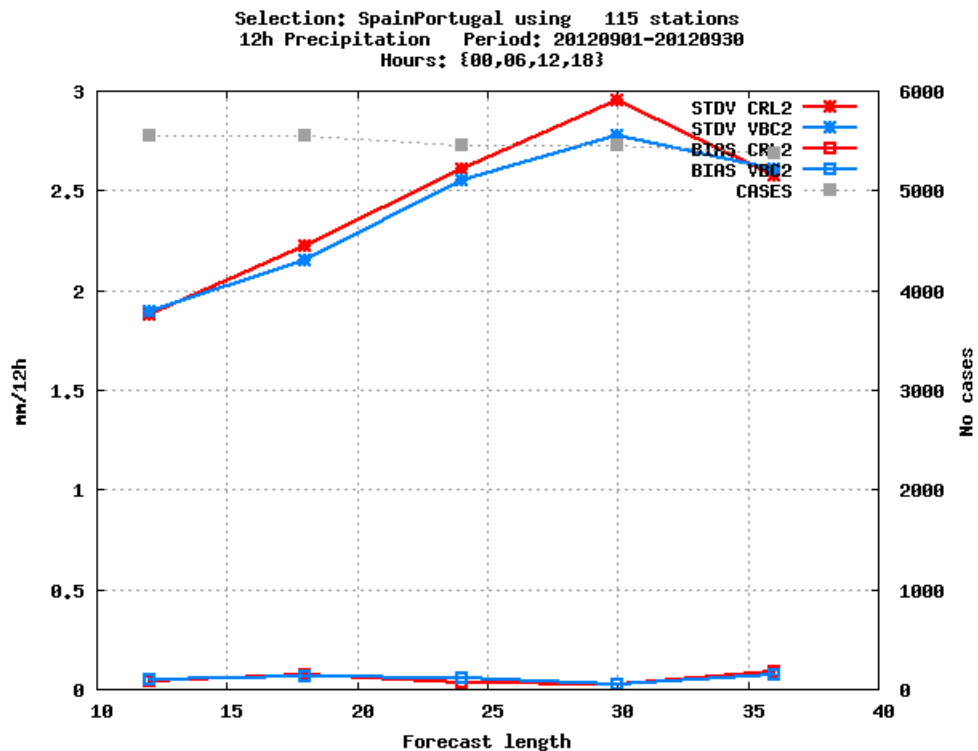
CRL2- Only conv. obs.
VBC2-Conv. obs. and GNSS obs.

Assimilation of GNSS ZTD with HARMONIE

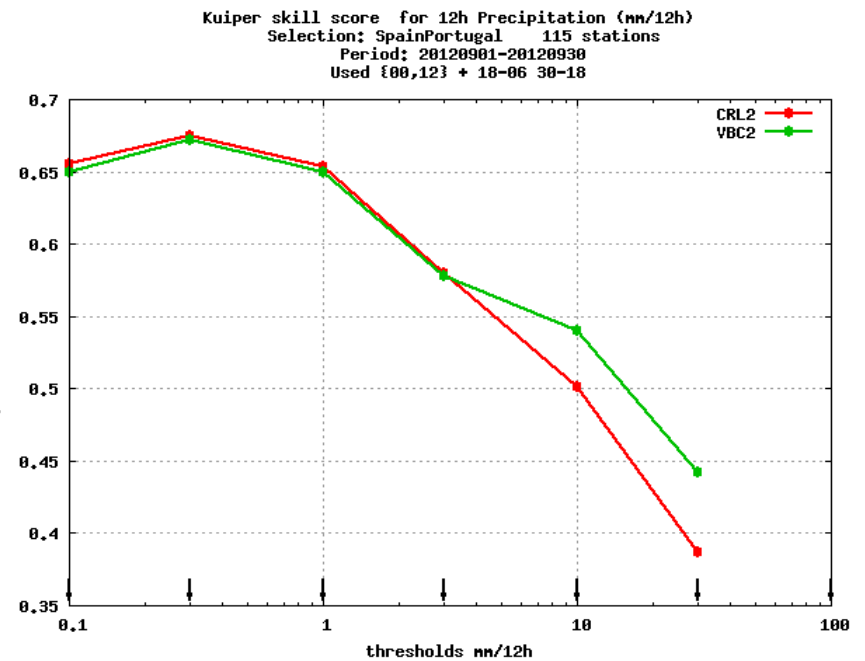
Verification scores against observations: 12h precipitation

Improvement of the forecast skill of 12h accum. precipitation when assimilating ZTD GNSS observations with VarBC scheme, mainly for high precipitation rates.

BIAS and RMSE of +6,+12 and +18 h



Kuiper Skill Score



Assimilation of GNSS ZTD with HARMONIE

Conclusions & Future work

- Encouraging results from parallel experiments assimilating ZTD GNSS observations with VarBC scheme have been found.
 - Further studies of the results are being carried out.
 - A scientific paper is being prepared.