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Mineralogy of the Northern Llowlands on Mars

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We analyzed the spectral properties of the 1 μm band to constrain the composition of the lowland terrains of Mars and compared them with the global mineralogy of the planet. The analysis has been carry out with the data of OMEGA instrument on board of Mars Express using the method of Carrozzo et al. [1].
The spectral behavior in the right shoulder at 1 μm together with that of other spectral indices such as the 1 μm band integral and width confirm the peculiar nature of these terrains. They are characterized by a well known negative slope in the NIR range, but they show a spectral behavior in the visible domain typical of the mafic terrains located on the southern cratered and older regions of Mars. Similar NIR negative is also present in spectra taken from the northern circumpolar dark sand dunes, characterized moreover by the typical hydration bands.
Recently, Horgan and Bell III [2] proposed that the northern dark plains are consistent with both high abundances of iron-bearing glass and silica-enriched leached rind on glass. Our results, together with the recent ones from CRISM [3], seems to confirm that the mineralogy of these peculiar areas is likely linked to a weathered basaltic component.
The spectral similarity in the NIR range with the northern circumpolar dark sand dunes, undergoing every Martian year the deposition of the ices and their sublimation, can put some constrains in the weathering processes that took place on the northern lowlands. Unlike the southern and older mafic terrains, they may have interacted with the ices, as also suggested by the morphological structures present in these areas [4].

Reference:
[1] Carrozzo F. G. et al. (2012) JGR, 117(E00J17), doi: 10.1029/2012JE004091[2] Horgan and Bell III (2012) Geology, doi:10.1130/G32755.1 [3] Salvatore M. R. et al. (2010) JGR, 115(E07005) [4] Zealey W. J. (2009)Planetary and Space Science, 57(5-6) 699-710.