



# A new phase: HIRLAM-C (2016-2020)

Jeanette Onvlee

EWGLAM meeting, Rome, 03/10/2016

# Organizational aspects

- ✓ **New MoU: Jan 2016 – Dec 2020**
- ✓ **Members unchanged: Dk, Es, Fi, (Fr), Ic, Ir, Li, Ne, No, Sp, Sw**
- ✓ **New management group:**
  - ✓ **Programme manager: Jeanette Onvlee**
  - ✓ **PL Atmospheric data assimilation: Roger Randriamampianina**
  - ✓ **PL Atmospheric forecast model: Lisa Bengtsson**
  - ✓ **PL Surface analysis and modelling: Patrick Samuelsson**
  - ✓ **PL Probabilistic forecasting: Inger-Lise Frogner**
  - ✓ **PL Quality assurance: Bent Hansen Sass**
  - ✓ **PL System: Daniel Santos Munoz**
  - ✓ **Scientific secretary: Frank Lantsheer**



# R&D goals for HIRLAM-C

- ✓ **Integrated probabilistic (very) short-range forecasting system esp. suited for extreme weather**
- ✓ **More advanced use of wider range of high-resolution remote sensing observations, esp. for surface**
- ✓ **More sophisticated description of radiation-cloud-microphysics-aerosol interaction and of surface**
- ✓ **Towards higher resolution (operational: ~90L, 0.5-1.3km, research: O(200m))**
- ✓ **Identify and address systematic model weaknesses**
- ✓ **Towards more complete earth system modelling (focus: sea (surface))**
- ✓ **Enhance model efficiency, scalability, transparency**

# Data assimilation and use of observations

- ✓ Enlarging the pool of observations for 3D-Var in operational suites: conventional obs; AMSU-A/B, ATMS, MHS, IASI, SEVIRI radiances; radar reflectivity and wind; GNSS ZTD; Mode-S; AMV; scatterometers; GPS-RO ...
- ✓ Radar: developing PREP-OPERA tool for handling/QC of OPERA data in general
- ✓ GNSS: working on enhancing varBC predictors, slant delay operator.
- ✓ Preparations for assimilation of all-sky radiances
- ✓ Preparations for next generation satellite products (MTG/IRS L2, ADM/Aeolus)
- ✓ Study 3D-Var balances
- ✓ 4D-Var: working on enhancing functionality, efficiency
- ✓ Surface: Development of EKF+sat data for various surface components

**Implementation**

World Meteorological Organization  
 Meteorological Institute  
 Research, Training, Policy and Project Management

- ♦ **Obs operator**
  - coordinate along signal path in x-z-plane
  - from full level to full level:

$$N(h; H_k \leq h < H_{k-1}) = N_k \left( \frac{N_{k-1}}{N_k} \right)^{\frac{h-H_k}{H_{k-1}-H_k}}$$

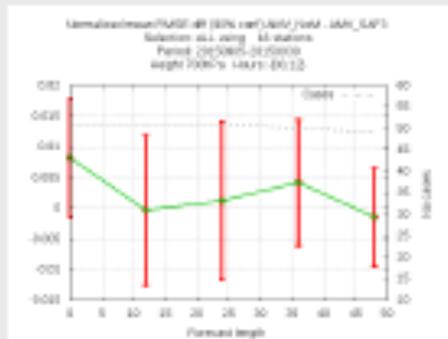
Courtesy: Siebren de Haan

# AMV impact experiments

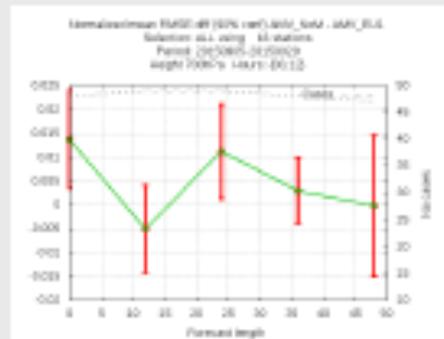
## MPEF, HRW and polar AMV data (Roger):

– Decision taken on the implementation of all (MARS, HRW, MPEF, polar) AMV data in Harmonie (Angeles, Eoin, Roger).

