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The puzzling origin of the Martian Northern Lowlands

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Abstract.

Surface studies of the northern lowlands of Mars have shown that this region has undergone a complex history including volcanism, sedimentary deposition and secondary modification by climate change. Despite these analyses, the origin and the evolution of this region are still debated. No clear and definitive evidences have been found so far to conclude whether these plains were formed by a giant impact, were once covered by an ocean or were filled by a large quantity of lavas. In the visible and infrared spectral range, the northern lowlands differ from southern terrains in the NIR negative slope while they exhibit VNIR spectra similar to the southern pyroxene-rich areas (Carrozzo et al., 2012). These observations, combined with both recent detection of mafic minerals at higher spatial resolution by CRISM (Salvatore et al., 2010) and recent results of Horgan and Bell (2012), supports that their mineralogy is linked to weathered basalts with a glassy component. In addition to this, the spectral similarity of Acidalia area with the northern circumpolar sand dunes, apart from the hydration features, suggests that the weathering processes that took place there could be related to past glacial activity, in agreement with superficial morphology showing glacial structures. Aim of this work is to combine the OMEGA mineralogical maps with morphological features (Tanaka et al., 2011) and investigate possible terrestrial analogues in order to give some constrains on the composition and origin of these puzzling Martian terrains.

References

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