HIRLAM
Flashbacks of the past year

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EWGLAM meeting, 30/9/2013

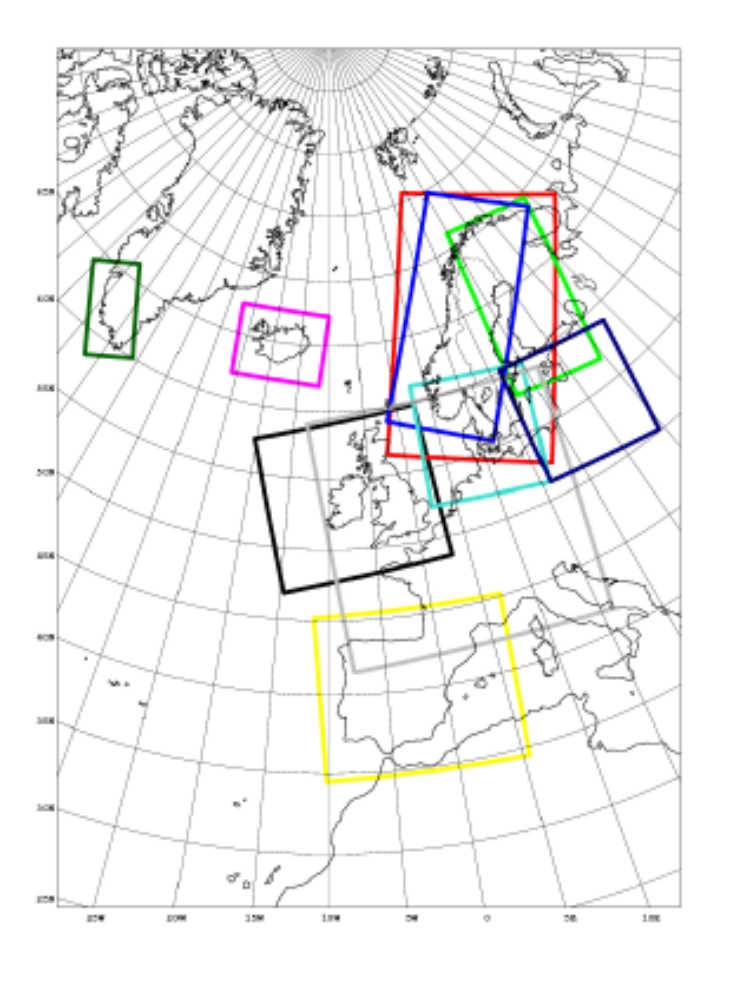
Organizational aspects

- ✓ Members: unchanged since last year (Dk, Es, Fi, Fr (coop), Ic, Ir, Li, Nl, No, Sp, Sw)
- ✓ No changes in project leaders:

  Ulf Andrae, Jelena Bojarova,

  Inger-Lise Frogner, Mariano Hortal, Laura Rontu, Xiaohua Yang

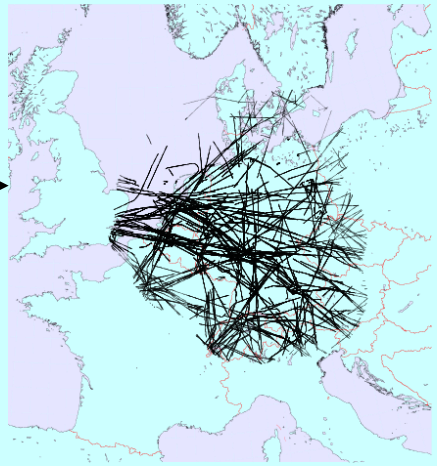
with ALADIN: considering further steps in cooperation (system, organizational, data policy)



Upper air data assimilation

Challenge: How to make the best use of high-res observations in a mesoscale analysis system?

