Geophysical Research Abstracts
Vol. 13, EGU2011-3057, 2011
EGU General Assembly 2011

Trees, topography and erosion: a comparison of two landscapes

Bill Dietrich and Dino Bellugi
Department of Earth and Planetary Science, University of california, Berkeley 94720, USA

A comparison of two landscapes in the coastal mountains of the western United States raises many questions. Both of these forested sites, which have never been logged, experience rainfall in excess of 2 m. At the more northerly site (Oregon), conifer trees dominate the ridges and side slopes while hardwoods are found along the canyon floors. At the southern site (California) hardwoods dominate the ridges and side slopes while conifers instead occur along the valley axes. Fire, once strongly managed by Native Americans, appears to have left a different legacy at each site, with the Oregon site having not experienced fire for perhaps 100's of years, while frequent burning was continued into the 20th century in California. We propose that in Oregon, the hardwoods (a known disturbance species, Alnus rubra) along the canyon corridors reflect the effects of repeated debris flow scour in a moist environment favorable to this tree's recruitment. A model under development specifically accounts for the species specific effects of root strength in predicting landslide size and is linked to a simple debris flow runout to delineate this interaction. Instability and erosion rates also depend on biogenic-induced soil production and transport rates. In the California site, conifers are currently invading and replacing the hardwood domains. This spread, however, may be buffered by bedrock properties. An on-going intensive field study suggests that rock moisture in the underlying fractured bedrock may provide critical late summer water. We hypothesize that such water is not available in the mélange rocks to the east. Limited dating of debris flow deposits and review of historical records suggest that debris flows while active in the Holocene have not occurred for perhaps more than 100 years in this study area. Here debris flows may also be primarily linked to the motions of large deep-seated landslides, whose activities (as inferred from morphology and cosmogenic dating) has been considerably less in the Holocene than in the wetter Pleistocene. The absence of debris flows would then allow the conifers refuge from frequently set fires in the moist steep canyon corridors. Hence, the striking reversal of forest dominance and topography relationships at the two sites appears to record the interplay of fire history, topographic-driven moisture dynamics, lithologic properties, climate history, and landsliding.