Verification of assimilation of radar reflectivity data

29 June 2018 – 16 August 2018
Operational model
Addition of radar reflectivity data from France
1D+3DVar method

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We use cycle 40 of Harmonie and 3DVar variational data-assimilation in a 3 hourly assimilation cycle, implemented on KNMI's supercomputer.

The test-run has started on 29 June 2018, 12:00 UTC, and still runs, with radar-data from France assimilated on top of conventional observations, scatterometer data and Mode-S EHS data.

The radar-data are obtained from an OPERA ftp-site, a large repository of quality-controlled data from many European countries, updated every 15 minutes. We use reflectivity data only.

Prior to assimilating, the data are averaged in the azimuthal direction (every 3 rays) and in the radial direction (binsize 6000 km), using a script that was developed at DMI and SMHI.

The radar reflectivity data are assimilated by means of the 1D+3DVar method that was developed by Caumont and others at Météo-France (Tellus, 2010, 62A, 173-187).
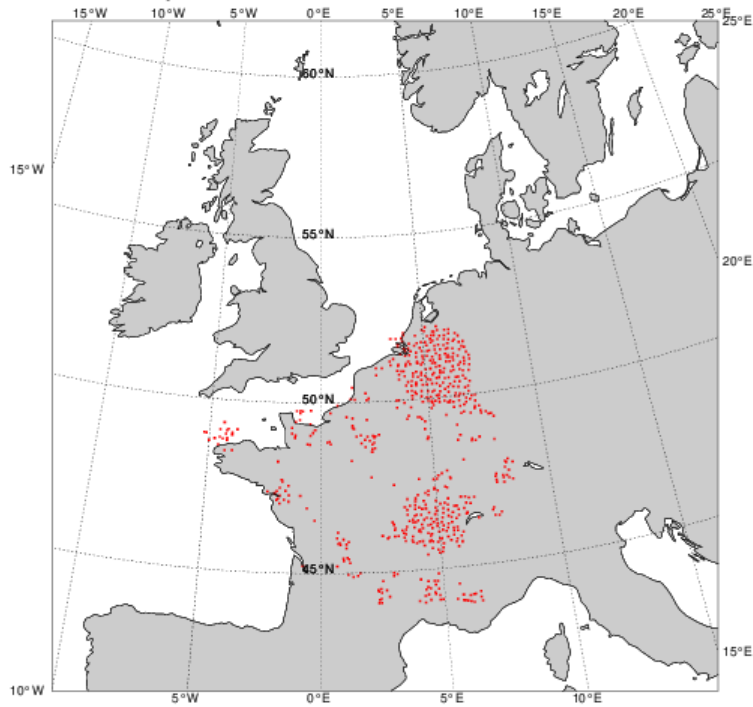
In this technique, reflectivities are transformed into profiles of humidity, using a Bayesian technique, which profiles are then assimilated by means of the 3DVar method of Harmonie.
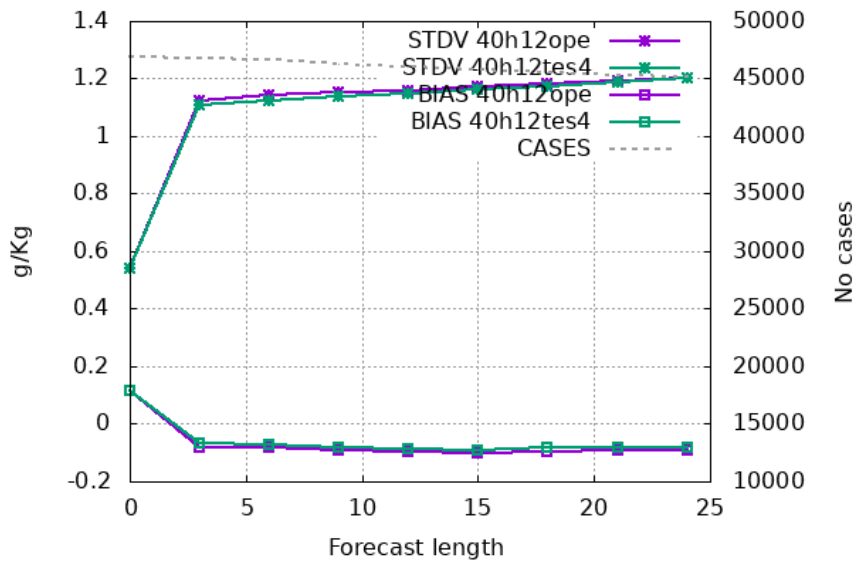
radar_q_20180607_03UTC; 965 observations

