

# Preliminary color map of the Borealis (H-01) quadrangle of Mercury

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## 1. Introduction

This study is part of the Mercury mapping campaign to support the observational strategy of the future BepiColombo mission. The target is the color map of the north polar region - Borealis quadrangle from the multi-band images of Mercury Dual Imaging System Wide Angle Camera (MDIS-WAC) of Messenger mission. Three principal component (high-reflectance plains, intermediate terrains and low-reflectance material) and two minor color units (red spots and hollows) were identified based on the reflectance and the slope of spectra [1].

## 2. Data set

The surface of Mercury is subdivided into 15 quadrangles. This study focuses on the Borealis (H-01) quadrangle of Mercury, extends from  $65^\circ$  to  $90^\circ$  in latitude and from  $0^\circ$  to  $360^\circ$  in longitude. The data of MDIS-WAC was taken with 12 different bands in visible and near-infrared; however, we just use the data of 8 filters: 433.2, 479.9, 558.9, 628.8, 748.7, 828.4, 898.8 and 996.2 nm (respectively F, C, D, E, G, L, J and I filter) for the scientific analysis.

## 3. Method

The software ISIS (Integrated Spectrographic Innovative Software) of USGS is used to produce the color map of Borealis. The image processing follows: 1/ Importing the raw data into ISIS format; 2/ Georeferencing to update information of the spacecraft position, pointing, the sun position, etc; 3/ Performing radiometric calibration to remove the bias, the dark current and the flat field; 4/ Polar stereographic projection with 450 m/pixel resolution; 5/ Applying Kaasalainen-Shkuratov photometric correction to normalize the data with

lab conditions (incidence angle  $i=30^\circ$ , phase angle  $\phi=30^\circ$  and emission angle  $e=0^\circ$ ); 6/ Coregistration of each image with filter G; 7/ Stacking and trimming the images to obtain the mosaic of Borealis.[2]

## 4. Preliminary results and future work

The preliminary RGB map of the Borealis obtained with filters at 996.2, 748.7, and 479.9 nm, respectively, is in Figure 1.

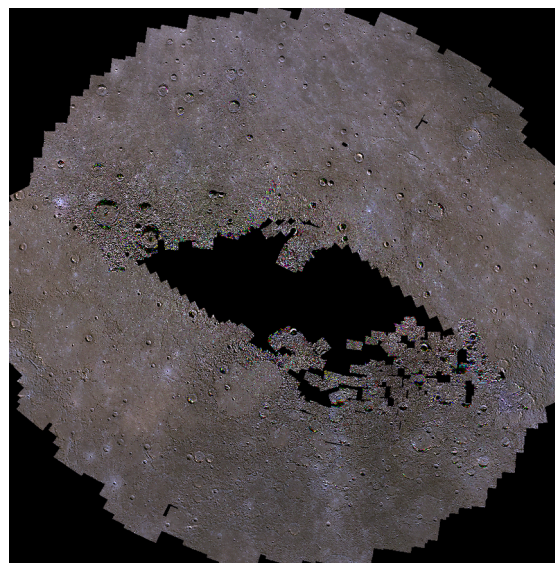


Figure 1: RGB map of the Shakespeare quadrangle (R=996.2 nm, G=748.7 nm and B=479.9 nm)

We will present an analysis of this map. Several method will be applied for example K-means, principal component analysis to classify the surface of the Borealis, similar to N. Bott and F. Zambon in other quadrangles of the Mercury mapping campaign.

Then, the color map will be combined with its geology and the data of Mercury Dual Imaging System (MDIS) to find out regions of interest for the BepiColombo mission.

## **Acknowledgements**

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## **References**

- [1] Blewett, D. T. et al.: Multispectral images of Mercury from the first MESSENGER flyby: Analysis of global and regional color trends, *Earth and Planetary Science Letters*, Vol. 285, pp. 272-282, 2009.
- [2] N. Bott et al.: The Shakespeare (H-03) quadrangle of Mercury: from color mapping to distinction of lithological heterogeneity, *Mercury: Current and Future Science 2018 LPI Contrib. No. 2047*, 2018.