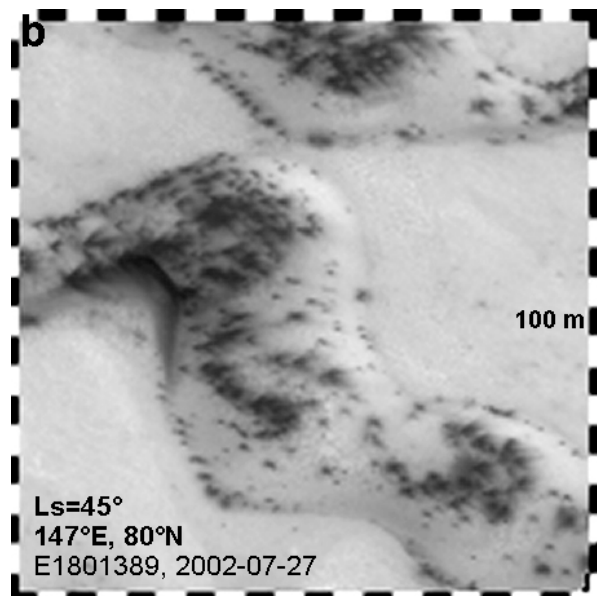


**BIOGENIC RINGED DARK DUNE SPOTS ON MARS? A. Horváth (1,2), T. Gánti (3), Sz. Bérczi (4), E. Szathmáry (3,5);** (1) Budapest Planetarium of Society for Dissemination of Scientific Knowledge ([planet@mail.datanet.hu](mailto:planet@mail.datanet.hu)), H-1476 Budapest Pf. 47, Hungary; (2) Konkoly Observatory, H-1525 Budapest Pf. 67, Hungary; (3) Collegium Budapest (Institute for Advanced Study), 2 Szentháromság, H-1014 Budapest, Hungary; (4) Eötvös University, Dept. G. Physics, Cosmic Mat. Sp. Res. Gr. H-1117 Budapest, Pázmány 1/a. Hungary ([bercziszani@ludens.elte.hu](mailto:bercziszani@ludens.elte.hu)); (5) Eötvös University, Dept. of Plant Taxonomy and Ecology, H-1117 Budapest, Pázmány 1/a. Hungary, ([szathmarty@colbud.hu](mailto:szathmarty@colbud.hu));

**Abstract:** Comparison of the Dark Dune Spots of the Southern and those of the Northern Polar Regions of Mars shows that northern DD spots have various shapes and they have only rarely circular shape similar to the southern one.

**Introduction:** There are regions on Mars which are covered by dark dune material. They are distributed across the whole planetary surface; however, there is a phenomenon which associated with them in the Polar Regions. Because of the precipitation of the frost in the winter, the defrosting phenomenon is very well observable on these surfaces.

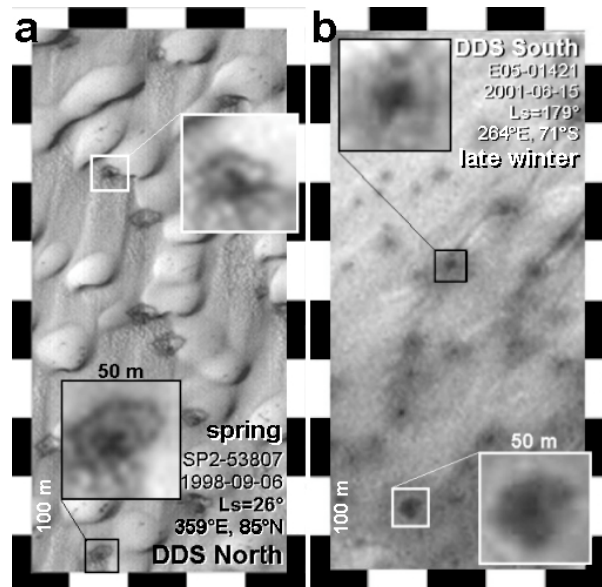
Dark dune fields form a wide belt around the north pole of Mars. Contrary to this, in the Southern Polar Region the dark dunes form only smaller patches; here they occur mainly inside the craters. The larger dark surface at the North Pole is more extended and the frosting-defrosting phenomenon is more complex in the North than in the South (Fig. 1).



**Fig.1** In the vicinity of the North Pole the defrosting pattern of the dark dune spots exhibit various shapes: lineaments, wind-blown, but circular too.

Nearly half thousand of the MGS MOC images of South and North Polar Region of Mars from the three observed Martian years (1998–2002) winter-spring transitional period had been analyzed morphologically and stratigraphically. Previously we had focused on the Southern Dark Dune Spots (DDSs) and their transitional forms; now we turn to the North [1, 2].

