Geophysical Research Abstracts
Vol. 16, EGU2014-3877, 2014
EGU General Assembly 2014

Future drought scenarios for the Greater Alpine Region based on dynamical downscaling experiments.

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Large scale droughts have major ecologic, agricultural, economic as well as societal impacts by reducing crop yield, producing low flows in river systems or by limiting the public water supply. Under the perspective of rising temperatures and possibly altered precipitation regimes in the upcoming decades due to global climate change, we accomplish an assessment of future drought characteristics for the Greater Alpine Region (GAR) with regional climate model simulations.

This study consists of two parts: First, the ability of the Regional Climate Model COSMO-CLM (CCLM) to simulate drought conditions in the past in space and time is evaluated. Second, an analysis of future drought scenarios for the GAR is conducted. As a drought index the Standardized Precipitation Evapotranspiration Index (SPEI) is used.
For the evaluation of the Regional Climate Model in the past, simulations driven by ERA-40 are compared to observations. The gridded observational datasets of the HISTALP-database are used for evaluation in the first place. To assess the skill of CCLM, correlation coefficients between the SPEI of model simulations and gridded observations stratified by seasons and time scales are accomplished.
For the analysis of future changes in the drought characteristics, four scenario runs are investigated. These are ECHAM5 and HadCM3 driven CCLM runs for the SRES scenarios A1B, A2 and B1. The SPEI is calculated spanning both the C20 and the scenario runs and are therefore regarded as transient simulations.
Generally, trends to dryer annual mean conditions are apparent in each of the scenario runs, whereas the signal is rather strong in summer, contradicted by winter which shows a slight increase in precipitation north of the Alps. This in turn leads to higher variability of the SPEI in the future, as differences between winter (wetter or no change) and summer (considerably dryer) grow larger.