Geophysical Research Abstracts
Vol. 16, EGU2014-15035, 2014
EGU General Assembly 2014

Comparison of various remote sensing classification methods for landslide detection using ArcGIS

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A comprehensive landslide inventory is vital in landslide hazard analysis. It provides statistical and spatial distributions at a given time which can be used as parameter for susceptibility and classification modelling. It is usually derived from historical data, field surveys, and manual interpretation of aerial and satellite images. However, historical data is not always available and complete, intensive field surveys are impractical for large-scale studies, and manual analysis of aerial and spectral images can be tedious and time-consuming. With the advancement of spectral remote sensing systems, different automated procedures for image classification have been developed. To test the effectiveness of various automated image classification methods, we compared several procedures utilizing spectral images taken after the Mw 7.2 Bohol (Philippines) earthquake on October 15, 2013 instead of a comprehensive landslide inventory. These procedures included: 1.) an unsupervised ISODATA clustering classification, 2.) a supervised maximum likelihood classification using raw spectral bands, 3.) another supervised classification using the Normalized Difference Vegetation Index (NDVI), and 4.) a manual reclassification of NDVI values using specific ranges. We used the fourth method to highlight the difference between using its unbiased mathematical data with supervised classification training sites that has an added human factor. We then compared each image classification with the manual inventory done to determine its accuracy. The unsupervised classification had the lowest accuracy and reliability in distinguishing the landslides. The supervised classification using raw spectral bands, though it showed clear regions of landslides, only distinguished 75% of the landslides manually inventoried. Both methods that involved NDVI were more useful for landslide identification but had different advantages. The supervised classification with NDVI was more useful in pinpointing landslide areas because of the high contrast of barren soil and earthflows to grass/forest and urban areas. It identified 88% of the previously pinpointed landslides. On the other hand, the manually reclassified NDVI showed a better delineation of the landslide area and detected 82% of the landslides.