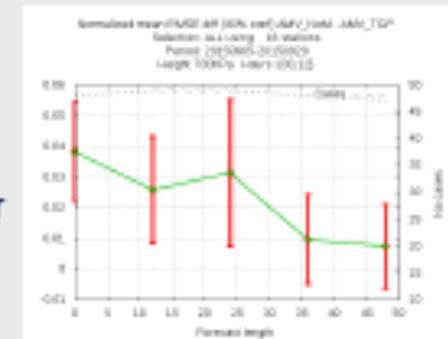
HRW wind alone



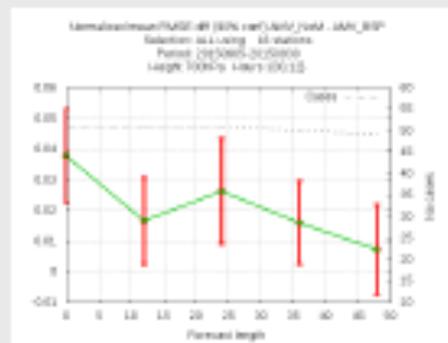
MPEF wind alone



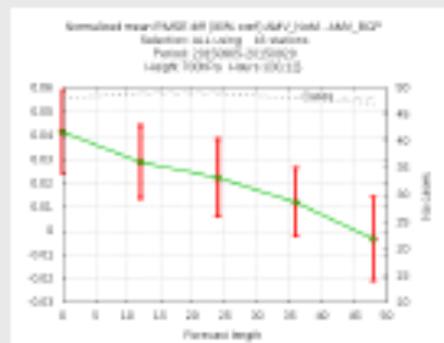
All AMV winds together



HRW and polar winds together



MPEF and polar winds together



# Forecast model

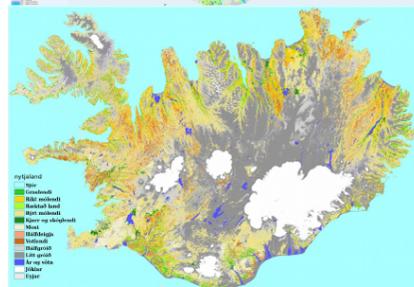
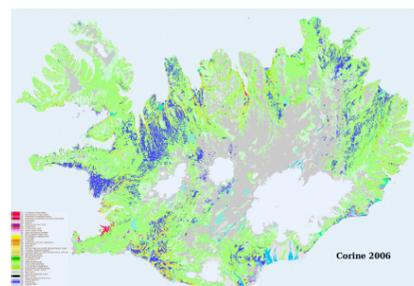
- ✓ Dynamics: experimentation with non-linear spectral grids
- ✓ Studies to improve cloud behaviour
  - microphysics, radiation, turbulence and statistical cloud model experiments leading to reducing several systematic model errors (and discovering some compensating errors in the process).
- ✓ More consistent treatment of radiation/clouds/aerosol
  - study of radiation, cloud optical properties and direct aerosol effects
  - implementing improved climatological /MACC analyses of aerosol
- ✓ Surface:
  - implementation of new modules for soil, snow+vegetation, sea ice, lakes in combination with surface DA.
  - Enhancing treatment of sea ice, glaciers, surface patches, ...

