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Mapping and analysis of Martian landslides

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This work is part of a larger effort aimed to a more quantitative description of landslide phenomena on Mars and the understanding of rock mass properties and landslide mobility with respect to their Earth equivalents. Recently, large satellite imagery datasets have become available and they have been mosaicked in different suitable tools making mapping an easier job than before. Furthermore, the availability of other georeferenced database makes possible and easily feasible some spatially distributed analyses. We prepared a new landslide inventory to acquire information about: landslide size distribution and areal density, controls of geometrical condition along Martian slopes, landslide typology and mechanism, relationship with impact craters distribution, runout, volume estimates, characteristic features. We adopted Google Earth, Google, Inc. as a mapping tool using both visible and CTX images. Landslides have been mapped according to standard geomorphological criteria, by two landslide experts delineating both the landslide scar and accumulation limits, associating each scarp to a deposit. Multiple accumulations have been differentiated where possible to obtain a more sound dataset. We prevalently mapped landslides located along the Martian valleys and Chasma flanks with only minor attention to classical block and slump instabilities typical of crater rim failures. This because we were mainly interested in long runout landslides or complex failures which could allow to define some rock mass characteristics along these slopes, and to study landslide mobility with respect to Earth equivalent phenomena. So long runout landslides have been mapped also when recognized within crater rims. Topographic characteristics have been extracted by means of the available MOLA dataset. The inventory presently consists of 1232 landslides covering a total area of about 180,000 km2. Landslide size ranges from 0.15 km2 to a maximum of 12,000 km2. We examined area-frequency distributions of land-slides by developing logarithmically binned, non-cumulative size frequency distributions. Drop height ad maximum runout distance have been analysed in different areas characterised by different morphological settings. The dataset is still under construction and analysis are under completion. Nevertheless, the dataset confirm some of the previous observations concerning the mobility of Martian landslides with respect to their Earth equivalent. At the same time this large dataset will allow to examine further in detail the controls by different morphogical, geological and environmental factors.