Geophysical Research Abstracts
Vol. 18, EGU2016-14062, 2016
EGU General Assembly 2016

Robust increase in concurrent hot and dry periods at the global scale

Jakob Zscheischler and Sonia I. Seneviratne
ETH Zürich, Institute for Atmospheric and Climate Sciences, Zürich, Switzerland (jakob.zscheischler@env.ethz.ch)

Ongoing climate change is largely affecting the frequency and magnitude of climate extremes in many areas of the world. Most studies investigating extreme events focus on a single variable such as, for instance, extreme temperature, drought, and heavy precipitation. Often, however, it is compound extremes that have the strongest impacts on ecosystems and society. For example, extreme rainfall in combination with high soil moisture causes floods with severe impacts. Similarly, droughts combined with extreme hot temperatures have particularly devastating impacts on ecosystem functioning.
The magnitude of an extreme event can be reflected in its return period. Recently, the concept of copulas has been adapted to estimate multivariate return periods of, e.g., drought extent and duration, peak flow and peak volume, or extreme precipitation events at nearby stations. We use this concept here and estimate bivariate return periods of concurrent hot and dry, and concurrent cold and wet periods of 3 months length on gridded temperature and precipitation data from 1901 onwards. We find a strong increase of concurrent dry and hot periods over the recent decades, in particular in the northern hemisphere. At the same time we detect a decrease in concurrent wet and cold periods. This can be primarily attributed to the strong increase in temperature in many land areas. Averaged over the land surface, the variations of concurrently dry and hot, and cold and wet periods over the 20th century can be related to changes in surface radiation (global dimming and global brightening), which affected both temperature and the hydrological cycle.