



Modelling soil erosion in a head catchment of Jemma Basin on the Ethiopian highlands

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Soil erosion represents one of the most important global issues with serious effects on agriculture and water quality especially in developing countries such as Ethiopia where rapid population growth and climatic changes affect wide mountainous areas. The catchment of Andit-Tid is a head catchment of Jemma Basin draining to the Blue Nile (Central Ethiopia). It is located in an extremely variable topographical environment and it is exposed to high degradation dynamics especially in the lower part of the catchment. The increasing agricultural activity and grazing, lead to an intense use of the steep slopes which altered the soil structure. As a consequence, water erosion processes accelerated leading to the evolution of sheet erosion, gullies and badlands.

This study is aimed at a geomorphological assessment of soil erosion susceptibility. First, a geomorphological map is generated using high resolution digital elevation model (DEM) derived from high resolution stereoscopic satellite data, multispectral imagery from Rapid Eye satellite system. The map was then validated by a detailed field survey. The final maps contains three inventories of landforms: i) sheet, ii) gully erosion and iii) badlands. The water erosion susceptibility is calculated with a Maximum Entropy approach. In particular, three different models are built using the three inventories as dependent variables and a set of spatial attributes describing the lithology, terrain, vegetation and land cover from remote sensing data and DEMs as independent variables. The single susceptibility maps for sheet, gully erosion as well as badlands showed good to excellent predictive performances. Moreover, we reveal and discuss the importance of different sets of variables among the three models.

In order to explore the mutual overlap of the three susceptibility maps we generated a combined map as color composite whereas each color represents one component of water erosion. The latter map yield a useful information for land use managers and planning purposes.