HARMONIE DATA ASSIMILATION

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Structure

- Overview
- Background error statistics
- Single assimilation cycle
- Verification scores
- Conclusions

Overview
HARMONIE data assimilation system

- **Introduced into mini-sms**

- **Analysis is composed of:**

AnSFC-Canari surface assimilation

AnUA-ALADIN 3D-VAR analysis

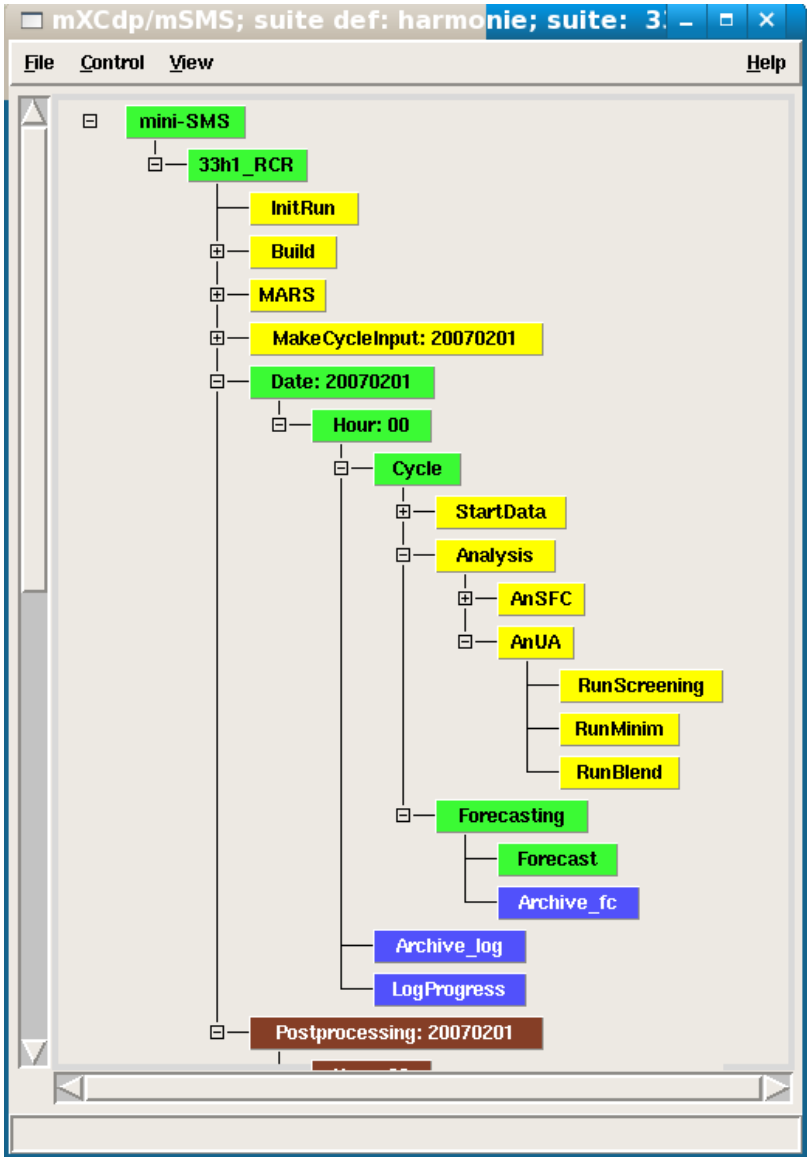
(including SCREENING, Minimization and a BLENDING step)

- **Pre- and Post-processing for DA:**

Extraction of observations

Calculation of observation fit statistics

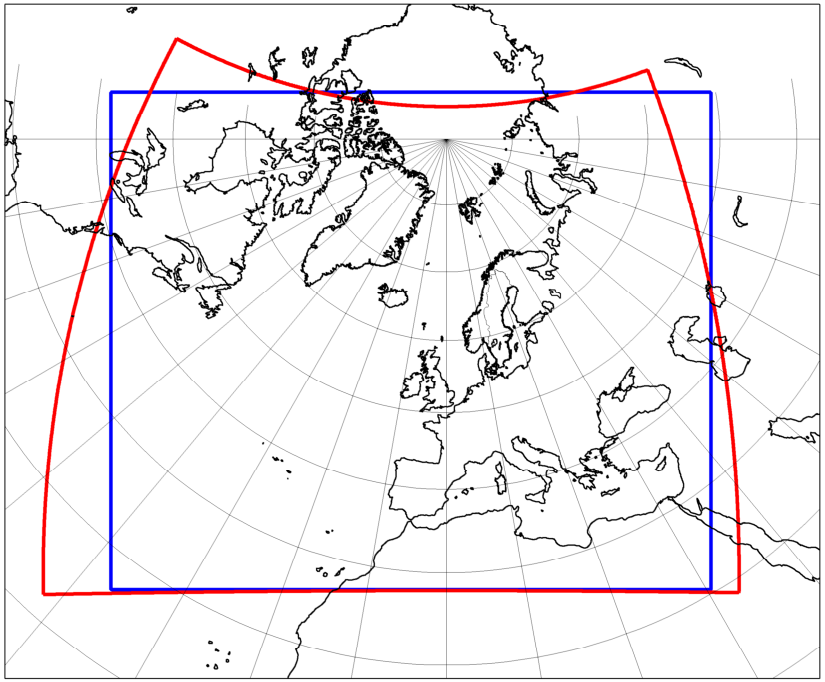
Geographical maps of observation usage



HARMONIE reference set-up

- 16 km horizontal resolution
- 60 vertical levels
- Polar stereographic projection
- 648 x 540 grid-points

