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Imaging Mercury Surface: The SIMBIO-SYS Experiment for the BepiColombo Mission

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During its three fly-bys, the last in 1975, Mariner 10 obtained the only coverage at medium-low resolution allowing the mapping of about 45% of the Hermean surface. The next mission to Mercury, Messenger (NASA), will arrive at Mercury in 2011, 36 year after Mariner. The ESA cornerstone mission to Mercury, designed in cooperation with Japan, will be launched in 2013. It is named BepiColombo in honour of prof. Giuseppe Colombo, one of the European pioneers in Space research. BepiColombo is the most complex and capable of the missions to the inner planet of the Solar System designed so far. The main scientific objectives of the mission are the study and analysis of the surface, interior and exosphere of Mercury and the verification of general relativity and alternative theories of gravity. SIMBIO-SYS (Spectrometer and Imaging for MPO BepiColombo Integrated Observatory SYStem) is an instrument suite selected as part of the scientific payload for this fundamental mission, with a High Resolution Imaging Channel (HRIC), a STereo imaging Channel (STC) and a VIsual and Infrared Hyperspectral Imager (VIHI) channel, sharing a common main electronics and power

supply. SIMBIO-SYS is dedicated to the study of the surface geology of Mercury (stratigraphy and geomorphology), magmatic activity (lava plain emplacement, identification of volcanoes), the global tectonics (structural geology, the mechanical properties of lithosphere), the age of the main geological provinces (crater population and morphometry, degradation processes) and the surface composition (maturity and crustal differentiation, weathering, rock forming minerals abundance determination). The SIMBIO-SYS data will constitute an essential contribution to geophysics (libration measurements, internal planet dynamics) and altimetry (Digital Terrain Model of the entire surface of Mercury). In particular, SIMBIO-SYS will provide:- a global mapping with stereo imaging (spatial resolution between 50 and 100 m, and vertical accuracy of 84 m at the periherm on the equator);- a global mapping with imaging in 3 broad band filters (in the range 500-900 nm) - a global mapping with spectroscopy in the spectral range 400 - 2000 nm (spectral sampling of 6.25 nm), with a spatial resolution better than 500 m;- high spatial resolution (5-10 m) imaging of selected areas in a panchromatic filter and in 3 different broad band filters (in the range 400-900 nm);- spectroscopy of selected areas in the spectral range 400 - 2000 nm (spectral sampling of 6.25 nm), with a spatial resolution down to100 m. The paper describes the design capabilities of the instrument and how it will respond to the scientific questions linked with the Mercury surface. KEYWORDS: High spatial resolution imaging, Stereoimaging, Hyperspectral Imager