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Assessing the climate drivers leading to winter wheat yield shock in Europe

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Ongoing global warming has major implications on the food security and the agricultural sector. Extreme weather such as precipitation extremes, heatwaves, frost and drought can cause severe reductions in crop production. Furthermore, these events can be strongly amplified when considered as compound events. In this study, we inquire into the temporally combination of climate extremes leading to substantial drops in winter wheat yield (in the following called “yield shock”) throughout different countries in Europe. Winter wheat is one of the most important crops in Europe in terms of production, and is also acknowledged a major crop globally. We use the Global Data of Agricultural Yield, a satellite-reported yield hybrid dataset of major crops. We categorise the yield as “yield shock” and “no yield shock” in order to reduce the uncertainty and to mainly focus on historical yield plunges. We consider and test different climate indicators (like the number of warm days or cumulative precipitation) that represent weather extreme events at a subseasonal scale. Moreover, we employ a Random Forest to capture any possible nonlinear relation. Our study illustrates the probability of winter wheat yield shock under the occurrence and co-occurrence of subseasonal weather extremes, and the nuances throughout countries with different climatic patterns.