# Physiography-related problems (and solutions)

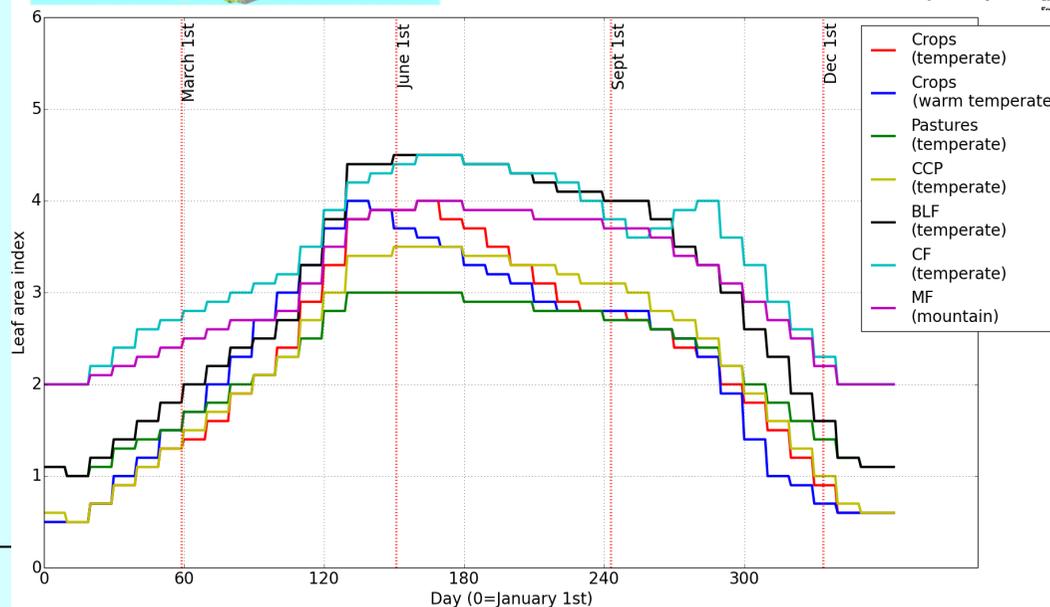
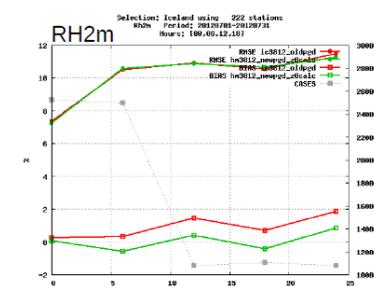
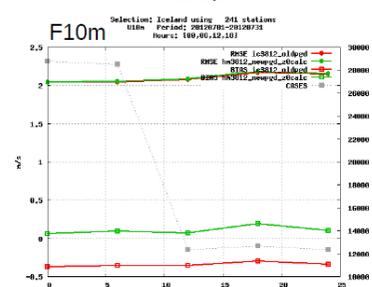
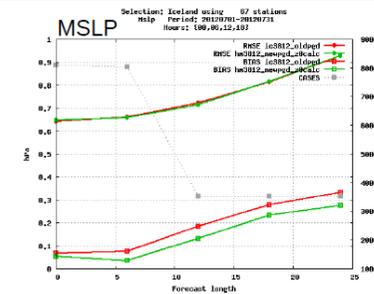
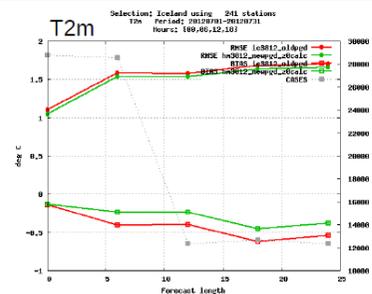
New PGD: Corine and AUI maps used



Verification old vs. new PGD for July 2012



- Three databases joined into new EcoClimap-II for Iceland
- Corine 2006
- AUI Soil map used for non-veg. areas
- Finally all vegetation over-written with the best veg. map from AUI.
- AUI → Agricultural Uni. of Iceland



