AOGS 2005

MERTIS – A Thermal infrared imaging spectrometer for the Bepi Colombo mission

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Among the terrestrial planets, Mercury plays a special role. It is the smallest planet, the densest, the one with the probably oldest surface heavily gardened by space weathering, and shows large daily surface temperature variations. Understanding Mercury is crucial to develop a better understanding of the early processes in the inner solar system, of how our Earth formed, how it evolved, and how it interacts with the Sun. The ESA-JAXA mission Bepi-Colombo consists of two probes – a planetary and a magnetospheric orbiter. The mission will be launched in 2012 and will reach Mercury in 2016. MERTIS (MERcury Thermal infrared Imaging Spectrometer) is part of the payload of the planetary orbiter, focused on understanding the surface and interior of Mercury.

The scientific goal of MERTIS is to provide detailed information about the mineralogical composition of Mercury's surface layer by measuring the spectral emittance of different locations in the spectral range from 7-14µm. Knowledge of mineralogical composition is crucial for choosing the best of several competing theories, and thus for selecting the valid model for origin and evolution of the planet. MERTIS has four main scientific objectives, building on the general science objectives of the Bepi-Colombo mission: Study of Mercury's surface composition, identification of rock-forming minerals, global mapping of the surface mineralogy, and study of surface temperature and thermal inertia.

The instrument covers the range from 7-14 µm at a high spectral resolution of up to 90nm which can be adapted depending on the actual surface properties to optimize the S/N ratio. MERTIS will globally map the planet with a spatial resolution of 500m and a S/N of at least 100. For a typical dayside observation the S/N ratio can exceed 1000 even for a fine grained and partly glassy surface. MERTIS will map 5-10% of the surface with a spatial resolution higher than 500m. The flexibility of the instrumental setup will allow to study the composition of the radar bright polar deposits with a S/N ratio of >50 for an assumed surface temperature of 200K.