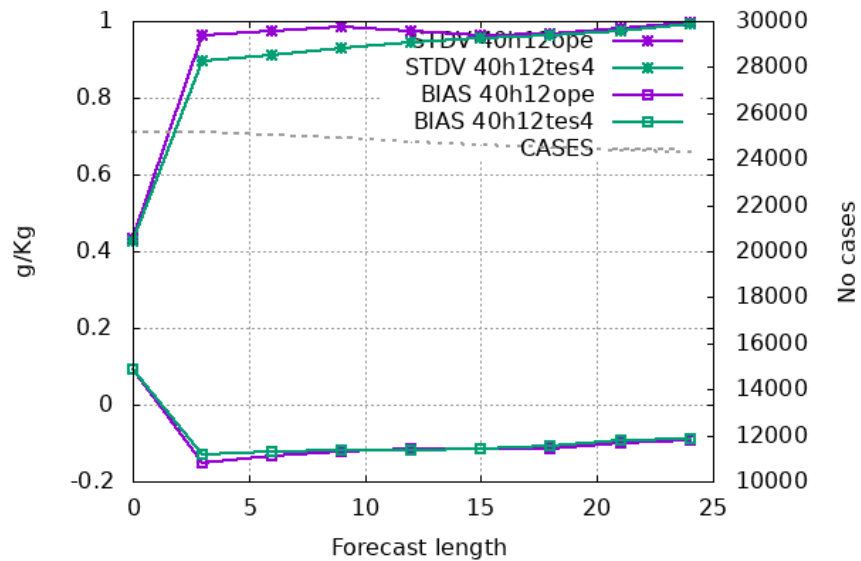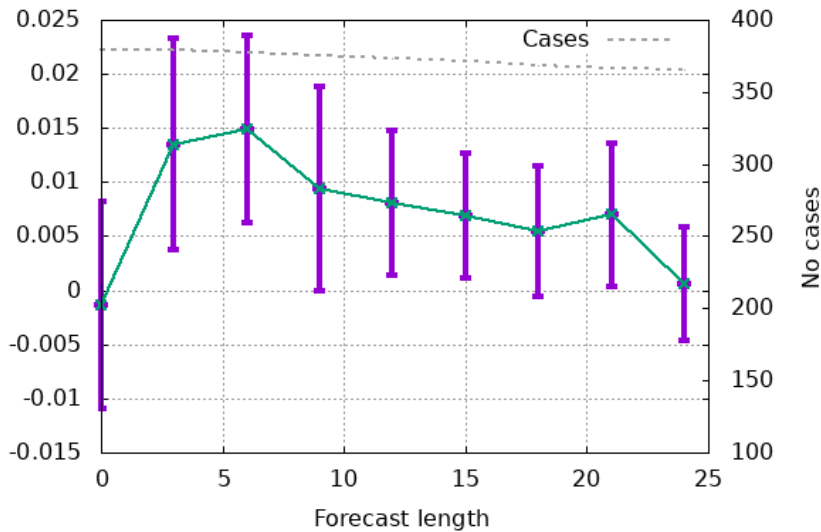radar_q_20180608_00UTC; 585 observations