- ✓ Introduce new high-resolution obs types or better handle existing ones (BC, QC, thinning,…):
  - Radar: introducing multi-country data locally
  - GNSS data: bias correction and quality control
  - Mode-S: NRT provision of EuroControl data (mode-s.knmi.nl)
  - cloud-affected radiances: IASI, SEVIRI
  - cloud initialization with MSG data: under testing



- ✓ Development of more flow-dependent algorithms: 4DEnsVAR framework

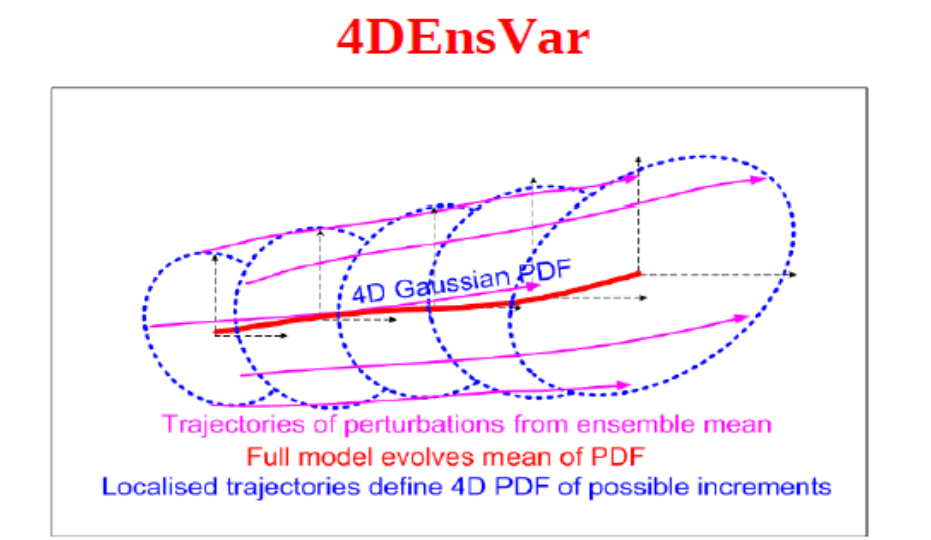
- ✓ Rapid update cycling setups
  - 1h, 3h cycling experiments: faster has added value

New flow-dependent assimilation techniques

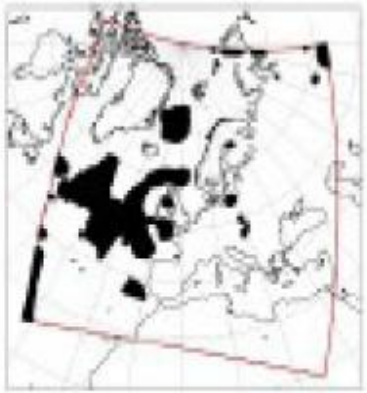
Required to more effectively draw information from observations

Combining traditional 3/4D variational assimilation with ensemble techniques: 4DEnsVar (set up and tested in Hirlam, to be developed for Harmonie in OOPs)

Developing field alignment/image warping techniques to correct for displacement errors

