NWP news

Danish Meteorological Institute

September 2009

Operational HIRLAM model areas used at DMI from May 2009

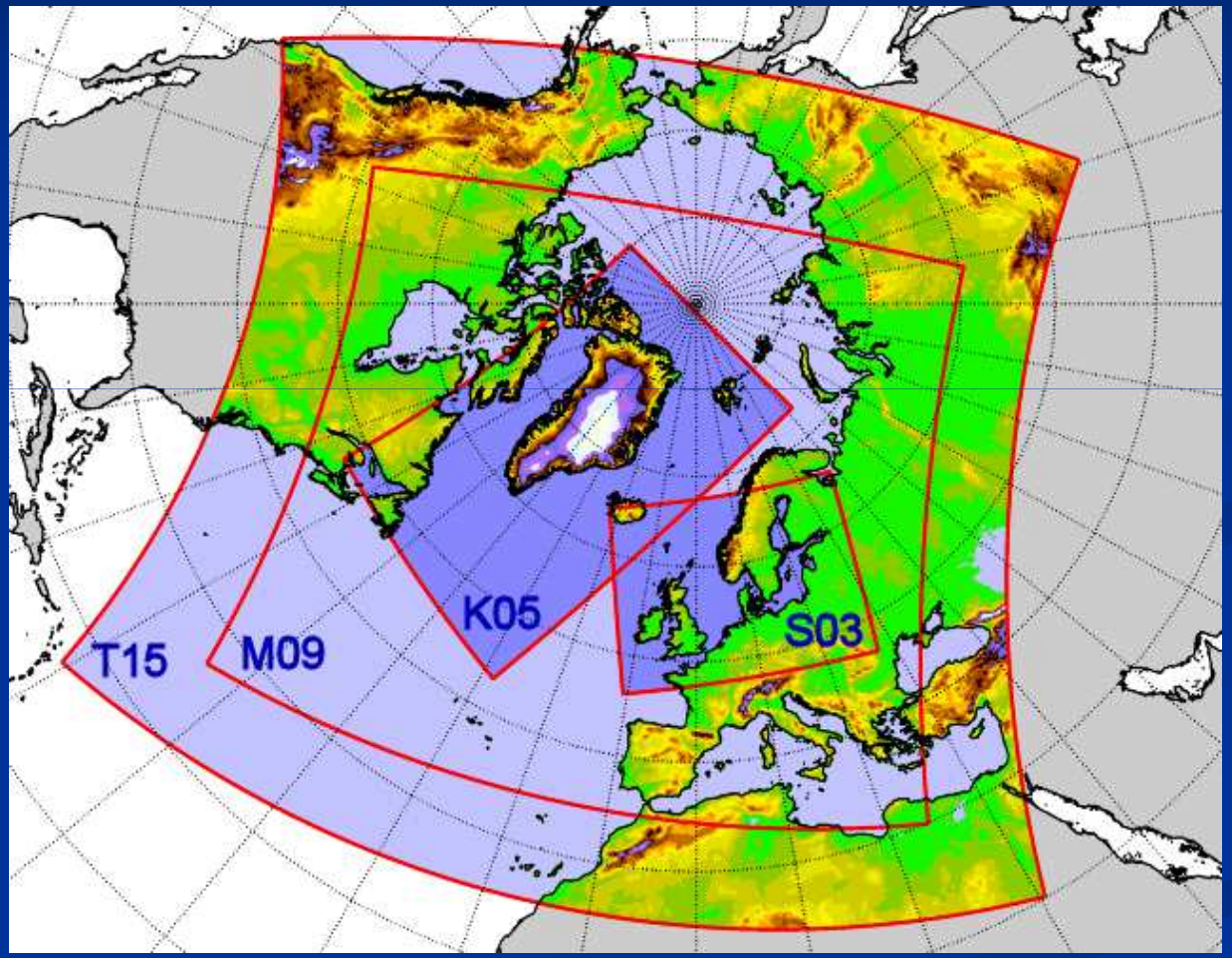


Fig.1

Main operational models at DMI 2009

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

- In 2010 the HIRLAM S03 model will be compared with a setup using Harmonie (Arome) 2.5 km gridsize non-hydrostatic model on the same domain.

