Geophysical Research Abstracts
Vol. 17, EGU2015-3456, 2015
EGU General Assembly 2015

Landslides on Earth, Mars, Moon and Mercury

Maria Teresa Brunetti (1), Zhiyong Xiao (2,3), Goro Komatsu (4), Silvia Peruccacci (1), Federica Fiorucci (1), Mauro Cardinali (1), Michele Santangelo (1), and Fausto Guzzetti (1)

(1) Research Institute for Geo-Hydrological Protection, Italian National Research Council, Perugia, Italy (mariateresa.brunetti@irpi.cnr.it), (2) Planetary Science Institute, China University of Geosciences, Wuhan, Hubei, P. R. China, (3) Centre for Earth Evolution and Dynamic, University of Oslo, Oslo, Norway, (4) International Research School of Planetary Sciences, Università d'Annunzio, Pescara, Italy

Landslides play an important role in the evolution of landscapes on Earth and on other solid planets of the Solar System. On Earth, landslides have been recognized in all continents, and in subaerial and submarine environments. The spatial and temporal range of the observed slope failures is extremely large on Earth. Surface gravity is the main factor driving landslides in solid planets. Comparison of landslide characteristics, e.g. the landslide types and sizes (area, volume, fall height, length) on various planetary bodies may help in understanding the effect of surface gravity on failure initiation and propagation. In the last decades, planetary exploration missions have delivered an increasing amount of high-resolution imagery, which enables to resolve and identify morphologic structures on planetary surfaces in great detail. Here, we present three geomorphological inventories of extraterrestrial landslides on Mars, Moon and Mercury. To recognize and map the landslides on the three Solar System bodies, we adopt the same visual criteria commonly used by geomorphologists to identify terrestrial slope failures in aerial photographs or satellite images. Landslides are classified based on the morphological similarity with terrestrial ones. In particular, we focus on rock slides mapped in Valles Marineris, Mars, and along the internal walls of impact craters on the Moon and Mercury. We exploit the three inventories to study the statistical distributions of the failure sizes (e.g., area, volume, fall height, length), and we compare the results with similar distributions obtained for terrestrial landslides. We obtain indications on the effect of the different surface gravity on landslides on Earth and Mars through the relationship between the landslide area and volume on the two planets. From the analysis of the area, we hypothesize that the lack of medium size landslides on Mars is due to the absence of erosive processes, which are induced on Earth chiefly by water-related weathering processes. We find that gravity is key to explain the difference between the distribution of the landslide area on the Moon and Mercury. The different surface gravity likely sets the minimum crater diameter at which slope failures start to occur.