HARMONIE HIRLAM RCR



Background error statistics

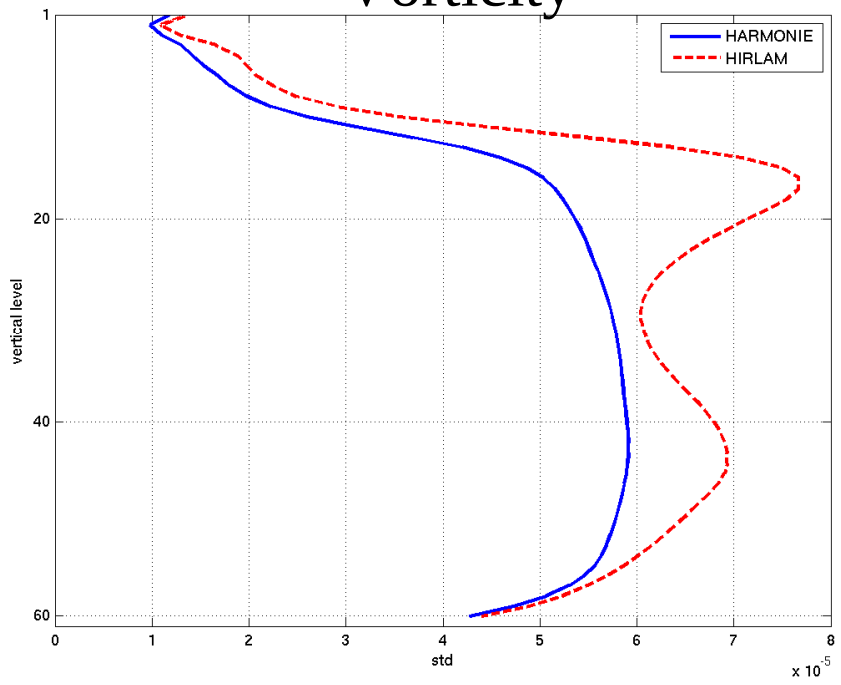
- Ensemble based background error statistics.
- Differences of a sample (124 cases) of 6 h ALADIN forecasts.
- Analyses and boundaries from ECMWF ensemble data assimilation experiment with perturbed observations and model physics.
- A statistical balance formulation with a constant Coriolis parameter was applied.

Background error standard deviations

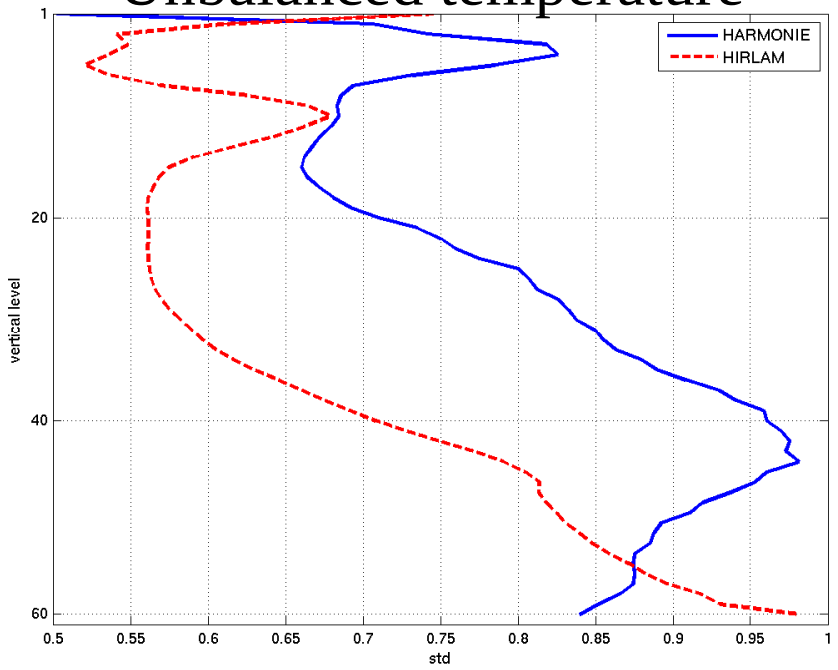
HARMONIE (REDNMC=1.9)

HIRLAM (REDNMC=0.9)

