

Validation test for HIRLAM 5.1.4: winter condition

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Abstract

The Beta release version 5.1.4 of HIRLAM reference system is evaluated in parallel with the latest "official" release 5.1.0 for a winter month, using an experiment setup similar to the standard DMR configuration. The test is performed on the ECMWF Fujitsu VPP5000 computer. Observation verification, using EWGLAM surface and sounding data, indicates exceptionally good scores (standard deviation and bias) by 5.1.4 in surface synoptic quantities (precipitation, surface wind, temperature and relative humidity), with exception of MSLP. The latter, together with several upper air verification parameters, show some degree of degradation in scores.

1 Experiment configuration

Parallel data assimilation experiments using reference system 5.1.0 and 5.1.4, respectively, are performed for a month-long winter period between Jan 15 and Feb 15, 2002. The experiments, performed on ECMWF supercomputer Fujitsu VPP5000 using 4 processors, are configured on the standard reference HIRLAM DMR (Delayed Mode Run) domain, at 0.5 degree resolution, on a 166*130*31 grid. 6-hr data assimilation interval and 48 hr forecasts following each analysis has been chosen, with lateral boundary update every 6 hour using archived ECMWF analyses. The advection scheme is semi-Lagrangian and time step 600s. QI analysis and Digital Filtering Initialization, as standard options in the current reference systems, are used in both runs.

The main motivation for the parallel runs is to provide basis for decision-making on adoption of the latest beta-release (5.1.4) into an official version. The main changes between versions 5.1.0 (official release) and 5.1.4 (beta test version), which are of major meteorological importances, include introduction of modified update to CBR turbulence scheme according to G. Lenderink at KNMI, the ISBA surface analysis and forecast schemes. The first version of shallow convection update (Sass, 2001) to STRAC cloud and precipitation scheme, which are contained in version 5.1.0, on the other hand, have been taken out in 5.1.4 following discovery of certain conflicts with the original Lenderink CBR update in version 5.0.6.

