Geophysical Research Abstracts
Vol. 21, EGU2019-13664-9, 2019
EGU General Assembly 2019

Orbital facies changes and anticlinal structures within interior layered deposits across Valles Marineris and equatorial craters on Mars.

Gene Schmidt (1), Monica Pondrelli (1), Francesco Salese (1,2), Angelo Rossi (3), and Laetitia Le Deit (4)

(1) International Research School of Planetary Science (IRSPS), Universita' "G.D'Annunzio", Pescara, Italy, (2) Faculty of Geosciences, Utrecht University, Utrecht, The Netherlands, (3) Department of Physics and Earth Sciences, Jacobs University, Bremen, Germany, (4) Laboratoire de Planétologie et Géodynamique (LPG), University of Nantes, Nantes, France

The origins of ILDs (interior layered deposits) are a topic of ongoing debate and research. Although their composition, distribution, and post-depositional history (e.g., faulting, morphology and alteration) can be recognized, depositional processes remain difficult to determine. Depositional methods each have their own pitfalls in that they can readily explain some features of the deposits while neglecting others. A variety of processes and depositional regimes, both sedimentary and volcanic, have been proposed over the last four decades to explain ILD formation and include lacustrine, groundwater springs, ash fall, diapiric uplift, dust rich glaciers, aeolian deposition and a combination of multiple processes.

A comparison is made between both the intra-crater deposits of Arabia Terra and the ILDs of Valles Marineris to better constrain the depositional hypotheses. By analyzing the deposits' stratigraphy, mineralogy and layer attitudes, as well as surveying their general geographical distribution, insights into how the ILDs of these two regions may share common formation processes were obtained. 1013 craters were observed within a 2,000 by 3,100 km area of western Arabia Terra, bounded by the Oxia Palus quadrangle (MC-11), with the aim to identify and characterize its extensive intra-crater layered deposits. 3,500 km west, in Valles Marineris, a large 7.5 km tall, 120 by 43 km ILD mound within Hebes Chasma was also investigated.

The ILDs of both areas are often identical in their composition, layering, attitude and morphologies. Both are characterized by water-altered minerals and laterally continuous uniform layering. Mineralogical transitions from mono to polyhydrated sulfates within individual deposits are present in both areas, where monyhydrated sulfates tend to comprise the lower elevations and polyhydrated sulfates tend to comprise the upper elevations. In Arabia Terra, a regional facies change was observed and is expressed through southeast to northwest changes in layer thickness, deposit thickness and mineralogy. The southeast craters contain thicker deposits with thicker layering and are dominated by hydrated sulfates, whereas the northwest craters contain thinner deposits with thinner layering and are dominated by clays. Formation of this facies change could possibly have been influenced by the region's gradual southeast to northwest elevation decrease, changes in depositional environment or, in an ash fall deposition scenario, proximity to volcanic provinces. Anticlinal structures absent of any major faulting or deformation were identified in several craters as well as in Hebes and are interpreted as drape folding structures formed syndepositionally in an aeolian deposition scenario. Additionally, ways that the compositional and structural characteristics between ILDs in both areas might influence the contending depositional hypotheses are explored.