# Thermal-Infrared Spectroscopy of Mercury: Telescope Data to Laboratory Measurements Supporting MERTIS Payload Onboard BepiColombo Mission

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On October 20$^{th}$ 2018 ESA/JAXA's BepiColombo mission was launched to Mercury which carried a thermal/mid-IR imaging spectrometer - the Mercury Radiometer and Thermal Infrared Imaging Spectrometer (MERTIS). MERTIS will be the first thermal-infrared (TIR) hyperspectral imager to orbit Mercury and perform global mapping of emissivity at 7-14 µm with spatial resolution of 500 m/pixel [1]. Its radiometer, covering the wavelength range from 7-40 µm, will map the surface temperature at 2km/pixel spatial resolution. The compositional maps derived from MERTIS data will allow new and unique insights into the evolution of one of the least explored terrestrial planets.

Mercury has been studied via TIR spectroscopy from ground/telescopic observations over three decades [2-8]. However, the total number of observations made is still quite small. Over the past decade, the Planetary Spectroscopy Laboratory (PSL) at German Aerospace Center (DLR) Berlin obtained experimentally thermal emissivity measurements of analog materials under controlled and simulated surface conditions of Mercury from 100° to 500°C under vacuum conditions in support of MERTIS [9]. Using a specialized endmember spectral library created under Mercury's conditions will increase significantly the accuracy of the deconvolution model results of not only MERTIS but also telescopic observations of Mercury.

The interpretation of telescope spectra by all the studies [2-8] so far is mainly based on using inverted reflectance measurements (Kirchhoff's law) of various samples measured at room temperature and pressure as proxy for the thermal emissivity. Using a specialized endmember spectral library created under Mercury's conditions from PSL should increase significantly the accuracy of the deconvolution model results of not only MERTIS but also telescopic observations of Mercury.

In this study, we revisited the available telescope spectra to study their spectral counterparts by only choosing the endmember spectral library created at PSL for unbiased model accuracy. Along with the traditional quantitative deconvolution algorithm by [10-11], the machine learning techniques such as bayesian endmember selection is been adapted to unmix these telescope spectra. Comparison of different spectral unmixing algorithms over the available spectra will therefore increase the confidence of unmixing results of the endmember counterparts. The results will be presented at this meeting.

**References:**

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