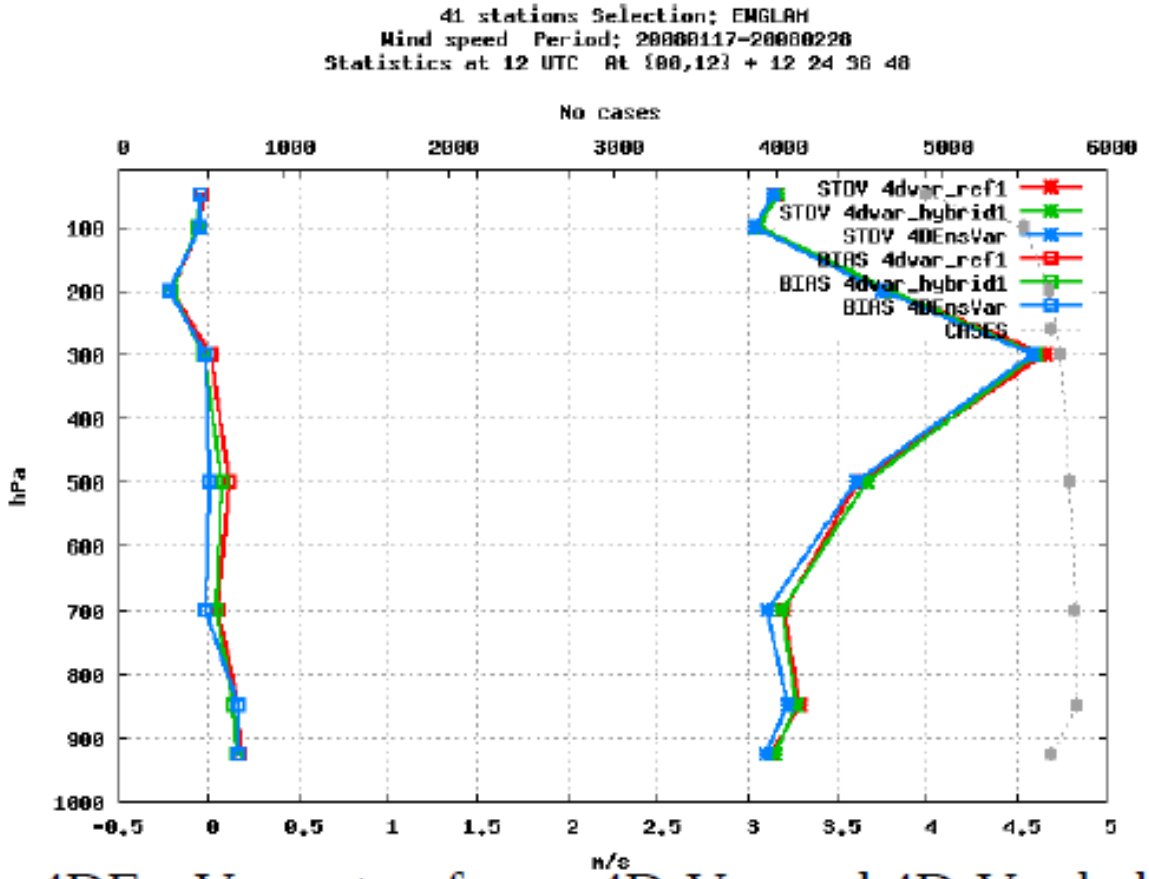



Displacement field


Pseudo observations

Verification of wind speed profiles against EWGLAM radiosonde stations; average over +12h, +24h, +36h and +48h

------ 4D-Var, ----- 4D-Var Hybrid, -----4DEnsVar



Comment: 4DEnsVar outperforms 4D-Var and 4D-Var hybrid in the troposphere

Forecast model

Upper air:

- ✓ Dynamics: ALADIN NH VFE formulation stable
- ✓ Studies to assess/improve:
  - stable BL behaviour
  - fog over sea
  - behaviour of ice and mixed-phase clouds
- ✓ Radiation intercomparison study

Surface:

- ✓ Snow and lake data assimilation
- ✓ Validation/implementation Multiple Energy Budget scheme, prognostic sea ice

