

Geo-morphometric Analysis of Sub-watersheds for Flash Floods Hazard Management

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Abstract

Flash Floods are difficult to predict in terms of time and place of occurrence because they form rapidly. In addition, the rainfall depths and duration required to cause flash floods will vary with topography, channel characteristics and antecedent conditions. Knowledge of the flash flood hazards as well as vulnerabilities is a fundamental prerequisite in designing action plans for reducing flash flood disaster risks. However, many developing regions with observed flooding incidences are also regions of scarce hydrological data. The meteorological and rainfall systems within such developing regions are rarely well developed while the density of river gauging stations is also poor. However, a tentative flash flood hazard assessment may be achieved through morphometry, the analysis of terrain characteristics, for the factors that contribute to the occurrence of the Flash Floods. Through the study of basin morphometry, we can relate the basin and stream network geometries, shape and relief to the transmission of water and sediment in the basin. Morphometric parameters provide insight into the surface flow, discharge, permeability, infiltration, magnitudes of peak, mean runoff as well as runoff direction and volume. This paper describes a workflow for computing the geo-morphometric parameters from a Digital Elevation Model using QGIS, open source Geographic Information Systems software. The Geo-morphometric parameters were computed for the Breg-Brigach catchment, within the state of Baden Wuerttemberg in Germany, normalized and combined to derive Flash Flood Hazard maps. In addition the paper discusses the potential of the Geo-morphometric parameters in Flash Flood Hazard Management by considering the relationship between these parameters and Flash Floods occurrences.

Key Words: DEM, Flash Floods, Geomorphometry, QGIS, Watersheds