Selection: EWGLAM using 128 stations
Q2m   Period: 20180629-20180816
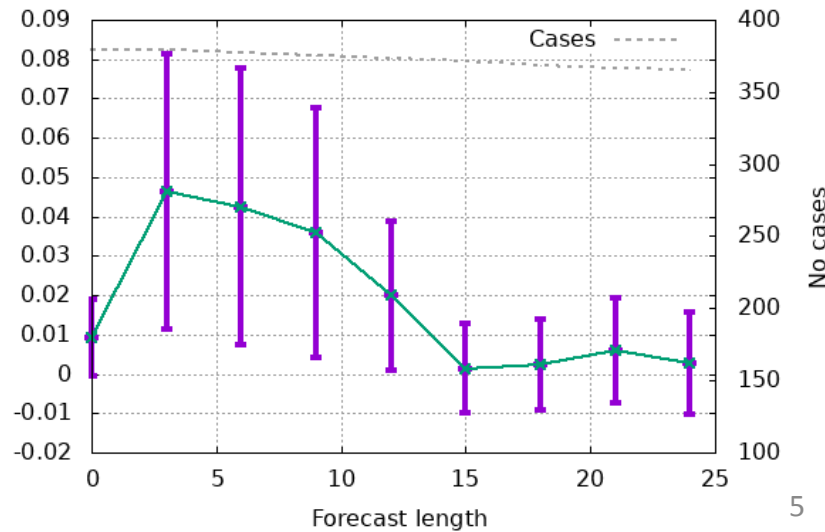Hours: 00,03,...,21

Selection: Netherland using 68 stations
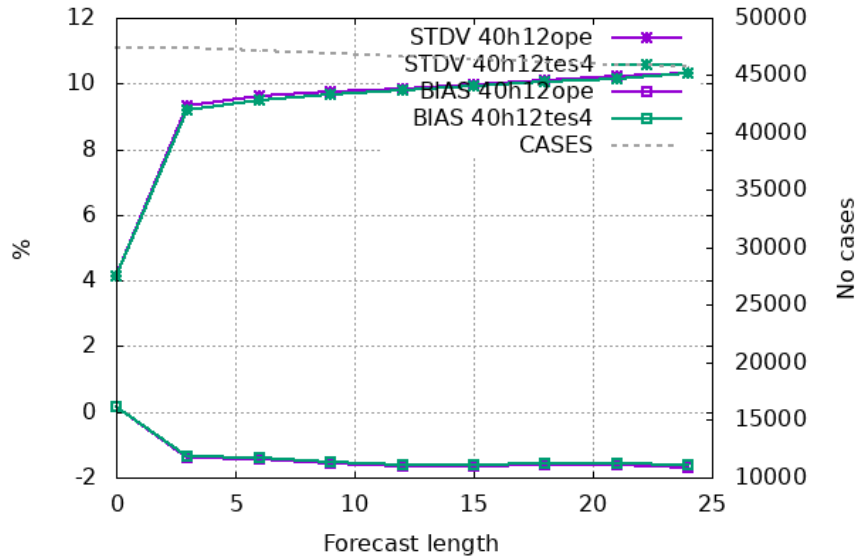Q2m   Period: 20180629-20180816
Hours: 00,03,...,21