Vorticity

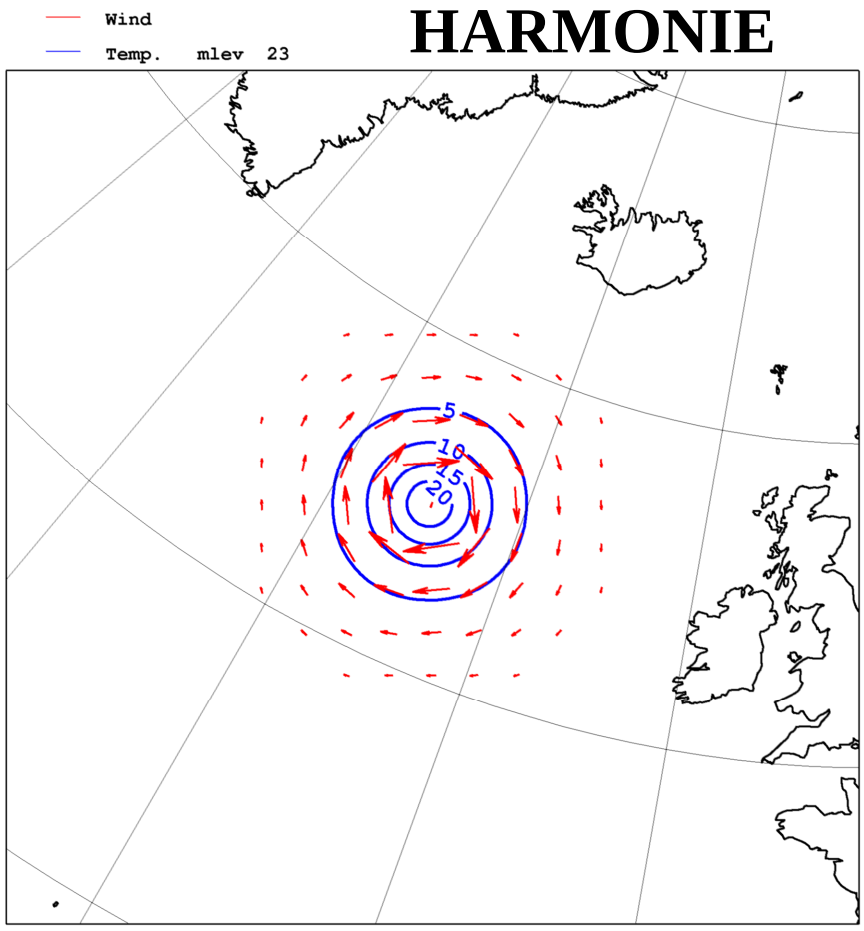


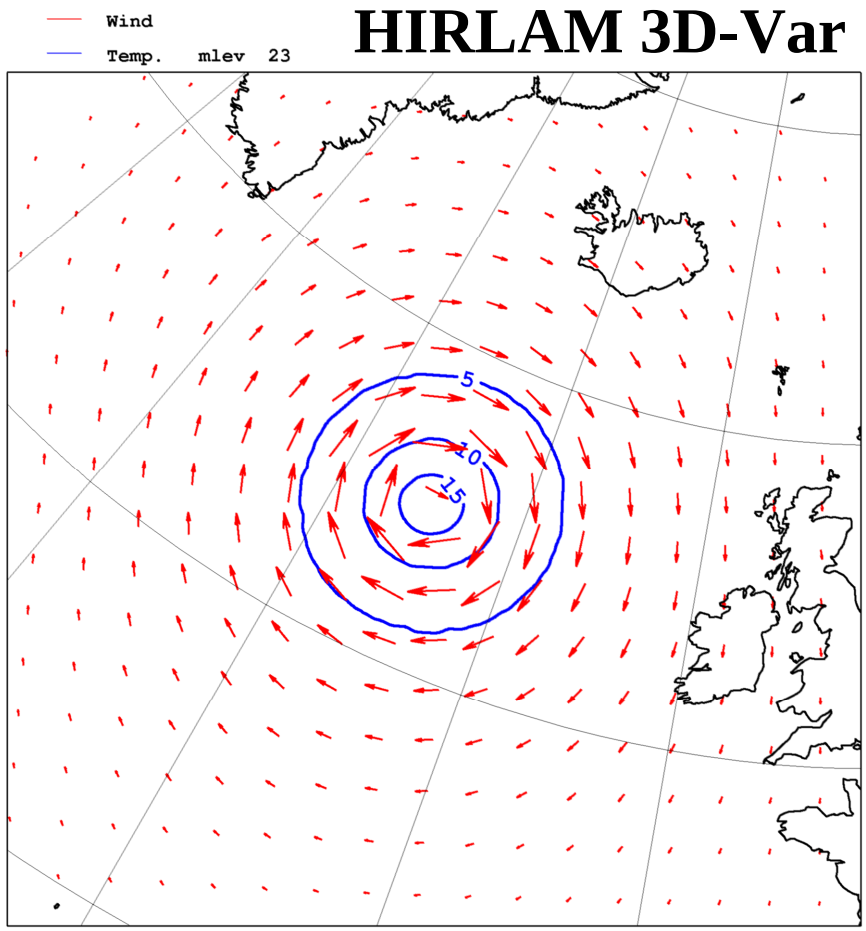
Unbalanced temperature



Single-observation impact experiment

Horizontal impact due to one single temperature observation at 500 hPa and 3 K warmer than the corresponding background value.

