

More persistent boreal summer weather in a 2°C world

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Persistence is a key characteristic of many damaging extreme weather events as heat waves, droughts or floods. For instance, the summer 2018 was extreme in Europe due to a nearly uninterrupted warm and dry period that lasted over several months. This extended heat wave wasn't especially extreme in terms of daily temperature records but severely impacted agriculture and water availability. While an intensification of heat and rainfall extremes has been reported as a consequence of global warming, it is still debated whether greenhouse gas forcing leads to more persistent summer weather. Some studies suggest that local weather persistence is increasing whereas climate models project a decline in the frequency of atmospheric blocking events.

Here we systematically analyse changes in persistence of local weather conditions in four GCMs in a 2°C, 1.5°C and a current climate scenario. Our approach is based on the length of periods of relatively warm, rainy, dry and compound dry-warm daily weather conditions. We find that boreal summer weather is projected to become more persistent in the mid-latitudes in a 2°C scenario as compared to present day climate conditions with a relative increase of 5% in the probability of 14-day long dry-warm periods and up to 25% relative increase in the probability for 7 consecutive rain days. The consistent lengthening of periods of all kinds of local weather conditions suggests that on top of thermodynamic forcing, global warming intensifies extreme weather events by dynamically lengthening periods of severe weather.