UNUSUAL FEATURES OF WIND-RELATED EROSION WITHIN A SMALL IMPACT CRATERS IN CHRYSE PLANITIA ON MARS. R.O.Kuzmin[1], I.V.Kuznetsov[1] and R.Greeley[2], [1]Vernadsky Institute of Geochemistry and Analytical Chemistry, Russian Academy of Sciences, 19 Kosygin str., Moscow 119991, Russia, e-mail: rok@geokhi.ru, [2] Department of Geological Sciences, Arizona State University, Tempe, AZ 85287

Introduction. High resolution Mars Orbiter Camera (MOC) images [1] show wide variety of the aeolian features within the impact craters attributed to wind erosion and deposition. The features include different types of bright and dark wind streaks behind the craters, duneforms, bright transverse dunes, interacrater deposits, and rim scouring forms. The orientation of these aeolian features is consistent with the direction of current strong winds [2,3], while origin of some of them could be related with paleowind regime[4]. Here we present the results of study of unknown before phenomenon of the wind-related modification of the impact craters on Mars in the form of blowout hollows which have been found only in two places on Mars: mostly in southern part of Chryse Planitia and in rare case in south-western part of Elysium Planitia.

Observation. The studded features represent the circular and elliptical relatively shallow depressions (20-200 m in diameter), settled predominantly on the interior craters slopes of SW-SE exposition in quantity of one, two, several and numerous forms (fig.1). Average size of the depressions is 105 m along the long axis and 70 along short one. The range size of the craters with such features is 100-2000 m.

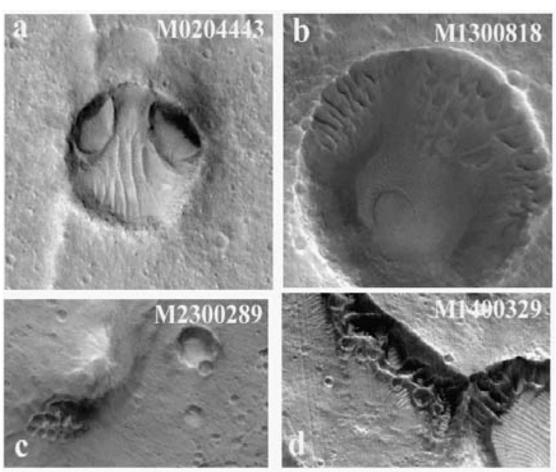

Fig.1. Examples of the blowout hollows within the impact craters (a,b), on the slopes of the hills (c) and escarpments (d)

Often the depressions have distinct rim. In rare cases the features also are placed on a hills and escarpments slopes with the SW-SE exposition (see fig.1c,d and fig.2). In the cases with several or more depressions within crater, the features are organized in chain of overlapping each other forms.

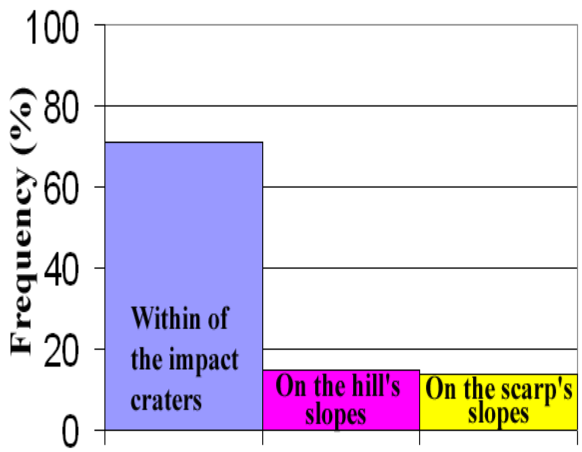

Fig.2. Frequency distribution of the blowout depressions within impact craters, on hill's and scarp's slopes.

The intercrater's depressions have been met only in the cases when craters interior slopes are covered by the deposits of friable and loose material. Based on analysis of 1187 high resolution MOC images in the region of Chryse Planitia (10°-40°N, 10°-60°W), the blowout hollows on the internal slopes of a small impact craters and in rare cases on the hills and escarpments slopes has been found only on 144 images within an anomalous areas of the southern Chryse Planitia. The map of the blowout hollows spatial spreading and their density distribution within individual MOC images is shown on fig.3.

