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# Climate change and its impact on precipitation, runoff, and erosion in a small semi-arid watershed of the American Southwest

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Changes in precipitation due to climate change may contribute to changes of soil erosion and runoff in semi-arid rangelands. Therefore it is important to quantify the spatial-temporal characteristics of precipitation in order to better understand climate impacts on soil erosion and sedimentation. This study investigates historic changes in spatial-temporal precipitation and the responses of corresponding soil erosion and sedimentation in a small catchment of the Walnut Gulch Experimental Watershed (WGEW) - a semiarid rangeland watershed of the American Southwest. Spatial and temporal dynamics in rainfall and rainfall energy and erosivity are analyzed on the more than 50 years of records in the densely distributed rainfall gauges network in WGEW. The discussion focuses on data preprocessing, time series modeling, dimension reduction, spatial-temporal analysis, and potentially the spatial-temporal array in data management.

The process-based hydrological and soil erosion model -Water Erosion Prediction Project (WEPP) (Flanagan and Nearing, 1995) and the GIS interface of WEPP - GeoWEPP (Renschler, 2003) was used to investigate the relationship between climate change and soil erosion. Observed precipitation and precipitation statistics that represent the watershed were processed into climate files and applied to simulate the runoff, sediment yield and erosion with WEPP/GeoWEPP in hillslope and different watershed scales, of which the results were compared with annual rainfall erosivity.

The contributions of this study were: 1) analyzing the explicit spatial-temporal rainfall and rainfall energy; 2) testing the capability of WEPP/GeoWEPP in simulating climate change effects on sediment leaving and soil erosion in semiarid rangeland watersheds; and 3) analyzing the impact of climate change on water runoff and soil erosion.