Machine Learning Algorithm for impact crater extraction from high resolution DEM derived from SfM data in Vanuatu

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As the 2015 Ontake eruption unfortunately reminded us, volcanic balistic impacts are serious threats to humans and infrastructures alike. To improve disaster risk management, probablisitic and physical models calibration, data on the spatial distribution of ballistic impacts are essentials. Investigating this issue, the present contribution explains the usage of a crowd-sourced high-resolution close-range photogrammetric technique (Structure from Motion), which was used to collect 3d Data of impacts in Vanuatu around an active volcanic vent, and for which a machine-learning algorithm was developed.
The dataset used in this presentation was collected using a GoPro3 camera, which was chosen as it is easy to operate and relatively low-cost, with the goal to simulate a crowd-sourcing exercise. For the present experiment, a student with no experience of SfM and to whom only simple information was given, collected the data at 12 different sites. Out of 12 investigated sites, 8 provided images of sufficient quality, number and overlap.
Using half of the 8 succesfull survey sites as training sites and the other half as test sites, the developed algorithm detects the lowest point in a depression and try to determine whether it has been created by a volcanic bomb or whether it is an unrelated depression. This choice is based on a comparison with an existing dataset of angles of curvatures of the radii of the depression.
The algorithm is meeting some success, increasing the information productivity - which is often an issue in post-disaster management - although its scalability remains to be proven at other volcanoes.

Keywords: close-range photogrammetry, Structure from motion, Machine learning, Vanuatu Volcano