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On the key role of anthropogenic warming in triggering extreme convective events: the case of the destructive Mediterranean derecho in 2022

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A derecho is a widespread, long-lived, straight-line windstorm that is associated with a fast-moving group of severe thunderstorms known as a mesoscale convective system.

During 18 August 2022, a highly intense and organized convective storm, classified as a derecho, developed over the western Mediterranean Sea affecting Corsica, northern Italy and Austria, with wind gusts up to 62 m/s and giant hail (~11 cm). There were 12 fatalities and 106 people injured. This event received much attention in the media for its extraordinary impact and the rareness over the Mediterranean Sea. The derecho developed over an extreme marine heatwave that persisted during the whole summer. Therefore, the hypothesis of a relationship between the extreme atmospheric event and the extreme marine heatwave rapidly arose, and thus, a possible link with anthropogenic climate change.

This convective event can be considered as extreme from the affected locations point of view (in terms of winds) but also is between one of the most powerful derechos ever recorded in the USA and Europe. Also, the event developed over an extreme marine heatwave that was mainly affecting the western Mediterranean Sea during summer 2022.

Here, by performing model simulations with both the NCAR Model for Prediction Across Scales and the Météo-France nonhydrostatic operational AROME model and using an storyline approach, we find a relationship between the marine heatwave, the actual anthropogenic climate change conditions, and the development of this extremely rare and severe convective event. We also find a future worrying increase in intensity, size and duration of such an event with future climate change conditions.