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The new very short range forecast model LMK for the convection-resolving scale

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Up to now the model chain of the Deutscher Wetterdienst (German Weather Service, DWD) is built up by the global model GME with about 40 km resolution and the regional, meso-beta model LME (commonly developed in COSMO) with 7 km resolution. Since August 2006, the newly developed numerical weather prediction system LMK ('LM-Kürzestfrist') for very short range forecasts (up to 18h) and with a resolution on the meso-gamma scale (dx=2.8km) is in a pre-operational trial at the DWD. This is the first time that a convection resolving model is used at the DWD. The emphasis of this model system lies in the prediction of severe weather events related to deep moist convection and to interactions of the flow with small scale topography. One example of the latter effect are severe downslope winds connected with hydraulic jumps which generate strong wind gusts by increased turbulence. One such an event occured at the Erzgebirge in autumn 2006 and was simulated by LMK but not by LME. The prediction of lee waves benefits from higher resolution, too; they are especially interesting for glider flight forecasts. One of the most farreaching changes from meso-beta to meso-gamma resolution is the abandoning of a parameterisation of deep convection. Instead of this, LMK resolves at least the biggest parts of convection explicitly. This leads in general to a more unstable stratified model atmosphere which contains more humidity resulting sometimes in a more realistic diurnal cycle of rainfall. For the smaller scales of convection the slightly modified shallow convection scheme of the Tiedtke cumulus parameterization is used. This parameterization especially delivers the transport of moisture from the boundary layer to a height of about 3 km and therefore avoids the overestimation of low cloud coverage. Some examples of explicit convection simulation are shown, where LMK has an increased predic-

tion skill, as for convectively forced frontal precipitation. But there are also examples where LMK has problems to initiate convection properly. A meso-gamma-model has special requirements concerning data assimilation: at this scale highly resolved, rapidly updated observations are needed, which can in principle be delivered by radar data with a resolution of roughly 1 km by 1km. They are assimilated by the latent heat nudging (LHN) approach. One basic assumption of the LHN is that this relation is valid in a vertical model column. This basic assumption is in contradiction to the use of a prognostic precipitation scheme which drifts rain and snow by several grid intervals over several time steps. This feedback problem can be solved partially by using an undelayed reference precipitation step additionally to the prognostic precipitation step. To drive the Latent Heat Nudging assimilation, quality controlled radar data are needed. The up to now applied pattern recognition methods allow especially the filtering of artificial signals like positive or negative spokes, anomalous propagation and clutters. The operational usage of LMK at the DWD is planned for spring 2007.