



# Highlights of recent HIRLAM activities

Jeanette Onvlee  
ASM/Workshop 2009  
20090512

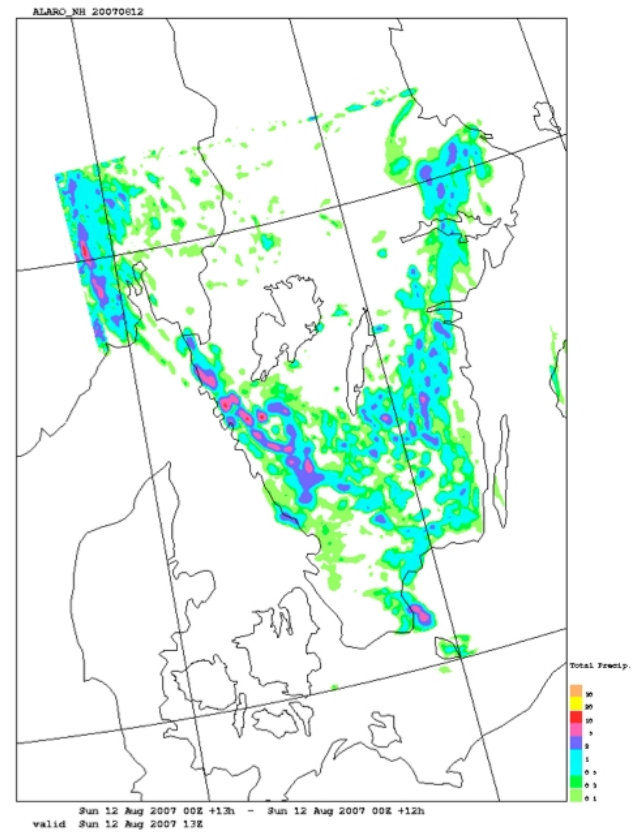
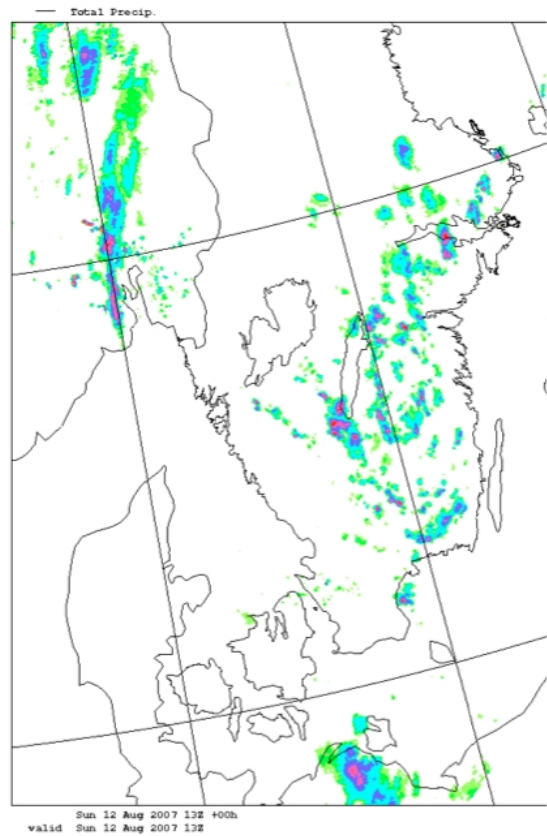
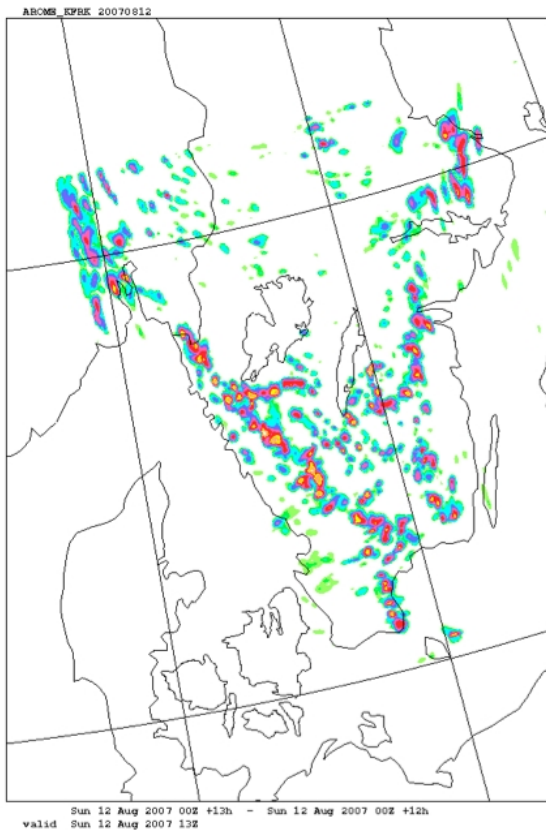
# HARMONIE forecast model

