Geophysical Research Abstracts
Vol. 16, EGU2014-1123, 2014
EGU General Assembly 2014

A Markov chain method to determine the dynamic properties of compound extremes and their near future climate change signal

Katrin Sedlmeier, Sebastian Mieruch, and Gerd Schädler
KIT, IMK, TRO, Karlsruhe, Germany (katrin.sedlmeier@kit.edu)

Compound extremes are receiving more and more attention in the scientific world because of their great impact on society. It is therefore of great interest how well state-of-the-art regional climate models can represent the dynamics of multivariate extremes. Furthermore, the near future climate change signal of compound extremes is interesting especially on the regional scale because high resolution information is needed for impact studies and mitigation and adaptation strategies.
We use a method based on Markov Chains to assess these two questions. It is based on the representation of multivariate climate anomalies by first order Markov Chains. We partition our dataset into extreme and non-extreme regimes and reduce the multivariate dataset to a univariate time series which can then be described as a discrete stochastic process, a Markov Chain. From the transition matrix several descriptors such as persistence, recurrence time and entropy are derived which characterize the dynamic properties of the multivariate system.
By comparing these descriptors for model and observation data, the representation of the dynamics of the climate system by different models is evaluated. Near future shifts or changes of the dynamics of compound extremes are detected by using regional climate projections and comparing the descriptors for different time periods.
In order to obtain reliable estimates of a climate change signal, we use an ensemble of simulations to assess the uncertainty which arise in climate projections.
Our work is based on an ensemble of high resolution (7 km) regional climate simulations for Central Europe with the COSMO-CLM regional climate model using different global driving data. The time periods considered are a control period (1971-200) and the near future (2021-2050) and running windows within these time periods. For comparison, E-Obs and HYRAS gridded observational datasets are used.
The presentation will mainly focus on bivariate temperature and precipitation extremes.