GEOMORPHOLOGY IN THE TRANSITION ARABIA TERRA/NOACHIS TERRA, MARS

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Abstract

Since the formation of the planet, Mars environmental conditions were very different from those today [1]. An active hydrosphere characterized early Mars with significant implications for both, climate and life [2, 3]. For this reason, unveiling the geomorphological record of aqueous processes on Mars is paramount, and following the evolution of fluvial landforms provide critical evidence for climate change on a planetary scale.

The main objective of this study is to characterize the geomorphology of an area in the southern equatorial regions, located in the transition between Arabia Terra and Noachis Terra, approximately centered at 26º S and 6.5º E, in order to understand the hydrological evolution of early Mars. Mapping the geological features and focussing specially on describe landforms related with the past presence of liquid water will allow uncovering the presence of abundant water masses and a potential coastline regression at southern latitudes on early Mars.

We use orbital imagery to map the geomorphological features, looking for indicators of aqueous erosion and deposition processes on Mars. In support of our analyses, we used the digital terrain model (DTM) from Mars Orbiter Laser Altimeter (MOLA; $\sim$ 460 m/pixel, [4]), and available Context Camera (CTX; $\sim$ 6 m/pixel, [5]) images using ArcGIS Software.

The obtained geomorphological map reveals significant aqueous activity in the study area during early Mars. The overlapping between landforms that shaped the area through vastly different processes often requires a subjective interpretation. Some of the best morphologies to identify water presence would be incisions or valley-like features for channels, and smooth and filled circular craters for paleobasins where materials were deposited.

We have investigated the topographic profiles of some of these craters, which reveal flat floors, coherent with the impact processes melting the surface rocks [6]. The craters serve as natural dams and help water accumulation inside. This type of morphology is associated with hydrated mineral deposits, such as phyllosilicates, and also with other aqueous morphologies like paleochannels, means they were filled with possible lake sediments.

All these features suggest that large bodies of water may have covered the surface of this area during early Mars [7, 8], corroborating the existence of past aqueous activity on the

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region and making this study area on Mars an attractive place in terms of habitability.

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