SEASONAL FROST BEHAVIOR IN AND AROUND DOKKA CRATER ON MARS. A. Kuti[1,3], A. Keresztu-ri[2,3]. [1]Eotvos Lorand University of Sciences Department of Astronomy, H-1518 Budapest, Pf. 32., Hungary, [2]Collegium Budapest Institute for Advanced Study, [3]Hungarian Astronomical Association e-mail: adrienn.kuti@index.hu.)

Introduction: Based on theoretical computations and observational evidences, the latitudinal distribution of H_2O ice on Mars changes according to the orbital changes. There are water ice "islands" separated from the north permanent cap within the circumpolar dunes [1], which could be remnants of former and greater water ice polar caps. As a result they may contain substantial amount of deposits, water ice, dust and CO_2 ice mixed together. Their analysis may give insight to the climatic fluctuation forced by orbital changes and to paleoclimatic chatracteristics of Mars.

We have classified the "unusual" phenomena around and beyond the northern receding seasonal cap edge into two groups: 1. H_2O annulus: based on THEMIS images at north, the CO_2 cap edge is too bright to be defrosted, and too warm to be CO_2 ice. This annulus is composed of H_2O ice and it widens as it recedes [2].

Three thermally different terrains could be detected at the northern cap edge: a CO_2 covered cold, a defrosted warm and an intermediate one between those two. The temperature of this intermediate region varies between 167 K and 206 K which means it's too warm to be CO_2 frost but too cold to be barren surface – so it is composed of waterice. The waterice signature extends beyond the cap edge toward north, probably because the H_2O recondenses onto the receding cold cap. 2. Frost outliers: many of the bright terrains keep their high albedo during summer as well, when they are separated from the residual cap [3][4][5].

The aim of our work is the analysis of such frost outliers in and around Dokka crater. Dokka is 50 km in diameter, located at 77°N, 214°E. Its interior is filled with sediments which are resembling to outliers of ancient polar layered deposits, just like inside Korolev crater [6], which thermal behavior differs from the regular annual behavior at this latitude on Mars. The characteristics of Dokka will be useful for further research in understanding the composition and behavior of the north polar region [7][8], as well as other polar craters with summertime frost inside [9] [10][11][12].

Methods: For the analysis we have used MGS TES bolometer data, acquired in nadir-pointing mode. Bolometric brightness temperatures were retrieved by using "vanilla" software, for three Matrian years (MY24, MY25 and MY26). Our work is restricted to three regions in the northern polar region (Fig. 1): 1. below Dokka (145°-146.9°W, 75.8°-76.3°N), 2. the crater floor of Dokka (145°-146.9°W, 77.0°-77.5°N), 3. above Dokka (145°-146.9°W, 78.0°-78.5°N). These regions show different thermal behavior from each other.

Discussion: Based on the analysis of annual temperature changes we could draw the following conclusions on the annual frost behavior: there's a rapid temperature rise at around Ls=59°, which is the Crocus date for the crater floor, in good agreement with Korolev crater (Ls=58°), situated at nearly the same latitude (196°W, 73°N) [13]. Surface temperature reaches its maximum value not much after Ls=90°. Daytime temperature climbs up to 215 K during the northern hemisphere summer, while at night it drops back to 133-137 K. Since the temperature values are significantly lower in the crater floor compared to the region slightly below Dokka, ice coverage inside the

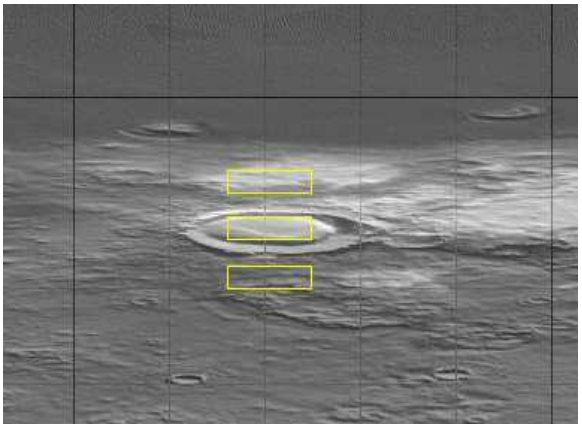

Figure 1 *The three analyzed terrains in the northern polar region*

crater (Fig. 2) lasts longer. The small area above Dokka clearly shows the opposite than the region southward of Dokka, but similar to the region inside Dokka. After reaching the peak, there's a slighter decrease in temperature until Ls ~210°. According to the altitude of Sun, daytime and night-time temperatures become indistinguishable after Ls=201°. In wintertime, when the seasonal CO_2 cap covers the analyzed regions, there is a noticable difference in temperatures between the crater floor and the areas below and above it; the values are lower for the crater floor. Based on the anal-

ysis of 20 MGS MOC images, frost cover is present inside the crater between Ls=69° and 156°, so it can be seen during summertime as well (Fig. 3). This cannot be CO_2 ice since the temperature is too high for it to form, suggesting that it can be waterice. Between Ls=110° and 160° the temperature fluctuates inside Dokka, possibly by some change in the waterice frost cover.

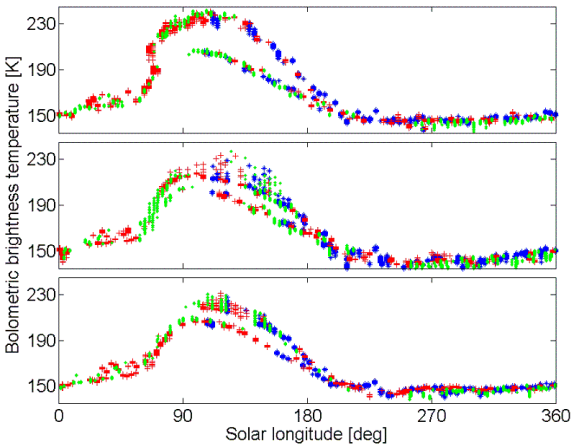

Figure 2. *Seasonal trends of TES bolometric brightness temperature for the analyzed regions. Top: area southward of the crater; middle: crater floor; bottom: area northward of the crater. Blue stars stand for MY 24, red crosses for MY 25, green dots for MY 26.*

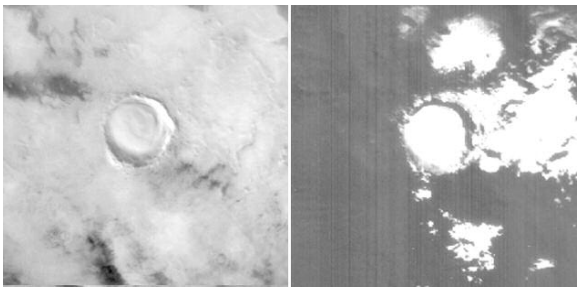

Figure 3. *Two MGS MOC images of Dokka crater acquired at Ls=58° (left panel, S1802213) and at Ls=148° (right panel, M0105680), showing the crater floor and some other patches around. The trapped white frost can clearly be seen even in summertime.*

Conclusion: Based on our analysis, the terrain inside and northward of Dokka show different thermal behavior than the latitude band they are situdated on, with long duration waterice surface cover. During late summer the temperature fluctuates, possibly in connection with changes in the frost coverage. As a result Dokka's specific thermal behavior may give insight to the role of frost outliers in the water cycle of Mars.

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