



Heatwaves and compound extremes under atmospheric blocking

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In early September 2023, Europe was under the influence of a pronounced atmospheric block in the shape of the Greek letter “omega”. Such an *omega-blocking* is characterized by a persistent anticyclone in the center flanked by two low pressure systems to the south in the west and east. The omega-block interrupts the mean westerly flow and leads to prolonged persistent conditions lasting for at least five days. The core of the omega-blocking in September 2023 was located over Central Europe and Southern Scandinavia, which experienced a heatwave in the first week of September 2023. On the other hand, the regions positioned at the eastern flanks of the omega-blocking (Greece, Bulgaria, Libya) were hit by heavy precipitation resulting in major floods.

While omega-blocking situations can result in severe spatially compounding extremes, there is still a research gap on current and future dynamics of (omega) blocking. Current generations of climate models underestimate blocking frequencies – especially over Europe. This makes it difficult to derive robust statistics about blocking related compound extremes under current and future climate, because the observational record only offers a limited number of event examples and atmospheric blocking underlies a high natural climate variability.

We employ the novel method of ensemble boosting to explicitly boost blocking situations in the Community Earth System Model 2 (CESM2) large ensemble. With this model re-initialization method initial conditions 10 to 30 days before the event are slightly perturbed, which results in hundreds of coherent physical event trajectories (event storylines). This allows to study following research questions: Is the CESM2 model capable of reproducing an omega blocking event with spatially compounding extremes in the magnitude of the September 2023 event? Could the September 2023 event have been even more devastating by chance? Have we experienced anything close to the most intense compound omega-blocking event possible under current climatic conditions? In our poster, we present our research concept as well as preliminary results.