

Development of Mercury Sodium Atmosphere Spectral Imager (MSASI)

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The Mercury's Sodium Atmosphere Spectral Imager (MSASI) onboard the BepiColombo/MMO spacecraft addresses a range of fundamental scientific questions on Mercury's exosphere. MSASI is a high-dispersion imaging spectrometer, which is dedicated for the spectral range around sodium D2 emission (589 nm). To achieve both high spectral resolution and compact size, the instrument consists of fixed gap Fabry-Perot interferometer (FPI) and refractive optics. Two-dimensional images are acquired in combination with a one degree-of-freedom scanning mirror (MSASI-G), and spin motion of the MMO spacecraft.

The responsible processes are (1) Chemical sputtering, (2) Thermal desorption, (3) Photon-stimulated desorption, (4) Ion sputtering, and (5) Micro-meteoroid impact/vaporization. Each candidate seems to be fairly operative, but any cannot completely explain phenomena observed from the Earth. Also, the fate of ejecta from the regolith is still unknown. Some are expected to return to the lithosphere, the other are lost to interplanetary space. Circulation of lithospheric sodium atoms via exosphere-magnetosphere might bring a significant change in the composition of surface layer on Mercury. The measurements will provide us new information on regolith-exosphere-magnetosphere coupling as well as new understanding of the dynamics governing the surface-bounded exosphere, the solar wind and interplanetary space.