

Phobos observations by the OMEGA/Mars Express hyperspectral imager: B. Gondet¹, J-P. Bibring¹, Y. Langevin¹, F. Poulet¹, S. Murchie² and the OMEGA Science team, IAS, Université Paris-Sud, 91405 Orsay, France, Applied Physics Laboratory, Laurel, MD brigitte.gondet@ias.u-psud.fr

Introduction: As a complement to Mars observations, Phobos spectral imaging was implemented in order to acquire compositional mapping with the prime objective to answer to the following questions :

1. is Phobos a "primitive" (undifferentiated) body, or is its mass sufficient for this small body to have suffered some degree of internal differentiation, so as to exhibit surface compositional variations reflecting variation with depth?

2. can one detect surface material containing either volatile or organic compounds ?

We will present an overview of the results acquired, and discuss them in terms of planetary differentiation

Dataset: OMEGA/Mars Express [1] has mapped Phobos along six tracks, from altitudes ranging from 150 km to 1900 km, leading to footprints of 180 m to 2.2 km accordingly, and with a variety of phase angles (fig 1). For each pixel, OMEGA acquires the VIS/NIR spectrum, from 0.35 to 5.1 μm in its nominal mode. In this spectral range, key mafic minerals, such as pyroxene and olivine, have diagnostic features.

figure 1: Omega Phobos observations

Results: we have identified three locations (A, black; B, turquoise; and C, blue), along the highest resolution track (figure 2) for which the spectra have been acquired (figure 3), and plotted against a spectrum (red) derived from the Phobos 2 observations, by ISM and KRFM [2]. Spectra ratios exhibit slopes (photometrical) differences, but no diagnostic mafic mineral features.

Conclusions:

1. No evidence so far that Phobos is a differentiated small body: Phobos return sample mission (e.g. Phobos Grunt) should procure pristine (essentially) unprocessed material.

2. No evidence for hydration (possibly as a result of thermal dehydration).

3. No evidence (yet) of organic material.

References: [1] Bibring J-P. et al. (2004) *ESA SP 1240*, 37. [2] Murchie S.. et al. (1996) *Icarus* 123, 63-86.

OMEGA / Mars Express Phobos observations

orbit #	distance (km)	px size (m)	phase angle (°)
756_0	149	170 m	62.6
413_0	1882	2200 m	47.2
2747_0	1050	1300 m	95
2780_0	606	750 m	47.8
3769_3	776	1000 m	65
3843_4	658	900 m	66

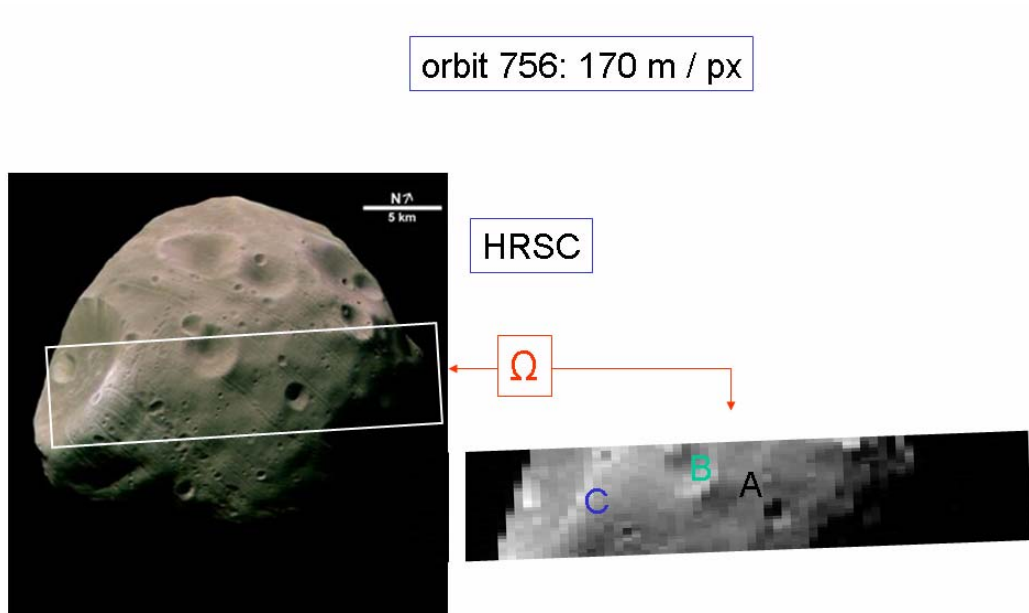


figure 2: example orbit 756

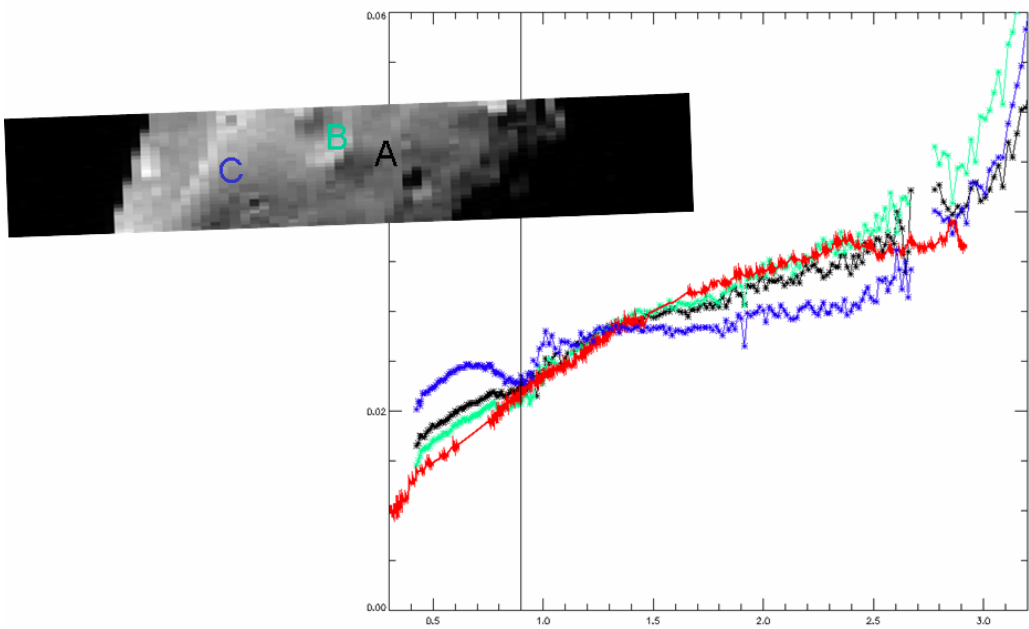


figure 3: Omega/MEX spectra