

Planets seen by AstroLe

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The Astrophysics Group of the University of Lecce (AstroLe) is active in many different areas of the planetary exploration, which can be grouped into three main research fields: laboratory activity, data analysis and space instruments design. Our laboratory activity, based on the well known theoretical approaches of Hapke and Mie, allows us to derive optical constants from transmittance, reflectance and emittance measurements of particulate materials. The object of our study are commercial and collected rocks and minerals together with their controlled mixtures. The spectroscopic measurements are performed in the range between 0.18 and 78 micron, and are supported by morphological and elemental analysis using a Scanning Electron Microscope (SEM), equipped with an Energy Dispersive X-ray Spectrometer (EDX); in addition precise grain size information can be obtained using a Laser Diffraction Granulometer. Another field of interest is related to the simulation, using UV irradiation and thermal annealing, of the amorphization and recrystallization processes in the interplanetary medium. The output of the laboratory work is used as input in the data analysis activity, connected to instruments such as imaging spectrometer OMEGA and Fourier spectrometer PFS on board ESA-MEX, as well as the Fourier spectrometer TES on board NASA-MGS. These datasets are usually coupled with NASA-MOLA and ESA-HRSC data. The elaborations of the data are performed on dual core processor work station, and UNIX cluster computer, since our final aim is to correlate all the instruments, developing special parallel algorithms for the analysis on a many tera FLOPs grid. Finally our experience with the design of space instrumentations is related to the optical modelling of the imaging spectrometer VIRTIS on board of ROSETTA and VeX, and the Fourier spectrometer PFS on board of MEX and VeX ESA missions. Lately we have developed the optical design of the Fourier spectrometer MIMA to be mounted on the rover of the ESA mission Pasteur EXOMARS.