



Interconnections and decadal predictability of global hot, dry and compound hot-dry events

Alvise Aranyossy^{1,2}, Markus Donat^{1,3}, Paolo Deluca¹, Carlos Delgado-Torres^{1,2}, and Balakrishnan Solaraju-Murali¹

¹Barcelona Supercomputing Center, Earth Science Departement, Barcelona, Spain

²Universitat de Barcelona, Barcelona, Spain

³Institució Catalana de Recerca i Estudis Avançats (ICREA), Barcelona, Spain

We investigate the representation of compound hot-dry events in decadal predictions and their relationship with their univariate hot and dry components. We use a CMIP6 multi-model ensemble (MME) of 125 members from the Decadal Climate Prediction Project (DCPP) hindcast simulations and compare it with different observational references. Our analysis focuses on the first five lead years of the simulations, with the different ensemble members initialised every year from 1960 to 2014. We analyse the skill of predicting hot, dry and hot-dry events in the multi-model ensemble. Specifically, we select the days above the 90th percentile of the daily maximum temperature for hot events. For dry events, we use two indicators, the Standardised Precipitation Index (SPI) and the Standardised Precipitation Evapotranspiration Index (SPEI), with accumulation periods of 3, 6 and 12 months, and we consider a dry event a month that shows an SPI or an SPEI value ≤ 1 . Finally, we identify days that present both hot and dry conditions according to these criteria as compound hot-dry days.

Preliminary results for the observations show a strong correlation between precipitation and the occurrence of compound events, especially for long accumulation periods, suggesting the importance of dryness as a driver for compound hot-dry events. In the DCPP hindcasts, the hot events show some robust predictive skill, mainly as a consequence of the increasing trend in temperature. On the other hand, dry events show sparse skill, concentrated in dry areas of the world and especially for extended accumulation periods. Further analysis of the skill of compound events and their relationship to their univariate counterparts in DCPP hindcasts will shed light on the representation of such events in decadal forecasts. However, these initial results underline the importance of precipitation in both the occurrence of present hot-dry compound events and the prediction of such events in the future.