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Evaluation of seismic effects on the landslide deposits of Monte Salta (Eastern Italian Alps) using distinct element method

G. Marcato (1), M. Mantovani (1), K. Fujisawa (2), A. Pasuto (3), F. Tagliavini (3), L. Zabuski (4)

(1) CNR-IRPI – National Research Council of Italy, Research Institute for Hydrological and Geological Hazard Prevention, C.so Stati Uniti 4, 35127 Padova, Italy, (marcato@irpi.cnr.it / Fax: +39 049-8295827), (2) PWRI – Public Works Research Institute. Erosion and Sediment Control (Landslide Team), Minami-hara 1-6, 305-8516 Tsukuba, Japan, (3) GRJL – Geo Risk Joint Lab, C.so Stati Uniti 4, 35127 Padova, Italy, (4) IHEPAS – Institute of Hydro Engineering of the Polish Academy of Science,7, Koscierska Str., 80-953 Gdansk, Poland

The aim of the paper is to present the modelling of the ground effects of seismic waves on a large debris deposit lying on a steep mountain slope, with particular attention paid to the triggering of slope movements. The study site is located below a huge rock fall named “Monte Salta Landslide” along the northern slope of the Vajont valley, at the border between the Veneto and the Friuli Venezia Giulia Regions in north eastern Italy. The Mt Salta landslide is induced by the presence of the Mt Borgà regional thrust, which uplifts limestone Jurassic in age on top of a Formation Cretaceous in age. Above the thrust zone, folded, highly fractured bedding planes dip steeply towards the slope free face, producing a highly unstable setting. Several historical landslide events were reported in the area; the first one dates back to the XVII century. The landslide deposit completely mantled the slope with a thick cover of rock blocks. The study area is classified as high seismic hazard and moreover has different vulnerable elements that can be affected by the remobilization of blocks like a village, the national road and a big quarry that was opened on the landslide deposit with the intent to exploit part of the debris material for construction purposes. The study was carried out in collaboration with the Department of Civil Defence of Friuli Venezia Giulia Region. Numerical analysis to simulate the slope behaviour was performed, using distinct element method and applying UDEC code. The 2D models

were built on 3 cross-sections and elasto-plastic behaviour was assumed for both rock matrix and discontinuities. The earthquake effect was modelled in pseudo-dynamic way, i.e. by magnifying the acceleration and applying also its horizontal component. The seismic force of the study area was calculated on previous studies in 0.28 g. The results proved that the increase of the vertical component alone has a small influence on the system behavior. Hence, the acceleration vector was deviated at 5˚ and then at 10º from vertical. A small increment of the displacement was observed in the first case, whereas in the second case very large movement occurred. Therefore, it can be concluded that, besides the magnitude of the earthquake, even small seismic waves in horizontal direction could trigger significant movements and therefore hazardous conditions. The scenario carried out by the model should be helpful for planning more functional countermeasure works or civil defence evacuation plan.