THE SHAKESPEARE (H-03) QUADRANGLE OF MERCURY: FROM COLOR MAPPING TO DISTINCTION OF LITHOLOGICAL HETEROGENEITIES. N. Bott1, A. Doressoundiram1, D. Perna1,2, F. Zambon3, C. Carli3, F. Capaccioni3, 1LESIA - Observatoire de Paris - CNRS - Sorbonne Université - Université Paris-Diderot (5 place Jules Janssen, 92195 Meudon, France; nicolas.Bott@obspm.fr), 2Osservatorio Astronomico di Roma - INAF, Monte Porzio Catone, Italy, 3Istituto di Astrofisica e Planetologia Spaziali - INAF, Roma, Italy.

Introduction: Mercury mapping campaign started to support the observational strategy of the SIMBIO-SYS instrument onboard the future BepiColombo spacecraft. A goal is to integrate the color variations due to differences in composition to the photo-interpreted geology of the innermost planet. The used data are image mosaics from the Mercury Dual Imaging System (MDIS) Wide Angle Camera (WAC) onboard MESSENGER spacecraft. Authors identified three major color units (high-reflectance plains, intermediate terrains and low-reflectance material) and two minor color units (red spots and hollows) [1]. We analysed the spectral properties of the surface in the H-03 quadrangle to define its compositional variability and identify units constrained by opportune spectral parameters.

Data Set: The surface of Mercury is subdivided into 15 quadrangles. Some have already been mapped [2,3], others are in progress [4]. Here we focus on the H-03 quadrangle, Shakespeare, with 22.5° < latitude < 65° and 180° < longitude < 270°. We used the data of the 8 following filters: 433.2, 479.9, 558.9, 628.8, 748.7, 828.4, 898.8 and 996.2 nm. The other filters (698.8, 947.0 and 1012.6 nm) can not ensure the coverage of the quadrangle.

Method: To produce the color map, we used the software ISIS (USGS) and we proceeded as follows: 1) Importation of raw data into ISIS format; 2) Georeferencing using SPICE kernels and a DEM produced at DLR; 3) Radiometric calibration; 4) Equirectangular projection; 5) Kaasalainen-Shkuratov photometric correction [6, Table 9] to report the data at standard illumination conditions (inc. i=30°, em. e=0°); 6) Coregistration of images to obtain the mosaic of Shakespeare.

Results: Color mapping. We applied techniques of image analysis, such as RGB color combinations and Principal Component Analysis [7], to emphasize differences in spectral properties which can be correlated to variations in composition. Examples of RGB maps of Shakespeare have been shown recently [8]. We will expose and discuss the last updates.

Spectral mapping. From the mosaic 8-color mapping, it is possible to infer interesting spectral parameters to identify units associated to specific terrains. Considering a thresholding of the values of a spectral parameters (reflectance at 750 nm, PC2...), we obtained indications of units, showing different terrains with probable differences in composition (Figure 1). For example, it appears on the above map that the floor of Degas crater (cyan) is clearly distinct from other terrains (Sobkou planitia, in yellow on the left) in term of values of PC2. As PC2 highlights the spectral slope variations, it means that the floor of this young crater has a spectral slope distinct from the rest of the quadrangle. This is confirmed on the plot of the normalized averaged spectra of each unit defined by the threshold of this parameter (embedded graph, Fig. 1). More analyses of spectral parameters will be presented.

Future Works: This work on spectral properties of the surface material present in the Shakespeare quadrangle will be integrated to the geological map of the Shakespeare quadrangle produced by [9], and aims to define higher level units to produce a more accurate map of this quadrangle.

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