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Mining the wealth of Phobos multispectral data contained in MEX-OMEGA and MRO-CRISM datasets

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The origin of Phobos is still strongly debated between in situ versus asteroid capture formation scenarios. Growing interest in Phobos as a scientific destination is demonstrated by the multiple NASA-Discovery missions presented in 2015, the proposed ESA-M class mission PhoDEx, and JAXA's Mars Moon's sample return mission (MMX, Mars Moons eXploration).
This large number of Phobos dedicated missions and JAXA's planned mission clearly illustrate the scientific interest in Phobos as a destination. We believe that there is still a wealth of data that can be mined in order to constrain Phobos' surface properties and possibly its origin. There are several multispectral Phobos datasets available on the NASA-Planetary Data System.

In this work we focus on the first steps aimed to perform a new spectral analysis on the Mars satellite Phobos. We made use of the available Mars Express (MEX) OMEGA spectral cubes, obtained throughout the MEX mission, and Mars Reconnaissance Orbiter (MRO) CRISM hyperspectral data obtained during early MRO orbits around Mars.
Previous analyses (Fraeman et al. 2012, 2014) mainly focus on three specific Regions of Interest, ROIs, located inside the so-called blue and red regions of Phobos, i.e. inside or close to Stickney crater (the biggest crater on Phobos, 8-km in diameter) and its eastern ejecta blanket. We extended this analysis by considering multiple ROIs located both in the leading and the trailing hemispheres of the satellite, taking advantage of the broader coverage of the OMEGA and CRISM data. This provides the possibility to detect spectral properties of intermediate areas located in the transition region between the blue and the red spectral unit. The analyses can enable i) documentation of how the spectral slope changes between these two units, ii) their boundaries and surface extent, and iii) identify additional surface materials, if present.
This work paves the way to a more thorough analysis, foreseen in the near future, where the widest spectral wavelength range available (from near UV to far-IR) will be mined, returning a desirable complete picture of surface properties to enable planning for, and validation/confirmation by, future Phobos spacecraft.

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References: Fraeman et al. 2012, J. Geophy. Res, E00J15, 10.1029/2012JE004137; Fraeman et al., 2014, Icarus, 229, 196-205, 10.1016/icarus.2013.11.021