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Mineralogy of Aram Chaos on Mars derived from OMEGA hyperspectral data

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The OMEGA imaging spectrometer onboard Mars Express has completed a near global coverage of Mars in 352 spectral channels from 0.3 to 5.1 μm at a spatial resolution ranging from 300 m to 4 km. This data set provides the opportunity to investigate the mineralogy of the surface of Mars by looking at diagnostic spectral features in the visible and near infrared domains [1]. We have focused our study on the Aram Chaos region of Mars. Aram Chaos is a circular depression which is 300 km in diameter. It is thought to be filled by sediments which were mixed with a significant amount of water ice. A melting of the water ice due either to a global warming or to the rise of a hot mantle plume is at the origin of observed chaotic terrains. The liquid water exited the Chaos through a channel which feeds the Ares Vallis system. We have reduced OMEGA data on Aram Chaos in order to look for particular mineralogical signatures. The atmospheric contribution in the spectra has been removed by using a ratio of two spectra at the summit and bottom of Olympus Mons scaled to the depth of the 2 μm CO2 feature. Maps of spectral parameters have then been produced, together with maps of the main mineralogical families derived from a linear unmixing deconvolution algorithm [2]. These OMEGA processing products have been integrated into a GIS in order to compare the spectral characteristics with high resolution imagery (Themis, MOC, HRSC, Hirise). A flat top unit display signatures of typical dust with a small amount of pyroxenes. Strong signatures of ferric oxides have been found in the intermediate exposed layers, where the flat top unit has been removed by erosion (probably driven by the wind). They are correlated to a significant

1.92 μm hydration band. The lowest part of the excavated materials show signatures typical of monohydrated sulfates (consistent with either szomolnokite or more probably kieserite). The geological implications of the mineralogical detections will be discussed in the presentation.

References: [1] Bibring et al. (2005), Science, vol. 307, 5715, 1576-1581. [2] Combe, J.-Ph. et al., (2006), Lunar Planet. Sci. Conf. XXXVII, abstract #2010.