Geophysical Research Abstracts
Vol. 18, EGU2016-6155, 2016
EGU General Assembly 2016

Influence of spatial and temporal scales in identifying temperature extremes

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Extreme heat events are becoming more frequent. Notable are severe heatwaves such as the European heatwave of 2003, the Russian heat wave of 2010 and the Australian heatwave of 2013. Surface temperature is attaining new maxima not only during the summer but also during the winter. The year of 2015 is reported to be a temperature record breaking year for both summer and winter. These extreme temperatures are taking their human and environmental toll, emphasizing the need for an accurate method to define a heat extreme in order to fully understand the spatial and temporal spread of an extreme and its impact.
This research aims to explore how the use of different spatial and temporal scales influences the identification of a heat extreme. For this purpose, two near-surface temperature datasets of different temporal scale and spatial scale are being used. First, the daily ERA-Interim dataset of 0.25 degree and a time span of 32 years (1979-2010). Second, the daily Princeton Meteorological Forcing Dataset of 0.5 degree and a time span of 63 years (1948-2010). A temperature is considered extreme anomalous when it is surpassing the 90th, 95th, or the 99th percentile threshold based on the aforementioned pre-processed datasets. The analysis is conducted on a global scale, dividing the world in IPCC's so-called SREX regions developed for the analysis of extreme climate events. Pre-processing is done by detrending and/or subtracting the monthly climatology based on 32 years of data for both datasets and on 63 years of data for only the Princeton Meteorological Forcing Dataset. This results in 6 datasets of temperature anomalies from which the location in time and space of the anomalous warm days are identified.
Comparison of the differences between these 6 datasets in terms of absolute threshold temperatures for extremes and the temporal and spatial spread of the extreme anomalous warm days show a dependence of the results on the datasets and methodology used. This stresses the need for a careful selection of data and methodology when identifying heat extremes.