Normalized mean RMSE diff (90% conf) 40h12ope - 40h12tes4
Selection: EWGLAM using 128 stations
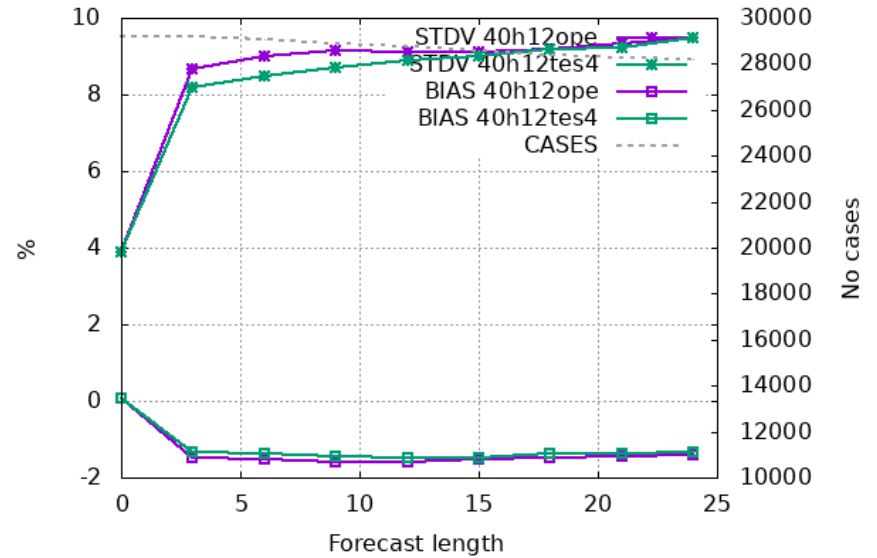Period: 20180629-20180816
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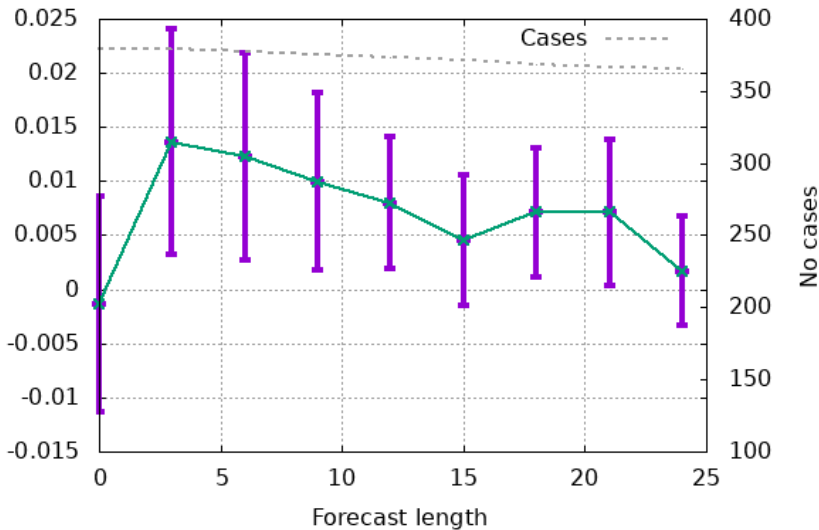Q2m   Hours: 00,03,...,21

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Selection: EWGLAM using 129 stations
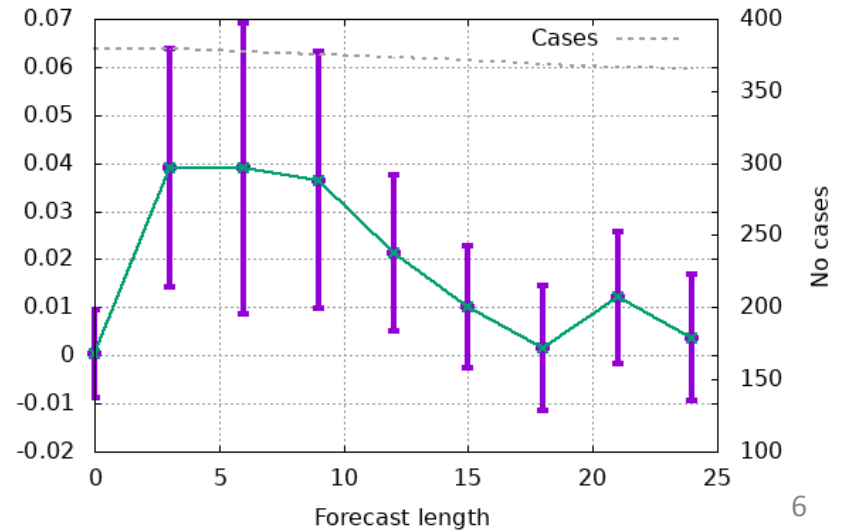Rh2m Period: 20180629-20180816
Hours: 00,03,...,21

