

## Mineralogical interpretation of Phobos OSIRIS reflectance spectrum: is Phobos a collisionally captured asteroid?

**M. Pajola** (1), M. Lazzarin (2), C. M. Dalle Ore (3,4), T. L. Roush (4), S. Magrin (2), I. Bertini (1), F. La Forgia (2) and C. Barbieri (1,2)

(1) Center of Studies and Activities for Space, CISAS, 'G. Colombo', University of Padova, 35131 Padova, Italy, (2) Department of Physics and Astronomy, University of Padova, 35131 Padova, Italy, (3) Carl Sagan Center, SETI Institute, Mountain View, CA 94043, USA, (4) NASA Ames Research Center, Moffett Field, CA 94035, USA.  
(maurizio.pajola@studenti.unipd.it; maurizio.pajola@gmail.com)

### Abstract

We will present the reflectance spectrum of Phobos from Near Ultraviolet to Near Infrared (245.5-992.0 nm) acquired by the OSIRIS [1] instrument onboard the ESA Rosetta mission. The data have been acquired through the filters of the Wide and the Narrow Angle Camera of the OSIRIS instrument (see Tab. 1) during Rosetta Mars swing-by maneuver on February 24<sup>th</sup> and 25<sup>th</sup>, 2007 [2]. Since the time of the fly-by a wide Phobos paper [3] has been published, which focused on the NAC Phobos spectrophotometry and showed that the OSIRIS-NAC spectra are within the spectral dispersion of D-types asteroids. These results lead us to speculate on a possible asteroidal origin of Phobos and we decided to complement our work by performing an investigation of the conditions needed to collisionally capture Phobos in a way similar to that proposed for the irregular satellites of the giant planets [4, 5]. The observational and dynamical results we obtained strongly argued for an early capture of Phobos, likely immediately after the formation of Mars.

With this work we are making a step forward from our Phobos paper [3] and we are showing the results we have accomplished in characterizing and interpreting the mineralogical possible origin of the Phobos OSIRIS data by analyzing the complete (NAC-WAC) reflectance spectrum. The observed area goes from 86.8° N to 90° S in latitude and from 126° W to 286° W in longitude, belonging both to the leading and to the trailing hemisphere of the satellite. We have performed a mineralogical modeling of the surface composition of Phobos which plays in favor of the interpretation of Phobos as a possible collisionally captured asteroid.

Table 1: OSIRIS camera, ID number, central wavelength and the full width half maximum, FWHM, of the filters used during the OSIRIS Phobos observation on February 24<sup>th</sup>, 2007.

OSIRIS camera	ID no.	Wavelength (nm)	FWHM (nm)
WAC	F31	245.5	13.0
WAC	F41	258.0	4.0
NAC	F15	263.5	45.0
WAC	F51	295.0	10.0
WAC	F61	308.5	3.0
WAC	F81	335.0	4.0
NAC	F16	360.0	50.0
WAC	F13	374.5	9.0
WAC	F14	387.0	4.0
NAC	F84	480.0	72.0
NAC	F83	535.0	61.0
WAC	F15	571.0	10.0
WAC	F16	589.5	3.0
WAC	F18	611.5	9.0
WAC	F17	630.5	3.0
NAC	F82	650.5	81.0
NAC	F87	700.5	21.0
NAC	F88	742.5	61.0
NAC	F51	804.5	39.0
NAC	F41	882.5	65.0
NAC	F61	932.0	40.0
NAC	F71	992.0	44.0

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