Geophysical Research Abstracts
Vol. 19, EGU2017-5931, 2017
EGU General Assembly 2017

Applying simplified sliding block concepts and finite element codes to analyze the Aso-bridge landslide induced by the 2016 Kumamoto earthquakes

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The 2016 Kumamoto earthquakes struck beneath the Kumamoto City of Kumamoto Prefecture in Kyushu Region, Japan, and generated numerous landslides around the city. Among the several landslides, the Aso-bridge landslide is the largest one triggered in this disastrous event. For the purpose of examining the behavior of this large-scale landslide during the main-shock of the Kumamoto earthquakes, simplified sliding block concepts and finite element codes are conducted in this study. This paper concludes: (a) the slope of the Aso-bridge landslide, about 710 m high and with a dip angle of 33, is marginal stable in the absence of earthquake; (b) the failure surface obtained by finite element codes is in satisfactory agreement when compared with that of the actual failure surface; (c) it is revealed that the initiation-time of the Aso-bridge landslide lie in between 18.45 to 21 s; (d) the combination of internal friction angle of 35 and cohesion of 80 kPa would lead to a failure surface closest to that observed in the field. The study demonstrates that the simplified sliding concepts and the finite element codes can be applied to analyze the Aso-bridge landslide with a reasonable agreement.