Geophysical Research Abstracts, Vol. 9, 05056, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-05056
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Role of land use/-cover in controlling runoff generation on mountain slopes

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Mountain ecosystems fulfill essential hydrological functions, as they act as important water sources and regulators. Although there is a growing interest in evaluating the effect of global change (such as climate and land use/-cover change) on mountain hydrology, quantitative assessments are often hampered by the lack of field measurements characterizing runoff generation processes.

In this paper, we present results on rainfall runoff mechanisms in the southern Ecuadorian Andes. A rainfall simulator was used to quantify the hydrological response of distinct land use/-cover types to intense rainfall (36 mm/h). Our rainfall runoff experiments indicate that runoff generation on mountain slopes is highly variable. Although accelerated runoff and erosion have commonly been related to agricultural activities, our experimental data indicate that degraded and abandoned land are the most important sites of runoff generation. Degraded and abandoned land generate surface runoff within a few minutes after the start of the rainfall event. These lands have a very rapid and sharp hillslope hydrological response, as Hortonian overland flow is the dominant runoff generation mechanism. In contrast, surface runoff on arable and rangeland is rare. Their soils are characterized by a high infiltration capacity (i.e. $>$ 29 mm/h), and runoff generation by Hortonian overland flow is limited or simply not occurring.

The differences in hydrological response that were observed between various land

use/-cover types in the southern Ecuadorian Andes imply that land use/-cover change is expected to have a significant effect on catchment hydrology.