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GLOBAL MINERALOGICAL MAPPING OF THE MARTIAN SURFACE FROM OMEGA/MEx

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OMEGA/Mex returned visible and near-infrared reflectance since January 2004. The first martian year of OMEGA observations provided, in 2007, a first analysis of the global distribution of some surface materials [1]. Today, we obtained more than 3 martian years of surface observations, representing more than 8000 orbits and allowing an almost complete coverage of the martian surface. Here, we present a global and final data set of the distribution of weathered and igneous materials as revealed by the OMEGA instrument. Identification and mapping of ferric oxides and mafic minerals (olivine and pyroxene) are derived from spectral parameters developed in [1] and [2]. Two spectral indexes are implemented for olivine, capable to distinguish between Fe-rich and Mg-rich compositions. Surface frost, atmospheric effects (clouds, aerosols) and instrumental artifacts interfere with OMEGA observations leading us to implement a filtering process based on parameters that gauge the presence of H2O, CO2 ice and dust opacity [3]. Final maps with a grid of 40 pixel/° are obtained by selecting the highest value of the criteria for each pixel. The albedo map shows a significant increase of the OMEGA data global coverage of the martian surface since the 2007 study. The bright regions are characterized by strong Fe3+signatures, while pyroxenes are mainly localized in the low albedo regions of both southern and northern hemispheres, which is in good agreement with the 2007 analyses. Olivine distribution is uneven, but still mostly localized in the southern highlands. All previously olivine regions identified by [1] including Nili Fossae, Terra Tyrrhena, Syrtis Major and Ganges Chasma are detected. Numerous additional small deposits, especially around the Argyre and Hellas basins and in the northern plains are here reported. Mg-rich olivine is mostly found in regional enhancements of both Hesperian and Noachian ages and is present at all altitudes. To the contrary, the Fe-rich olivine is more commonly found in the oldest terrains and in discrete occurrences with the exception of extended deposits around large basins. Fe-rich olivine is distributed according to two main ranges of altitude, between -2.5 and 0 km, which corresponds to the surrounding areas of major basins (Hellas, Isidis and Argyre), and between -4 and -2.5 km, which corresponds to the craters in the northern plains. The global maps will be presented and be discussed in order to better understand their implication for the crust formation and evolution.

References: [1] Poulet F. et al. (2007) JGR, 112,E08S02. [2] B. Gondet et al. (2007) LPSC XXXVIII. [3] A. Ody et al. (2010) LPSC XXXX.