AOGS 2006

Analysis of OMEGA/Mars Express Hyperspectral Images with a Linear Unmixing Model

STEPHANE LE MOUÉLIC[1], CHRISTOPHE SOTIN[1], JEAN-PHILIPPE COMBE[1], LAETITIA LE DEIT[1], OLIVIER GRASSET[1], JEAN-PIERRE BIBRING[2], YVES LANGEVIN[2], BRIGITTE GONDET[2], ALINE GENDRIN, JOHN MUSTARD[3]

[1] *Laboratoire de Planétologie et Géodynamique, Nantes, France*

[2] *Institut d Astrophysique Spatiale, Orsay, France*

[3] *Brown University, Providence, USA*

The OMEGA imaging spectrometer onbord 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 unprecedented data set provides the opportunity to investigate the mineralogy of the very top surface of Mars by looking at diagnostic spectral features in the visible and near infrared domains [1]. We have focused our data reduction approach on the linear unmixing strategies. Working on a pixel by pixel basis, we find the best linear combination of a suite of laboratory spectra of pure minerals which matches the OMEGA data. A spectral flat and dark artificial component is introduced to account for shading effects. Similarly, we use two pure positive and negative slopes to account at first order for continuum slope variations linked to scattering, grain size and photometric effects. This approach allows us to draw several conclusions on the overall mineralogy of the observed regions. In particular, the Syrtis Major area appears dominated by a mixing between low and high Calcium pyroxenes in various amounts, with localized exposures of iron-rich olivines. At a global scale, the southern hemisphere appears enriched in both low-Ca and high-Ca pyroxenes. Signatures of iron oxides are detected in the bright regions of the northern hemisphere. These results agree with those obtained with different approaches such as MGM or ratio images [1, 2]. The advantages and limits of the unmixing approach applied to OMEGA hyperspectral images is discussed References: [1] Bibring et al. (2005), Science, vol.307, 5715, 1576-1581. [2] Mustard et al., Science (2005), vol.307, 5715, 1594-1597.