HIRLAM as input to micro-meteorological computations

The DMI road weather model is forced by meteorological forecasts from a special version of HIRLAM. Hourly runs produce detailed diagnostic/prognostic output of temperature and humidity along road stretches.

An example of the new data for terrain height is given in Fig.2a showing a cross section of the road. The y-axis shows terrain height in metres and the x-axis shows horizontal distance in metres. Note that the presence of two lanes is reflected in the cross section: The lanes are slightly higher in the middle in order to prevent rain from accumulating on the road. The new detailed height data have been obtained from the Danish state agency KMS and are based on laser beam technology installed in flights operating at low levels. Fig. 2b shows a map of Denmark. The light red roads are being included into the DMI micro-meteorological road stretch simulations with computations approximately every 100 m along the roads.

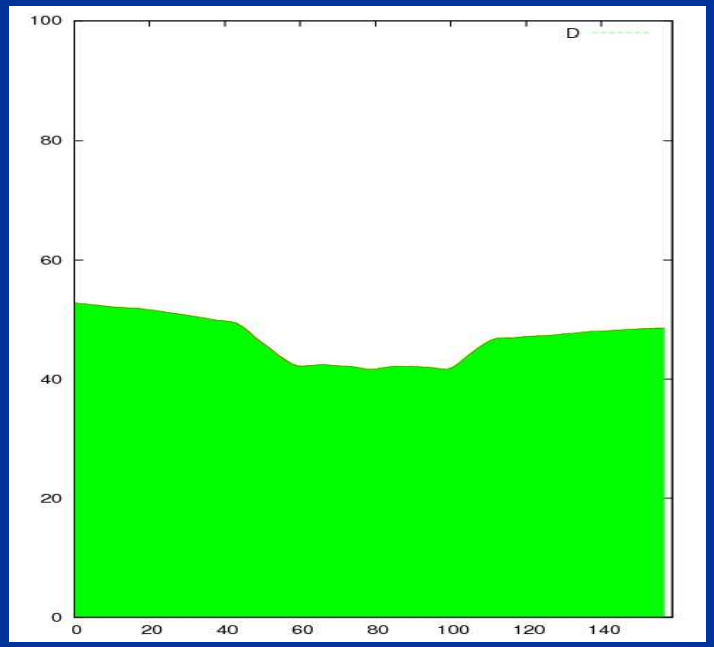


Fig. 2a

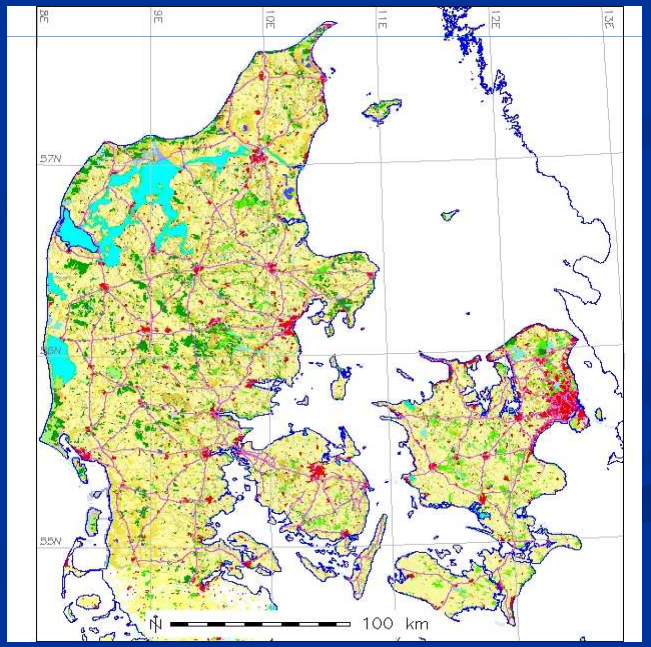


Fig. 2b

As the grid size of an NWP model gets smaller the assumption about 'vertical column physics' becomes increasingly incorrect.

