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Tempo-spatial downscaling of multiple GCMs projections for soil erosion risk analysis at El Reno, Oklahoma, USA

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Proper spatial and temporal treatments of climate change scenarios projected by General Circulation Models (GCMs) are critical to accurate assessment of climatic impacts on natural resources and ecosystems. For accurate prediction of soil erosion risk at a particular farm or field under climate change, climate change scenarios projected by General Circulation Models (GCMs) must be appropriately downscaled to the target location. The objective of this study was to evaluate site-specific impacts of climate change on soil erosion and surface hydrology at El Reno, Oklahoma in U.S.A. using the Water Erosion Prediction Project (WEPP) model. Climate change scenarios during 2010-2039 projected by four GCMs (CCSR/NIES, CGCM2, CSIRO-Mk2 and HadCM3) under three emission scenarios (A2, B2 and GGa) were used. Monthly projections at the GCMs grid scales were tempo-spatially downscaled to daily weather data at the El Reno location. Univariate transfer functions were derived by matching probability distributions between location-measured and GCM-projected monthly precipitation and temperature for the 1957-2006 period. The derived functions were used to spatially downscale the GCMs monthly projections of 2010-2039 to the El Reno unit watershed. The downscaled monthly data were further disaggregated to daily weather series using a stochastic weather generator (CLIGEN). Potential changes in soil erosion risk or uncertainty at the study location will be evaluated using soil erosion rates predicted using the WEPP model for the climate change scenarios projected by the four GCMs. The effectiveness of conservation tillage under future climate change will also be explored.