KARST LANDFORMS AS MARKER OF EVAPORITE DEPOSITS WITHIN A CRATER IN NORTHERN SINUS MERIDIANI, MARS. D. Baioni[1], [1]Planetary Geology Research Group, Dipartimento di Scienze Pure e Applicate Università degli Studi di Urbino "Carlo Bo", Campus Scientifico "E.Mattei" località Cro-cicchia, 61029 Urbino, Italy, davide.baioni@uniurb.it.

Introduction: Sinus Meridiani is part of the large area known as Terra Meridiani, located near the southwestern margin of Arabia Terra, in the equatorial region of Mars. In this area several studies showed evidence of past aqueous activity preserved in several distinct units that were identified and classified as layered deposits with monohydrated and polyhydrated sulfate spectral signa-tures [1]. Further studies on spectral analyses defined and mapped several distinct stratigraphic units in which exposure of hydrate sulfates and Fe/Mg smectites were recognized [2].

I have identified a crater in northern Sinus Meridiani, Mars (centered at 4°.45 N; 3°.31 W), where crater-floor light toned deposits (LTDs) display traits that are consistent with formation by karst-driven processes. The mineralogical composition of LTDs within this crater is unknown. A morphologic and morphometric analyses of the surfaces of these LTDs was performed through an integrated study of images available through the Reconnaissance Mars Orbiter High-Resolution Imaging Science Experiment (HiRISE).

In particular, the analysis are focused on the landforms that are interpreted as karst landforms, studying the possible processes involved in their formation and shaping.

Karst landforms: On the LTDs surface closed rimless depressions surrounded entirely by unbroken plains can be observed. These depressions are either rounded-shaped (Fig.1) or elliptical-elongate shaped (Fig.2), and range in length from 30 m to up of 500 m, while widths are generally between 20 and up of 200 m. The depressions display both simmetrycal and asymmetrical walls, and generally flat floor geometry. These landforms display similarities with the terrestrial sinkholes that commonly develop in all kinds of evaporite terrains in arid or cold regions on Earth. Moreover, they strongly resembled the evapori-te sinkholes described in other regions of Mars [3].

Discussion and conclusions: The depressions that can be observed in the LTDs surfaces lack evidence of wind action and erosional features associated with the evolution of impact craters. In fact, the analysis carried out suggests that they were not built or shaped by wind erosion, or impact craters heavily eroded or reworked by geomorphic processes. Moreover, the landforms display features that rule out the formation due to periglacial, groundwater ant tectonic processes. Thus these morphologies, might be interpreted as karst landforms (sinkholes) of polygenetic origin formed by corrosion and solution-related intra-crater processes. The water necessary to shape and build these forms probably has been provided by the melting of ice or snow, that can be formed during periods of ice-snow-rich deposition from the atmos-phere that may occur as the result of changes in the obliquity of Mars [4]. On Earth sinkholes are considered diagnostic of the presence of karst processes and therefore they are markers of soluble rocks. Similarly, the landforms observed in the studied crater suggest that they represent a clear sign of the presence of soluble rocks. Thus, karst landforms highlight the presence of soluble rocks, and can therefore be used as significant lithological markers to distinguish units characterised by soluble minerals such as evaporites within the studied crater.

Figure 1: Rounded-shaped depression located on the LTDs (Images HiRISE ESP_032296_1845).

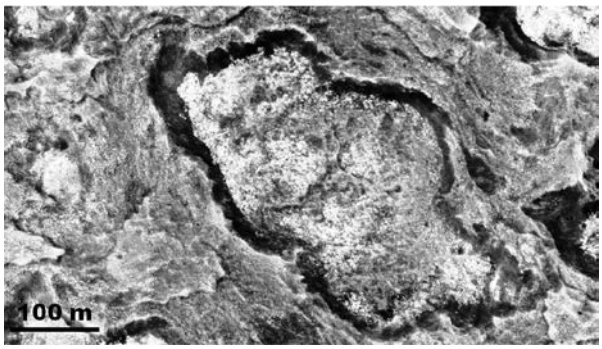

Figure 2: Elongate-shaped depression located on the LTDs (Images HiRISE ESP_032296_1845).

References: [1] Weitz C. et al. (2011) Geology, 39, 899-902. [2] Thollot P. et al. (2012) Journal of Geophysical Research, 117, E00J06. [3] Baioni D. et al. (2009) Acta Carsologica, 38/1, 9-18. [4] Laskar J. (2004) Icarus, 170, 343-364.