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Comparison Analysis of the Climate Extreme in 2022

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Extreme events are on the rise. The 2022 compound heatwave and drought event caused significant vegetation mortality and serious ecosystem destruction in Europe that urgently need to be investigated. In this study, we used climate data (ERA5-Land air temperature at 2 m and precipitation) and remote sensing products (kNDVI derived from MODIS and ESA CCI Land Cover product) to investigate the dynamics of the 2022 extreme events and vegetation responses. Furthermore, we compared the effects of this year to other normal as well as abnormal years in Europe. We propose a ranking-based approach that compares cumulative sums of climate variables and kNDVI over the growing season to determine extreme areas and compound intensity over the last 23 years.

The results show that the 2022 event is a widespread compound heatwave and drought event, with a similar spatial pattern to the 2018 extreme event, but less severe. Vegetational response differed among land cover classes, grassland was more affected while deciduous trees were barely affected in the 2022 event. In general, vegetation recovered relatively quickly after the 2022 event.

Our ranking-based approach enables an effective comparison and characterization of climate extremes and their effects on vegetation over different years. A more in-depth analysis of spatial and temporal patterns can contribute to the development of targeted measures and support decision-makers in responding to climate extremes.