Geophysical Research Abstracts
Vol. 15, EGU2013-6374, 2013
EGU General Assembly 2013

The influence of orogenic plateau formation on climate and erosion

Todd A. Ehlers
University of Tübingen, Department of Geosciences, Tübingen, Germany (todd.ehlers@uni-tuebingen.de)

The development of orogenic plateaus such as the Andean and Tibetan Plateaus has a strong influence on regional climate. Changes in plateau elevation over million-year timescales modifies the distribution and magnitude of precipitation, surface temperatures, and wind directions. These changes in climate impact the erosion of plateau margins, stable isotope derived paleoaltimetry estimates, and plant ecosystems that influence orogen weathering, erosion, and sediment transport. Unfortunately, quantitative estimates of the spatial distribution and magnitude of climate change occurring during plateau development are limited.
In this study, the influence of changing plateau topography on paleoclimate is evaluated. A series of experiments are presented using regional and global Atmospheric General Circulation Models (AGCM) to characterize changes in precipitation amount, surface temperature, and wind direction (vapor source) as a function of changing plateau elevation. Emphasis is placed on understanding the evolution of Andean and Tibetan Plateau topography and climate. Results indicate that South American and Andean climate changed significantly in response to plateau growth. More specifically, lowering of the plateau to below 0.50-0.75 of its present day elevation results in a 700 mm/yr decrease in mean annual precipitation over large portions of the Andes. Plateau lowering also results in a 6 to 10 C increase in temperatures (after correction for a change in lapse rate) over the central Andean Plateau. Finally, the prevailing wind direction and the vapor source for precipitation progressively changes from the equatorial Atlantic to South Pacific as plateau elevation decreases. Similarly large changes in precipitation, temperature, and wind directions are noted for the Himalaya-Tibet orogen. The impact of these changes on climate-sensitive paleoaltimetry data and fluvial erosion of plateau margins is discussed.