Selection: Netherland using 78 stations
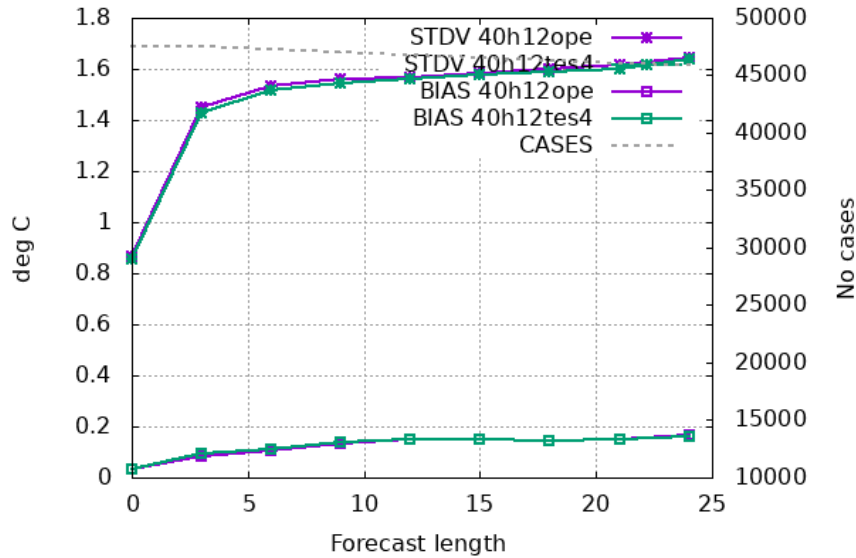Rh2m Period: 20180629-20180816
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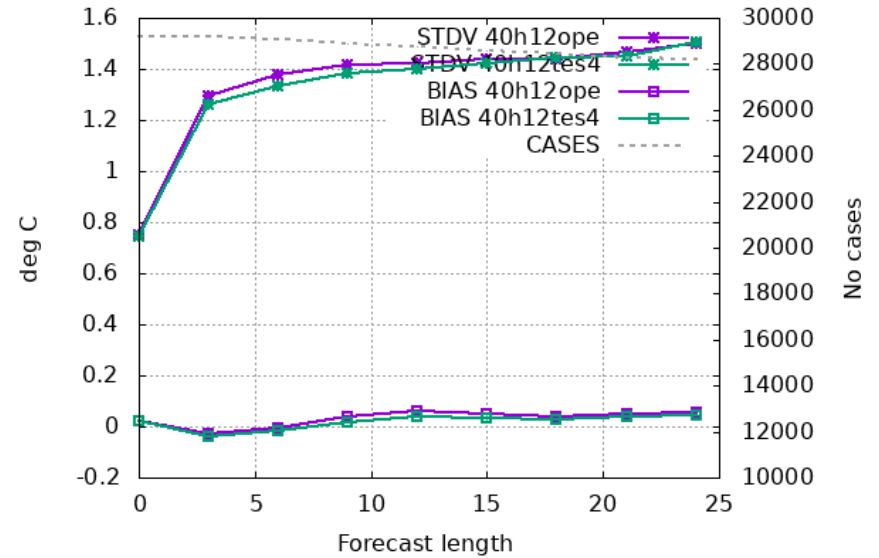Period: 20180629-20180816
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Normalized mean RMSE diff (90% conf) 40h12ope - 40h12tes4
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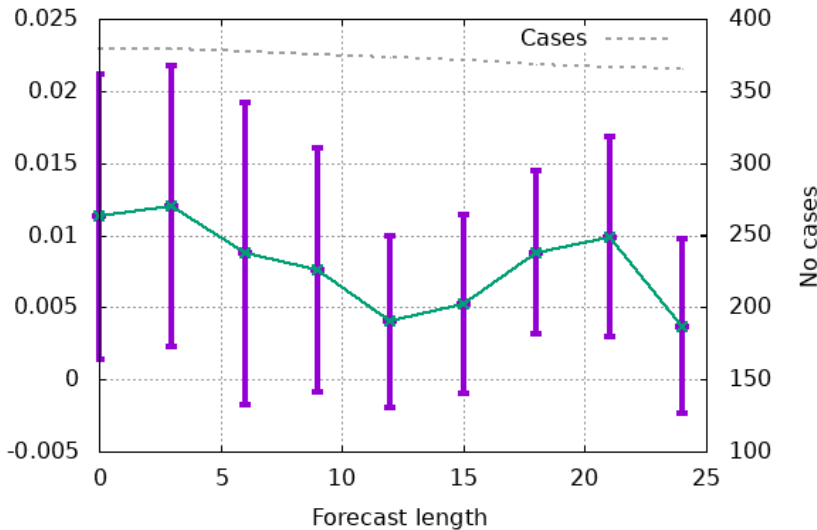Period: 20180629-20180816
Rh2m Hours: 00,03,...,21