# Probabilistic forecasting

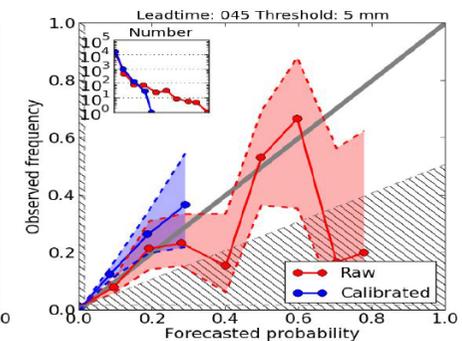
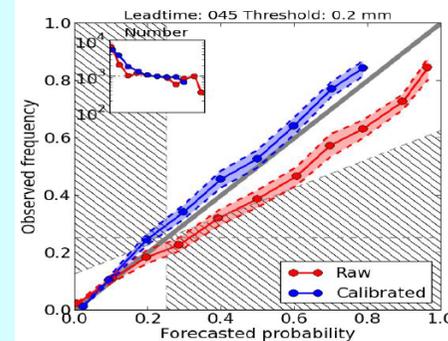
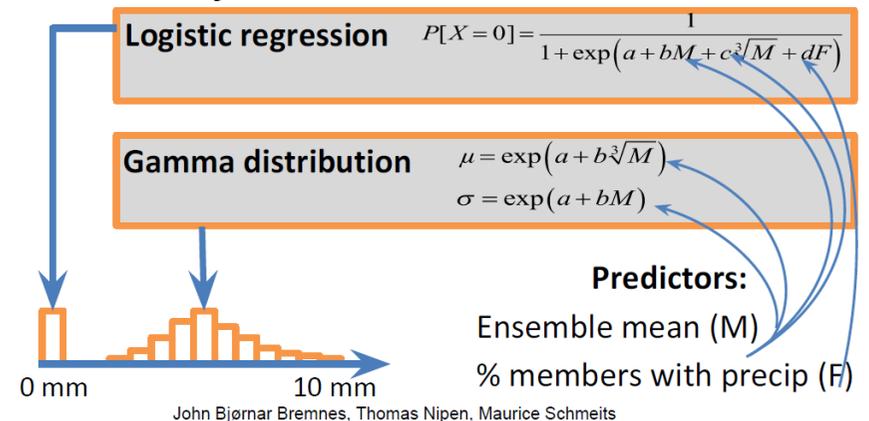
## Operational:

- Improving spatially varying calibration T2m, u10; introducing calibration of precipitation
- E-suite for GLAMEPS-v3: hor. resolution 8 -> 5km, hourly output, several new perturbation types

