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Influence of atmospheric blocking on heatwaves in large model ensembles

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Heatwaves have notoriously large impacts on our societies but some of these impacts might be alleviated through increased preparedness. Since some heatwaves are triggered by atmospheric blockings, there is hope that with improved forecasts of such blocks, society could be better prepared for heatwaves. To this end, however, we need to better understand the relationship between atmospheric blockings and heatwaves in the present and future climate, especially since heatwaves are also influenced by other factors, such as soil moisture and vegetation interactions. Here, we investigate this relationship and focus on heatwaves in northern Europe and western Russia in two large ensembles from the CanESM2 and NCAR CESM models. This allows us to quantify model uncertainties as well as uncertainties due to internally generated climate variability. We use the Heat Wave Magnitude Index (HWMId), capturing both the duration and intensity of heatwaves in a single number, and an atmospheric blocking index based on daily 500 hPa geopotential height.

First results indicate that strong heatwaves are indeed associated with long-lasting atmospheric blockings, although this is not a necessary condition. In addition, although neither the blocking frequency nor the heatwave magnitudes, when computed relative to present and future reference periods, are expected to significantly change in the future, accounting for large-scale circulation is still highly relevant because it allows for conditional statements.