Selection: EWGLAM using   129 stations
T2m   Period: 20180629-20180816
Hours: 00,03,...,21

deg C — No cases — Forecast length

STDV 40h12ope
STDV 40h12tes4
BIAS 40h12ope
BIAS 40h12tes4
CASES

Selection: Netherland using   78 stations
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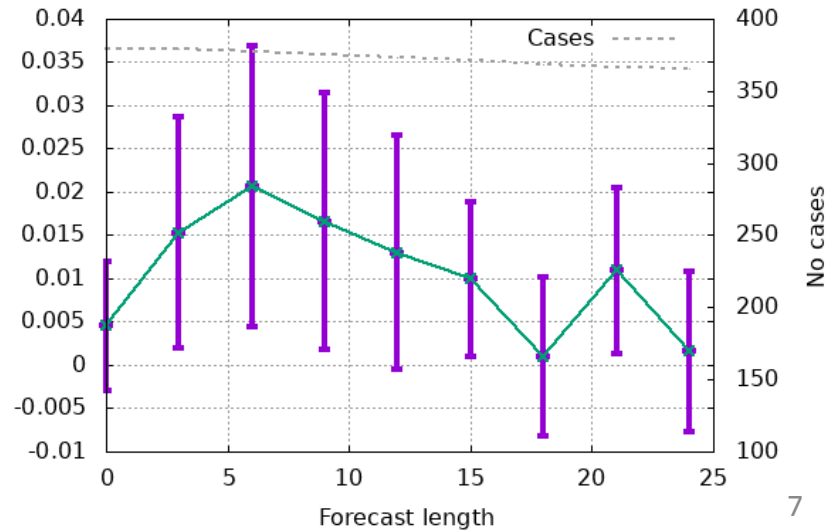U10m Period: 20180629-20180816
Hours: 00,03,...,21