## Convection-permitting (HarmonEPS):

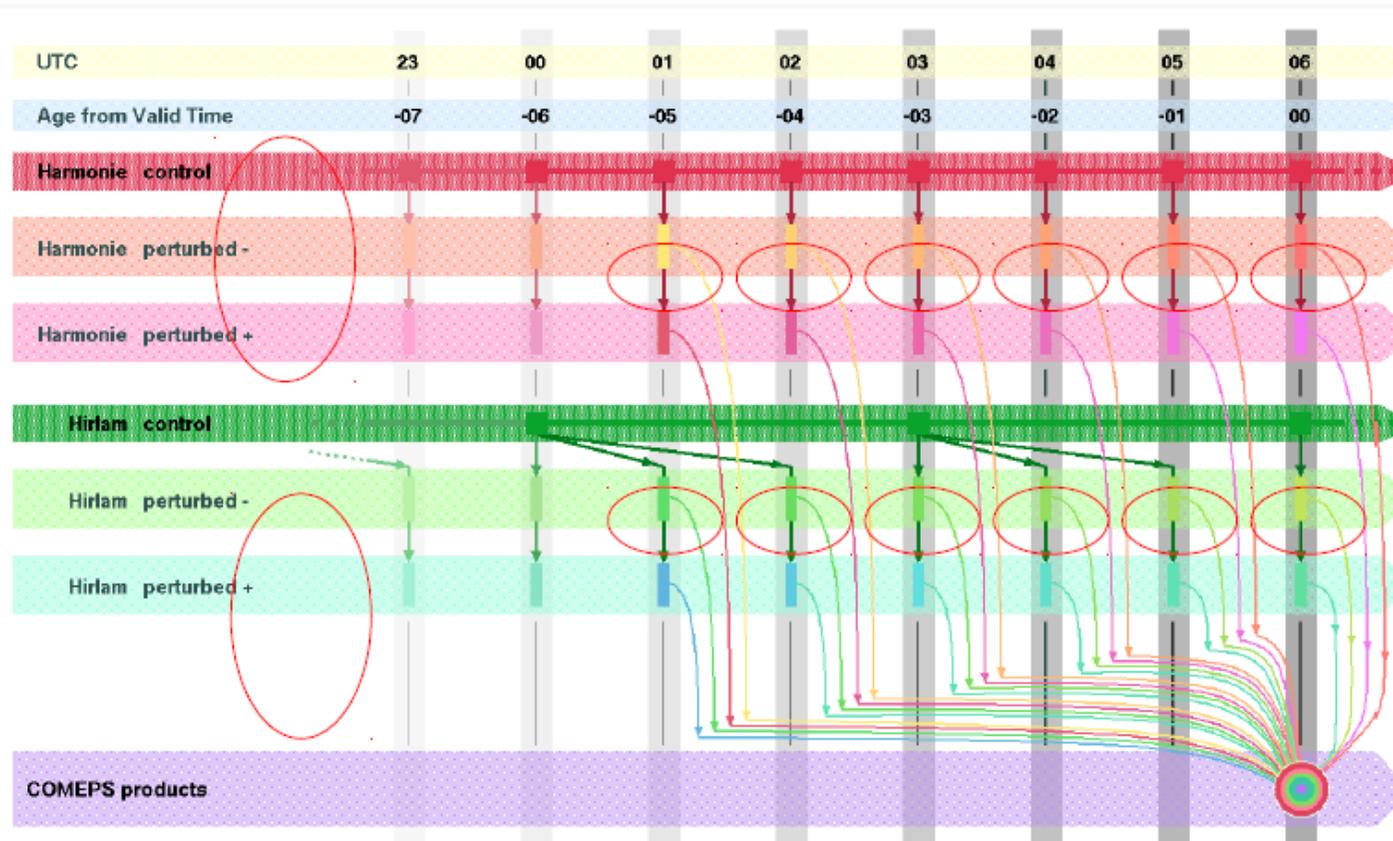
- Local suites being made operational (MetCoop, DMI, AEMET, KNMI)
- Experimenting with somewhat different setups (e.g. DMI COMEPS “Nowcasting setup”)
- Multi-physics experiments
- Surface perturbations experiments

