How Well Do Global Gridded Crop Models (GGCMs) Replicate the Responsiveness of Historical US Yields to Weather?

Objective

Characterize differences in yield responses to heat and moisture among GGCMs, and between models and observations.

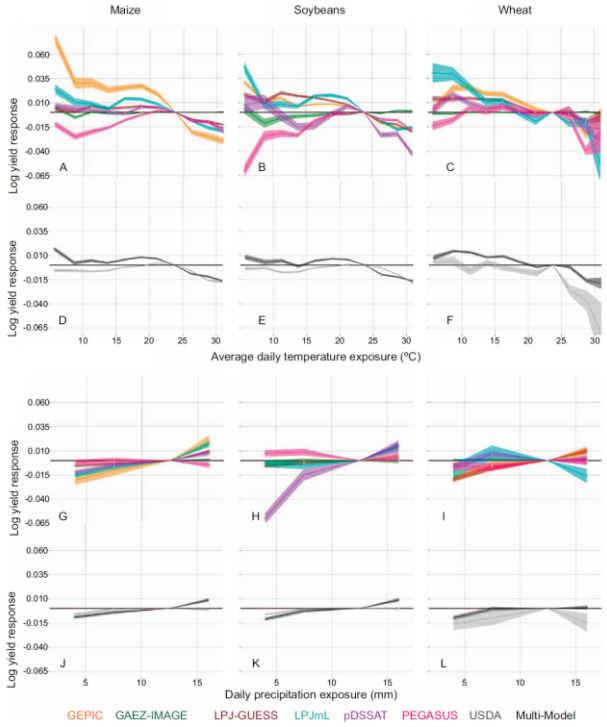
Approach

We compare rainfed maize, wheat, and soybean yields simulated by six GGCMs against USDA records for ~1,000 counties.

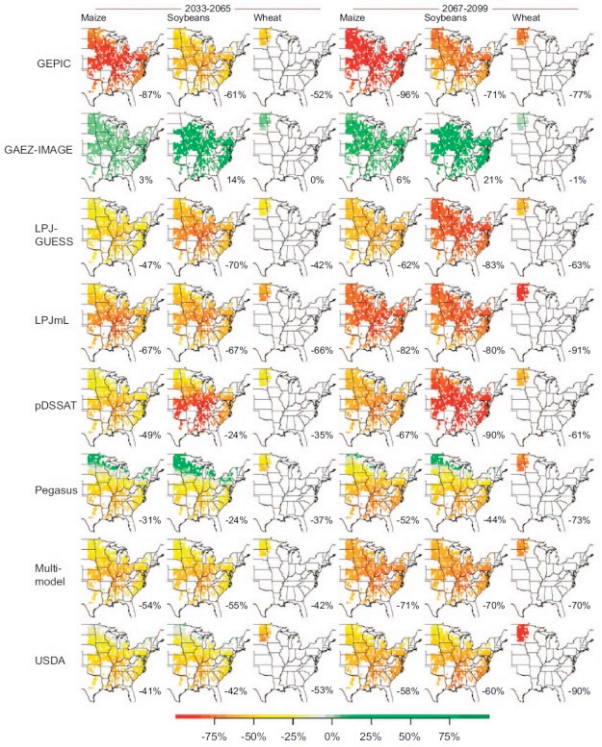
We derived modeled and observed yield responses to heat and moisture using econometric methods from empirical climate change economics.

Impact

Diagnosing GGCMs' skill against observed yield anomaly distributions, and why their responses differ, provides context for interpretation of crop model projections of climate change impacts, and helps pinpoint specific internal process representations for improvement.



GGCM yield responses to heat (A-C) and moisture (G-I) are larger than those for observations (D-F and J-L).



GGCM responses generate yield impacts of climate change at mid- and end-of-century that diverge from one another, and often overstate observationally-based projections.

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Mistry, M., I. Sue Wing and E. De Cian (2017). Simulated vs. empirical weather responsiveness of crop yields: US evidence and implications for the agricultural impacts of climate change, Environmental Research Letters 12: 075007. https://doi.org/10.1088/1748-9326/aa788c