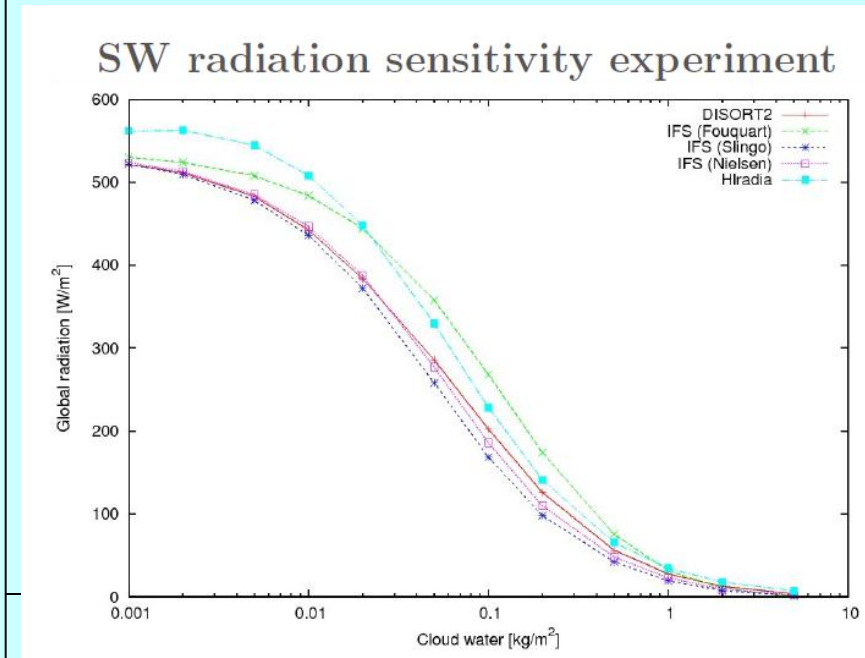
Radiation intercomparison

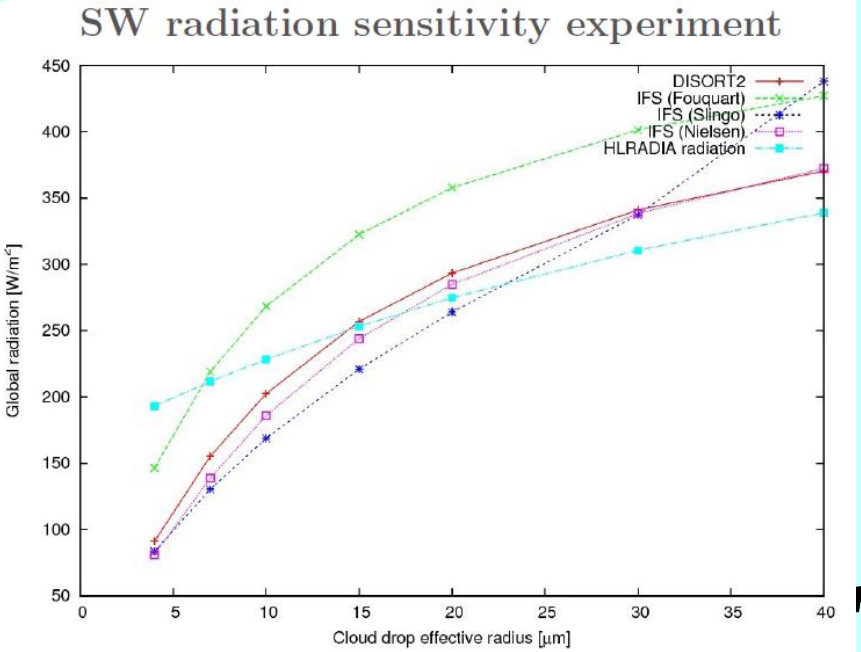
Parametrization of cloud particle r_e => parametrization of optical properties (extinction coefficient, single scattering albedo, asymmetry factor g) => radiative transfer model => SW, LW fluxes

Indication for RCM community: esp. mixed clouds too transparent

Cloud optical properties parametrization tested against Mie-Debye calculations, radiative transfer models tested against DISORT 30-stream model =>

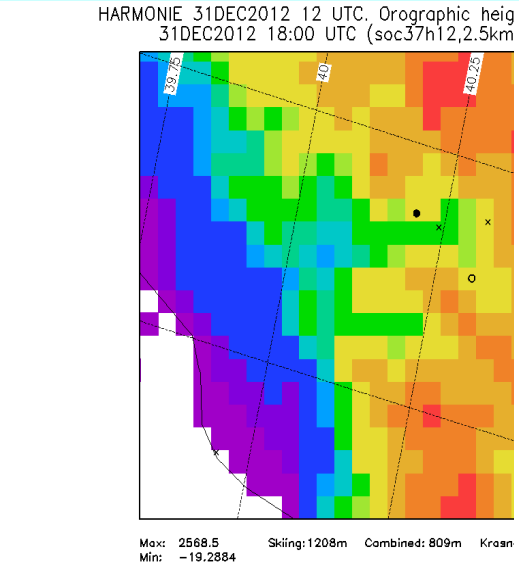
- Proposed alternative optical properties parametrization by Nielsen

