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Implementation of advanced numerical schemes for moisture advection in MM5 and cross-validation of resulting moisture distributions with results of the LAUNCH-2005 campaign at Lindenberg (Germany)

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Advection plays as a basic process an important role in fluid dynamics. Many meso- or synoptic-scale weather-systems are advection-dominant systems and they are not well predicted with the current numerical weather prediction models like MM5. This is due to the poor numerical advection treatment of the modelling equations. With an increase in computational power, the numerical errors from the advection computation become more significant as the resolutions of the simulations decrease from regional to the local scale. The numerical treatment of the MM5 modelling equations is based on the leapfrog scheme, which was quite popular in the late seventies and eighties, but it does not fulfil the demands of a sophisticated numerical treatment of the governing equations. This study will give some preliminary results of an investigation of advanced numerical advections schemes for the moisture equations in MM5. Focusing on numerical properties like dissipation, dispersion, conservation and shape preserving, the numerical advection schemes of Smolarciewicz and Bott have been adapted three-dimensionally for the implementation within MM5. Together with the original MM5-Leapfrog-Scheme a combined centered- and upstream-differencing scheme was also used in the study. Ths simulated moisture distributions were cross-validated with results of the LAUCH-2005 (*International Lindenberg campaign for assessment of humidity and cloud profiling systems and its impact on high-resolution modelling*) campaign at Lindenberg (Germany). The study presents the first results of the comparisons of Raman Lidar measurements and numerical weather prediction output from

high resolution MM5 simulations using various new advection schemes.