EMS Annual Meeting Abstracts
Vol. 9, EMS2012-318, 2012
12th EMS / 9th ECAC

Improving the representation of small-scale variability in the radiation and land-surface parameterizations of a mesoscale numerical weather prediction model

A. Schomburg (1,2,4), V. Venema (2), F. Ament (3), and C. Simmer (2)

(1) Deutscher Wetterdienst(DWD), Research and Development, Germany (annika.schomburg@dwd.de), (2) Meteorological Institute, University of Bonn, Germany, (3) ZMAW, University of Hamburg, Germany, (4) EUMETSAT

For the simulation of subgrid-scale physical processes in mesoscale numerical weather prediction models, generally various kinds of spatial and temporal sampling or averaging methods are employed to decrease their computational burden. These methods are applied both within the physical parameterizations, but also by restricting the number of calls to these parameterization schemes in time and space. This under-representation of small-scale variability can lead to systematic errors due to the nonlinearity of processes and may cause inconsistencies between variables computed by the different parameterization schemes.

In this presentation two methods, which provide a more efficient and consistent spatial and/or temporal sampling of heterogeneities in parameterizations of small-scale processes in atmospheric models, will be presented. The first method, called adaptive radiative transfer parameterization, provides an efficient technique to compute the radiative tendencies in the atmosphere and at the surface. Adaptive parameterization schemes can be accurate and efficient by smartly combining an accurate, but computationally expensive parameterization with an efficient, but approximate one. The second method allows for a scale-consistent coupling of atmospheric and soil-surface models, by running a high-resolution soil-vegetation-atmosphere transfer (SVAT) model coupled to a coarser atmospheric model. They are connected by a disaggregation scheme for the atmospheric input variables needed to drive this soil model on the fine scale. This disaggregation system has been developed and tested based on high-resolution model output (400m horizontal grid spacing).

Both approaches have been implemented and tested in the numerical weather prediction model COSMO, in this presentation some results and the main conclusions will be given.