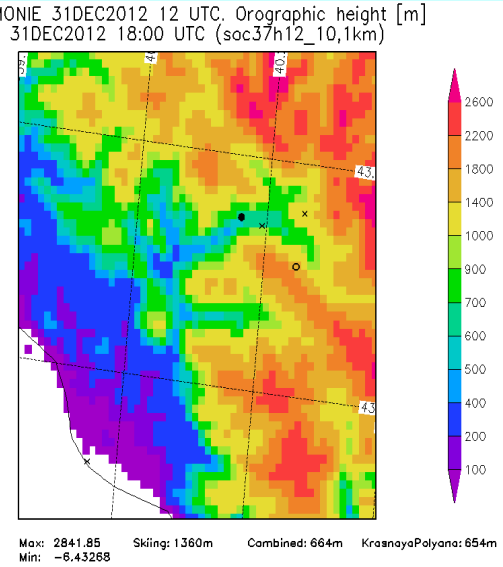


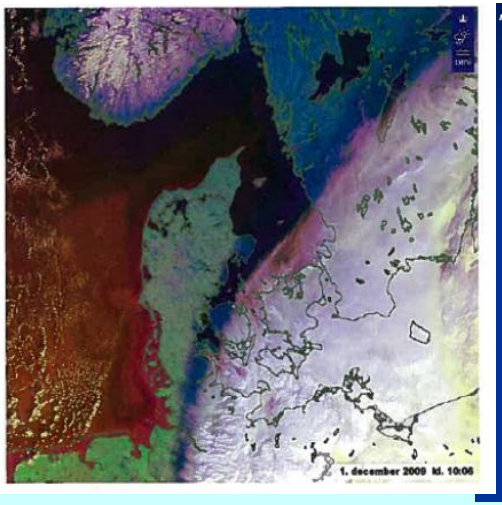


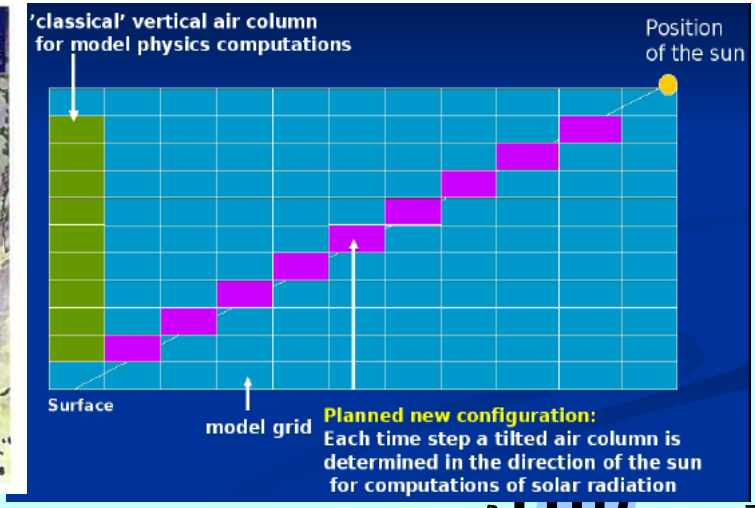
Towards higher model resolutions

- MeteoFrance: 1.3km resolution next year
- Hirlam: experiments at 0.5-1km resolution
- Assessing higher-resolution orography and physiographic data
- Need for different physics param's (shallow convection, 3D radiation, …?) ??
- SRNWP good forum to discuss relevant experimentation?