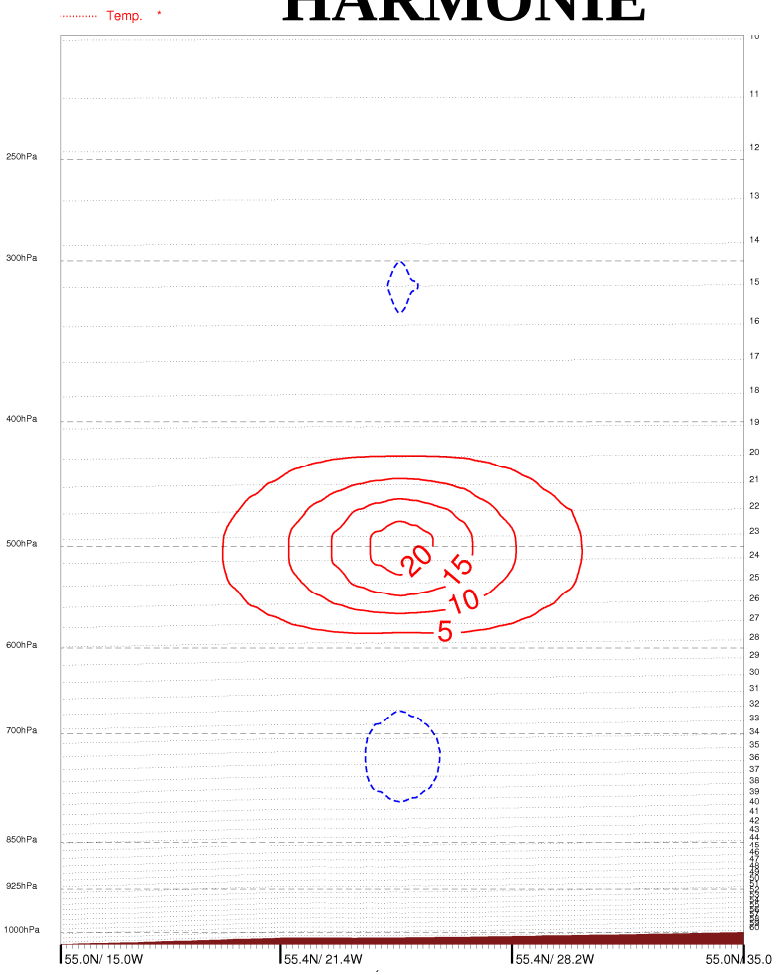




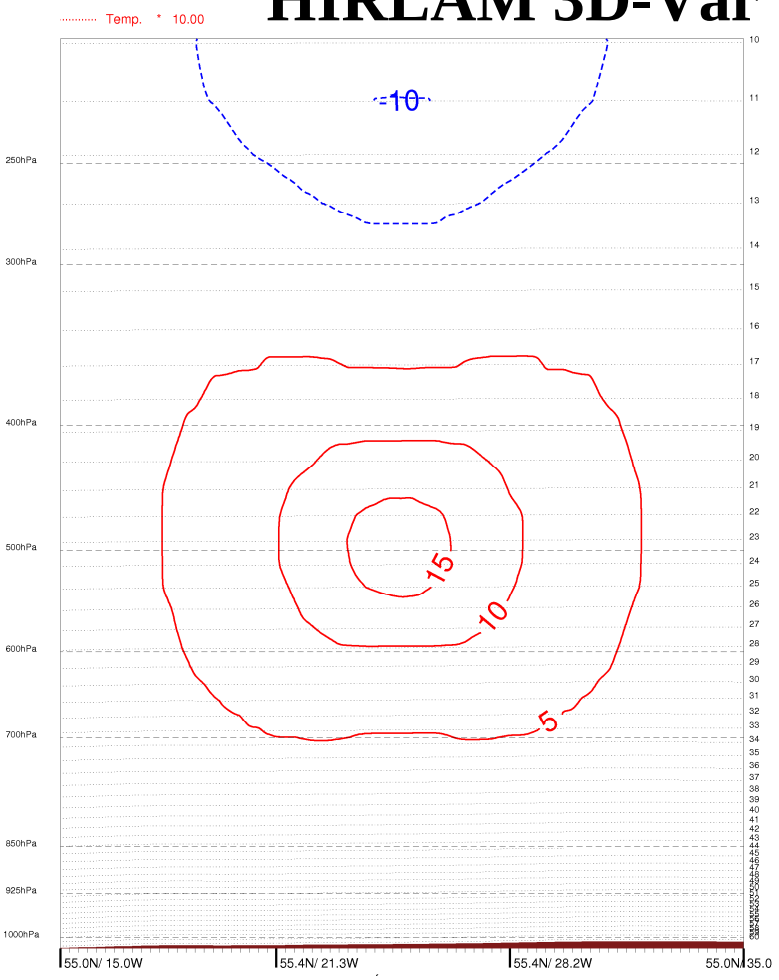
Single-observation impact experiment

Vertical impact due to one single temperature observation at 500 hPa and 3 K warmer than the corresponding background value.

HARMONIE



HIRLAM 3D-Var



Single assimilation cycle

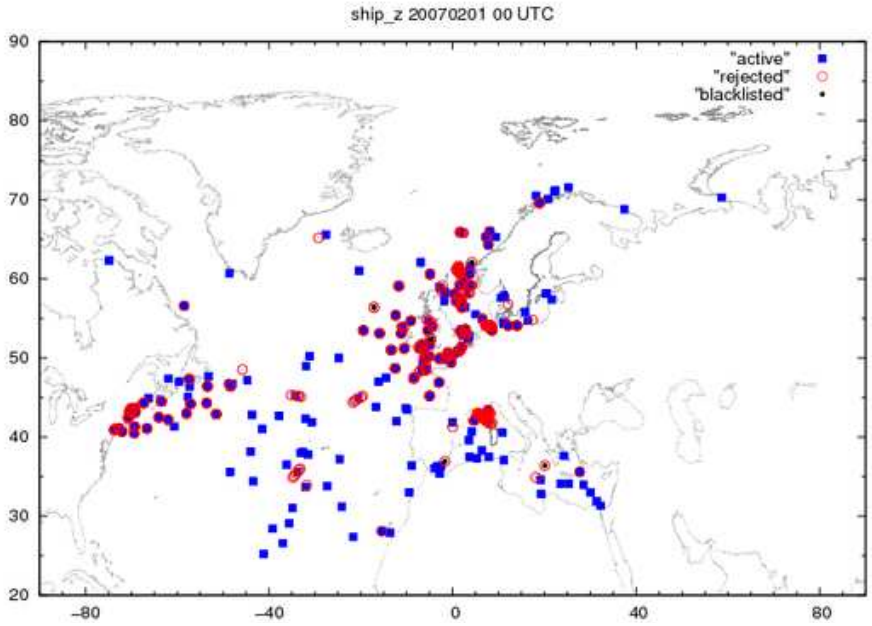
(2007-02-01 00 UTC)

