



An improved adaptive radiative transfer scheme

Victor Venema (1), Annika Schomburg (2), and Clemens Simmer (1)

(1) University of Bonn, Meteorological institute, Bonn, Germany (victor.venema@uni-bonn.de), (2) Deutscher Wetterdienst, Offenbach, Germany

Since the computational burden of radiative transfer parameterisations is considerable, operational atmospheric models use various sampling, coarsening and interpolation techniques to reduce this load, which, however, introduce errors.

An adaptive radiative transfer scheme combines an accurate with a fast parameterisation. The task of the computationally light simple parameterisation is to follow the fast temporal fluctuations. Because, the simple parameterisation may be biased compared to the accurate one, the physical accurate parameterisation has the duty to avoid biases.

In previous studies a simple spatial adaptive scheme was implemented in the numerical weather prediction model COSMO and compared to the operational configuration for Germany, COSMO-DE, where the radiation computations are performed quarter-hourly on 2x2 averaged atmospheric columns. The results showed that the radiation fields are modelled more accurately and that physical relationships are reproduced more closely. It was also shown that these improvements lead to improvements with respect to the dynamical development of the model simulation, which has a smaller divergence from the reference model run. In all cases frequent radiation computations for the full grid are used as reference.

Currently we are working on an improved adaptive scheme, which is based on the original spatial adaptive scheme, taking both the surface heat fluxes as well as the atmospheric heating rates into account. The main improvement is that the new scheme additionally uses a simple parameterisation scheme to correct the end results for remaining differences in the surface net flux using properties of the atmosphere and surface. Furthermore, a simple change in the computation of the solar zenith angle reduces the diurnal cycle in the instantaneous biases. With these steps, the new adaptive scheme is able to make another clear accuracy gain.

For more information please go to:

http://www2.meteo.uni-bonn.de/venema/themes/adaptive_parameterisations/