



Main Operational HIRLAM runs

4 analyses and forecasts per day. 00, 06, 12, 18

HIRLAM C 11km – 4D-VAR 2 loop LSMIX +60 h 2 hours data cut-off HIRLAM E 11 km – 3D-VAR no LSMIX+72 hours 1 hour 15 min data cut-off ECMWF rotated HIRLAM grid boundaries for both ECMWF GTS -> BUFR obs preprocessing SYNOP, SHIP, TEMP, PILOT, **BUOY, AIREP, AMDAR BUFR AMDAR ATOVS AMSU-A radiances – EARS**

Other operational and semioperational HIRLAM

4 analyses and forecasts per day HIRLAM G 05 km 3D-VAR + 24 hours Used for certain products HIRLAM E 05 km + 48 hours Experimental and HIRLAM 7.3

- Surface data assimilation with CANARI-OI_main

Shared HPC resource

At start of operational production in spring 2014: Vilje at NTNU in Trondheim (place 68 in TOP500 in June 2013)

Next HPC resource will be procured by SMHI for production from 2015.

Current milestone

Pre-operational model setup

Next milestones:

- Operational organization
- Common operations

Towards a joint Swedish-Norwegian NWP production MetCoOp – Meteorological co-operation on Operational NWP

Model setup: HARMONIE Arome

- AROME currently cycle 38h1.b2
- 2.5 km, 750x960 grid points, 65 levels
- 3D-VAR 3h-RUC, forecast length +60 hours
- 4 analyses and 4 forecasts per day
- Conventional observations
- ATOVS (passive currently)
- Radar (in test)





/MetCoOp domain







HARMONIE-RCR for cy38h1 MET and SMHI will jointly run the "regular cycle with the reference" for the HIRLAM-consortium.

MetCoOp Technical Memorandum Series: http://metcoop.org/memo

Based on HIRLAM version 7.1.2	Based on HIRLAM 7.3 or 7.4 soon	4DVAR operational since 2008013006	Version/res	status	gridpoints	levels	timestep	Assimilation	Boundaries
Large Scale Mixing (LSMIX)	Meso-scale sub scale orography	3 (or 2) dx linear grid (66 / 33 km grid)	C11	Oper	606x606	60	300 s	4D-Var	ECMWF
4DVAR on C11-domain. 2 outer loops.	New snow and soil scheme	SL, SETTLS	E11	Oper	256x288	60	150 s	3D-Var	ECMWF
3D-VAR FGAT on E05-domain	RTTOV-8 and more satellites 4D-VAR optimisations	vert. diff. + large scale cond. Linearised simplified physics	G05	Limit oper	294x441	60	150 s	3D-Var	HIRLAM
ISBA (surface scheme)	65 levels in 7.4 !	weak digital constraint	E05	pre-oper	506x574	65	150 s	3D-Var	HIRLAM
Kain-Fritsch from CAM3 (convection) Rasch-Kristjansson (large scale)		statistical balance background constraints	ARO 02	Pre-oper	750x960	65	60 s	3D-Var 3h- RUC	ECMWF
		2 outer loops							



Harmonie



Bias and standard deviation verification scores for mean sea level pressure forecasts over a Scandinavian domain averaged over the period 19 January - 29 February 2008.

- Augmentation of control variable with localized weights assigned to ensemble member perturbations.
- Preliminary tests also with 4D-Ens-Var
- Performance ranking from worst to best:
- 3D-Var < 3D-Var hybrid < 4D-Var ≈ 4D-Var hybrid < 4D-Ens-Var
- Contact: Nils Gustafsson (SMHI)

Data used: T700, July-August 2010, 12+1 GLAMEPS members with HIRLAM/Kain-Fritsch. DA on control member with hybrid ensemble 3D-Var.

Archiving on MARS at SMHI Tape Storage - MARS at SMHI for storage of: MARS - Operational NWP output MARS operational research - Air quality model output Firewall Firewall Regional reanalysis (EURO4M) Research experiments with **Firewall SMHI Firewall SMHI** Byvind proxy server Server stationed at computing centre Firewall **Firewall** NSC. Proxy server for direct access Vagn Krypton

Contact: Åke Johansson (SMHI)

A Large Scale Host Model Constraint in a Limited Area 4D-Var



Fig. 11. Verification of forecasts compared with observations of mean sea level pressure (MSLP). Upper lines are the Root Mean Square (RMS) error and the lower lines show the mean error, or bias. Full line: reference experiment (i.e. the host model constraint is not activated). Dotted line: same as reference except that J_k is now actively used. The amount of observations used in the statistics is also shown using the right hand y-axis.

Problem: Include host model uncertainty in LAM data assimilation.

Method: Additional term J_k in cost function with the large-scale background error covariance B_{ls} . B_{ls} contains the error covariances of \mathbf{x}_{ls} in the regional model geometry. **Results:** Clear positive impact on surface pressure and temperature profiles.

Contact: Per Dahlgren