Fig 3a shows that the true solar flux reaching the ground is not necessarily determined by the cloud cover in the vertical column.

A version of HIRLAM at DMI computes every time step a tilted column directed towards the sun. The tilted air column (Fig. 3b) is used just for computing the incoming radiation to the ground taking into account both cloud cover, vapor and cloud condensate in the tilted column.

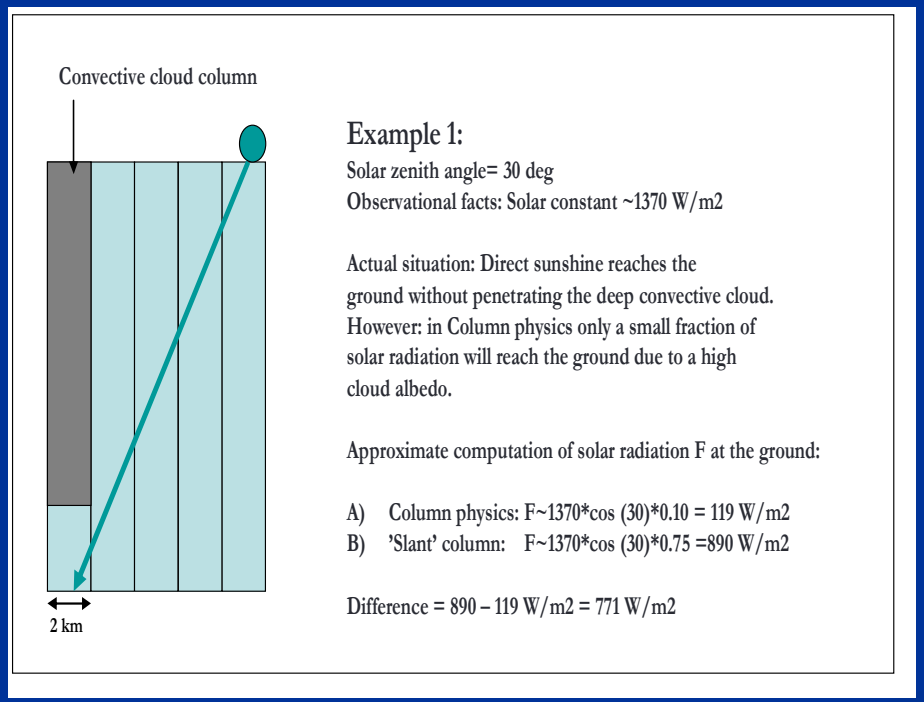


Fig. 3a

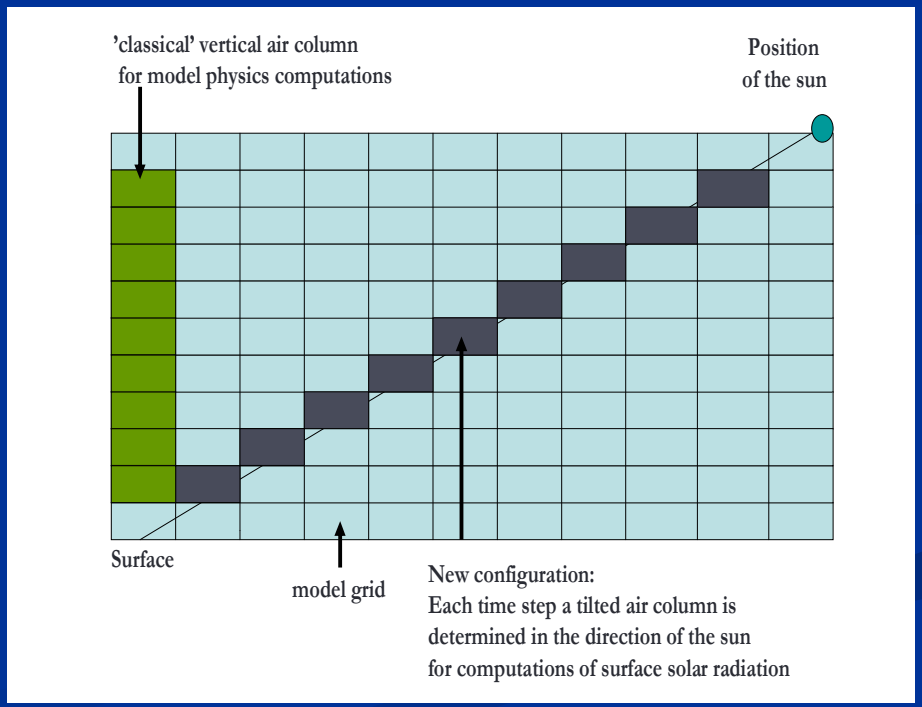
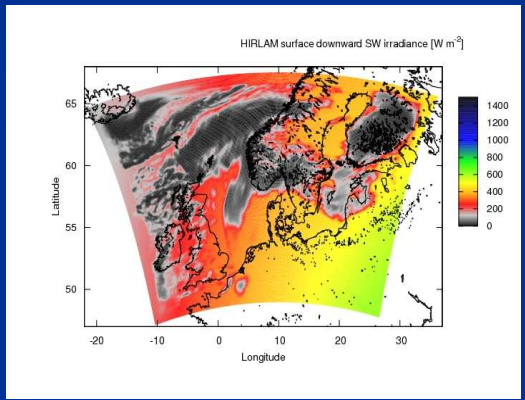