As seen from the map, the area of the features distribution is elongated in NE-SW direction and is located in transitive zone between the lowland surface of the Chryse Planitia and the highland terrain of western Arabia Terra.

fig.4b). Apparently exactly those winds were responsible for observing blowout depressions within impact craters.

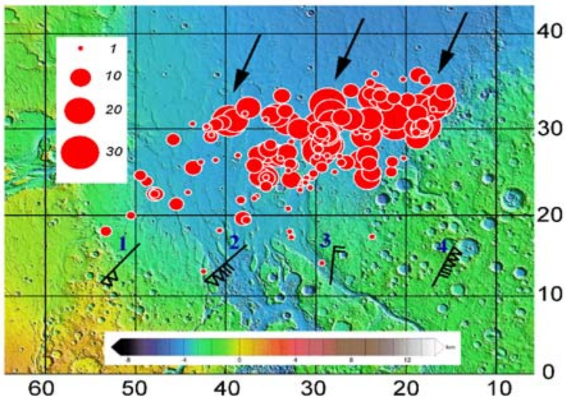

Fig.3. Distribution of the crater-related blowout hollows in Chryse Planitia. Red circles show number of the hollows on one MOC image. 1,2,3,4 –force and direction of the season winds (spring, summer, fall and winter respectively) predicted by MGC model. Arrows shows the orientation of the crater bright streaks.

Our study show that disposition of the blowout depressions within the craters directly correlates with both the leeward facing interior slope of the craters and orientation of the bright craters streaks (fig.4a).

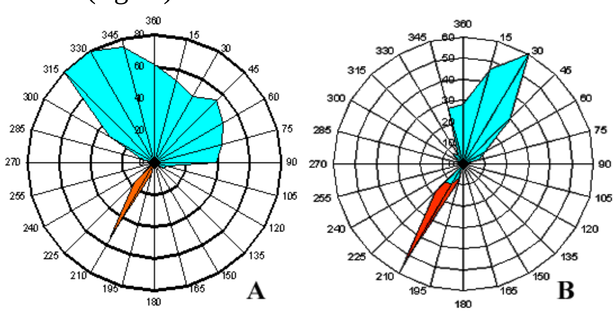

Fig.4. Rose-diagrams of the blowout depressions location (blue color) within the impact craters (a) and on leeward slopes of the hills and escarpments (b). The azimuths of the strongest winter wind in the region are shown by red.

The craters streaks are predominantly associated with the strongest winds (blowing from NE to SW), which are predicted by Mars GCM [5] for winter season. Similar correlation has been found also for the depressions located on the leeward slopes of the hills and escarpments (see fig.4b).

Discussion. We interpret the features as blowout depression formed due to localized and high shear-stress of vortical air movements within the craters. Such air movement may to be resulted by leeward air flow separation in the form of vortex with vertical axis, which have been formed on (and below) the edge of the crater rims, the escarpments edges and the hill's leeward slopes. It is not excluded that much more higher radiation heating of the craters interior slopes with SW-SE exposition during winter time could to increase the effect of flow separation on the leeward crater slope. The blowout depressions located on leeward slope of Bruneau star dune in western Idaho may to serve as terrestrial analogy of observing features on Mars. The experimental modeling of the wind flow streamline of craters models (filled by fine sand), conducted in Wind Tunnel Facility of Arizona State University, has demonstrated appearance of similar blowout hollow on leeward internal slope of the crater model due to formation in the place of vortical air movements below the edge of the crater rims. The experimental results well support wind-related origin of the studded blowout depression within the Martian small impact craters.

Reference: 1- Malin M.C. and K.S.Edgett (2001) *JGR*, 106, 23,429-23,570; 2- Greeley et al. (1999) *JGR*, 104, 8573-8584; 3- Greeley et al. (2000) *JGR*, 105, 1829-1840; 4- Kuzmin R.O. et al. (2001) *Icarus*, 153, 61-70; 5- Haberle R.M et al. (1993) *JGR*, 98, 3093-3123.

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