OBSERVATION TYPE	HARMONIE (number)	HIRLAM 3D-Var (number)
SYNOP z	2132	2155
SHIP z	219	298
DRIBU z	78	195
TEMP T	7048	7258
TEMP u/v	6866	7239
TEMP q	3521	6433
PILOT u/v	490	420
AIREP T	9298	7782
AIREP u/v	9268	7715

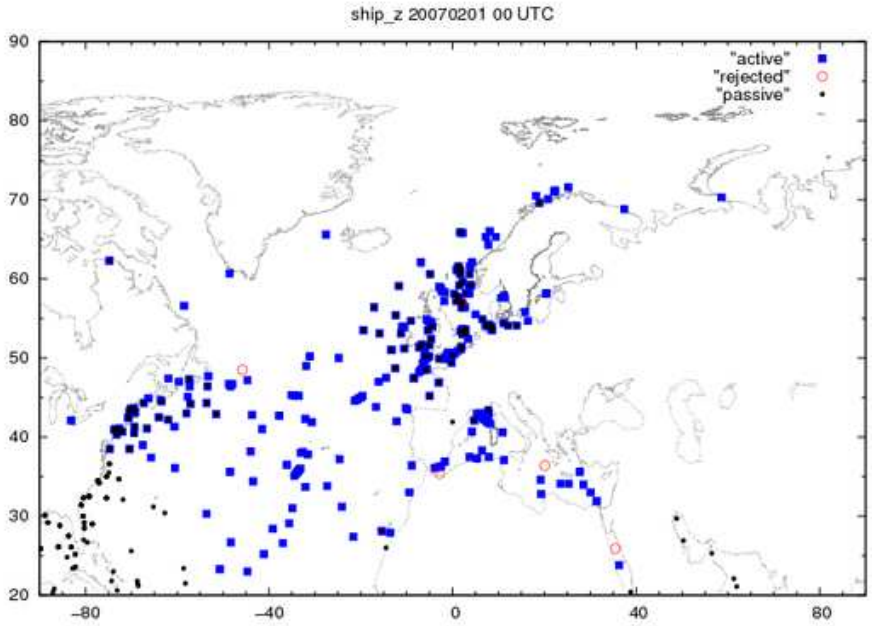
Single assimilation cycle (2007-02-01 00UTC)

SHIP Z observation usage and rejections

HARMONIE



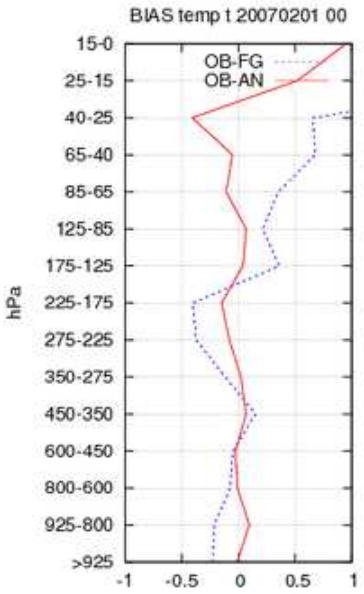
HIRLAM 3D-Var

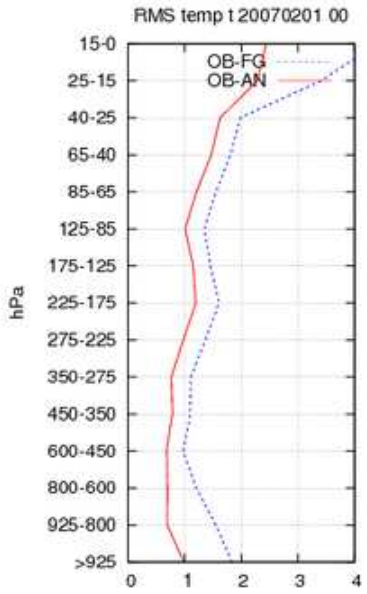


Single assimilation cycle (2007-02-01 00UTC)

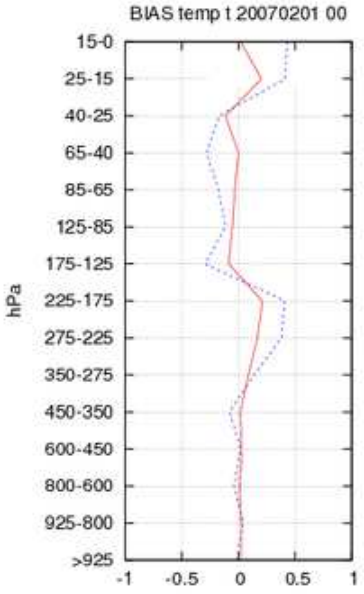
Radiosonde temperature observation fit statistics

