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Mineralogy variations across Syrtis Major and surroundings as inferred from visible-near-infrared spectroscopy by OMEGA/Mars Express

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An extended mosaic of the region of the Syrtis Major shield and surroundings has been produced from a number of orbits, with cross track swaths varying from 128 to 32 pixels.

It combines the spectral data acquired in the visible and near-infrared channels, respectively from the push-broom spectrometer operating from 0.35 to 1.08 micron and from the infrared whisk-broom C, operating from 0.98 to 2.6 micron.

A systematic analysis of the spectroscopic variability is carried out by means of a principal component analysis (PCA) which highlights the different spectra representative of the spectroscopic endmembers corresponding to various mineralogies on the basis of the contribution of both the 1 and 2 micron absorption features. These spectra are then analysed using the modified Gaussian model (MGM). It is achieved considering a sum of Gaussian functions and assuming that the spectral continuum can be modeled by a polynomial shape. Depending on the encountered mineralogical complexity, an increasing number of gaussian bands has been considered, in order to address various mixtures of mafic minerals involving orthopyroxene, clinopyroxene and/or olivine. The potential identification of minerals is carried out through a systematic search, based on a sorting of bands relying on laboratory studies addressing separately pyroxene mixtures and olivine suite. Two types of spectral behaviors are found: the first one, associated with np-opx weak absorptions and the second, associated with pronounced cpx-ol absorptions. In both cases, the spectral shapes are modulated by changes in the overall slope of the spectra which may range from positive to negative. The present analysis leads to the identification of olivine, consistent with iron-rich forsterite to fayalite composition and agrees with other approaches and observations (Hoefen et al. (2003), *Science* , vol. 302, 627; Bibring et al. (2005), *Science,* vol. 307*, 5715, 1576;* Mustard et al. (2005), *Science,* vol. 307, 5715, 1594;.McSween et al., *JGR 111, EO210;* LeMouélic et al., 1^{st} *Europlanet Conf; ;* Poulet et al. (2007), *JGR OMEGA special issue*). Olivine, in variable mixtures and abundances, appears more widespread than previously thought.