Geophysical Research Abstracts, Vol. 9, 06038, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-06038

Erosion-driven nutrient dynamics in different vegetation communities in Jornada, New Mexico: implications for land degradation.

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We present the results from a series of small-scale rainfall-simulation experiments undertaken in the dryland environment of Jornada, New Mexico, with the aim of linking erosion and runoff dynamics with changes in dissolved and sediment-bound nutrient fluxes. Quantifying nutrient fluxes in a degrading landscape enables us to investigate feedbacks between erosion, nutrient transfers and vegetation dynamics. Rainfall simulations were undertaken on 1.5 m^2 plots on three vegetation types: mesquite, creosotebush, and grassland. Mesquite and creosotebush represent degraded land, whereas the grassland represents land prior to degradation onset. Fluxes of dissolved nutrients (NH_4^+, NO_3^-, PO_4^{3-}, K^+ and major cations and anions) and bio-available sediment-bound nutrients (N, P and K) in runoff were determined, and the relationship between particle size and nutrient transfers was investigated. Preferential erosion of finer material was one of the driving factors behind the different sediment-bound nutrient dynamics according to vegetation type. Relationships between the quantities and species of nutrients and sediment-transport dynamics suggest important implications for land degradation. The grassland in Jornada was less able to conserve nutrients in both dissolved and sediment-bound forms than the mesquite and creosotebush. The location of the remaining pockets of grassland (i.e. whether they are source or sink areas) will determine the susceptibility of those areas to further land degradation within Jornada.