Geophysical Research Abstracts
Vol. 21, EGU2019-9520, 2019
EGU General Assembly 2019

WRF-based dynamical downscaling of ERA5 in High and Central Asia: a sensitivity study of nesting strategies and physical parameterization schemes

Xun Wang, Marco Otto, Vanessa Tolksdorf, and Dieter Scherer

Technische Universität Berlin, Institute of Ecology, Chair of Climatology, Berlin, Germany (xun.wang@tu-berlin.de)

Within the framework of the CaTeNA (Climatic and Tectonic Natural Hazard in Central Asia) project funded by the German Federal Ministry of Education and Research (BMBF), a new version of High Asia Refined Analysis (HAR v2) is currently developed and will be applied to analyze the climatic landslide-triggering factors (e.g. extreme rainfall, fast snowmelt, etc.) in Central Asia. The first version HAR v1 was generated by dynamical downscaling of the Global Operational Final Analysis data (FNL) from the National Centers of Environmental Prediction (NCEP) using the Weather Research and Forecast Model (WRF) version 3.3.1. The HAR v1 covers the period from September 2000 to October 2014 at three-hourly (grid spacing 30 km) and one-hourly (grid spacing 10 km) intervals using a daily re-initialization scheme. Compared to the old version, HAR v2 has the following major changes: (1) using the newly developed ERA5 reanalysis data set as forcing data; (2) extending the 10 km domain; (3) adding new domains with 2 km resolution; (4) using WRF version 4 to apply new model features. As first step, we need to optimize the model set-ups for HAR v2 considering the model performance and the computational costs. In this study, we present a sensitivity study, in which different nesting strategies (direct downscaling and two-way nesting), planetary boundary layer schemes (MYJ, YSU, BouLac) and land surface models (Unified Noah LSM, Unified Noah LSM with mosaic approach, Noah-MP LSM) are compared and evaluated against observations. Preliminary results suggest that even though ERA5 already has a spatial resolution of 0.25° (∼31 km), a 30 km domain is still needed as parent domain when downscaling ERA5 to 10 km resolution, since direct downscaling causes distortions in long-wave dynamics. We found, in accordance to other studies, that there is no optimal combination of physical parameterization schemes in general. The choice always depends on the research region and variable. However, the short time integration of 36 hours (first 12 hours as spin-up time) generally prevents the model from strongly deviating from the forcing data, thus the downscaling results are not highly sensitive to the parameterization schemes.