

GEOLOGICAL RELATIONSHIPS BETWEEN HYDRATED MINERALS AND FLUVIAL LANDFORMS IN TYRRHENA TERRA. S. Bouley¹, D. Loizeau¹, N. Mangold¹, V. Ansan¹, F. Poulet², J.P. Bibring², Y. Langevin² and Omega Team. ¹IDES, Bat. 509, Université Paris XI, 91405 Orsay cedex, France, sylvain.bouley@u-psud.fr, ²Institut d'Astrophysique Spatiale, Bat. 121, Université Paris XI, 91405 Orsay cedex.

Introduction: Tyrrhena Terra is located in cratered and dissected Noachian terrains in the southern hemisphere [1] south of Isidia Planitia and north of Hellas basin. Tyrrhena Terra contains both highlands and a series of intercrater plains. In this region, many outcrops of phyllosilicates are observed by OMEGA spectrometer on many craters walls or ejecta [2, 3]. Several plains in Tyrrhena Terra display hydrated minerals. THEMIS Daytime IR images (100m/pixel) and HRSC images (13m/pixel) allow to map fluvial landforms and the different geologic/geomorphic units observed in a part of Thyrrhena Terra (76° to 87°E, 6°S to 17°S). These two datasets allow us to study the relationship between the location of hydrated minerals and fluvial landforms.

Geologic/Geomorphic terrains in Thyrrhena Terra: Four different terrains have been observed and it is important to know their origin to understand the context of formation of hydrated minerals. MOLA data show different topographic steps between these different units. For each terrain, the absolute age was determined in counting craters down to 1 km and using the Martian impact cratering chronology curve determined by Hartman and Neukum [4].

Early/Late Hesperian intercrater plains: These terrains present a smooth texture modified by wrinkle ridges. These plains are flat (slope <0.05°) and are located at low elevation (~1000m). Wrinkle ridges show that these plains may have a volcanic origin [5].

Intermediary plains: These intermediary plains are smaller than intercrater plains but present a smooth texture too. They are located at the foothill of highlands and they are in contact with intercrater plains but are located at higher elevation (~1500m). They present an older age than intercrater plains with an Early Hesperian age. *Dissected terrains:* These terrains are rough and are the results of degradation by fluvial erosion. Average slope of these terrains are around 0.8° Observed valley networks present a dendritic organisation .

Late Noachian/ Early Hesperian plateau: This terrains are located at high elevation (>2000 m) . They present a smooth texture. Some of these terrains are incised continuously by fluvial valleys and are the location of sources of main valley networks in Thyrrhena Terra.

Spectral data: OMEGA spectrometer allows us to know the mineralogical composition of these different units. We observed that Early/Late Hesperian intercrater plains are composed by High Calcium Pyroxene (HCP), and olivine, which confirm their volcanic origin. The origin of Intermediary plains are less certain. HCP are still present but with smaller band depth and olivine is not observed. As a major characteristic, this unit contains hydrated minerals whose exact compositions are uncertain because of the presence of single 1.93 micron signature with only poor 2.3 micron peak locally.

Relations between hydrated minerals and valleys: Hydrated minerals are observed on the two types of terrains: intermediary plains and highlands. In one location (plain α), hydrated minerals are distributed homogeneously in a small intermediary plain of 40×80km. Limits of this outcrop correspond to the limit of the plain. This smooth plain corresponds to the outlet of many small valley networks which are located in Degraded Terrains and consequently may be an alluvial plain. On an other plain (plain β), hydrated minerals are not located on the surface but inside valleys incising this intermediary plain. We observed that they are both located close to the sources and along the path of valleys and they correspond to valley's sides and bottom. Hydrated minerals are not present at the surface and valleys incised consequently a buried hydrated layer.

Discussion: Hydrated minerals are visible in different locations in Thyrrhena Terra. First of all, they correspond to an alluvial plain in Intermediary plains (plain α). 2 hypotheses of formation are possible (1) valleys transported hydrated minerals located upstream in highlands, (2) Surface weathering by running water can form hydrated minerals if the action of water is long enough [6]. We don't observe hydrated minerals upstream of the plain α , suggesting the occurrence of in situ alteration during the alluvial plains formation. However, the presence of alteration material in ejecta of craters present regionally could suggest that such type of minerals was buried into highlands and remobilized into alluvial plains by the erosion. This might explain their presence in plain β , where hydrated minerals are located inside valleys. In this case, valleys formed likely after the hydrated minerals formation.

Based on our observations, intermediary plains may have a sedimentary origin from the erosion of upstream terrains. The presence of alteration minerals suggest either their formation during these episodes of erosion, or the remobilization of clays buried in the crust.

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