Geophysical Research Abstracts,
Vol. 11, EGU2009-10287, 2009
EGU General Assembly 2009


# Potential landslide activity affecting the archaeological site of Orongo (Easter Island-Chile): preliminary analysis

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Easter Island forms part of the Easter Line, a continuous latitudinal chain of volcanic seamounts and islands in the Pacific Sea. The island's roughly triangular shape is determined by the merging of lava flows produced by its three main volcanoes (Rano Kau, Terevaka, Poike) which form its main mass. The Rano Kau volcano, sited in the SW vertex of the island, is made up of numerous basaltic lava flows and has been reduced in size by faulting and marine erosion. Its crater (1.4 km wide) is a small caldera that collapsed after a late, large explosive phase, as attested by the presence of breccia deposits around the eastern rim of the crater. The archaeological stone village of Orongo is located above the inner wall of the crater at an altitude of ca. 300m a.s.l. Prominent historical remains are the numerous petroglyphs that represent the ancient ceremonial of the birdman cult (tangata manu). Rano Kau is mainly composed of sequences of basaltic and intermediate lavas and pyroclastics. Most of the of the original caldera area, especially in the southern flank, has been disrupted by marine erosion. This has caused a dramatic change of the original morphology, resulting in a sub-vertical cliff and steep slopes, especially in the middle-low portions. In the upper part of the slopes weathered soils and regolith are outcropping. Topographical and geomorphological analysis of the area conducted by a direct field surveys in January and July 2008 have provided clear evidences of slope instability along the southern external flank of the caldera. Different landslide areas have been detected. The most active area is located at east of the village in correspondence of the crest zone of Rano Kau where a debris slide/fall has recently occurred. The analysis of photos taken in Nov. 2007 in the same area evidences that the landslide crown area was originated at an elevation of ca. 200m a.s.l. along a probable contact between basaltic layers on the top and weathered lava. Other minor landslide crowns are currently located in the same level some hundreds m at west, just below the plain where Orongo is founded, threatening the stability of the petroglyphs area. According to the above observations, although after preliminary superficial surveys, the potential landslide evolution of the area may be the following: i) slope toe affected by coastal erosion; ii) triggering of debris slide/fall in the middle-upper portion of the slope with failure depth of ca. 2.5-4m; iii) increasing of stress and retrogressive landslide activity (debris-slide) towards the crest zone. A possible development of the research will be based on implementation of a multi-temporal analysis of landslide activity through a 3D-GIS modeling coupled with a back analysis in order to define present slope stability conditions and possible evolution of the slope. This to provide useful tools for local authorities in implementing preventive landslide risk mitigation measures for the protection of the cultural heritage in Orongo.