- Dynamics:
  - Progress due to new staff
  - NH-VFE scheme under testing in simplified model
  - Variable map factor, physics/ dynamics at different resolutions/time steps: ready for testing
- Upper air physics:
  - Convection, microphysics and outflow behaviour case studies and tests
  - Comparison with HIRLAM at 5-15km hor res
- Surface:
  - Work on inclusion of snow/forest scheme in SURFEX started
  - Study of characteristics of underlying physiographic data

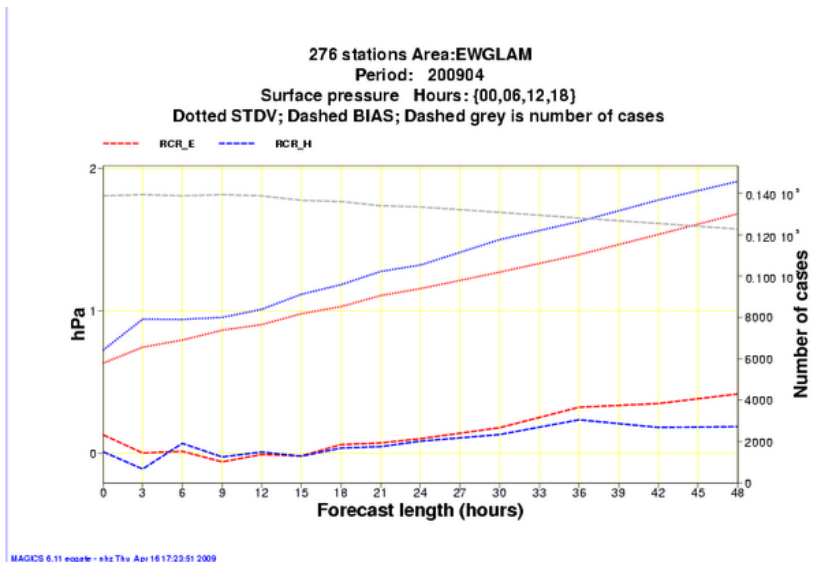
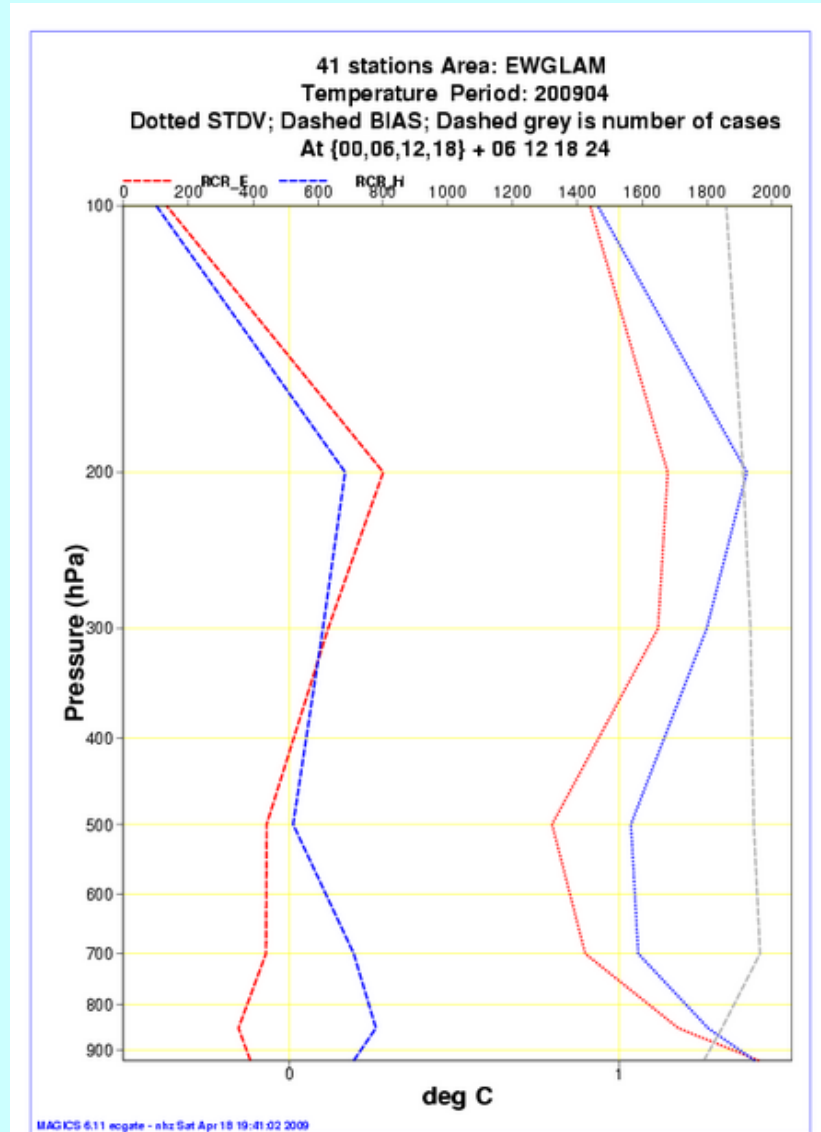
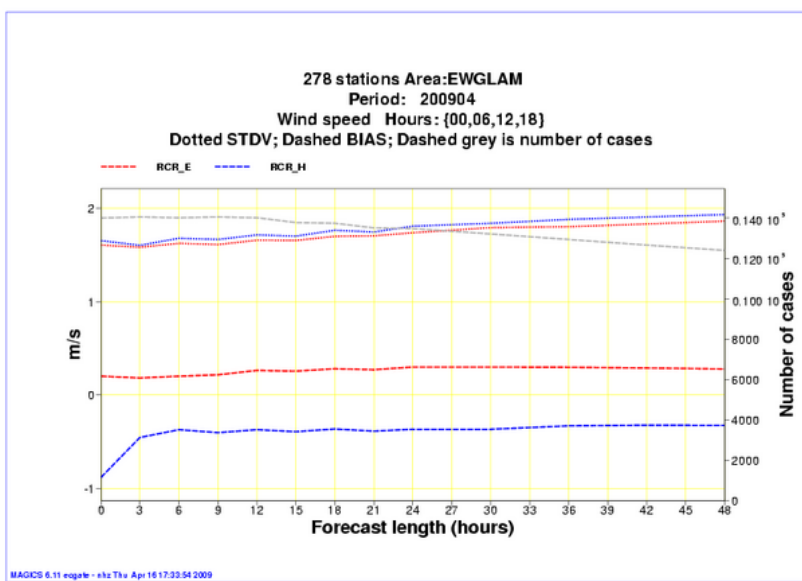
# Convection behaviour and general validation studies