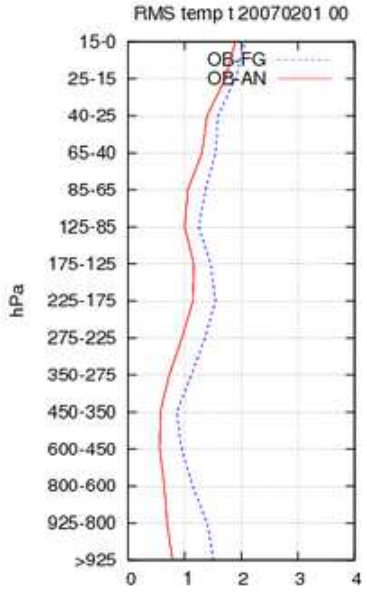
HARMONIE





HIRLAM 3D-Var



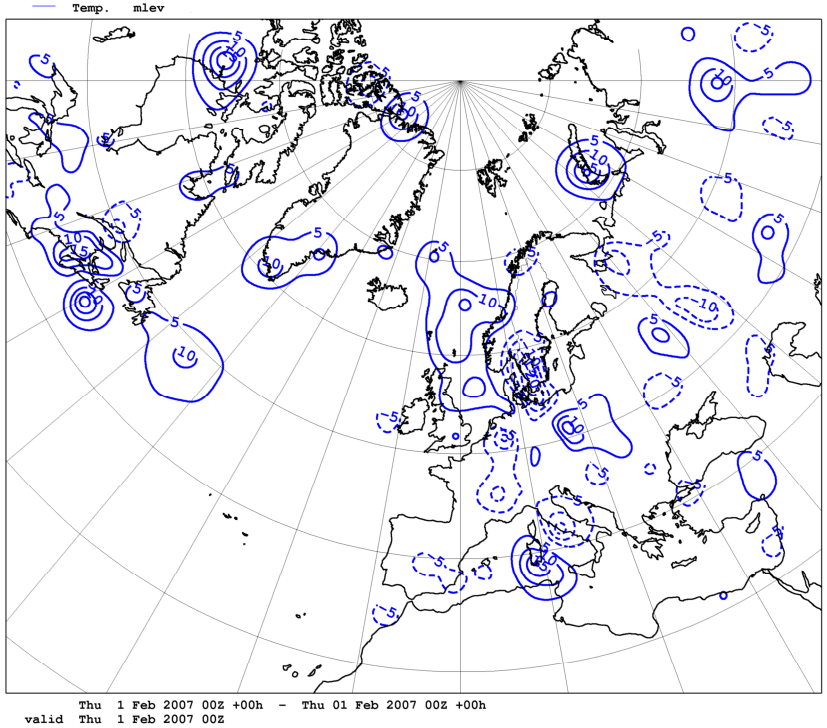


Single assimilation cycle

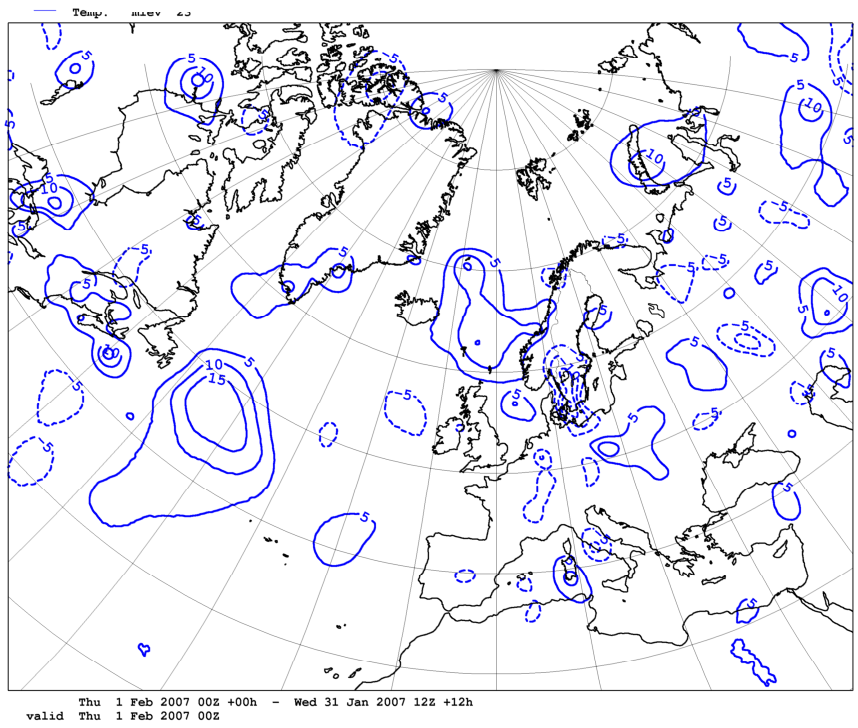
(2007-02-01 00 UTC)

