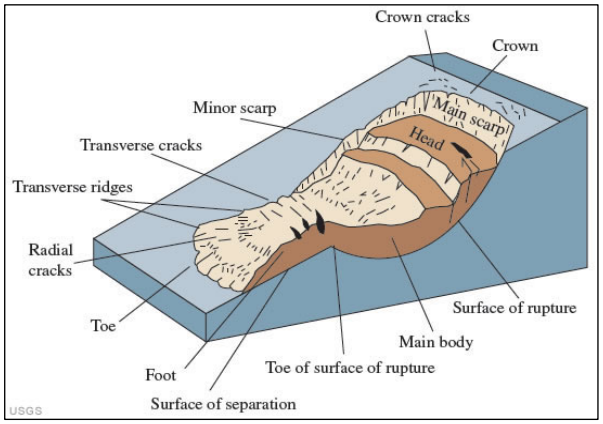
Melanie Harris

Title: Object-Oriented Methods for Post-Event Landslide Mapping: the Utility of Texture and DEM-derived Parameters

Level: MSc

Description of work:



(Semi-)automatic landslide mapping based on image data, a developmental step following visual interpretation that has been applied for decades to aerial photos, has traditionally been done using pixel-based methods such as, change detection, image thresholding and supervised classification. Those, however, focus entirely on statistical image analysis, ignoring altogether the concept of relationships at the spatial unit level and how this changes with scale. Additionally, the spectral characteristics of landslides in an image are often non-unique; bare rock, mines and dirt roads also share the same spectral signatures. These false positives greatly limit the accuracy of per-pixel landslide analysis. Object-oriented analysis (OOA) is a knowledge-based technique comprising image segmentation and classification which allows for the inclusion of information such as shape and texture and also field observations as a thematic layer. When considered with the neighbourhood concept and how relations may change at different scales, OOA greatly aids classification. Though the usefulness of OOA for identifying landslides has been demonstrated by various studies, these focussed mainly on spectral characteristics, shape and size relations for detection. More recent work has successfully integrated the use of elevation data to classify different landslide types (Martha *et al.* "*In press*", Barlow and Franklin 2008). Some attempts were also made to incorporate textural parameters (Haralick's GLCM) into the classification scheme (Martha *et al.* "*In press*", Moine *et al.* 2009), but these were trial and error approaches which failed to establish clear linkages with the landslide phenomena. There appears to be a gap in knowledge surrounding the utility of specific DEM indicators for anatomical classification (parts of a landslide) and the systematic application of texture measures for landslide detection. Field surveys are necessary for detailed site mapping but it is not yet understood how these data can be incorporated in automated post-event inventory mapping. Anatomy refers to the constituent parts of the landslide (scarp, zone of depletion and accumulation, flanks) and is important for subsequent hazard analysis and mitigation planning. Thus, the intention of this research is to determine the diagnostic features for classifying a landslide anatomically and translating these into quantitative texture measures and DEM derived indicators which can be applied in an automated object oriented analysis context.

Biography: In 2007 Melanie Harris received her Bachelor degree (BSc) in Geology and Geography at the University of The West Indies, Mona, Jamaica. The title of her Geography BSc dissertation is "An Investigation into the contribution made by quarrying to flooding: A case study of the watershed of Santa Cruz, Trinidad". It is a geomorphological study which focused on the impact of sedimentation of waterways on river morphology. Her geology dissertation is entitled "Lithological and Geomorphological controls on the occurrences of landslides along the North Side Road from Bloody Bay to L'Anse Fourmi, Tobago".

She is currently completing her MSc degree at ITC in Applied Earth Sciences with a focus on Geo-Hazards. Her ongoing thesis research is in keeping with her interests in disaster management, specifically, the landslide hazard and with a focus on object-oriented methods (OOA/OBIA).