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Compound occurrence of heat waves and drought in the Northern Hemisphere, atmospheric circulation patterns and impacts.

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The compound occurrence of heatwaves and droughts (COHWD) may result in disastrous impacts and losses across various socioeconomic sectors. Therefore, it is important to understand and predict these phenomena to support decision makers and stakeholders in implementing preparedness and adaptation measures. However, questions concerning the underlying physics that drive and potentially exacerbate these extremes in the future still remain open.

This study focuses on identifying COHWD and their characteristics during the lasts 62 summers through the analysis of atmospheric variables from the ERA5, GPCC and CRU datasets in the northern hemisphere (NH). Three regions, as categorized in the latest IPCC report, are analyzed: Western & Central Europe (WCE), the Mediterranean (MED) and Eastern Asia (EAS). These regions are selected because they account for the main breadbaskets in the NH.

Results show that WCE and MED have witnessed an increase in the area affected by COHWD over . In contrast, EAS does not exhibit a clear trend over the past six decades. Moreover, by analyzing the variability of large atmospheric circulation patterns and climate oscillations, such as the North Atlantic Oscillation and the El Niño/Southern Oscillation, the dynamical drivers of COHWDs are identified. This research aims at providing new insights into the dynamical mechanisms driving COHWDs, to improve the identification, understanding, prediction and management of such events in the future.