



Effect of hourly rainfall extremes on maize yields in the United States

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Crop production is susceptible to weather extremes over hourly to seasonal timescales. Much attention has been devoted to the impact of short-duration heat extremes and seasonal droughts on crop yields, however the effect of heavy convective rainfall on crops remains relatively understudied, not least due to low temporal resolution of typical rainfall observations. Heavy rainfall may reduce crop yield by saturating soil and causing root zone anoxia, eroding soil and leaching soluble nutrients, and directly damaging above ground plant tissue. The globally important Midwestern maize belt of the United States is particularly prone to mesoscale convective weather systems that deliver frequent heavy rainfall during the growing season. In this study, we use radar-derived hourly rainfall measurements from an array of radar and weather stations across the United States with county-level maize yield data to estimate the impact of extreme rainfall events during the growing season on maize yield. In the context of increasing frequency and intensity of such rainfall extremes across much of the globe, this study provides a baseline estimate of maize sensitivity to short duration rainfall extremes in the present climate. In addition, these findings may help identify and characterize vulnerabilities and resilience to such extremes among maize crops as well as opportunities for adaptive management and crop development.