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# Statistical estimates to emulate yields from global gridded crop models

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This study provides a statistical emulator of crop yields based on global gridded crop model simulations from the Inter-Sectoral Impact Model Intercomparison Project Fast Track project. The ensemble of simulations is used to build a panel of annual crop yields from five crop models and corresponding monthly weather variables for over a century at the grid cell level. This dataset is then used to estimate, for each crop and gridded crop model, the statistical relationship between yields and temperature, precipitation and carbon dioxide. This study considers a new functional form to better capture the non-linear response of yields to weather, especially for extreme temperature and precipitation events. In- and out-of-sample validations show that the statistical models are able to closely replicate crop yields projected by the crop models and perform well out-of-sample. This study therefore provides a reliable and accessible alternative to global gridded crop yield models. By emulating crop yields for several models using parsimonious equations, the tools will be useful for climate change impact assessments and to account for uncertainty in crop modeling.