HUMORUM BASIN GEOLOGY FROM CLEMENTINE DATA D. Ben J. Bussey[1], Paul D. Spudis[1], B. Ray Hawke[2], P.G. Lucey[2], C. Peterson[2], and G.J. Taylor[2] 1. Lunar and Planetary Institute, Houston TX 77058 2. HIGP, Univ. Hawaii, Honolulu HI 96822

Humorum is a Nectarian-age multi-ring basin on the western near side of the Moon [1]. We have been studying the geology of this feature and the composition of its deposits for several years [2-5] in order to understand the mechanics of formation of impact basins and to characterize the composition of this region of the lunar crust [2]. With the advent of the new, global Clementine data [6], we can now map the variations in the composition of basin ejecta for the entire feature, a significant improvement over previous compositional studies, which were largely limited to the northwestern portion of the basin. In this paper, we present some initial results from our study of the full resolution Clementine data.

Method We have constructed full resolution image mosaics of Clementine UVVIS images in the 415, 750, and 950 nm bands. These images are mosaicked to cover the approximate extent of the deposits of the chosen basin (in the case of Humorum, from 10°-40° S latitude and 25°-50° W longitude). Image mosaics are produced in the 750 nm band (albedo), false-color composites (blue=415/750, green=750/950, red=750/415), and iron concentration maps using the method described by Lucey et al. [7]. Basin topography has been studied using the Clementine laser altimetry to create a topographic map of the basin [8,9].

Basin Configuration The dimensions and configuration of the Humorum basin have been discussed in [2,9]. In short, the problem with the configuration of Humorum basin is similar to the problem posed by Crisium basin [10], i.e., which ring represents the main topographic rim of Humorum. Humorum displays at least five, possibly six rings [2], with diameters of 210, 340, 425, 570, 800, and 1200 km [2]; the listing of [1] gives three definite rings of 325, 440, and 825 km, with partial arcs of 560 and 700 km diameters also given. Spudis [2] considered that the 425 km diameter, mare-bounding ring was the basin rim, but in a later work, equivocated and indicated that the Clementine altimetry supported either that ring or one 800 km across could be the rim crest [9]. This dilemma is similar to the one at Crisium, where two distinct rings of comparable elevation could be interpreted as the rim crest. At Humorum, the case for the 800 km ring being the basin rim crest is supported by the rim elevation being marginally greater (elevation 0.5-2.5 km) than the next most prominent ring, the mare-bounding 425 km ring (elevation 0.0-1.0 km).

Composition of the Humorum Basin Clementine color data show that the highlands around the Humorum basin are feldspathic, but somewhat more mafic (FeO=4-8 wt.%) than the deposits of other basins we have studied by this technique (e.g., Orientale [12]). Basin deposits to the west of Mare Humorum appear to be slightly more feldspathic than those to the east, with FeO contents of 2-6 wt.%, while small highlands areas just east of the mare have much higher FeO contents of 6-10 wt.%. This is not a resolution effect, as the individual highland outcrops are clearly distinguishable in the full resolution data. Numerous patches of mare material occur outside the main mare area, partly covering the basin deposits; these basalt units have FeO contents between 10-14 wt.%.

As seen in most of the other basins that we have studied to date with the Clementine data, numerous small deposits are seen along the inner, mare-bounding ring of Humorum basin that have extremely low FeO contents. These zones correspond, in part, to small fresh craters for which we have previously obtained spectral reflectance data from Earth-based telescopes [3,11]; these spectra indicate no mafic absorption and we interpret the spectra to indicate the presence of pure anorthosite deposits. This interpretation is supported by the Clementine FeO maps, which show a very low Fe deposits (FeO=0-2 wt.%) in association with each previously identified anorthosite (e.g., Mersenius C) as well as at several newly found locations (e.g., De Gasparis E, 6 km diameter). These outcrops of anorthosite are similar to those found at other basins we have studied. They are confined primarily to the 425 km ring of Humorum, suggesting, as at Orientale [11,12] and at Crisium [10] that this feature is an *inner* basin ring and that the true topographic rim of Humorum basin is likely to be the 800 km diameter ring, as previously postulated [1]. We note that there appear to be many fewer anorthosite outcrops at Humorum than at either Orientale or Humboldtianum, possibly reflecting the more mafic target of the Humorum basin compared with these other features.

The mare deposits of central Humorum show FeO contents between 16 and 20 wt.%. Mare deposits in central Humorum show little evidence of contamination by highland debris. Most of the craters in the maria do not expose sub-mare highlands debris, an exception being the craters Gassendi O (11 km) and a small, 4-km crater just northeast of it [15]. These two craters both expose material with lower FeO content, suggesting excavation from beneath the mare basalt; this exposure indicates that the mare in this region is less than 1 km thick. Very dark materials interpreted as pyroclastic deposits (also known as the Doppelmayer Formation; [13]) are prominent on the 750 nm albedo image and coincide with high FeO units within Mare Humorum, but it is unclear whether this iron signature reflects pyroclastics, as it apparently does elsewhere on the Moon (e.g., Orientale [12] and Humboldtianum [14]), or whether this unit is simply a continuation of the mare basalt of Humorum.

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