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Present Day Activity of South Polar Gullies on Mars

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Here we report on clearly identified seasonal changes of gullies observed within the last two martian years (MY) on slopes of a south polar pit, which is located in a filled crater (diameter ∼54 km) north of Sisyphi Cavi at ∼68.5°S and ∼1.5°E. Using new high-resolution imaging (High Resolution Imaging Science Experiment, HiRISE), temperature (Thermal Emission Spectrometer, TES) and spectral data (Compact Reconnaissance Imaging Spectrometer for Mars, CRISM; Observatoire pour la Minéralogie, l'Eau, les Glaces et l'Activité, OMEGA), we analyzed the exact timing of changes of gullies and detect the possible medium (CO_2, H_2O or dry) and mechanism which initiate present day gully activity.
Two locations in the study region with clear modifications of gullies were identified in MY 29 between LS 226° and LS 247° and between LS 209° and LS 247°. In MY 30 changes occur in both locations between LS 218° and LS 249°. Modifications are the formation of a new small apron and new deposits within the channel, both associated with the deposition of dark material. Erosion in gully alcoves or channels was not observed. TES data show temperatures between ∼180 and ∼240 K within the period of gully modifications. Maximum temperatures in the region rise up to ∼285 K between LS ∼270° and ∼310°. Spectral data show a CO_2-cover of the study region until LS 227°. CO_2-ice free surface are spectrally observed for the first time at LS 249°. H_2O was not spectrally detected in the study region and a mixture of CO_2 and H_2O as presented in [1] cannot be clearly detected. Unfortunately, there are no spectral data available between LS 227° and 249°.
Modifications of gullies imply seasonal volatile activity. The activity can be narrowed down to occur between LS 226° and 247° at mean temperatures between ∼180 and ∼240 K. This is in the range of temperatures where CO_2 sublimates back into the atmosphere. Based on the temperature range, the most likely candidate for the observed new deposits are processes related to the sublimation of CO_2. It is possible that the gully modifications were initiated by CO_2/dust avalanches as proposed by [2-5]. An alternative possibility might be that the new deposits were initiated by briny flows (liquid H_2O, melting point lowered due to salts) [6]. Temperatures are very variable in the time of the observed activity and exceed temperatures of 260 K. Some brines have eutectic temperatures down to ∼201 K [7], hence brines can remain liquid under temperatures below the H_2O freezing point [6]. CRISM data between Ls ∼230° and ∼245° could help to constrain if the changes are initiated by sublimation processes of CO_2 or by melting of H_2O-brines.

[1] Titus, T. N. et al. (2003) Science, 299, 1048-1051. [2] Hoffman, N. (2002) Astrobiology, 2, 313-323. [3] Cedillo-Flores, Y. et al. (2011) GRL, 38, doi:10.1029/2011GL049403. [4] Dundas, C.M. et al. (2010) GRL, 37, doi:10.1029/2009GL041351. [5] Diniega, S. et al. (2010) Geology, 38, 1047-1050. [6] Möhlmann, D.T.F. (2011) Icarus, 214, 236-239. [7] Möhlmann, D. and Thomson, K. (2011) Icarus, 212, 123-130.