LANDING SITES FOR A MARS SAMPLE RETURN MISSION IN ARABIA TERRA

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We are characterizing the geology of several area in Arabia Terra as possible Mars Sample return mission landing sites. Arabia Terra presents several interesting sites regarding the search for past traces of life on Mars. The long-lasting past presence of water, the flat floors and the low elevation of the intercrater plains in this region, represent excellent qualities when looking for possible sample return mission landing sites. We are investigating the stratigraphic and environmental setting of this region suggesting that different physiographic conditions, which interact with the groundwater, originated different sedimentary environments (deeper basins=clay bearing lacustrine conditions; shallower basins=sulphate-bearing evaporitic conditions).

The genesis of the layered deposits in this region has been attributed to different depositional processes and environments, many of them involving the presence of water either in surface or subsurface driven by hydrothermal processes and/or groundwater fluctuations [1,2,3]. Sulfate-bearing layered deposits formation have been related to a groundwater dominated hydrological system [2,3,4,5]. Additionally, fluid expulsion related processes have been increasingly invoked to explain the formation of some pitted cones and mounds within the light toned deposits in Arabia Terra [6,7]. The topgraphy of Arabia Terra is of particular interest because it shows gentle north-facing slopes over a wide area, thus favoring complex interactions with the groundwater table. The depth of several sites in this region, below -4000 m, has favored the prolonged presence of ponding water both on the surface and in the watery subsoil. Deep groundwater and spring/play deposits are both relevant for past life presence on Mars in different way. Deep groundwater is crucial for the presence of lakes and ocean, spring deposits and in general fluid expulsion-related environments (fissures, veins) are potentially suitable targets when searching for life or trace of life as it has been observed in many location on Earth [8].

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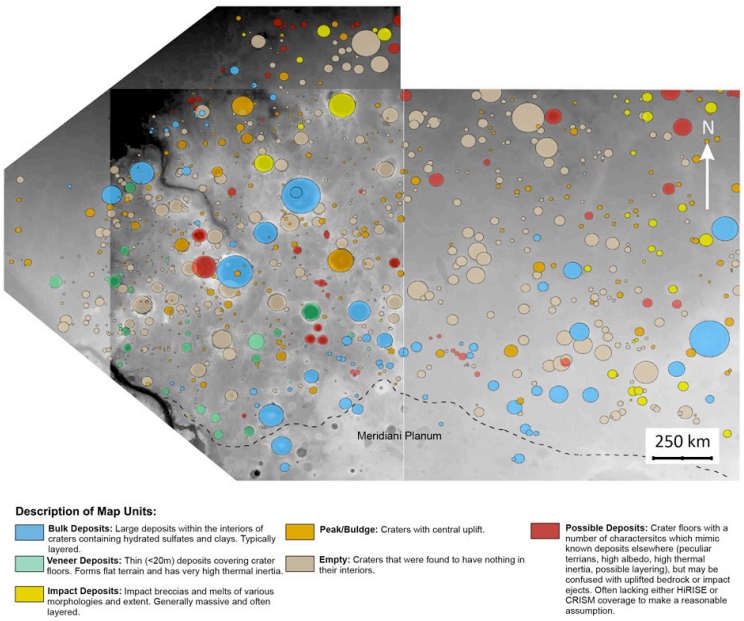

Figure 1 Arabia Terra (21°15′N 5°15′E) is a regional dichotomy boundary between the high- and lowlands of northern Mars, known for its densely cratered terrain and extensive distribution of water-altered deposits. Clay-bearing and sulfate-bearing light-toned layered deposits are widespread over the whole area [9] showing different morphological, sedimentological and mineralogical characteristics.