Geophysical Research Abstracts
Vol. 19, EGU2017-15546, 2017
EGU General Assembly 2017

Evaluation and projected changes of precipitation statistics in convection permitting WRF climate simulations over central Europe

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High-resolution regional climate models with a more detailed representation of heterogeneous land surface properties, as well as an explicit treatment of deep convection can lead to an improved simulation of meteorological processes and the climate system at the meso-gamma scale. In this study, results from the WRF RCM of 10 years ERA-Interim driven evaluation runs and 3x10 years MPI-ESM-LR driven climate projection simulations at 3km convection-permitting spatial resolution for a central European model domain are analyzed focusing on precipitation statistics. Science questions addressed are: How well can observations be reproduced? What is the added value of the high resolution runs? How do precipitation intensity distributions change in a future, projected climate? Evaluation simulations from both resolutions are compared and evaluated against sub-daily synop station data over three regions with a moderate, low mountain and high mountain topography. Added value in the 3km simulation is found especially at the sub-daily scale in the reproduction of intensity, diurnal cycle and spatial extent of precipitation. A positive precipitation bias found for both resolutions is more dominant in the 12km simulation, where too much light precipitation is generated. For different seasons, precipitation clearly differs between both simulations with largest differences over mountainous regions and during summer months with high convective activity. In a second part, based on the MPI-ESM-LR RCP4.5 driven control and scenario time slices, we examine changes in precipitation intensity distributions as well as extreme precipitation indices, again for areas with different topographic variances and mean altitudes.