ASSESSMENT OF THE VARIABILITY IN THE HYDROLOGIC RESPONSE OF MICRO-CATCHMENTS IN THE SOUTHERN ANDES MOUNTAIN RANGE OF ECUADOR

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The overarching goal of the research was to characterize the variability of the hydrologic response of 7 micro-catchments in the Southern Andes of Ecuador, and to explain differences in hydrologic response on the basis of climate, topography, soils, geology and landuse. The size of the catchments varied between 0.59 and 10.01 km^2, with an average slope between 22.61 and 75.76%. The comparative analysis is based on data collected during a period of 350 to 916 days. Rainfall and streamflow were measured with an interval of 5 minutes. Annual rainfall during the observation period varied between 1000 and 1200 mm per year, with the exception of one micro-catchment with a much drier climate, totaling an annual rainfall of 650 mm. Five of the catchments have an unimodal rainfall regime with a dry period of 7 months, whereas two catchments a bimodal rainfall distribution with a 3-month dry period. Soils in the micro-catchments consist primarily of degraded shallow stony soils (Leptosols) and deep soils with high organic matter content (Andosols), or a mixture of both dominant soil types. The volcanic underground consists primarily of molten rock and lava. Landuse in the studied micro-catchments varied from dominant páramo, pine forest to grassland, or a mixture of those landuses.

Flow duration curves of non-degraded well preserved micro-catchments, i.e. micro-catchments in which Andosols and forest/páramo vegetation are dominant, are characterized by a fairly uniform distribution even in dry periods. In degraded basins, i.e. micro-basins with shallow and stony soils with landuse including cultivated land and waste land, flow duration curves reflect high flows with very low streamflows during the dry season. Research results clearly demonstrate that under average rainfall conditions catchment characteristics and landuse have a regulating impact on rainfall-runoff. On the basis of the 35-year rainfall record of a nearby weather station observed extreme rainfall events, and related streamflows, had a return period of 1 in 37.5 to 125 years. The corresponding streamflows, expressed per unit area, were very similar independent the basin characteristics and landuse indicating that the regulating effect of basin characteristics and landuse is strongly neutralized under extreme events.