INTEGRATING DIVERSE DATASETS TO ASSESS APPROACHES FOR CHARACTERIZING MARE BASALTS. S. R. Deitrick[1] and S. J. Lawrence[2], [1]School of Earth and Space Exploration, Arizona State University, Tempe, AZ, [2]Astromaterials Research and Exploration Science, NASA Johnson Space Center, Houston, TX.

Introduction: The Marius Hills Volcanic Complex (MHVC), located on a plateau in central Oceanus Procellarum at 13.4N, 304.6E, is the largest single concentration of volcanic features on the Moon (~35,000 km^2) [1]. The region includes volcanic domes, cones, rilles, and depressions and represents a significant period of lunar magmatism thought to have taken place during the Imbrian (~3.3 Ga) through Eratosthenian (~2.5 Ga) periods [1,2]. Previous studies of the MHVC utilizing the Clementine Ultraviolet/Visible (UVVIS) camera, the Kaguya Multiband Imager (MI), and the Moon Mineralogy Mapper (M^3) aboard the Chandrayaan-1 mission have found that the volcanic domes and surrounding mare basalts are compositionally indistinguishable, indicating similar eruption times [1,2], although the domes are embayed by younger mare basalts [1]. This research utilizes new Lunar Reconnaissance Orbiter Camera (LROC) data to re-evaluate the composition of the volcanic domes and surrounding mare basalt flows in the MHVC. Through this, the compositions and relative ages of the domes and the surrounding flows can be determined, improving our understanding of the volcanic history of this region.

Methods: Color unit boundaries were mapped using the LROC Wide Angle Camera (WAC) 7-band multispectral [3] and Clementine 5-band color ratio [4] basemaps. The boundaries were iteratively compared to each other to assess any differences between them and were then compared to the WAC hillshade and morphology data to assess the quality of correlations between color unit boundaries and topographic features. Next, five LROC Narrow Angle Camera (NAC) featured mosaics were analyzed in order to associate the WAC color unit boundaries with morphologies that are evident in the high resolution NAC frames. The correlated morphologies were mapped and confirmed by taking elevation profiles of NAC Digital Terrain Models (DTMs) in the LOC featured mosaic area. The WAC color unit boundaries in that same area were then compared with the Clementine TiO_2, FeO, and OMAT data as well as the mare basalt units mapped by [2] to evaluate the differences between them.

Results: It was discovered that some of the volcanic domes are outlined or crosscut by the WAC color unit boundaries. It can also be seen that a large majority of the color unit boundaries mapped from the WAC basemap correlate with morphologies that are evident in the NAC frames. Evidence of morphology changes were found to correlate with the color unit boundaries near the flanks of the domes that were observed and show possible embayment of the mare basalt flows on the flanks.

The color units derived from the WAC basemap almost exactly parallel units evident in the Clementine TiO_2 map and also matched well with the Clementine FeO map, but not as well as with the OMAT map. The color unit boundaries mapped from the WAC also correlated very well with the mare basalt units mapped by [2], but in general are more detailed and complex than those from [2].

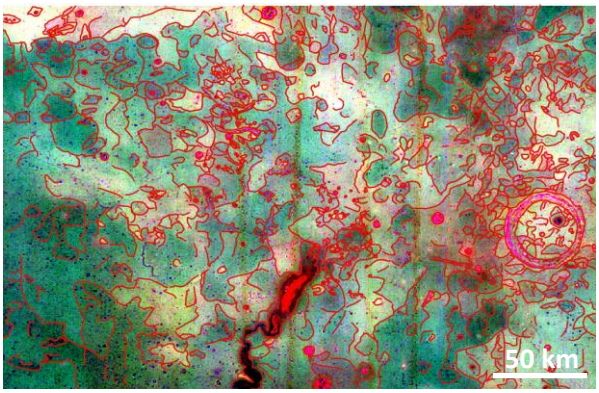

Figure 1. WAC color unit boundaries (red lines) overlain onto the WAC 7-band multispectral basemap.

Discussion: The morphologies seen in the NAC featured mosaics that parallel the color unit boundaries indicates that WAC color has great potential for identifying mare basalt units. When confirmed with elevation profiles from the NAC DTMs, the morphologies show embayment of the observed domes, indicating that the mare basalts were erupted after dome formation. This implies that the domes are older than the flows and the volcanic activity on the plateau was a complex process, as described by [1].

Conclusions: Color unit boundaries derived from WAC data correlate well with morphologies that are seen in the high resolution NAC featured mosaics. These results indicate that the domes are embayed by the surrounding mare basalt flows, a conclusion supported with elevation profiles from the NAC DTMs. This indicates that not only are the techniques used in this study useful for mapping distinct mare basalt units with the LROC WAC data, but will also be helpful in determining the relative stratigraphy and relative ages of the volcanic domes and surrounding mare basalts in the MHVC.

References: [1] Lawrence S. J. et al. (2013) *JGR, 118*, 615-634. [2] Heather D. J. et al. (2003) *JGR, 108*, E3, 5017. [3] Sato H. et al. (2014) *JGR, 119*, 1775-1805. [4] Eliason et al. (1999) *LPSC XXX*.