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Local climate variability and rainfed maize agriculture in Highland Oaxaca, Mexico

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We study climate variability and impacts on maize agriculture in highland Oaxaca, Mexico, by integrating local knowledge and quantitative climate data. Farmers in three small agricultural communities were interviewed about the effects of climate on rainfed agriculture. Farmers identified dry season soil moisture and frost occurrence as being very important variables for traditional maize varieties, known as 'maize de cajete'. Using station gauges and remotely sensed data, we constructed indices of these key climate variables, and found strong associations with ENSO variability. We also asked farmers about their historical memories of local climate change. Many farmers who have switched from 'maize de cajete' to other crops cite long-term declines in fall and spring rainfall as important factors in their decision-making. Using nearby stations with long time records, we constructed a time series of climate anomalies from the mid twentieth century. Preliminary results suggest that mean dry season rainfall has not decreased significantly since the 1980s, but that there has been an increase in precipitation variability, which we hypothesize partly explains the change in growing strategies. We also examine whether increased temperatures may explain a decline in soil moisture. Additionally, we attempt to downscale regional climate change projections to develop adaptation strategies for highland Oaxaca farmers at local scales. Climate models generally show increased temperatures and variability in precipitation over the next few decades, which may complicate farmers' attempts to continue to grow traditional rainfed maize varieties. However, the level of uncertainty at local scales poses a challenge towards developing adaptation strategies. Furthermore, as shown by farmers' adaptation strategies to interannual climate variability, vulnerability to climate change is strongly dependent on social and economic factors at different scales. Our study illustrates some of the complexities of combining physical climate projections and local knowledge to understand climate change vulnerability and resilience.