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Geoscientific Model Development Discussions

GMDD

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Interactive Comment

Interactive comment on "Forecasts covering one month using a cut cell model" *by* J. Steppeler et al.

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The authors thank referee 1 for the request for more information. We comment as follows: 1) The boundary conditions are implemented as described in Steppeler et al (2002). Velocity boundary grid-point values need not to be posed, as in the Arakawa C-grid there are no point-boundary amplitudes on the lower boundaries. The velocity amplitudes represent surface averaged values. The boundary condition is that the flow through the surface at the mountain is 0. The finite volume method needs just the fluxes through the boundaries. No point values of fluxes are needed at the surface. 2) The improvements leading to LM to CLM concern mainly changes in the precipitation scheme to make the model suitable for all climatic areas. These changes will be described in more detail under 3. In addition to this, technical changes were made to enable the model to run in climate mode, meaning long integrations. These changes contained for example the use of netcdf for output, the changing of output name conventions to

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support a large number of output files and the restart option. 3) The LM (now called COSMO model) belonged to the first non- hydrostatic models in operational use and after the first year of operation difficulties in precipitation forecasts became apparent. The physics package tuned to the hydrostatic version did not prove to be fully suitable. A retuning of the physics scheme seemed necessary. Deficiencies in the precipitation forecast were present in higher latitudes. When using the LM in tropical areas these precipitation errors were rather strong. In particular in convective situations the precipitation was too strong. Part of the problem was that the hydrostatic predecessor of LM and CLM was used for forecasts in Europe only. LM and CLM were intended to be used in many areas of the world and for climate simulation. There were many changes, including error corrections. The changes to the precipitation scheme are described in "Seifert, A. and S. Crewell, A revised cloud microphysical parameterization for operational numerical weather prediction using the COSMO model, 15th International Conference on Clouds and Precipitation ICCP 2008, Cancun, Mexico, 7-11 July 2008, 6 pages." There were two changes of particular importance. In the Kessler precipitation scheme the autoconversion parameter was changed to make scale precipitation less easy. The prediction of the snow phase was changed using a determination of parameters coming from the whole atmosphere. The old scheme was tuned with measurements in the lower atmosphere only. 4) The noz model has a problem of overprediction of precipitation. This started near mountainous regions of the tropics and was less severe in higher latitudes. The high precipitation then spreads very fast to the whole model area. As indicated above, the reason is that the physics scheme was not tuned for non-hydrostatic applications. As indicated above, this problem is now solved for noz/CLM. Even though LMZ does not have this problem, the resulata indicate that it is necessary to retune the physics with the cut cells.

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