500 hPa temperature analysis increments

HARMONIE



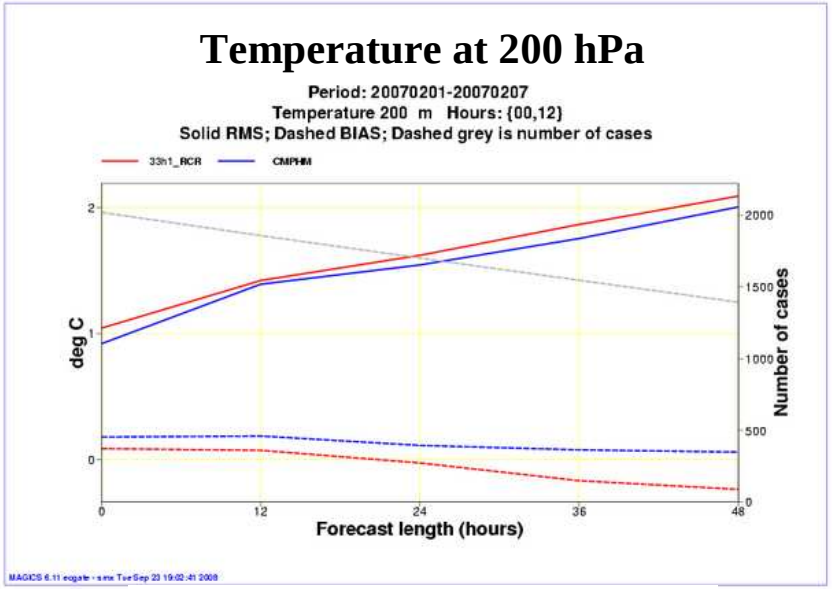
HIRLAM 3D-Var

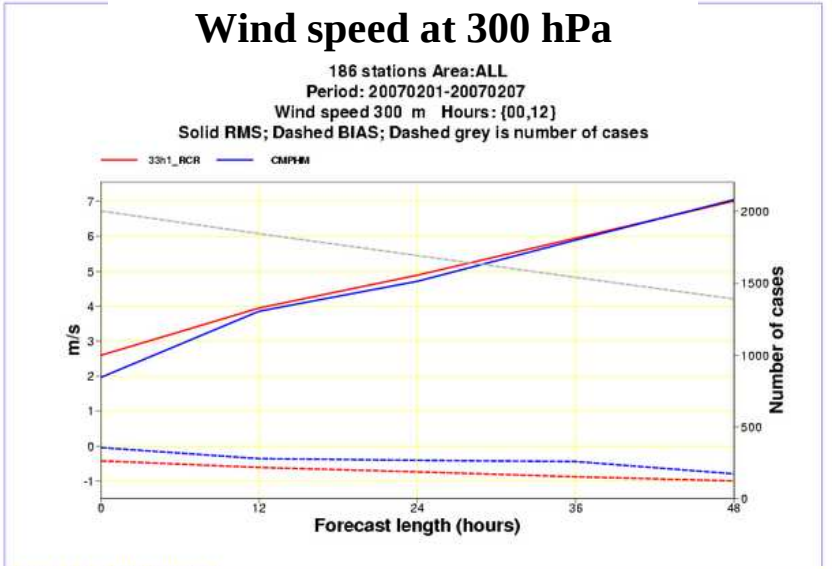


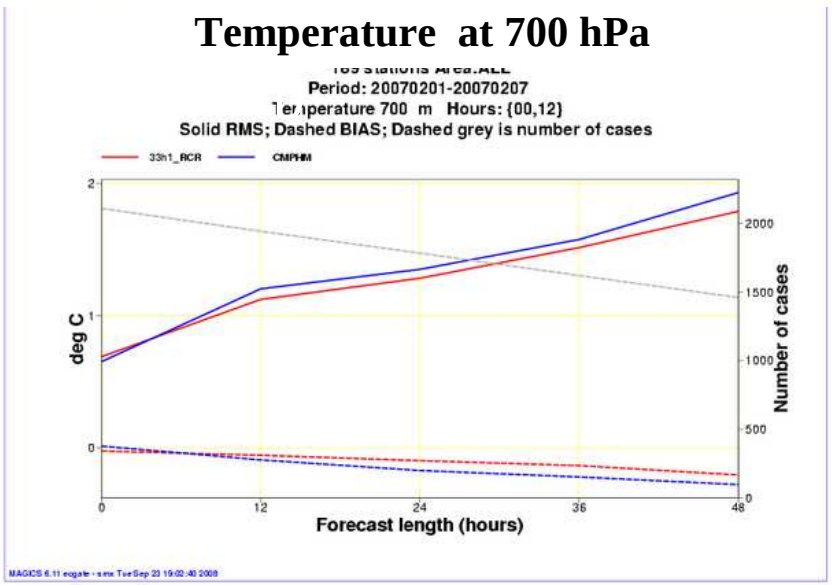
One week parallel assimilation and forecast experiment

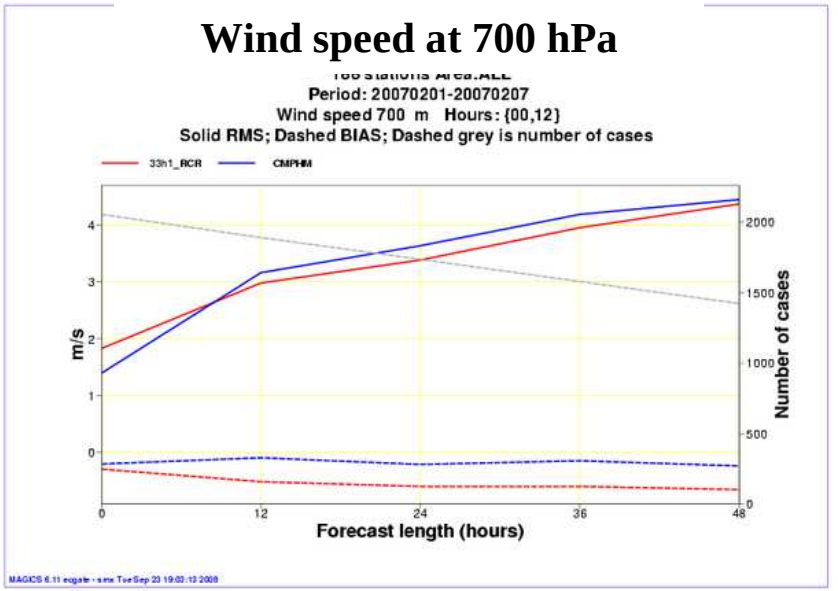
(20070201 to 20070207)

