Danish Meteorological Institute

NWP news 2010

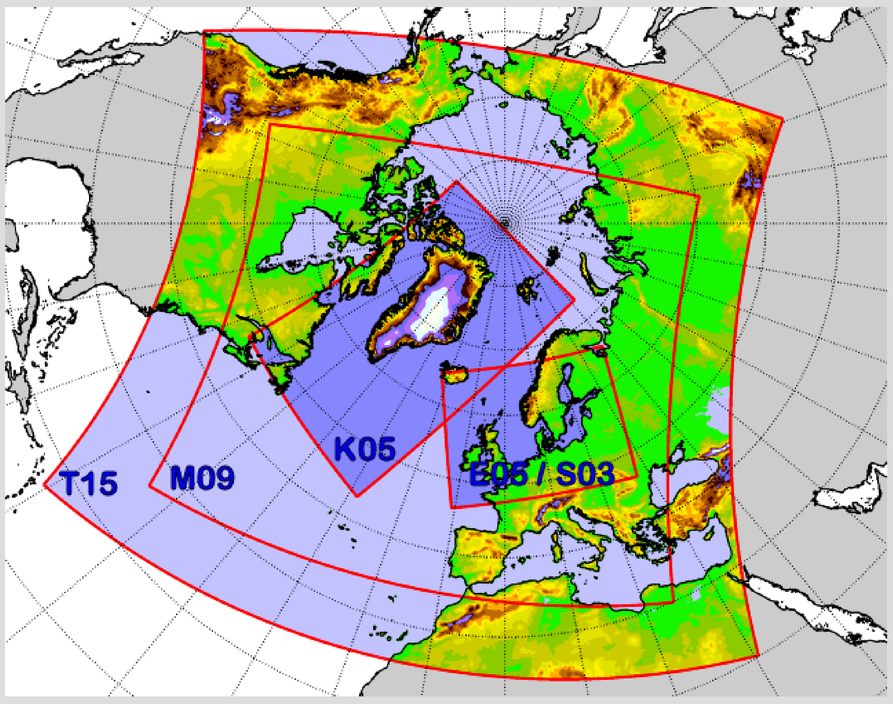

Fig . 1

DMI - HIRLAM

	M09	K05	S03	E05
Horizontal resolution	**0.09 ˚**	**0.05 ˚**	**0.03 ˚**	**0.05 ˚**
Time step	**400 s**	**150 s**	**90 s**	**150 s**
Boundary fields	**ECMWF**	**M09**	**ECMWF**	**M09**
Forecast length	**60 h**	**48 h**	**54 h**	**36 h**

Operational development at DMI

4th quarter 2010

- HIRLAM 7.3 (S03-model) operational with 65 vertical levels
- Ensemble prediction system (E05) with 25 members operational

Plans for 2011

- Operational Harmonie (2km grid) for South Greenland
- Regular runs every 6 hours of Harmonie 2.5 km on area corresponding to S03
- Development of products from ensemble prediction system (E05)
- Development of prototype (N03) system for very short range forecasts (12h) based on HIRLAM 3D-VAR and nudging of humidity related information using 1h rapid update cycles. N03 will be a sub-area of S03.
- Operational birch pollen forecasting based on Enviro-HIRLAM

Plans for 2012

- Harmonie 2.5 km grid operational with meso-scale data-assimilation on area corresponding to S03
- Very short range forecasts operational based on N03

Enviro-HIRLAM

Enviro-HIRLAM is a special version of HIRLAM which is developed in the context of environmental research , e.g. for FP7 –projects such as MEGAPOLI (http://megapoli.dmi.dk). It is based on the concept of 'online integrated modelling ' which implies that new variables are an integral part of the model.

Enviro-HIRLAM is also aimed at operational use. In 2011 the model will be used to forecast birch pollen concentrations operationally. An example of a birch pollen forecast is shown in fig. 3a. The pollen concentration is advected. The source of pollen is included by using a pollen emission module originating from FMI and adapted for Danish conditions. The sink includes both the effect of dry and wet deposition. The dry deposition is described from a resistance approach. The wet deposition is parameterized from the available precipitation field. The pollen concentration is also influenced by turbulent mixing in the model.

