EMS Annual Meeting Abstracts
Vol. 10, EMS2013-510, 2013
13th EMS / 11th ECAM

An analysis of sensitivity of WRF shortwave radiation schemes in the forecast of the surface downward flux using idealized 1-D atmospheric profiles

A. Montornès (1,2), B. Codina (1), and J. W. Zack (3)

(1) University of Barcelona, Barcelona, Spain (amontornes@am.ub.es), (2) AWS Truepower, Barcelona, Spain (amontornes@awstruepower.com), (3) MESO Inc., Troy, United States

A well parameterized radiative transfer equation in Numerical Weather Prediction (NWP) models is essential since it is a key component of the atmospheric system. Moreover, the accurate computation of the shortwave fluxes arises as a critical issue in a variety of applications such as renewable energy, air quality and weather forecast among others. Nonetheless the shortwave radiation transfer modeling often assumes various approximations to decrease the computational requirements in the weather simulations. The degree and the characteristics of the impact of these simplifications on the accuracy of the irradiance predictions and the overall NWP forecasts are not well known.

Analyses of four shortwave schemes available in the Weather Research and Forecasting-Advanced Research WRF (WRF-ARW) are presented: Dudhia, Goddard, GFDL-Eta and the Rapid Radiative Transfer Model (RRTMG). These sensitivity tests include several vertical discretization settings (i.e. number and distribution of the ETA levels), a variety of configurations for the top of the model and different atmospheric profiles.

Each scheme is isolated and adapted to work in a single atmospheric column using several theoretical vertical profiles as input data: dry with and without aerosols, wet cloudless and cloudy atmospheric profiles. The study for each scheme includes two parts: on the one hand, the quantification of the forcing due to dry gasses, water vapor, clouds and aerosols respect the baseline case of a transparent atmosphere is presented. On the other hand, the relationship between the vertical settings of the model and the computational error of each scheme is discussed besides a comparison between all of them.