Geophysical Research Abstracts
Vol. 15, EGU2013-784-3, 2013
EGU General Assembly 2013

Evaluating lavaka (gully) distribution and evolution in Madagascar between 2000 and 2009 using satellite image analysis

Andrea Raveloson (1) and Balázs Székely (1,2)

(1) Department of Geophysics and Space Sciences, Eötvös University, Budapest, Hungary (ravelosonegyed@gmail.com), (2) Research Groups Photogrammetry and Remote Sensing, Department of Geodesy and Geoinformation, Vienna University of Technology, Vienna, Austria

Lavaka (gully erosion) in Madagascar's central highlands occurs in many different forms and at various spatial scales causing many problems in agricultural lands (e.g., siltation of tilled fields). To have a better understanding on their distribution, evolution and impact on Malagasy soils, studies on regional scales need to be done. Therefore satellite imagery (Digital Globe through Google Earth) from 2000 and 2009 (2010, 2011 or 2012) were compared in order to understand the cause of lavaka density variation between the different selected study areas.

Nine regions were outlined in a total of 530 km^2 area, of which 313 km^2(six regions) were marked out in the lavaka-prone area, designated by earlier studies, and 217 km^2 (three of the selected nine regions) were analyzed outside this area. Lavaka density for each region was calculated for 2000 and 2009 through Google Earth, while the shape and size of individual lavakas were examined and measured using GIS tools. Changes in shape and size were studied from georeferenced overlapping images. Average lavaka density, size and their change between 2000 and 2009 were calculated for each region with the possible causes of differences between areas with high and low density Complexity and differences in the shape of individual lavakas were also studied that gave the following results. Data of lavaka density show great differences between the regions and unexpectedly high lavaka density ($>$1.5 lavaka km^{-2}) was found outside the lavaka-prone area, whereas very low density (0.1 lavaka km^{-2}) was noticed in regions located in the lavaka-prone area. Average density was 2.8 lavaka km^{-2} (with a max of 8.0 lavaka km^{-2}) in the lavaka-prone area (for 2006) and some slight lavaka densification (about 5%) was observed in most regions while decrease (due to the coalescence of individual lavakas) was detected in one region. Size of individual lavakas varies greatly from one spot to another and their shape show great diversity. Mid-slope and toe-slope lavakas were recognized in each studied area and about 5% of lavakas were found to be complex (caused by the coalescence of adjacent lavakas). No major changes were noticed in lavaka's growth between 2000 and 2009, though smaller and probably younger lavakas tend to evaluate quicker than the others.

These preliminary results provide enough information to quantify an order-of-magnitude estimate on soil loss, sediment deposition from lavaka and to have an approximate map of their spatial variation. This might help us to predict hillslope areas susceptible to gully formation in order to determine prevention priorities and, in long term, may provide help for farmers to manage their land in a sustainable way.

This is ILARG-contribution 06.