Geophysical Research Abstracts
Vol. 14, EGU2012-1045, 2012
EGU General Assembly 2012

Morphological characterization of springtime seasonal activity on the Russell dune (Mars)

G Jouannic (1), J Gargani (1), F Costard (1), C Marmo (1), F Schmidt (1), O Bourgeois (2), M Massé (3), and GG Ori (4)

(1) Paris Sud 11, UMR 8148, IDES, ORSAY Cedex, France (gwenael.jouannic@u-psud.fr), (2) Laboratoire de Planétologie et Géodynamique, CNRS/INSU UMR 6112, Université de Nantes, 2 chemin de la Houssinière, BP 92205, 44322 Nantes Cedex 3, France., (3) Lunar and Planetary Laboratory, University of Arizona, Tucson, Arizona, USA., (4) International Research School of Planetary Sciences, Università "G. d'Annunzio", Viale Pindaro 42, 65127 Pescara, Italy.

From a theoretical point of view, pure liquid water is not likely to be found at the present time on the Martian surface because atmospheric pressure/temperature conditions are below the water triple-point. However, gullies discovered by Malin and Edgett (2000) suggest that significant amounts of liquid water have flowed on Mars in a recent past.

Recent works showed that Martian dunes have exhibited modifications over the past years, including topographic changes on aprons and new channel incisions into dune surfaces (Diniega et al., 2010; Dundas et al., 2010; Reiss et al., 2010; Hansen et al., 2011). These seasonal activities can be explained by CO_2 frost processes (Diniega et al., 2010; Dundas et al., 2010; Hansen et al., 2011) or melting of water frost and/or near surface ice triggering sand-water flows (Reiss et al., 2010).

The new possibility given by HiRISE images to perform precise monitoring of present modifications of the surface of Mars allows to improve our understanding of the seasonal activity and of the topographic evolution of dunes. Numerous changes could be observed during the last three Martian years. Here, we show that there is a perennial activity on the Martian dune Russell: surface flows appear seasonally (Reiss et al., 2010), after the total disappearance of CO_2 at spring (Gardin et al., 2010; Reiss et al., 2010), and are able to erode their substrate. This perennial activity is constituted by a complex interconnected rill system that is recorded all year long and which grows from one year to the next at a rate of 10000 m2.yr-1. These flows are viscous and able to erode as well to transport a non negligible quantity of sand with a grain size of 500±100 [U+F06D]m at a minimum velocity of ~1.4.10-4m.s-1.

These flows could be composed in part of liquid water. The origin of the liquid water is probably from the melting of the water ice (accumulated on the dune surface by vapour condensation during winter) at spring or/and from the defrosting of a small active layer of permafrost. There are at least four processes that could explain the physical properties of this perennial activity: (1) brine flow (Chevrier et al., 2008), (2) liquid water flow mixed with sand (Reiss et al., 2010), (3) liquid water flow mixed with snow or ice, (4) a combination of the previous three processes.