MICROSTRUCTURE ON THE SURFACE OF DARK DUNES IN THE POLAR REGIONS OF MARS.

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Introduction: In this work we focus on the possible microscopic structures of the soil corresponding to the flow features originating from the Dark Dune Spots (DDSs), which have been studied in the last 10 years in the polar, seasonally frost covered regions of Mars [**1, 2, 3**]. In our earlier investigations on the MGS MOC images we discovered the DDS flow-features which were later identified as possible water or brine flows beginning to be formed during Martian springtime [**4, 5**].

Preliminary analysis of CRISM spectra from the target regions suggests that water ice is present as surface ice, or clouds between the dark surface and the detector [**6**], which is compatible with the idea of surface ice cover in the dark spots. On the basis of Phoenix in situ measurements and images, it was demonstrated that the fluid phase in form of brines may appeare on the surface [**7**] and this was supported by physical modeling, too [**3**, **8**]. As a result liquid flows may be present in the analyzed features. Time sequence phases of DDS flows were observed at the South (***Fig. 1.***) and at the North (***Fig. 2***.) polar regions on the MGS MOC and MRO HiRISE images.

Observations and new results: In the last years several flow-like features were observed on the slopes

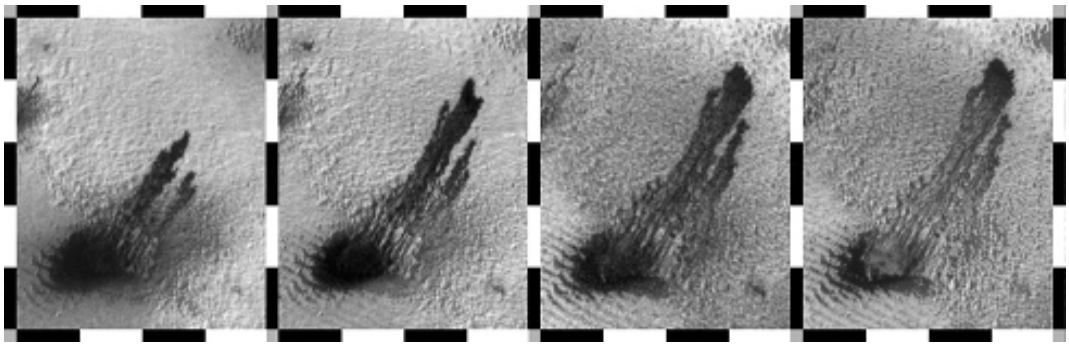

Fig. 1. Southern hemisphere DDS-seepages extending on 80x100 m sized subsets of HiRISE images of the Richardson crater. Image numbers and Ls-values from left: PSP-003175, 210.6°; PSP-003386, 220.7°; PSP-003597, 230.9°; PSP-00374, 238.1° [9]. The slopes are tilted upward

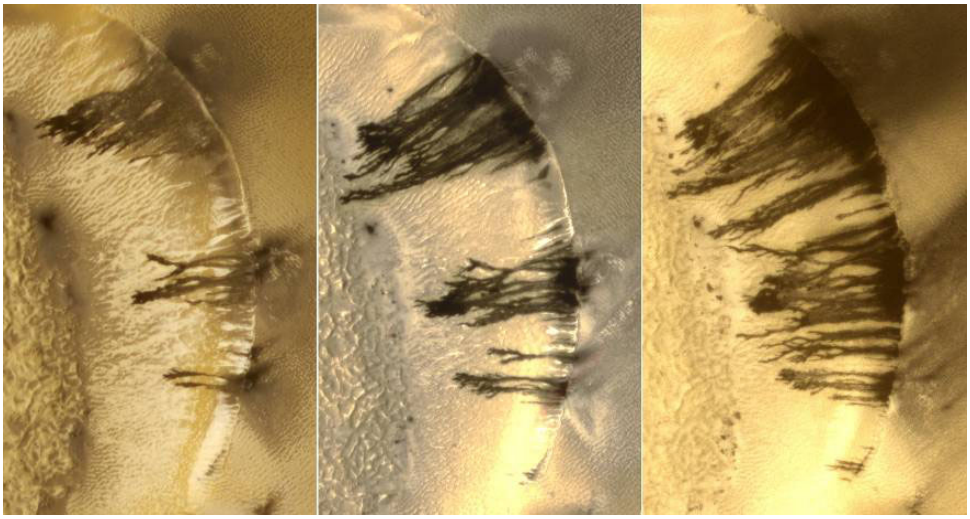

Fig. 2. Gradually growing seepage-like features as the season passes by on 100x150 m HiRISE images taken in the Northern Polar Region at 77.5°N, 300.1°E (difference in days=22 and 12 terrestrial days respectively. Image numbers: PSP-007468, -007758 and -007903) [10]