Scores for verification of HARMONIE and HIRLAM forecasts against observations









One week parallel assimilation and forecast experiment

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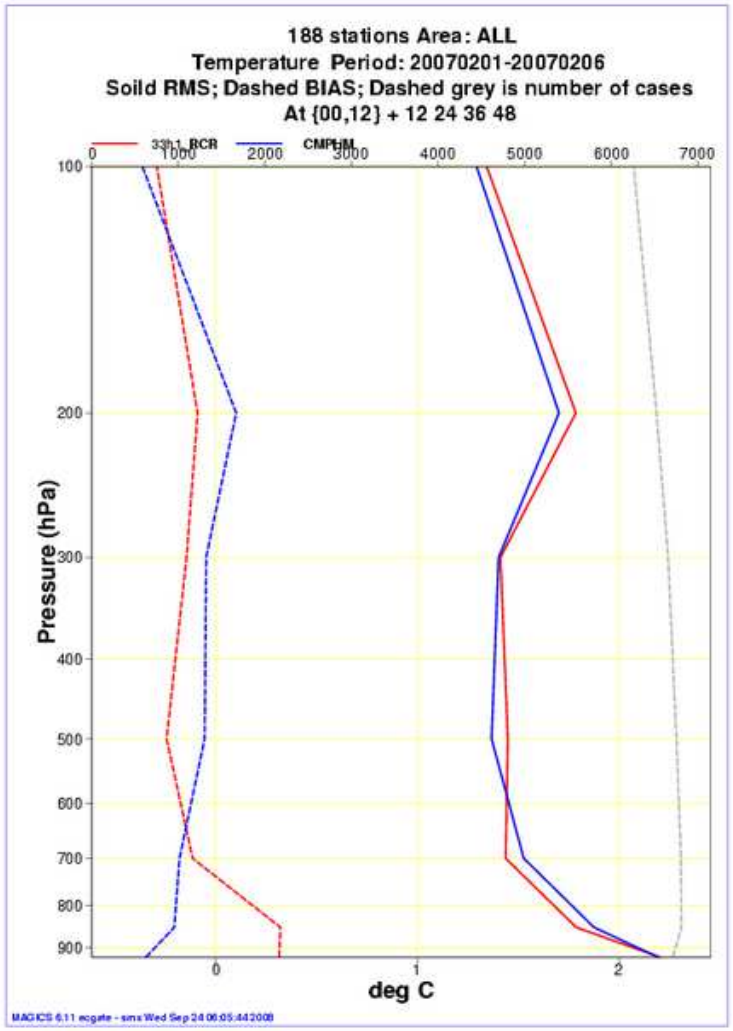
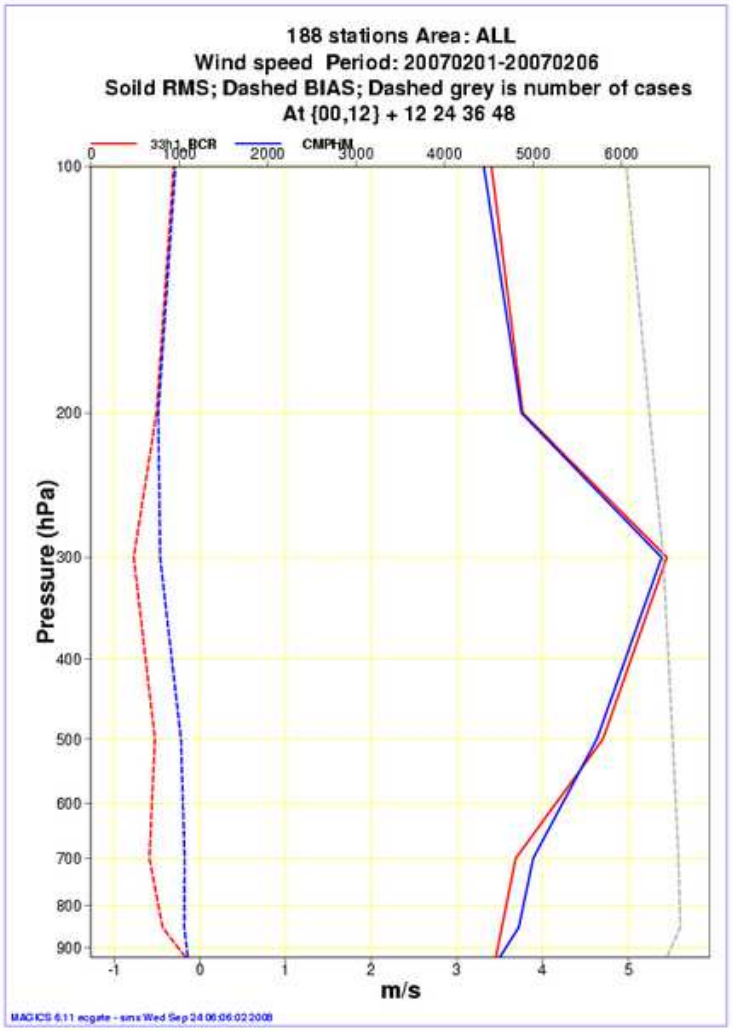
Scores for verification of HARMONIE and HIRLAM forecasts against observations

Temperature score vertical profile



Wind speed score vertical profile



Conclusions

- HARMONIE data assimilation system, including observation pre-processing, quality control, assimilation and monitoring, has been introduced to mini-sms system.
- The HARMONIE upper-air analysis has been set-up over a reference area and is being compared with HIRLAM 3D-Var.
- Results of recent studies indicate a properly working HARMONIE upper-air analysis.
- Future work include introduction of improved ECMWF to HARMONIE surface variable conversion, an improved SST analysis, as well as extended parallel runs.