Statistically bias-corrected and downscaled climate models underestimate the adverse effects of extreme heat on U.S. maize yields

**Objective**

Many studies rely on bias-corrected and downscaled climate information for coupled human-environment analysis. We quantify potential biases of this approach in the agricultural sector.

**Approach**

We use an ensemble of statistically bias-corrected and downscaled climate models (NEX-GDDP), as well as the corresponding parent models (CMIP5), to drive a statistical panel model of U.S. maize yields and analyze uncertainty in hindcasts and projections.

**Impact**

Most CMIP5 models considerably overestimate historical yield variability while the NEX-GDDP models underestimate the magnitude of the largest yield shocks, which we attribute to the effects of downscaling and bias-correction on temperature extremes. We also find large differences between the ensembles in projections.

**Figure: National-level evaluation of NEX-GDDP and CMIP5 maize yield hindcasts.** Panel a) shows historical (1956-2005) national-level log-yield distributions from each CMIP5 model (orange), NEX-GDDP model (purple), and the observational data (black). Panel b) shows percentage differences between each individual NEX-GDDP model and the observational data, for our chosen summary statistics: the mean, standard deviation (SD), 10th percentile (q10), and minimum (Min.). Panel c) shows the equivalent to b) but for the CMIP5 models.