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Comparison of turbulence and convection parametrization schemes in the COSMO-CLM model operated on convection permitting scales over the European Alpine region

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One of the biggest challenge in regional climate models is the proper use of parameterizations. Especially when resolutions increase some of the physical processes become (partially) resolved by the model dynamics and hence parameterizations can be switched off. One of the goal of this study is to investigate the relation between deep and shallow convection and the role of turbulence in COSMO-CLM.

In the framework of the project Non-Hydrostatic Climate Modeling II (NHCM-2; www.nhcm-2.eu), funded by the Austrian Science Fund (FWF; project number P24758-N29), sensitivity experiments with the COSMO-CLM version 5.0, using the usual TKE and TKESV (Turbulent Kinetic Energy Scalar Variances) scheme, recently developed at the German Weather Service; DWD) turbulence scheme and the Tiedke scheme with shallow-convection on/off, are performed. These experiments, driven by analysis fields of the Integrated Forecast System (IFS) of the ECMWF, are run with 3 km horizontal grid spacing and 60 vertical levels ("convection permitting" resolution) over the greater Alpine region. The model output is compared to analysis fields (near surface) of the Austrian nowcasting system INCA (1 km grid spacing) and analysis fields (2D and 3D) of the Swiss forecast model COSMO-7 (7 km grid spacing). In addition to a basic evaluation (temperature and precipitation), cloud over, total radiation, moisture, and vertical wind speed are also considered.

First results indicate that using the Tiedke scheme in this resolution leads to a lack of the precipitation in summer afternoon, because of unrealistic high cloud production. Shallow convection avoids this and leads to a more realistic diurnal cycle in summer precipitation. Further results (including TKSVE) will be shown.