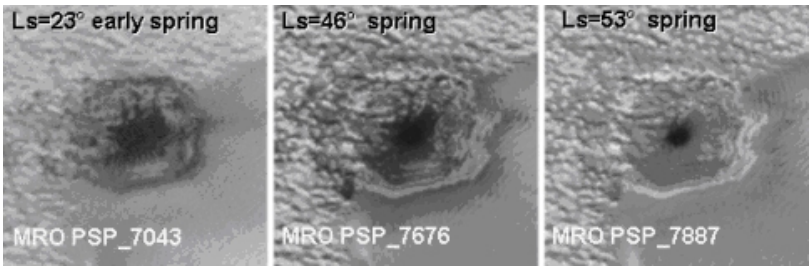

Fig. 3. Appearance of ring-strucrures during the seasonal development of a dark dune spot on the Northern Polar Region (84.7°N, 0.8°E, in spring 2008). On these 450x300 m enlarged frames of HiRISE-images DDS can be seen [11]

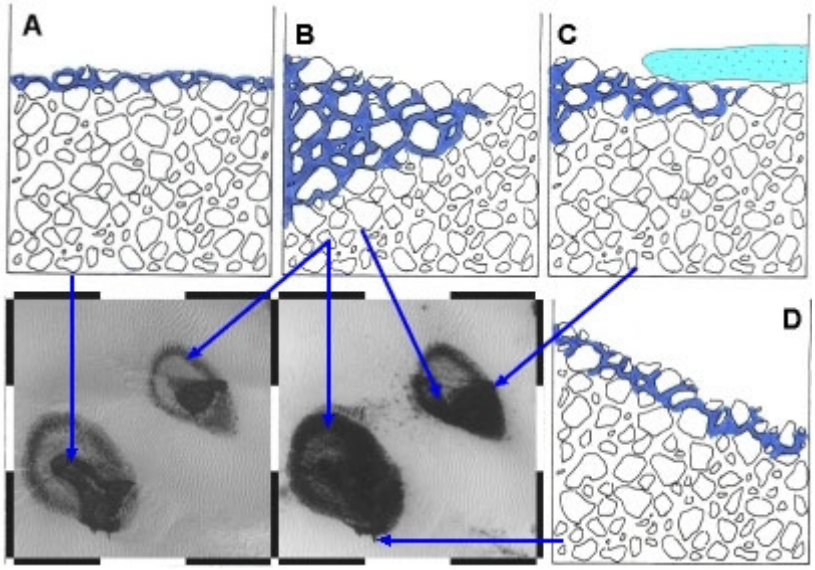

Fig. 4. Microscopic models of various flow-structures of DDS-seepages described by soil-grain cross sections. Dark blue is brine/water and light blue color shows frost. Lower left and central are 300x300 m enlarged frames of MRO HiRISE images (68.2°S, 1.32°E; numbers and Ls-values from left: PSP- 003432, 222.9°; PSP-003709, 236.4°). Explanation given in the text

of polar dunes, emanating from DDSs, different from features formed by CO_2-jets or wind blow [9]. These confined slope streaks (DDS seepages) are moving downslope with a speed of about 1 m/sol, showing a branching pattern (*Fig. 1., 2.*) and accumulated "ponds" at their end.

Discussion: Proposed microscopic view of various types and locations of brine filled: different cross sections are visible in *Fig. 4*. A) the graph shows the microscopic brines only at the surface. B) extending dark front [12]. C) the location of the retreating frost cover where the darker brine-wet surface becomes visible. D) the graph shows the slope where the gravity affected flow extends downward.

The ring structures visible around some DDS can be interpreted by two different models: 1) after a geyser/fountain-like eruption from the central portion the erupted material falls down forming the ring-like structure (it may consist of salts or refrosted vapors too) (*Fig. 3.*); or 2) a liquid material moves there forced by various effects beyond gravity (like capillary effect, pressure from volume change or from the liquid runnings after etc.) causing the flow to expand from the source [13] (*Fig. 4.*).

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References: [1] Szathmáry et al. (2007) in *Planetary Systems and the Origin of Life*, ed. Ralph Pudritz, Paul Higgs, Jonathan Stone, Cambridge Astrobiology Series III., Cambridge University Press, 241-262. [2] Horváth et al. (2009) *Astrobiology 9/1, 90-103*. [3] Kereszturi et al. (2009) *Icarus 201, 492-503*. [4] Horváth et al. (2001) *32th LPSC*#1543. [5] Gánti el al. (2003) *Origin of Life and Evolution of the Biosphere* 33, 515-557. [6] Kereszturi et al. (2010), *41st LPSC*#1714. [7] Renno et al. (2009) *JGR* submitted. [8] Kereszturi at al. (2010) *Icarus*, doi:10.1016/j.icarus.2009.10.012. [9] Kereszturi et al. (2007) *LPSC #1864,* [10] Kereszturi et al. (2009) *LPSC#1111*. [11] Horváth et al. (2009) *32nd NIPR*, Tokyo. [12] Möhlmann (2009) Icarus DOI: 10.1016/j.icarus.2009.11.013 [13] Möhlmann (2010), submitted to Icarus.