Geophysical Research Abstracts
Vol. 21, EGU2019-16346, 2019
EGU General Assembly 2019

Extreme weather events in the Northern Hemisphere mid- and high-latitude regions and their association with low-frequency climate variabilities and sea ice cover changes

Xavier Levine, Pablo Ortega, Markus Donat, and Ivana Cvijanovic
Barcelona Supercomputing Center, Barcelona, Spain

Arctic climate has experienced a rapid warming in past decades, associated with an extensive loss in sea ice cover. Those changes have been associated with unusual weather events over the Arctic and mid-latitude regions (e.g. heatwave in Scandinavia last summer, or cold outbreaks over Southern Europe last winter). Yet links between the variability in those extreme weather events (droughts/cold events/heatwaves/extreme rain or snowfall that may account for anomalies in both duration and intensity) and changes in the seasonal-mean climate remain poorly understood. In particular, it is unclear whether a drastic reduction in sea ice cover–as observed in recent years– can have a substantial influence on the occurrence of extreme weather events at mid- and high-latitudes (or vice-versa).

Here, we describe extreme weather events and their spatio-temporal variations in mid- and high-latitudes regions, in a large ensemble of simulations with fixed present-day conditions using the EC-Earth coupled climate model. First, we document and explain low-frequency variations in extreme weather events at mid and high-latitudes, and then seek to relate them to interannual or decadal modes of Arctic climate variability. Associations between extreme events and sea ice cover anomalies–occurring concurrently or prior to those extreme event–are quantified to assess seasonal predictability in both fixed present-day and historical conditions. To understand how extreme events respond to decadal changes in sea ice conditions, we then analyze Arctic climate variability in long-run Pre-CMIP6 (H2020 PRIMAVERA) simulations in which sea ice cover evolves freely, and compare them to a large set of CMIP6 (PAMIP) simulations in which sea ice cover is prescribed and held invariant across years. Finally, model biases in extreme weather events are assessed by comparing in both Pre-CMIP6 and CMIP6 simulations to observations of the past decades.