MARINER 10 MULTISPECTRAL IMAGES OF THE MOON AND MERCURY M.S. Robinson, B.R. Hawke P.G. Lucey, Planetary Geosciences, SOEST, University of Hawaii, Honolulu, HI, 96822, K. Edwards, U.S. Geological Survey, 2255 N. Gemini Dr., Flagstaff, AZ, 86001.

The Mariner 10 spacecraft acquired multispectral images of both the Moon and Mercury [1]. We have developed a calibration scheme to make these images useful for quantitative color studies [2]. This radiometric calibration includes dark current removal and a nonuniformity/nonlinearity correction [2]. Our initial calibration work included Mariner 10 image data of the eastern limb and farside of the Moon. These newly calibrated lunar images provide color data that are consistent with earlier measurements where the data overlap. On the basis of this consistency, compositional interpretations from Mariner 10 data are extended to areas previously not examined with spectral instruments. From these data there was no indication of the existence of basaltic soils with TiO2 in excess of 5% in the region of the Moon covered by the Mariner 10 images. Comparison of these new data, Earth-based spectral measurements, lunar meteorite compositions, and lunar mare emplacement models lead to the predication that no high titanium mare basalts were extruded in regions of the Moon with thickened crust (most of the farside). Additionally, these newly calibrated color data allowed a spectral confirmation of the presence of widespread cryptomare deposits northeast of Mare Marginis.

However, this lunar color effort is just a beginning. We are currently processing the rest of the Mariner 10 lunar image data. The remaining data cover portions of the eastern limb, at a resolution of ~1 km, in four wavelengths (orange, blue, ultraviolet and ultraviolet polarized) and provide excellent views of regions of the Moon poorly seen from the Earth. These include the Frigoris, Humboldtianum, Marginis, and Smythii regions. Initial analysis of these data indicates that the sensitivity of the Mariner 10 vidicons changed between the time of the acquisition of the low resolution color data and these high resolution images. This is most likely due to a change in the temperature of the instrument during closest encounter with Moon. Examination of overlapping images shows that this change is most likely confined to the edges of the frame; thus it may be possible to mask these "bad" areas. A preliminary mosaic constructed of masked images resulted in a nearly seamless image of the northeast nearside (NEN) region.

In addition to the radiometric calibration we have also developed a scheme to improve the pointing geometry for both the lunar and mercurian frames. This process involves limb fitting and minimizing camera angle discrepancies between each frame within a mosaic. In order to better control the color frames we are currently constructing a clear filter mosaic at a resolution of about 1 km for all of Mercury imaged during the first encounter.

Not only will these high resolution color image data of the moon provide new compositional information, they will also give further insight into the dynamic nature of the Mariner 10 vidicon calibration. This is important because we are also processing the Mariner 10 images of Mercury. Initial color work [3, 4] of Mercury, utilizing Mariner 10 orange and ultraviolet images, relied on a calibration that was based solely on pre-launch characterization of the vidicon response [5]. Our initial examination of the low resolution approach color images of Mercury reveals that the Mariner 10 vidicon dark current response changed from the time of the lunar encounter. Learning from the lunar experience, we are calibrating the mercurian images, taking into account changes in the dark current. Similar to the Mariner 10 lunar images, we have found that for the high resolution ultraviolet mosaic of Mercury, we can produce a nearly seamless mosaic after applying our new calibration and masking the edges of the frames (camera B frames). We have developed calibrations for the orange, blue and ultraviolet-polarized images for analysis of the mercurian surface. It will be quite useful to have the Mariner 10 lunar images to use as a comparison with the Mariner 10 mercurian frames. Since much is known of the Moon, having a like dataset for the two bodies will allow for the direct color comparison of morphologically similar features. For example, the inter-crater plains on Mercury are morphologically similar to plains found on the Moon. Currently, the mercurian plains are mostly thought to have a volcanic origin, while many of the lunar inter-crater plains are proposed to be impact related [6, 7]. Using the two Mariner 10 datasets we will investigate this apparent contradiction as well as other important issues of mercurian geology.

References: [1] Danielson et al., (1975) *JGR* 80, p. 2357. [2] Robinson et al., (1992) *JGR* 97, p. 18265. [3] Hapke et al., (1980) *PLPSC* 11, p. 817. [4] Rava and Hapke, (1987), *Icarus* 71, p. 397. [5] Soha et al., (1975) *JGR* 80, p. 2394. [6] Trask and Guest, (1975) *JGR* 80, p. 2461. [7] Strom et al., (1975) *JGR* 80, p. 2478.