Fig. 3b

Test example valid on 1 September 2009 at 9 UTC using the tilted column approach: Fig. 4 a-b show the global solar radiation at the ground and the 2m temperature respectively of the new version using tilted column approach. Fig 4c shows the difference between the results of global surface radiation obtained with the tilted column method and the normal column physics approach respectively. The corresponding difference plot for 2m temperature is shown in Fig. 4d

Fig. 4a



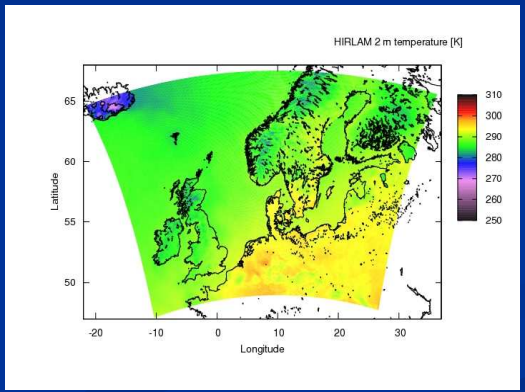
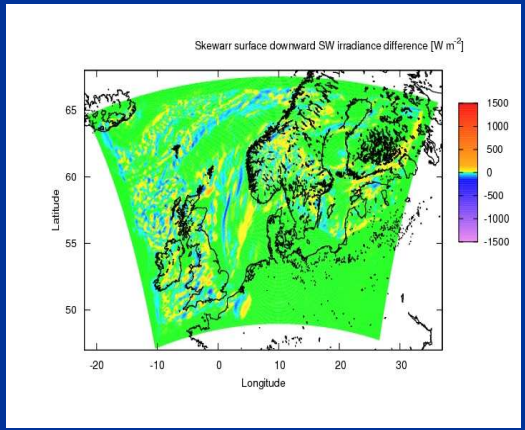


Fig. 4b

Fig. 4c



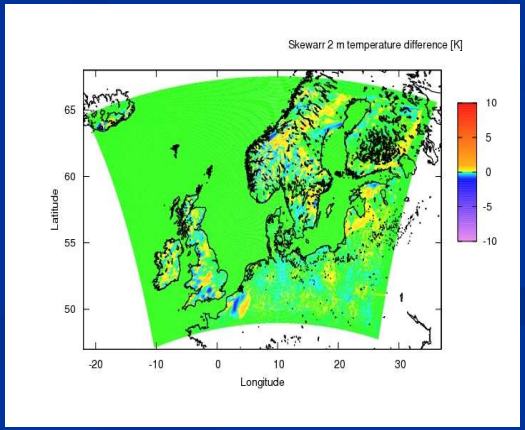


Fig. 4d

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