An important goal is to investigate the first and second indirect aerosol effects. Fig. 3b shows the results of a relatively inexpensive model run using a parameterization by Boucher and Lohmann (1995) for primary sulphate aerosol activation. The deduced droplet concentrations and related effective droplet radius are used directly in the HIRLAM physical parameterizations of radiation and precipitation generation. Fig. 3b indicates that the indirect aerosol effects will be reflected in monthly averages of the surface temperature.

Ensemble prediction system

- **An ensemble prediction system based on HIRLAM which has been running in a pre-operational phase during 2010 becomes operational in the 4th quarter.**
- **In 2011 special products will be developed from the system**
- **Focus on derived products which are user-oriented**
- **25 members**
- **Run at 5 km grid at an area similar to S03**
- **Run every 6 hours**
- **Fc-length= 36 hours**
- **40 model levels**

Sensitivity to
- **a) initial conditions (5 members)**
- **b) two condensation schemes (*2)**
- **c) stochastic physics (*2)**
- **d) new surface scheme +5**

Total =5*2*2 +5 = 25 members

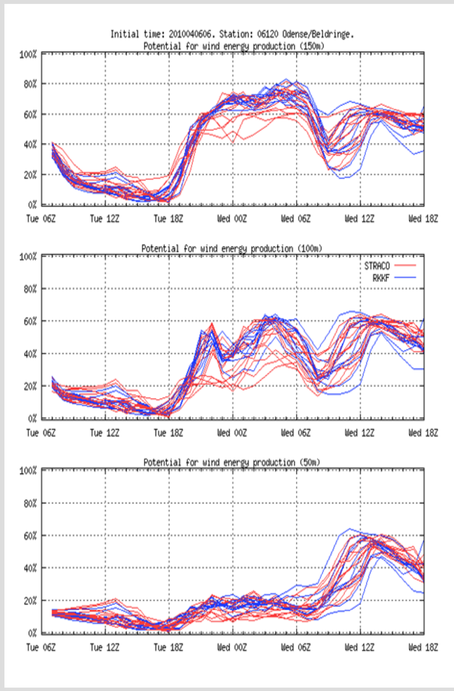

Fig.2 Ensemble forecast of potential wind energy at 150 m, 100 m and 50 m height in Odense (6 april 2010, fc-lenght = 36h)

HIRLAM R05 for road stretches

A special HIRLAM model is operational in the context of road-weather prediction. This model (R05) is running at a 5 km horizontal grid.

Hourly runs produce detailed diagnostic/ prognostic output of temperature and humidity along road stretches. A new feature under test is that the road forecast module is invoked for a total of 23000 points along the main road streches of Denmark (black stretches of fig.4a). The computations for all points (see dots along roads of fig.4b) utilize detailed physiographic data with information on shading conditions from a national database.

It is intended to combine the road-weather setup with the new setup N03 for rapid-update cycles.

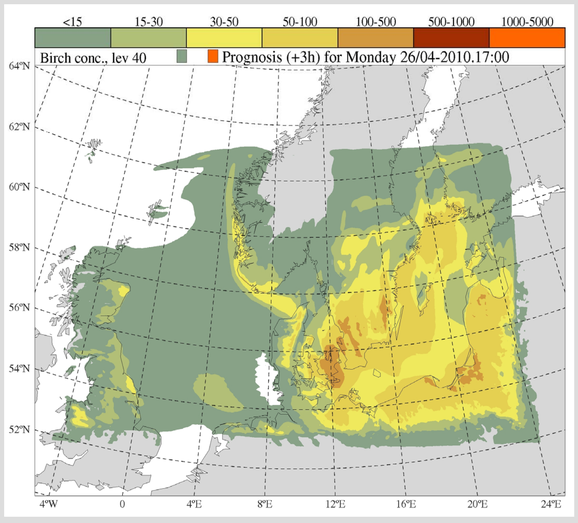

Fig. 3a Enviro-HIRLAM will be used operationally from spring 2011 to forecast birch pollen concentrations. The figure shows a 3h forecast from 26 April 2010.