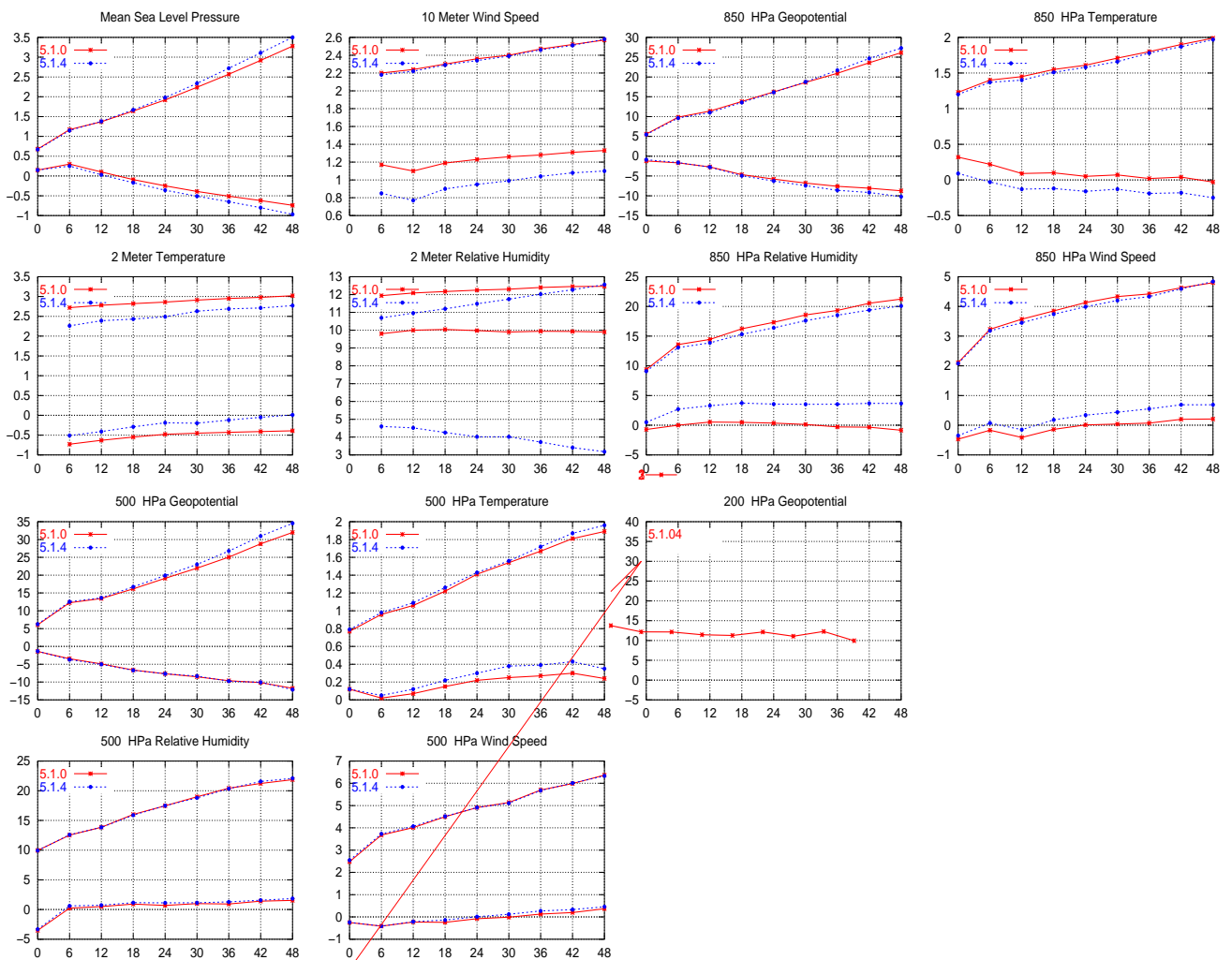
2 Results of parallel experiments

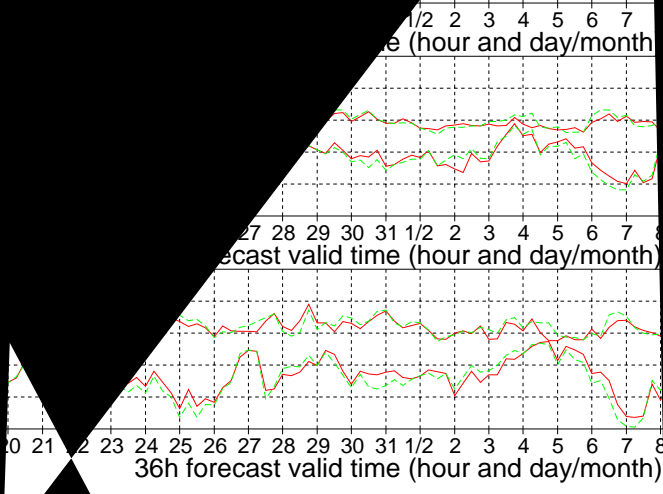
2.1 Observation verification scores

Figure 1 presents conventional verification of model outputs for key weather parameters against synoptic and upper air sounding data for EWGLAM stations located within the model domain, averaged over the parallel test periods which is one-month long.

The verification scores for surface quantities indicate a clear improvement in 5.1.4 for forecasts of screen level winds, temperature and relative humidity, characterized by significantly reduced positive wind bias, negative temperature bias. Also, following the introduction of ISBA scheme,

the prediction of 2-meter relative humidity starts to gain meaningful forecast skills and the wet bias has been reduced dramatically.





