Geophysical Research Abstracts
Vol. 13, EGU2011-7884-2, 2011
EGU General Assembly 2011

tRIBS-Erosion: combining mechanistic approaches for investigating eco-hydro-geomorphic response of river basins to climate change

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Vegetation interacts with hydrology, geomorphology and processes of a river basin in profound ways. Despite recent advances in hydrological modeling, the dynamic coupling between these processes is yet to be adequately captured at the basin scale to elucidate key features of process interaction and their role in the organization of vegetation and landscape morphology.

In this study, a newly integrated geomorphic component of the physically-based, spatially distributed hydrological model, tRIBS, the TIN-based Real-time Integrated Basin Simulator, is presented. Hillslope and channel erosion processes are parsimoniously coupled with vegetation-hydrology dynamics, making it possible to study how vegetation influences the hydrological and geomorphological processes.

In this study, the coupled model is used to analyze the sensitivity of landscapes to projections of climate change. Downscaled outputs of global circulation models inform a weather generator that is used to generate an ensemble of scenarios for Southwest U.S. These projections serve as input to the integrated model that is applied to two synthetic basins.

An assessment of processes of erosion and deposition for the different climate scenarios is carried out in an attempt to improve the understanding of the basin behavior to projected climate change.