- Physics/dynamics tests of convection behaviour
  - 3-D case studies with AROME and ALARO physics at different resolutions, different dynamics settings
  - 1-D versions of HARMONIE, AROME, ALARO in parametrization testbed: under development
  - Outflow problems remain
- Testing HARMONIE in the 5-15km hor res range
  - RCR Atlantic area, SMHI 5km
  - Technical and meteorological optimization still needed

# Case studies on convection behaviour: an example



# ALADIN (Cy35h1, blue) and HIRLAM (7.3 trunk, red) at RCR domain/resolution



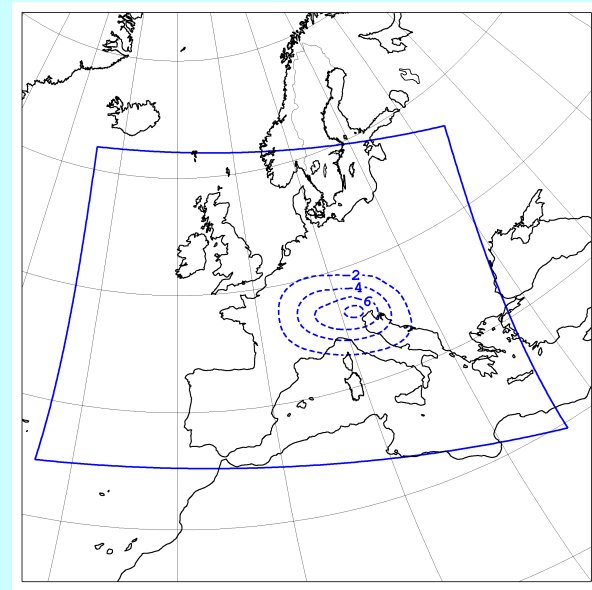
# HARMONIE data assimilation

- Several local implementations of 3D-VAR with conventional data
- Observation data handling for “standard” RS data streams
- 4D-VAR initial setup
- New types of remote sensing observations
  - IASI, binary cloud information, object assimilation
- Observation impact assessment
  - Convective CIS: preparations made, baseline experiments to start soon
  - Met.no 4km HARMONIE model to be included in regional OSE for EUCOS

# 4D-Var

- Working week in Toulouse in December 2008. 4D-Var developments by Bernard Chapnick and Filip Vana within OLIVE system introduced to HIRLAM team.
- Strategic planning document for future developments composed.
- ALADIN 4D-VAR system with French data ported to ECMWF and run in first very simple script system.
- Working week in Oslo in June, 2009. Port ALADIN 4D-Var in present form to HARMONIE system.
- Then further developments.

**Temperature analysis increments  
at 500 hPa  
from ALADIN 4D-Var single  
observation experiment.**



# Surface and nesting

- Surface:
  - Work on inclusion of snow/forest scheme concepts in SURFEX started
  - ECOCLIMAP 1.0 database: differences in quality, land use types over Europe
  - Lake database: to be extended
  - Good progress in surface data assimilation: EKF soil moisture, OI SST, revival CANARI snow analysis
- Nesting different surface models:
  - Interoperability programme: identified as most tricky problem
  - outcome Oslo workshop: agreement to apply (SWI) scaling



