Geophysical Research Abstracts
Vol. 13, EGU2011-4590, 2011
EGU General Assembly 2011

Geological variability of Equatorial Layered Deposits in Arabia Terra, Mars

Angelo Pio Rossi (1), Monica Pondrelli (2), Stephan van Gasselt (3), and Vikram Unnithan (1)

(1) Jacobs University Bremen, Bremen, Germany (an.rossi@jacobs-university.de), (2) IRSPS, Universita′ d′Annunzio, Pescara, Italy, (3) Freie Universität Berlin, Berlin, Germany

The genesis of Equatorial Layered Deposits (ELDs) is still debated, with interpretations ranging, for example, from an eolian or lacustrine [1], to volcanic/volcaniclastic [2] or spring-fed travertine-like origin [e.g. 3]. Crommelin (5 N, 350 E) and Firsoff (2.6 N 350.8 E) craters contain an extensive ELD cover, with an estimated thickness inside the craters of 200 to 500 meters.

The Noachian bedrock in the study area is nonconformably covered by the ELDs. Locally, close to the rim-tangential faults and fractures, ELDs are associated with mound- to cone-shaped subcircular features, which are disconformable on top of the layered deposits. ELDs are generally well-bedded bright deposits locally interbedded with some lower-albedo material. These deposits are present both inside and outside major craters (Crommelin, Firsoff) but their morphology and depositional architecture varies.

Layered deposits in Firsoff crater drape the crater floor and onlap against crater rims. Although the regional attitude of the layers is subhorizontal, locally beds appear to be folded. Overall, there appears to be a cyclical depositional pattern within ELDs [4]. There is observational evidence for elevated rims locally bounding the ELD-forming beds and differential cementation and erosion possibly due to subsurface fluid flow [e.g. 5]. Moreover, sediment expulsion features are present on the southernmost crater floor [6].

On the other hand, ELDs on the plateaus outside Firsoff crater lack landforms caused by subsurface fluid escape and they show a less complex internal architecture, draping the plateau topography without large-scale bulge-like thickening as in Firsoff or Crommelin craters.

Different processes might have dominated the deposition and post-depositional history of ELDs in Arabia Terra. We suggest that fluid escape, resulting either in spring-sustained deposition or mud diapirism/volcanism (possibly combined/alternated) had a stronger influence within major impact craters [3, 6]. Eolian deposition could instead have played a dominant role in the formation of “plateau” ELDs outside major impact basins [e.g. 1, 2,4].

References

[1] Malin, M. C., and K. S. Edgett (2000), Sedimentary rocks of early Mars, Science, 290(5498), 1927-1927.

[2] Hynek, B., and R. Phillips (2008), The stratigraphy of Meridiani Planum, Mars, and implications for the layered deposits’ origin, Earth and Planetary Science Letters, 274(1-2), 214-220.

[3] Rossi, A. P., et al. (2008), Large-scale spring deposits on Mars?, Journal of Geophysical Research-Planets, 113(E8), E08016-E08016.

[4] Lewis, K. W., et al. (2008), Quasi-Periodic Bedding in the Sedimentary Rock Record of Mars, Science, 322(5907), 1532-1532.

[5] Okubo, C. H., et al. (2009), Deformation band clusters on Mars and implications for subsurface fluid flow, Geological Society of America Bulletin, 121(3-4), 474-474.

[6] Pondrelli, M., Rossi, A. P., Ori, G. G., van Gasselt, S. (2010) Sedimentary Volcanoes in the Crommelin Crater Area, Mars, Lunar Planet. Sci. XVI, #1149