In the Northern Polar Region we observed that during the defrosting period the shape of the dark dune spot formations is varied: they form lineaments, grids, fans-shaped, wind-blown and circular features. Instead of such diverse forms, in the Southern Polar Region the defrosting pattern of the frosted surfaces is dominated by many tumens (tumen = ten-thousands in the Eurasian Steppe Culture) of mainly circular or concentric ringed Dark Dune Spots (RDS). It was surprising to observe that on the northern dark dunes only a small number of circular or ringed dark dune spots had been found.



**Fig.2** The ringed dark dune spots (RDS) have similar features in the Northern (a) and Southern (b) Polar Region.

We studied the transformations of the circular and ringed dark dune spots. The process of their shape changes was observed to be similar in details, both in the Southern and the Northern Polar Regions (Fig. 2, 3, 4).

Our analysis of the transformations and the arrangement of subsequent stages of ringed DDSs on Southern Polar Region into time sequence revealed their: *hole-like characteristics* [2, 3], development and *formation from the bottom* of the frosted layer [2, 3], *seasonal changes* (Fig. 3, 4) and *annual repeated* appearance in a pattern of multiple DDSs on the surface [2, 4, 5, 6], and probable origin [1, 2, 4, 7, 8].

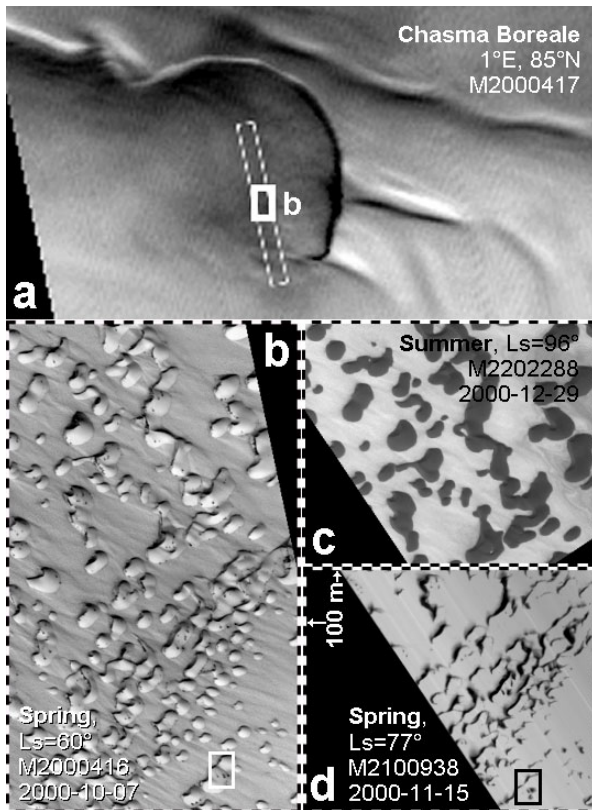


Fig. 3 Northern "test field" of ringed dark dune spots in a crater (a) at the inner end of Chasma Boreale. In spring on the frosted dark dunes (b) the dark dune spots appear and RDSs develop with time (d). The framed regions can be seen enlarged on Fig.4. In summer all barchan shaped dark dunes are defrosted and here they have dark tone (c).

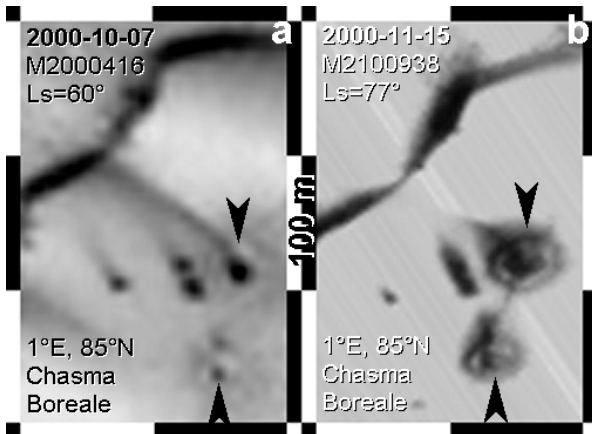


Fig. 4 Springtime growth of Northern ringed dark dune spots in the Chasma Boreale (see Fig.3a). Comparing the two images we can observe that the earlier spots (a) extended in size during the five weeks (b) elapsed between the two images. The arrows point to two large RDSs.

**Summary:** The smaller number of circular RDS in the Northern Polar Region may be explained with meteorological differences between the Northern and Southern Polar Regions. The Southern winters and springs are warmer (cca. 30 K degrees) because Mars is in its pericentrum during Southern spring.

We suggested a possible biogenic origin model for the genesis of the Southern DDS, which we called DDS-MSO hypothesis [1, 2, 4, 7, 8]. This model uses multiple factors in interpreting the formation of the circular ringed DDS, while the rival model of Malin and Edgett [9, 10], uses geophysical-geochemical reasons in their interpretation. These two hypotheses are competitors also in explaining the phenomena in the North as discussed in the present paper.

**Acknowledgments:** Authors thank for the use of MGS MOC images of NASA and Malin Space Science Systems [11].

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