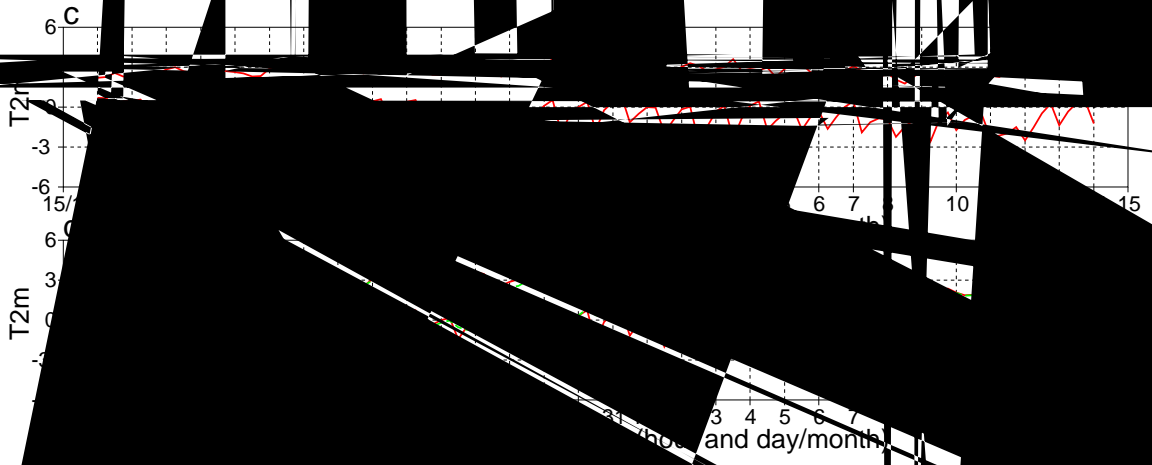


Table 1: Contingency table for 24 hr precipitation forecasts

Class	Obs:1	Obs:2	Obs:3	Obs:4
5.1.0:1	2953	78	38	8
5.1.4:1	4406	148	77	20
5.1.0:2	6218	2252	662	81
5.1.4:2	4798	2243	665	76
5.1.0:3	383	873	1810	114
5.1.4:3	349	807	1786	111
5.1.0:4	5	16	132	79
5.1.4:4	6	21	114	75

Table 2: Contingency table for 48 hr precipitation forecasts

Class	Obs:1	Obs:2	Obs:3	Obs:4
5.1.0:1	3124	110	66	19
5.1.4:1	4683	211	129	30
5.1.0:2	5841	2128	750	99
5.1.4:2	4301	2055	740	83
5.1.0:3	597	947	1687	122
5.1.4:3	577	923	1646	121
5.1.0:4	11	16	121	47
5.1.4:4	12	12	109	53

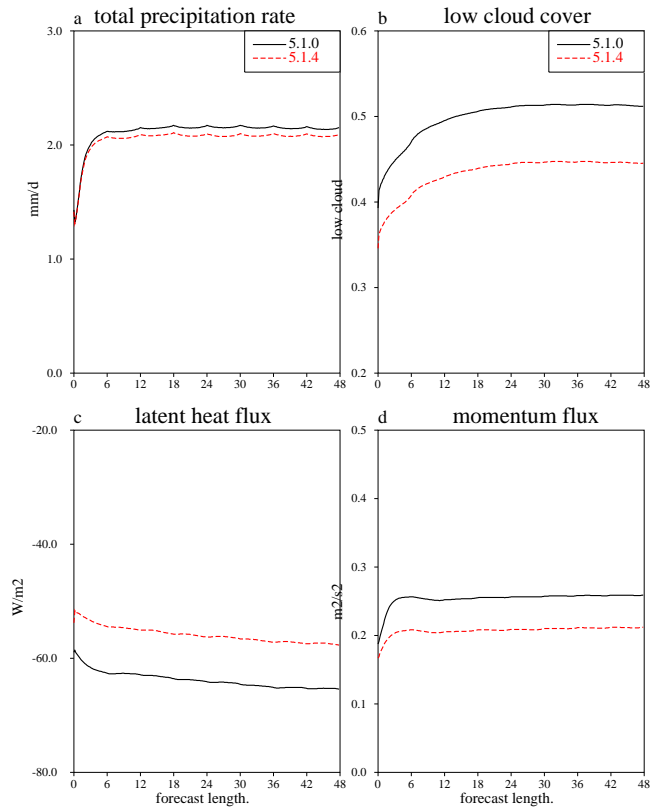


Figure 4. Domain averaged rain rate, low cloud cover, latent heat and momentum fluxes averaged for all cycles in parallel tests for 5.1.0 and 5.1.4.