Drivers and future changes in simultaneous extremes and their implications for global food security

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In a strongly interconnected world, simultaneous extreme weather events in far-away regions could potentially impose high-end risks for societies. In the mid-latitudes, amplified Rossby waves are associated with a strongly meandering jet-stream causing simultaneous heatwaves and floods across multiple major crop producing regions simultaneously with detrimental effects on harvests and potential implications for global food security.

While no scientific consensus on future changes in these wave events has been established so far, impacts of associated extremes are expected to become more severe due to thermodynamic factors alone, possibly enhancing crop production co-variability across major breadbasket regions and amplifying future risks of multiple harvest failures.

Quantifying future changes in crop co-variability linked to amplified Rossby waves faces a key challenge: Models need to exhibit sufficient skill along a chain of complex and non-linear features, namely i. Rossby Wave characteristics, ii. location and magnitude of associated surface extremes and iii. respective yield response. Here we investigate those relationships in the latest CMIP6 and GGCMI model simulations, providing preliminary results on future changes in crop production co-variability, linked to amplified Rossby waves.