Geophysical Research Abstracts
Vol. 17, EGU2015-4533, 2015
EGU General Assembly 2015

Realistic weather simulations and forecast verification with COSMO-EULAG

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Research conducted at Polish Institute of Meteorology and Water Management, National Research Institute, in collaboration with Consortium for Small Scale Modeling (COSMO) resulted in the development of a new prototype model COSMO-EULAG. The dynamical core of the new model is based on anelastic set of equation and numerics adopted from the EULAG model. The core is coupled, with the 1st degree of accuracy, to the COSMO physical parameterizations involving turbulence, friction, radiation, moist processes and surface fluxes. The tool is capable to compute weather forecast in mountainous area for the horizontal resolutions ranging from 2.2 km to 0.1 km and with slopes reaching 82 degree of inclination. An employment of EULAG allows to profit from its desirable conservative properties and numerical robustness confirmed in number of benchmark tests and widely documented in scientific literature.

In this study we show a realistic case study of Alpine summer convection simulated by COSMO-EULAG. It compares the convection-permitting realization of the flow using 2.2 km horizontal grid size, typical for contemporary very high resolution regional NWP forecast, with realization of LES type using grid size of 100 m. The study presents comparison of flow, cloud and precipitation structure together with the reference results of standard compressible COSMO Runge-Kutta model forecast in 2.2 km horizontal resolution.

The case study results are supplemented by COSMO-EULAG forecast verification results for Alpine domain in 2.2 km horizontal resolution. Wind, temperature, cloud, humidity and precipitation scores are being presented. Verification period covers one summer month (June 2013) and one autumn month (November 2013). Verification is based on data collected by a network of approximately 200 stations (surface data verification) and 6 stations (upper-air verification) located in the Alps and vicinity.