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OFAI: 3D block tracking for a real-size rockfall experiment in the weathered volcanic context of Tahiti, French Polynesia

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The Land Management Authority of French Polynesia contracted BRGM to run a real-size rockfall experiment name-coded OFAI in September 2009. The purposes of the experiment are two fold: first observe real-size rock trajectories in a context of variably weathered volcanic rock slopes; and second, use observed rockfall trajectories to calibrate block propagation numerical models (see Mathon et al., EGU 2010, this session). 90 basalt blocks were dropped down a 150-m-long slope made of hard basalt veins, lenses of colluvium and erosion channels covered in blocks of various sizes. Parameters of the experiment concerned the shape (from nearly perfect sphere to elongated cubes) and mass of the blocks (from 300 kg to >5000 kg), and the launching point, in order to bounce the blocks both off stiff basalt veins and colluvium lenses.

The presentation addresses the monitoring technique developed to measure block trajectories in 3D and the variables extracted from them. A set of two 50-frame-per-second digital reflex cameras (Panasonic GH1) were installed on two prominent vantage points in order to record block motion in stereoscopy. A series of ground control points, surveyed with centimetre accuracy, served to orient pairs of images in the local topographic reference frame. This enabled the computation of block position at 50 Hz along a section of ca. 30-m-long slope, constrained by the cameras field of view. These results were then processed to extract parameters, such as velocity (horizontal, vertical, rotational, incident and reflected), number of impacts, and height of rebounds in relation with ground cover properties.