

Seasonal albedo changes as derived from OMEGA/MEX RGB global maps.

F. Altieri¹, E. D'Aversa¹, A. Geminale¹, F. Oliva¹, G. Bellucci¹, G. Sindoni¹, G.F. Carrozzo¹, R. Politi¹

¹IAPS-INAF, Via del Fosso del Cavaliere 100, 00133, Rome, Italy

Introduction: OMEGA, the imaging spectrometer on board MEX, is composed by three spectral channels [1]: the Visible and Near-InfraRed (VNIR) channel (with 96 spectral samples from 0.36 to 1.07 μm), the IR-C channel (128 spectral samples from 0.92 to 2.7 μm) and the IR-L channel (128 spectral samples from 2.53 to 5.09 μm). In this work, data from VNIR [2] have been put together to build up seasonal RGB maps in order to study changes in the planet albedo due to different dust content with the final goal to make an inventory of local/regional dust storms.

OMEGA RGB maps: The wavelengths selected to perform RGB maps are reported in Table 1; Fig. 1 shows the corresponding histograms. OMEGA Radiance (Rad.) Factor data have been projected for $-65^\circ < \text{LAT} < 65^\circ$ on a grid of $0.28^\circ/\text{pixel}$. The projection is cylindrical. All the data with emission angle $< 90^\circ$ have been used to improve the spatial coverage and investigate possible effects close to the terminator.

	λ (μm)	Lower Limit (Rad. Factor)	Upper Limit (Rad. Factor)
R	0.588	0.09	0.33
G	0.514	0.05	0.20
B	0.439	0.03	0.15

Table 1: RGB wavelengths and corresponding upper and lower limits in Rad. Factor.

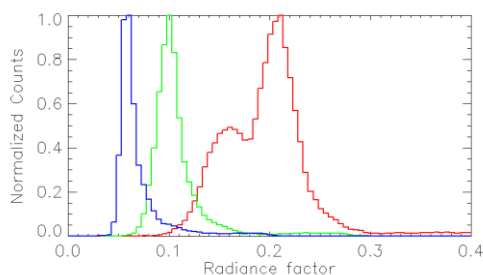


Figure 1: Normalized histograms for the RGB channels used in this study.

An example of a seasonal VNIR RGB map is shown in Fig. 2. The water ice Cloud Index (CI), computed as the ratio between Rad. Factor at 3.40 and 3.52 μm [3], is used to distinguish between water ice clouds and dust event occurrences. CI map is reported in Fig. 3; white color is for $\text{CI} \geq 0.8$, where no clouds are detected, while bluish regions are for $\text{CI} < 0.8$ and indicate the presence of water ice clouds.

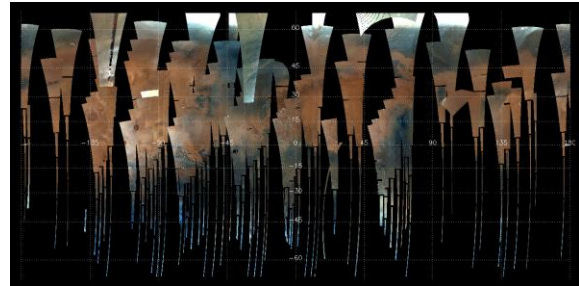


Figure 2: RGB map for MY (Martian Year) 27, LS (Solar Longitude) = 0° - 90° .

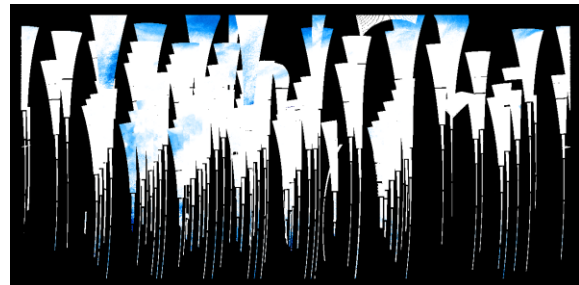


Figure 3: Map of CI parameter according to [3], 2017 for MY27, LS = 0° - 90° .

Scientific Objectives: VNIR properties of dust regional clouds already detected by OMEGA [4, 5] will be used to identify the most efficient spectral parameters suitable to make an inventory of small-scale dust events on Mars exploiting the whole OMEGA data set. Where available, dust free reflectance spectra for the surface obtained by means of the SAS method [6] will be used to better constrain dust properties.

References:

- [1] Bibring, J.P., et al., 2004, ESA-1240, 37.
- [2] Bellucci, G., et al., 2005, P&SS, 54, 7, 675.
- [3] Langevin, Y., et al, 2007, JGR, 112, E8.
- [4] Määttänen, A. et al. 2009, Icarus, 201, 504.
- [5] Oliva, F., et al, 2018, Icarus, 300, 1-11.
- [6] Geminale, A. et al., 2015, Icarus, 253, 51.

Acknowledgements: This study has been performed within the UPWARDS project and funded in the context of the European Union's Horizon 2020 Programme (H2020-Compet-08-2014), grant agreement UPWARDS-633127.