Selection: Netherland using 90 stations
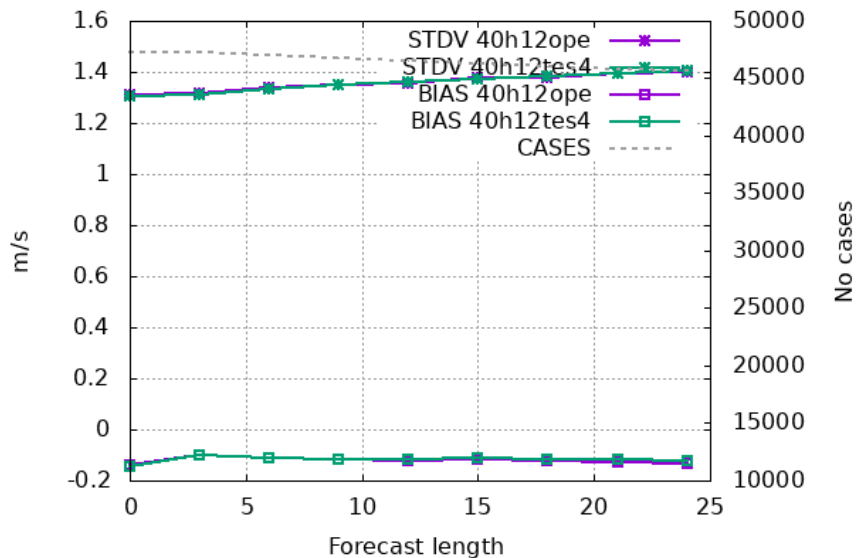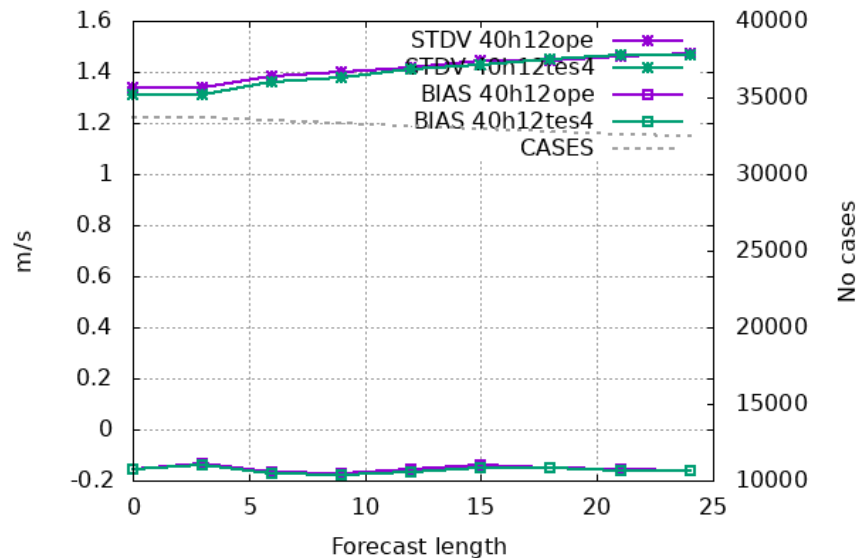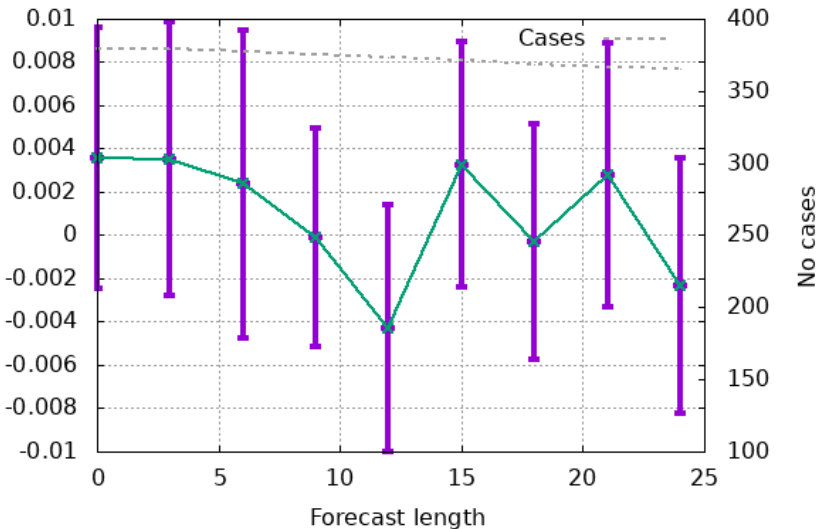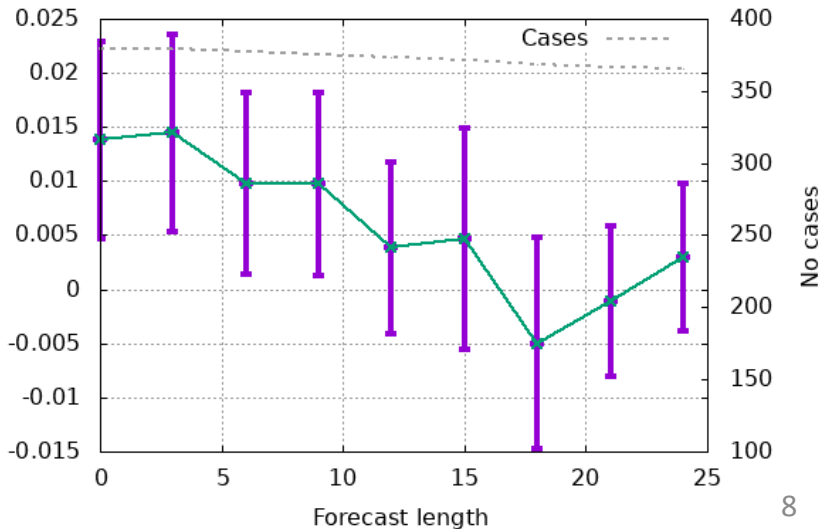U10m Period: 20180629-20180816
Hours: 00,03,...,21

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We conclude that the bias and standard deviation of the specific and relative humidity at 2m are significantly improved by assimilating radar-data, in particular over the Netherlands.

We will repeat the verification to check whether the improvement still holds, now that the run has progressed for another month. Step-by-step, radar-data from other countries will be added.

A similar test, conducted by Jan Barkmeijer, is presently running, with the same model and a somewhat extended set of radar-data, using a 4DVar data-assimilation technique.