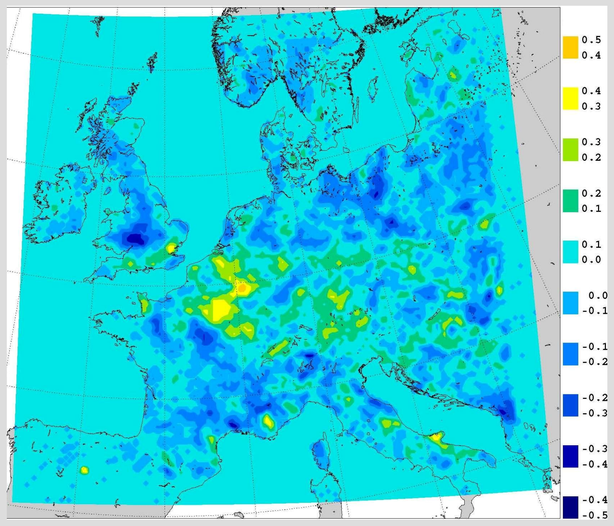

Fig. 3b Monthly averaged (June) surface temperature difference (˚C) between a baseline run and a simulation including the first and second aerosol indirect effects for primary sulphate aerosols.

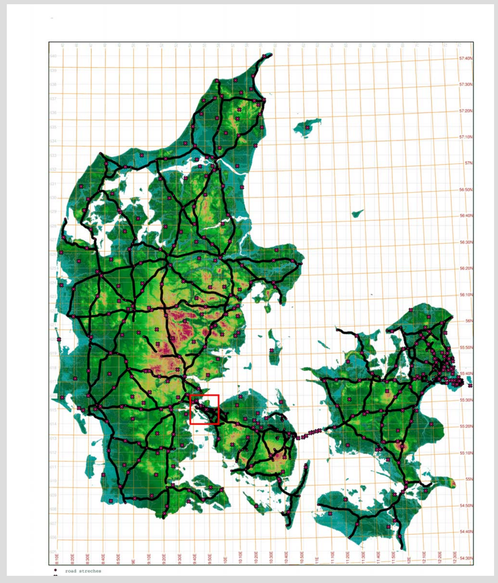

Fig. 4a Map of main roads in Denmark where a forecasting for road stretches is performed. The red square is magnified in fig.4b to show more details

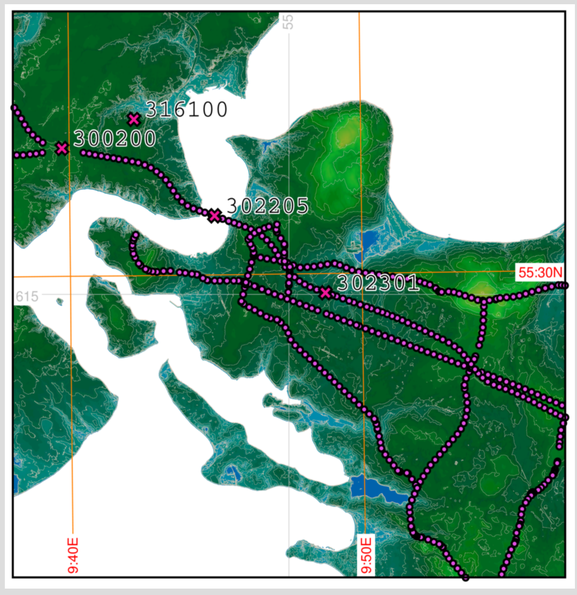

Fig. 4b Map displaying the many computation points along road stretches in the given region marked in fig. 4a by a red frame.

Danish Meteorological Institute, Meteorological Model Systems, Lyngbyvej 100, DK-2100 Copenhagen, DENMARK
Bent H Sass: bhs@dmi.dk, www.dmi.dk