Probabilistic forecasting: Studies to establish GLAMEPS-v2

Experiments:

- Include perturbations based on Hirlam CAPE SVs
  small improvement
- Include perturbations based on Hirlam ETKF
  ongoing
- Decrease/eliminate number of EC EPS members, increase the number of ALADIN members
  ongoing, roughly compensate each other
- Use lagged setup to increase nr of runs per day to 4
  started
- Increase horizontal resolution to ~8km to start soon

Probabilistic forecasting: HarmonEPS

- ✓ Setup: Harmonie Cy37 at 2.5km, 20+2 members with AROME/ALARO physics, surface ass. Run for 06, 18h UTC, up to +36h. Control run: full 6h cycling

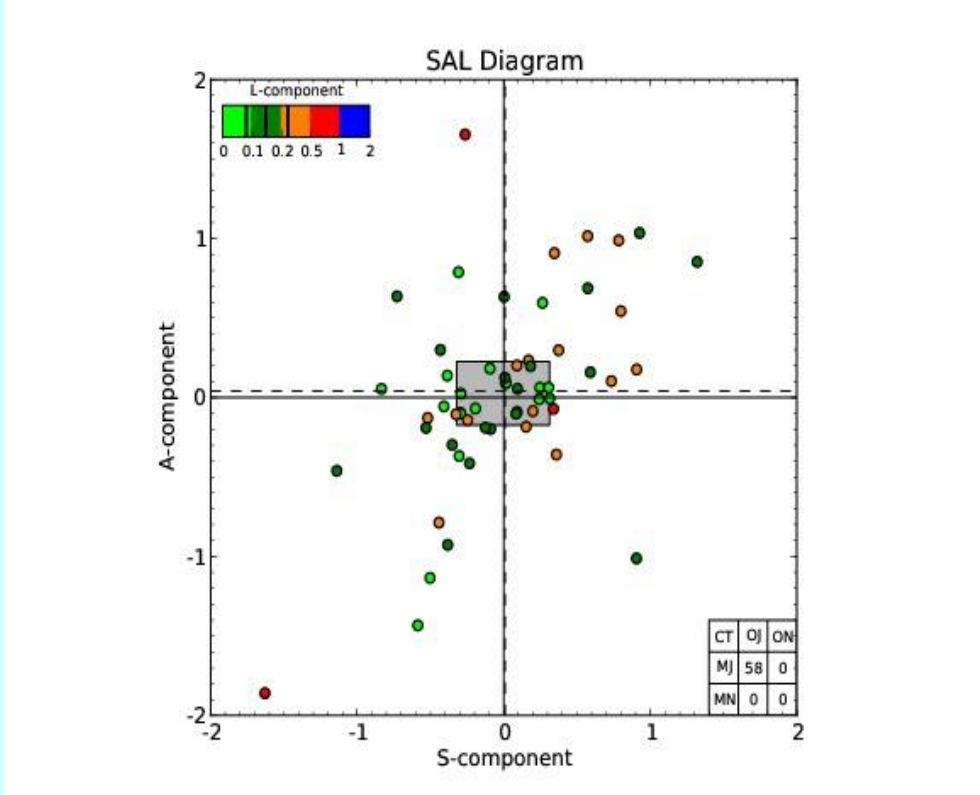
- ✓ First tests: downscaling with different nesting strategies:
  Single nesting within EC EPS 16km, EC EPS 32km
  Double nesting within EC EPS 32km, GLAMEPS

- ✓ Extensions:
  - upper air assimilation for all members
  - forecast model perturbations: SPPT and cellular automata, parameter perturbations
  - surface (analysis) perturbations
  - initial perturbations from ensemble assimilation

- ✓ Sensitivity experiments to be done (resolution ensemble vs deterministic, domain, ens size, different phys/ass approaches)

Quality assessment and monitoring

- Harmonie domains not overlapping, different weather regimes => Jointly assess model quality over all domains
- Automated monitoring system on hirlam.org (incl Hirlam, Harmonie, Glameps, data usage): routine verification against in-situ observations
- New joint Hi-Al tools for spatial and probabilistic verification: HARP(still being extended)



System aspects

- ✓ Reference Harmonie system: run operationally at one or more Hirlam services, rotating responsibility per cycle
- ✓ Code performance: greater transparency and speed. OOPS and COPE redesign, cleanup of other parts of code tbd.
- ✓ Steps towards convergence with Aladin on system tools and way of working
- ✓ Chemistry community experimenting with offline coupling to Harmonie. Ambitions to develop in-line coupled system on basis of Enviro-Hirlam experience