The application of the new IFS convection scheme in COSMO-CLM

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By default, the most recent versions of COSMO, respectively COSMO-CLM (CCLM), offer only one parameterization scheme for convection, namely the Tiedtke scheme (Tiedtke, 1989). However, the option exists to use the convection scheme of the Integrated Forecasting System (IFS) of ECMWF. This option was already available in previous versions of CCLM using version Cy33r1 of the IFS scheme (Bechtold, 2009). But as several studies (e.g. Brockhaus et al., unpublished manuscript) and sensitivity simulations within the frame of CORDEX showed, the IFS scheme produced to much rain of light intensity (< 3 mm), and the daily cycle of convective rain was also not correct. The precipitation maximum occurred a few hours too early, a shortcoming, which is also apparent when using the Tiedtke scheme. In summer 2013 ECMWF published a new version (Cy40r1) of its IFS convection scheme, which improved the diurnal cycle of convection considerably (Bechtold et al, 2013), at least when being applied within the IFS. In the meantime, this new version of the IFS scheme has been implemented in CCLM and can be chosen as the single alternative to the Tiedtke scheme. CCLM simulations applying the old and the new IFS scheme have been and are going to be carried out. On the one hand, these simulations are based on the ERA-Interim driven CORDEX Africa configuration, on the other hand it has been tried to confirm results of IFS simuation for the continental USA (Bechtold et al., 2013), but applying CCLM in connection with the new IFS scheme. Unfortunately, the latter CCLM simulations did not show improvements in the diurnal cycle of convection when compared to simulations using the old version (Cy33r1) of the IFS scheme. In collaboration with P. Bechtold from ECMWF we are going to find out the reasons for this. In the talk the current status of the development will be presented.

References:

Bechtold, P.., 2009: Chapter IV-5: Convection. ECMWF IFS documentation, www.ecmwf.int

Bechtold et al., 2013: Breakthrough in forecasting equilibrium an non-equilibirium convection. ECMWF Newsletter No. 136, 15-22.

Brockhaus et al.: The ECMWF IFS convection scheme applied in the COSMO-CLM limited-area model. Unpublished manuscript.

Tiedtke,M, 1989: A comprehensive mass flux scheme for cumulus parameterization in large-scale models. Monthly Weather Review, 117, 1779-1800.