ORAL PRESENTATION

O-06. Sander Tijm: Recent and future changes in HIRLAM physics and their impact on atmospheric chemistry transport modelling

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The model physics in HIRLAM is slowly evolving and this has its impact on the characteristics of the meteorological output of the model. Changes in meteorology can strongly impact downstream applications that make use of the HIRLAM output. Therefore, it is important that all downstream users of HIRLAM know the impact of the physics changes on the model meteorology so they can make an educated guess of the impact that these changes will have on their applications.

Three processes that have a strong impact on the meteorology of the model have undergone and will undergo large changes. First of all, currently we have STRACO (Smooth Transision to Convection) as the reference convection and condensation scheme in HIRLAM, and we will change over to KF-RK (Kain Fritsch & Rasch Kristjansson). With this change the behavior of the convection and condensation will change significantly. Initially this change will cause an increase in small precipitation amounts from relatively shallow clouds, a feature that has improved strongly over the last years in STRACO. The small precipitation amounts promise to be much better with the next version of RK that probably will be a part of the HIRLAM 7.3 release.

Another big difference between STRACO and KF-RK is the behavior of the convection itself. STRACO has the tendency to produce convective cells with circulations that have a length scale of 5-10 ΔX. Cross sections of e.g. the cloud water and the vertical velocity clearly show these cells, which have a typical size of 100 km in an 11km model. KF-RK does not show this interaction between the convection/condensation scheme and the dynamics.

Another feature that has improved drastically in STRACO over the last year is the formation and development of fog over the sea. In earlier HIRLAM versions the seas around Europe would fill in with fog whenever air with a dew point close to the SST would move over the sea. In addition to that the temperature would also become much too low in the fog layer, sometimes up to 8 degrees colder than the SST. In the current version of STRACO (to be a part of the HIRLAM 7.2 release) this behavior has improved drastically.

The last scheme that has changed considerably over the last few years has been the vertical diffusion scheme CBR. In old versions of this scheme the vertical diffusion was much too strong under stable conditions, leading to too weak low-level jets and too strong winds close to the surface. In the HIRLAM 7.2 version of CBR the mixing under stable conditions has been optimized, with less mixing under stable conditions. This leads to wind profiles that are much closer to the observed profiles and low-level jets that are in agreement with the observations.

These changes and the impact they can have on atmospheric chemistry transport modelling will be shown.