Geophysical Research Abstracts
Vol. 21, EGU2019-19135, 2019
EGU General Assembly 2019

Late Lava Flows and Hydrothermal Alteration in Ladon Basin (Mars)

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Ladon is an ancient multi-ringed impact basin located within a system of channels and basins along the Uzboi-Holdon-Ladon-Margaritifer outflow system that extends from Argyre to the south to the Margaritifer Basin [1]. The formation of this extensive system is thought to have occurred in the late Noachian to early Hesperian period [1] and large volumes of sediments derived from the surrounding Noachian terrain have mobilized and deposited within Ladon. Based on the joint observation of CTX and CASSIS images, we were able to recognize a later extensional activity that took place in the western side of Ladon basin through a widespread graben network with Y and T shaped junctions, typical of radial deformations under oblate strain fields. Some of the grabens are the direct evolution of ridges implying a strong relationship between possible extensive dike intrusions and grabens' formation. In addition, on CASSIS, CTX and HIRISE images dark young flows (model ages of around 1.6 Ga) appear to be in places originated from such structures. From CRISM data cube analyses the identified primary minerals of the flows are forsterite, and pigeonite and/or augite suggesting a mafic to ultra-mafic composition. The CaSSIS colour images have also revealed light toned rectilinear ridges. Similar features have been identified in other regions of Mars and interpreted as alteration along a percolating fracture system, possibly caused by hydrothermal activity [2]. These deposits were exposed by erosion, range from 4 to 15 km in extent and are $\sim$10 m thick and are surrounded by red/yellow halos. Alteration halos are also visible around linear structures developing from the main graben, involving a widespread surface portion. From CRISM data the halos seem to be due to hydrothermal alteration of the primary minerals of the region in serpentine and Mg-smectites and possibly Illite. All these evidences suggest that the western side of Ladon basin might be site of a late (Amazonian) volcanic insurgence causing regional radial extension under an oblate strain field and diffused fissural eruptions originating from the grabens. The magmatic activity was likely associated to hydrothermal circulation highlighted by alterations halos and veins.

The authors wish to thank the spacecraft and instrument engineering teams for the successful completion of the instrument. CaSSIS is a project of the University of Bern and funded through the Swiss Space Office via ESA's PRODEX programme. The instrument hardware development was also supported by the Italian Space Agency (ASI) (ASI-INAF agreement no.I/018/12/0), INAF/Astronomical Observatory of Padova, and the Space Research Center (CBK) in Warsaw. Support from SGF (Budapest), the University of Arizona Lunar and Planetary Laboratory, and NASA are also gratefully acknowledged. The authors with affilation (1) and (4) are funded by the European Union's Horizon 2020 research grant agreement No 776276- PLANMAP.

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