Geophysical Research Abstracts
Vol. 16, EGU2014-378-2, 2014
EGU General Assembly 2014

Spatial variability of mountain stream dynamics along the Ethiopian Rift Valley escarpment

Tesfaalem-Ghebreyohannes Asfaha (1,2), Amaury Frankl (1), Amanuel Zenebe (3), Mitiku Haile (3), and Jan Nyssen (1)

(1) Ghent University, Department of Geography, Gent, Belgium (TesfaalemGhebreyohannes.Asfaha@ugent.be), (2) Department of Geography and Environmental Studies, Mekelle University, Mekelle, Ethiopia, (3) Department of Land Resources Management and Environmental Protection, Mekelle University, Mekelle, Ethiopia

Changes in hydrogeomorphic characteristics of mountain streams are generally deemed to be controlled mainly by land use/cover changes and rainfall variability. This study investigates the spatial variability of peak discharge in relation to land cover, rainfall and topographic variables in eleven catchments of the Ethiopian Rift Valley escarpment (average slope gradient = 48% ($\pm$ 13%). Rapid deforestation of the escarpment in the second half of the 20th century resulted in the occurrence of strong flash floods, transporting large amounts of discharge and sediment to the lower graben bottom. Due to integrated reforestation interventions as of the 1980s, many of these catchments do show improvement in vegetation cover at various degrees. Daily rainfall was measured using seven non-recording rain gauges, while peak stage discharges were measured after floods using crest stage gauges installed at eleven stream reaches. Peak discharges were calculated using the Manning's equation. Daily area-weighted rainfall was computed for each catchment using the Thiessen Polygon method. To estimate the vegetation cover of each catchment, the Normalized Difference Vegetation Index was calculated from Landsat TM imagery (mean = 0.14 $\pm$ 0.05). In the rainy season of 2012, there was a positive correlation between daily rainfall and peak discharge in each of the monitored catchments. In a multiple linear regression analysis (R^2 = 0.83; $P<0.01$), average daily peak discharge in all rivers was positively related with rainfall depth and catchment size and negatively with vegetation cover (as represented by average NDVI values). Average slope gradient of the catchments and Gravelius's compactness index did not show a statistically significant relation with peak discharge. This study shows that though the average vegetation cover of the catchments is still relatively low, differences in vegetation cover, together with rainfall variability plays a determining role in the amount of peak discharges in flashy mountain streams.