THE COLOR OF MERCURY. M.S. Robinson[1], B.R. Hawke[2], P.G. Lucey[2], G.J. Taylor[2], P.D. Spudis[3], [1]Northwestern University, 1847 Sheridan Rd, Evanston Il., 60208; [2]Hawaii Institute of Geophysics and Planetology, Honolulu, Hawaii[3], Lunar and Planetary Institute, Houston, TX.

Past analyses of Mariner 10 images of Mercury revealed the existence of widespread plains deposits which were proposed to have formed as either volcanic materials or basin ejecta deposits [1-6]. We have recalibrated and mosaicked Mariner 10 color data to map the spatial distribution of color and albedo units for the mercurian crust. A key issue that we address is the origin of these enigmatic mercurian plains deposits.

Previous workers used Mariner 10 color images to delimit units on Mercury which led to three broad conclusions; crater rays and ejecta blankets are bluer than average Mercury, color boundaries often do *not* correspond to photogeologic units, and no low albedo blue materials are found that correspond to titanium rich lunar mare deposits [7,8]. However, the calibration employed in these earlier studies did not adequately remove vidicon blemishes and radiometric residuals. These artifacts were sufficiently severe that the authors were forced to present an interpretive color unit map overlaid on monochromatic mosaics while publishing only a subset of the color ratio coverage of Mercury [7-10]. We have refined the calibration, removed blemishes and used an averaging mosaicking scheme to maximize the signal-to-noise ratio of these data. We interpret these newly calibrated data in terms of the current paradigm of visible color reflectance for silicate regoliths [7,8,11] containing iron. These new mosaics represent the first presentation of the complete UV-orange color data for all of Mercury imaged by Mariner 10.

The visible color of the lunar surface (and by inference the mercurian surface) can be described by two nearly perpendicular trends (opaque mineral concentration and iron plus maturity) [7,11,12]. The addition of ferrous iron to a silicate material reddens (decrease in UV/Visible ratio; UV/orange color for the Mariner 10 data) the visible slope and lowers the albedo. Paralleling this iron trend, immature soils are bluer (increase in UV/Visible color ratio) and have higher albedo than mature soils, as soils mature their reflectance mimics that of adding iron, the soils darken and redden (decrease in UV/Visible color ratio). The addition of spectrally neutral opaque minerals, such as ilmenite, results in a trend that is nearly perpendicular to the iron maturity line: opaque minerals darken and increase the UV/Visible (UV/orange for the Mariner 10 data) ratio [7,8,12]. Following a method of coordinate rotation [12,13] of the relative color (UV/orange) and albedo (orange albedo, 575 nm) we have transformed the Mariner 10 color data such that opaque mineral abundance can be separated from maturity plus iron content into separate images. From these data we have mapped units based on orange albedo, UV/orange ratio, opaque content, and iron plus maturity index. We find that some of the previously mapped plains units correspond with units seen in the spectral data. Two examples with similar spectral properties are the Rudaki plains (l-4°S, 54°W) and the floor of Tolstoj basin (15°S, 163°W). The sharp spectral boundaries that correspond with the previously mapped morphologic boundaries strongly suggest that these plains were emplaced as volcanic materials. In the case of Tolstoj, plains-flooded craters (similar to the lunar crater Archimdes) occur on the floor of the basin, likewise supporting a volcanic origin for these smooth plains [6]. These putative volcanic units are not readily identifiable in the ferrous iron plus maturity image, indicating that they have very similar FeO contents as the rest of the mercurian crust imaged by Mariner 10. Erupted magmas, to a first order, represent the FeO abundance of mantle source regions [14]. The observation that volcanics identified in this portion of Mercury do not have FeO abundances differing greatly from the hemispheric average indicates that the mercurian mantle source of these volcanics is not enriched in FeO relative to the crust, in contrast to the Moon. The global crustal abundance of FeO on Mercury has been estimated to be less than 6 wt.% [16-21]. Our analysis indicates that the mantle shares the crustal FeO composition, and so supports the idea that Mercury is highly reduced and most of its iron is in the metallic core [22].

Planetary Body	**FeO (wt. %)**
Mercury	<6
Venus	8
Moon	
Mare source[23]	15-17
Bulk Mantle[24]	11.4
Earth[24]	8.0
Mars[25]	17.9
Vesta	
Bulk silicates[25]	11.2
Eucrite source[26]	26.3

Table 1. Estimates of the FeO wt. % for planetary mantles. We estimated the Venus mantle composition from Russian lander data.

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Appendix: Listed below are key Mariner 10 color images that are not archived on the Planetary Conversion Task tapes or CD-ROMs (grossly subsampled versions do exist). In cooperation with E. Eliason at the USGS Flagstaff and JPLwe determined that these images may be on deep archive ETVS tapes. The ETVS tapes have been read and the data copied to CD-ROM media, analysis is underway to verify and hopefully recover these data. Incoming frames 26964-26984, 27084-27088, 27091-27100; Outgoing frames 497-514, 614-634, 734-754, 854-874, 974-994, 1094-1114, 1214-1223.