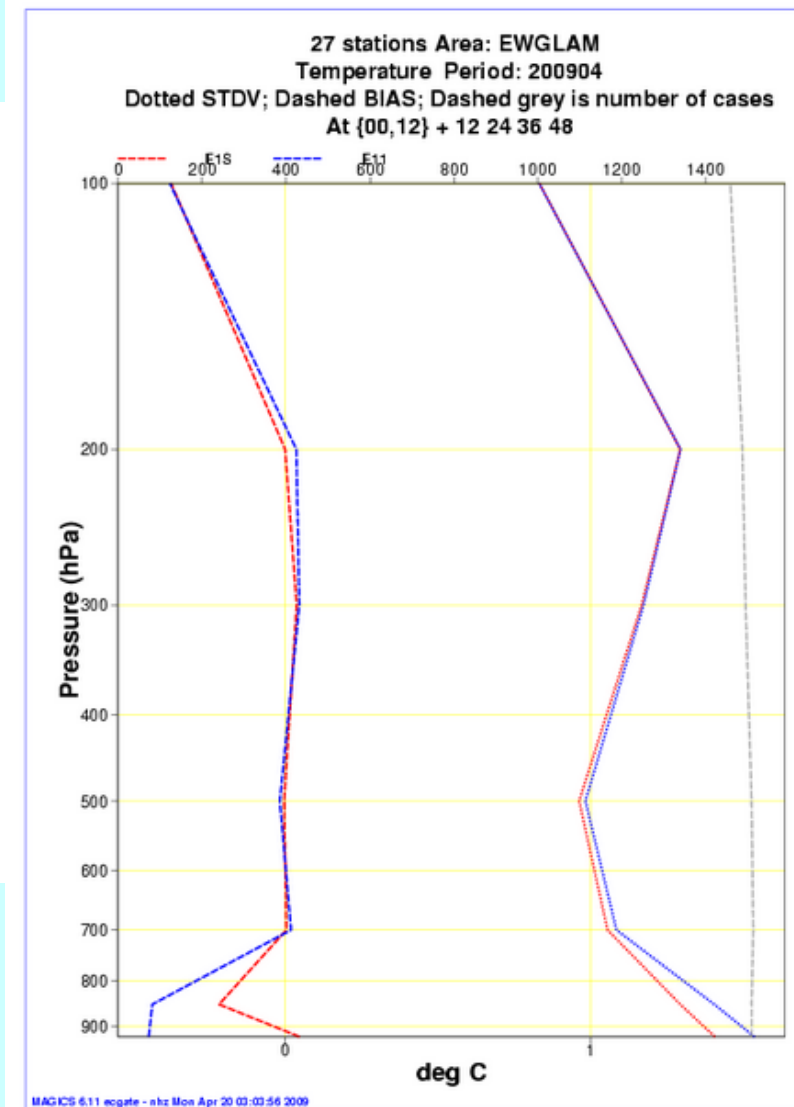
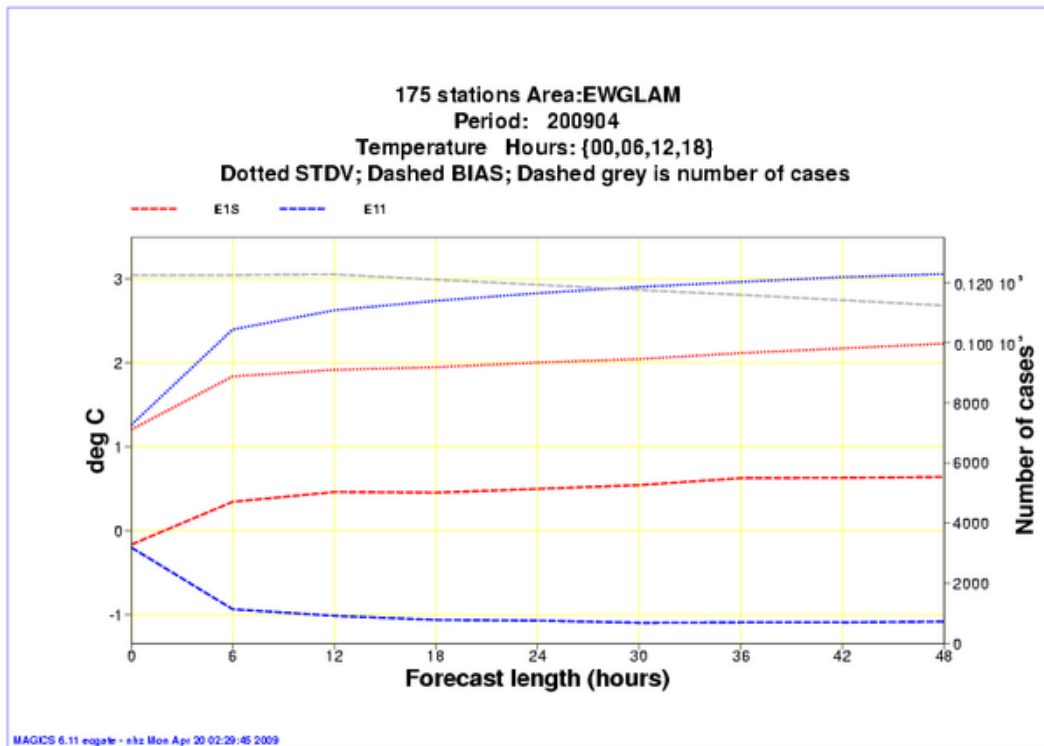
# HARMONIE system aspects