## Zero-adjusted Gamma distribution



# COMEPS

HIRLAM All-Staff Meeting/ALADIN Annual Workshop 2016, April 5 2016



COMEPS 2016

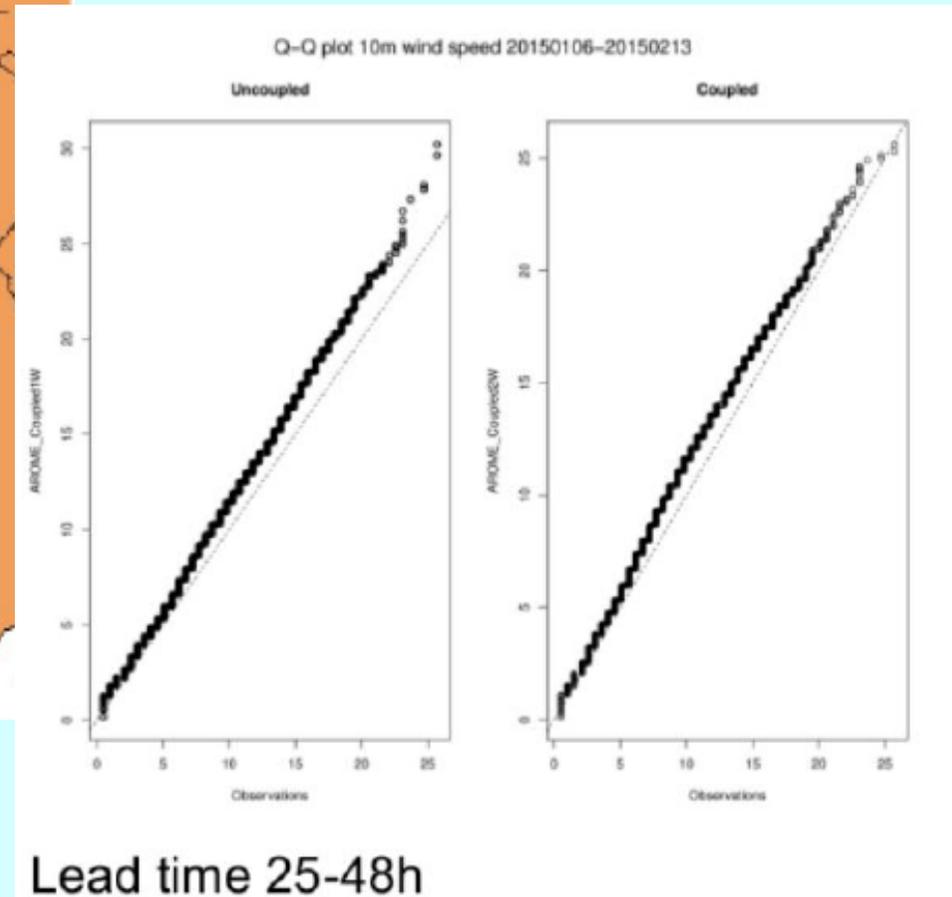
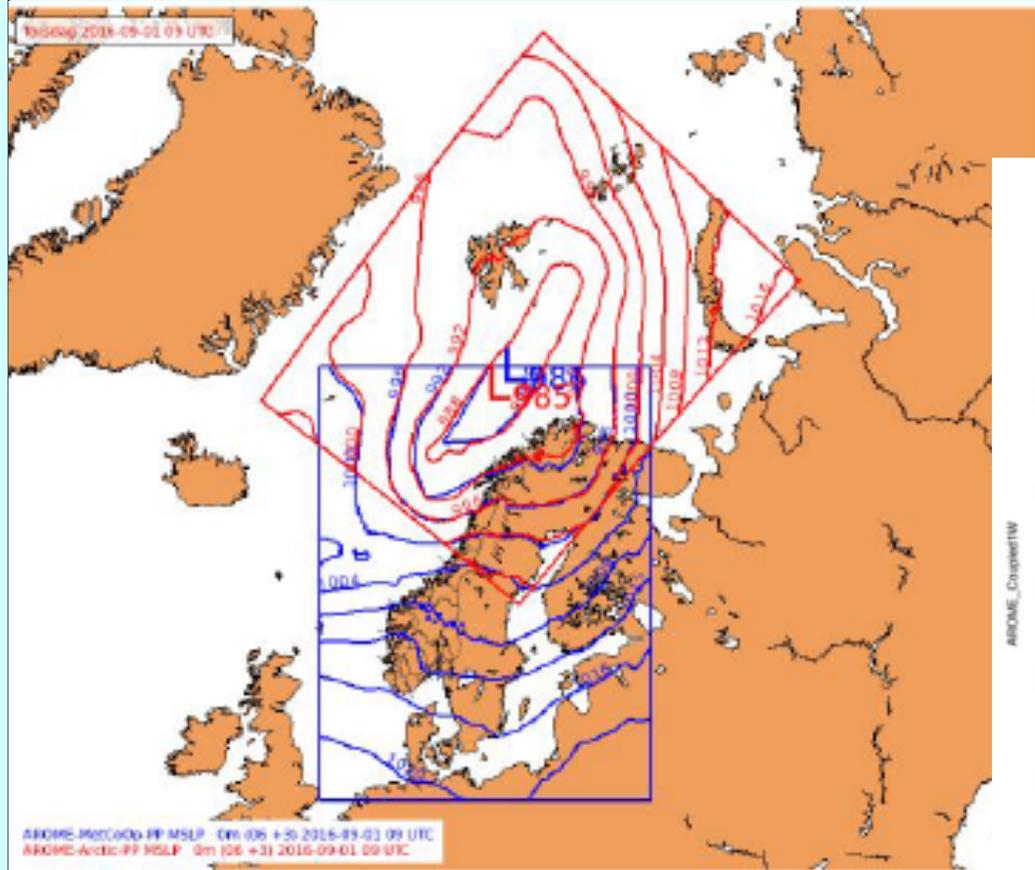
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Construct EPS with two sub-ensembles, with HIRLAM & HARMONIE models. Each hour with 1 control and 2 perturbed members per model

-> configure perturbed members with physics perturbation  
-> this forms a 24+ member EPS

COMEPS flow chart

# Atmosphere-wave-ocean coupling in Arome-Arctic



# Operational cooperation

Steadily increasing: In 2017 FMI joining MetCoop, DMI/IMO joint Greenland-Iceland domain;  
2021-22 aim at joint HPC facility, Nordic countries + NL

