

# **ANNUAL CHANGE OF OUTFLOWS FROM DARK DUNE SPOTS IN THE SOUTHERN POLAR REGION OF THE MARS**

A. Horváth (1, 2, 3), Sz. Bérczi (1, 4), Á. Kereszturi (1), T. Pócs, (1, 5), A. Gesztesi (1, 3), T. Gánti (4), E. Szathmáry (1,6);

(1) Collegium Budapest (Institute for Advanced Study), 2 Szentháromság, H-1014 Budapest, ([esa@colbud.hu](mailto:esa@colbud.hu)); (2) Konkoly Observatory, H-1525 Budapest Pf. 67; (3) Budapest Planetarium of Society for Dissemination of Scientific Knowledge, H-1476 Budapest Pf. 47, ([planet@mail.datanet.hu](mailto:planet@mail.datanet.hu)); (4) Eötvös University, Dept. G. Physics, Cosmic Mat. Sp. Res. Gr. H-1117 Budapest; (5) Eszterházy Károly College, Dept. of Botany, H-3301 Eger Pf 43, ([colura@ektf.hu](mailto:colura@ektf.hu)); (6) Eötvös University, Dept. of Plant Taxonomy and Ecology, H-1117 Budapest, Pázmány 1/a. Hungary.

From the rich database of the Mars Global Surveyor we found two images which were made on the same region, but one martian year difference, almost in the same phase of the seasonal cycle of the DDS-phenomenon. The crater is in the Southern Polar region of Mars, contains a dark dune field and spring many possibly biogene Dark Dune Spots (DDS) can be observed in it [1]. On the dark dunefield there is a long slope which is in contact with two smooth horizontal surfaces with different height. The dunefield is frosted during winter and interesting defrosting phenomenon can be observed on it during spring. The observed streaks represent defrosting forms along this slope region. In the frosting phenomenon water plays important role as observed by the ESA/Mars Express Orbiter [2].

On the images the streaks start from DDS at the upper margin of the slope. Because of the slope direction we considered them as downslope patterns. The dark and grey streaks from these DDS suggest that on the surface the frosted layer has been partly or totally defrosted. The observed main characteristics are: a) the dark streaks most frequently depart from DDS, b) there are grey streaks, for which at their lower end a spot indicates that probably the downflow material has been collected there, c) the darkness of the streaks is variable, d) most streaks become narrower at the foot of the slope then it was on the top, e) the phenomenon annually appears on Mars.

We interpret the downflow streaks phenomena in the following way. According to our earlier model the DDS forming defrosting process contains biological components. The defrosting process cycle begins in spring when the Martian Surface Organisms (MSOs) begins their activity and help enhance the melting of water [3]. The molten water seepage starts in downslope direction from the bottom of the frosted layer. Seepage happens not only downslope but probably also into the soil. That is why the streaks become narrower while going down the slope. On the water covered surfaces the sublimation increases, first only its grey color exhibits the thinner frosted layer, later the final dark color of the DDS exhibits the naked surface of the dark dunefield. On the basis of our earlier works we suggest that the DDS-MSOs, which could be bacterial ecosystems similar to the terrestrial crypto-biotic crusts (CBC) live in the upper layers of the dark soil. The CBCs periodically dry out and survive in this denaturated form till the next moisture period. Such CBC-like MSOs play important role in melting the water of the frosted layer on the dark dunefields on Mars [4]. It is important for our CBC analogy that such water outflows were observed in the case of terrestrial CBCs, too. In smaller scale the so called 'Tintenstriche' (ink streaks) of temporary water outflows on steep rock surfaces are somewhat similar, where the rock surfaces regularly wetted by the flow are covered by a CBC of dark pigmented cyanobacteria. Based on our previous work we suggest that the physico-chemical circumstances below the frost can produce such local microhabitat which existence is suggested by other authors only in localities deep below the martian surface.

**References:** [1] Horváth, A., Gánti, T., Gesztesi, A., Bérczi, Sz., Szathmáry, E. (2001) Probable evidences of recent biological activity on Mars: appearance and growing of dark dune spots in the

South Polar Region. *Lunar Planet. Sci. XXXII*, #1543, LPI, Houston; [2] Bibring, J.-P. et al (2004) [Perennial water ice identified in the south polar cap of Mars](#), *Nature* **428**, April 2004, pp. 627-630; [3] Gánti, T., Horváth, A., Bérczi, Sz., Gesztesi, A., Szathmáry E. (2003) DARK DUNE SPOTS: POSSIBLE BIOMARKERS ON MARS? *Origins of Life and Evolution of the Biosphere* **33**: pp. 515-557, Kluwer Academic Publishers, Netherlands. [4] Pócs, T., A. Horváth, T. Gánti, Sz. Bérczi, E. Szathmáry (2003) Possible Crypto-Biotic -Crust on Mars? *3rd European Workshop on Exo/Astrobiology*, 18-20, November, 2003, Madrid, *ESA SP-545*, March 2004, pp. 265-266.