- Towards a Reference System setup
  - Present cycle 35h1
  - Testbed to facilitate routine testing of various configurations (nesting, model, assimilation, surface and domain options)
  - Computational efficiency, profiling and platform dependency checking
  - Verification/comparison against HIRLAM
- Discussion with ALADIN on system management issues
- Script system cooperation with LACE

# HIRLAM

- Data assimilation methods
  - Several improvements in 4D-VAR (multiple outer loops, moisture variable, OpenMP and other efficiency gains)
- Comprehensive impact studies (CIS)
  - Atlantic CIS: to be redone in revised setup
  - Convective CIS: ready to start baseline experiments
  - EUCOS regional OSE's with HIRLAM, ALADIN and HARMONIE
- Newsnow
  - Helsinki working week: in-depth assessment with 1D-modelling
  - Downward longwave radiation increase: looks promising at SMHI, to be confirmed in Reference system setting
- HIRLAM-chemistry branch
  - Nearly ready for introduction in Reference System
  - Start made with studies of impact aerosols on atmosphere
  - Very positive engagement of ACT community

# SMHI newsnow results with downward LW radiation adaptation



# Integration domains

GLAMEPS Configuration Experiments  
with enhanced grid resolution.

(Type 1 experiments)

Green: Output area for data from  
EuroTEPS in model levels.

[NLON=137, NLAT=118, D=0.5deg,  
POLON=22, POLAT=-40]

Red: Aladin Domain (incl. 11d  
extension zone).

[CLONLAT=c(-3.6,51.8), NXNY=(509,416),  
d=12.9km, reflat=45, reflon=35]

Blue: Hirlam domain and common  
output domain.

[NLON=486, NLAT=378, d=0.115deg,  
POLON=36, POLAT=-45]

GLAMEPS configuration experiments:

Forecasts 00 and 12 utc, +0h - +42h

EXP\_0.1: 11 ens. memb. per model = 44

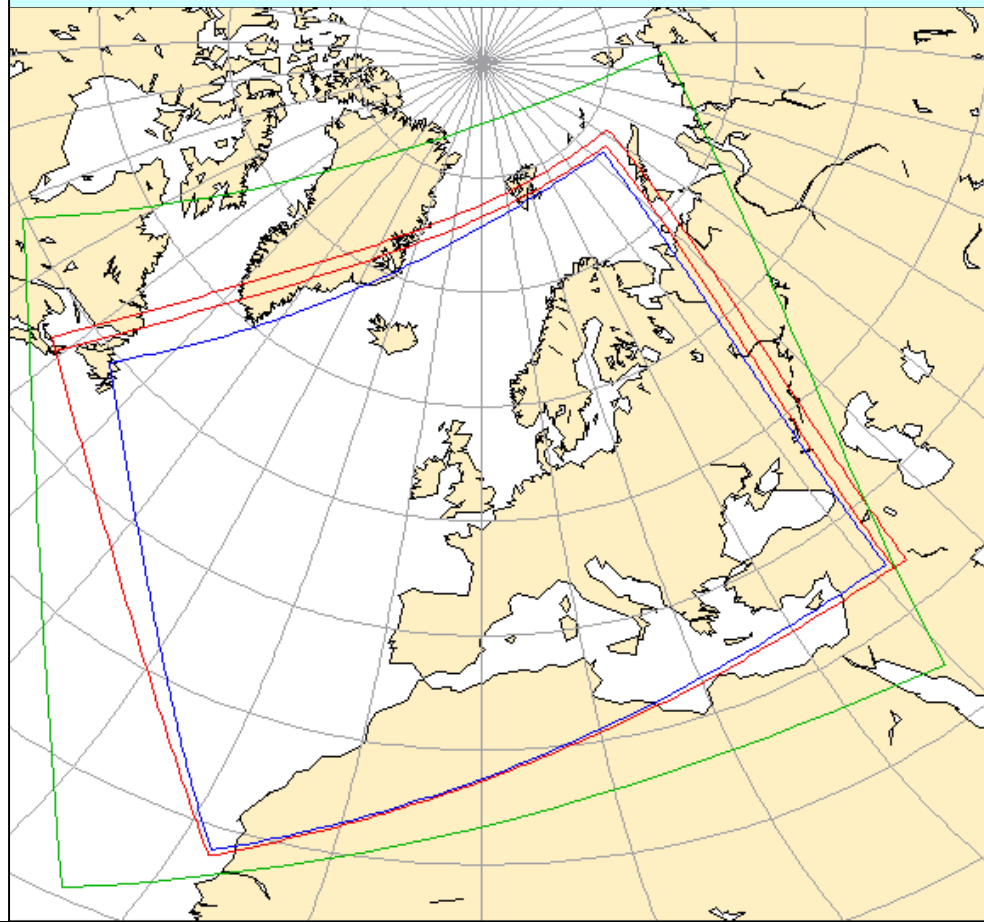
EXP\_0.2: 13 ens. memb. per model = 52

Models:

EuroTEPS; HirEPS\_K; HirEPS\_S; AladEPS

Test periods: 20070812 - 20070825 (2 WEEKS)

0909 200820080117 - 20080305 (7 WEEKS).



# GLAMEPS

- Configuration experiments
  - Winter, summer period: all runs performed, analysis ongoing
  - Preliminary results encouraging, indicating added value of LAM component over ECMWF EPS
- Calibration and product generation
  - Hppv recoding, speed-up
  - BMA calibration: automation, problematic for wind speed?
- Distributed production
  - ALADIN EPS at RMI, part HIRLAM EPS also outside ECMWF?
  - Technical tests of RT applicability tbd soon
- Ensemble generation methods
  - HIRLAM SV code in Ref system
  - ETKF
- Adaptations at ECMWF
  - Transition to new platform
  - Transition to new EuroTEPS version

# Varia

- Simplified versions of HIRLAM and HARMONIE for academic use universities:
  - Activities started in NL, Be (external funding received)
  - Initial work: interfacing with available nesting models/obs, visualization, selection of “typical” model settings
  - First aim: make accessible to limited number of “beta-testing” universities, for educational purposes
- HIRLAM web site overhaul:
  - New site launched under Joomla CMS
  - Documentation gathering/update
  - Contacts with ALADIN and LACE managers to see how best to share information and facilities such as wiki and data portal

# 2009: a year of harvesting

- HARMONIE
  - Definite switch in research efforts from HIRLAM to HARMONIE
  - First operational versions by end 2009/early 2010?
- HIRLAM
  - Planned DA and modelling developments largely completed
  - Chemistry branch up and running
- GLAMEPS
  - Demonstration of cost-benefits (added value over global EPS, extreme weather) and products
  - Pre-op RT runs to start end 2009/early 2010
  - Further optimization with additional ensemble generation / enhanced calibration methods