A MARINER/MESSENGER GLOBAL CATALOG OF MERCURIAN CRATERS. R. R. Herrick[1], L. L. Curran[1], and A. T. Baer[1], [1]Geophysical Institute, University of Alaska Fairbanks, Fairbanks, AK 99775-7320 (rherrick@gi.alaska.edu).

Introduction: Using MESSENGER and Mariner 10 flyby images, we have compiled a global catalog of impact structures with diameters D > ~10 km. Our initial compilation contains location and diameter information for ~17,000 craters, and we have added basic morphologic descriptions (e.g., central structures, terracing, volcanic filling, rayed) for ~25% of the craters. Our goal is to complete the morphologic descriptions and publicly release the database as a research tool in Fall, 2011.

Methodology: The database was compiled by identifying craters in the mosaics produceed by the USGS (combined MESSENGER/Mariner, 500 m/pixel, astrogeology.usgs.gov/Projects/Messenger/) and Arizona State (Mariner 10 only, 1 km/pixel http://ser.sese.asu.edu/M10/IMAGE_ARCHIVE/MOSAICS/index.html). We began by coregistering the database of [1] to the mosaic, and we updated that database within the Mariner 10 coverage area. We then utilized the toolkit of [2] to identify craters within the new areas revealed by the MESSENGER flybys. The toolkit determines the location and diameter of a crater from three points on the crater rim. Our goal is to create a comprehensive database of structures with D > 10 km, so we were conservative and marked all structures several km in diameter and larger. We included structures that were clearly flooded, deformed, or largely superposed by later structures, so without filtering the catalog only provides crude surface age information. We are now addidng basic morphologic information for the craters such as floor shape (bowl, flat-floored), presence of terracing, the nature of any central structure, and presence of craters rays.

Results: Figure 1 shows an excerpt of the planet with craters in the database outlined. Figure 2 shows R plots [3] of the entire database, an area with high spatial density of impacts (latitude range 0 to 30 S, 30 W to 90 W), and a portion of the Caloris basin (latitude 5 N to 55 N, 135 E to 175 E). Figure 3 shows a global plot of crater density for craters, where N is the number of craters within a 500 km diameter counting circle; center points of named planitia and basins with D > 300 km are labeled.

The consistent slope of the R plot for the global catalog for crater bins spanning 8 < D < 64 km suggests that for most of the planet we have successfully picked all identifiable craters with D > 8 km, and we feel the database can be considered comprehensive for craters in this diameter range. The R values that are obtained for the overall data set, the positive slope of the R plot for D < ~100 km, and the rollover to negative slopes for D > ~100 km are also consistent with previous size-frequency distributions determined for the Mercurian crater population from Mariner 10 data [4,5]. The R plot for the Caloris region is consistent with post-MESSENGER results presented in [6].

The most obvious characteristic of the crater density plot is a paucity of craters in the band running along longitude 30 E; that area was at a high sun angle during the MESSENGER encounters. We had trouble identifying craters in this band for the entire crater diameter range of our survey, and we expect that many more craters will be identified from the additional MESSEGER data to be collected from the orbital phase of the mission. Most of the remaining variations in crater density are interpreted to be due to real variations in surface ages. There is an strong correlation between low crater density and the presence of planitia and large impact basins, presumably attributable to post-heavy bombardment basin formation and/or volcanic plains resurfacing. At the regional scale there is roughly a factor of four variation in crater density.

Our initial observations are mostly consistent with [7] in terms of basic morphologic transitions.

Conclusions: We anticipate the database will serve as a starting point for further investigations by others in the planetary community, particularly 1) comparing relative ages of different Mercurian regional provinces, and 2) studying particular classes of impact structures (e.g,, mid-sized central peak craters). Consequently, we plan for our initial database release to coincide with the first public release of MESSENGER data from the orbital phasedata of the mission.

References: [1] Kozlova E. A. et al. (2001) *LPS XXXII*, Abstract #1231. [2] Kneissl T. et al. (2010) *LPS 41,* Abstract #1638. [3] Crater Analysis Techniques Working Group (1979) *Icarus*, *37*, 467-474. [4] Hartmann et al. (1981) *BVSP*, 1049-1127. [5] Strom R. G. and Neukem G. (1988) *Mercury*, 336-373. [6] Strom et al. (2008) *Science*, *321*, 79-81. [7] Pike R. J. (1988) *Mercury,* 165-273.

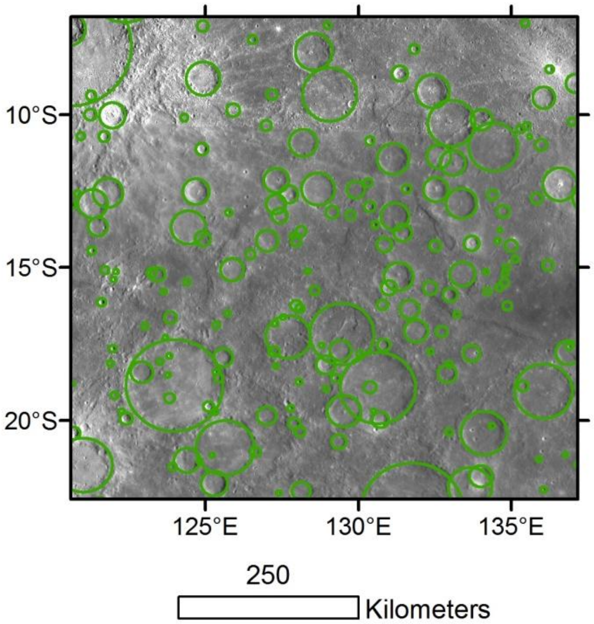

Figure 1. Example of craters identified for global catalog.

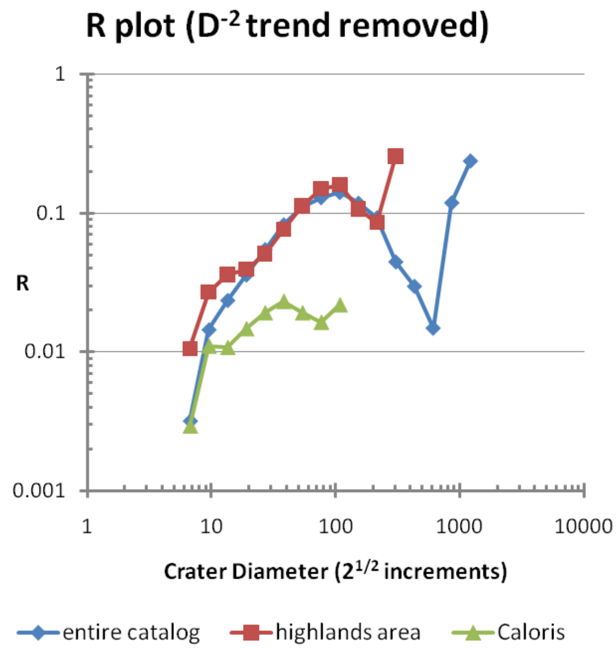

Figure 2. R plots for entire catalog, a highlands area (0 to 30 S, 30 to 90 W), and a portion of Caloris basin (5 to 55 N, 135 to 175 E).

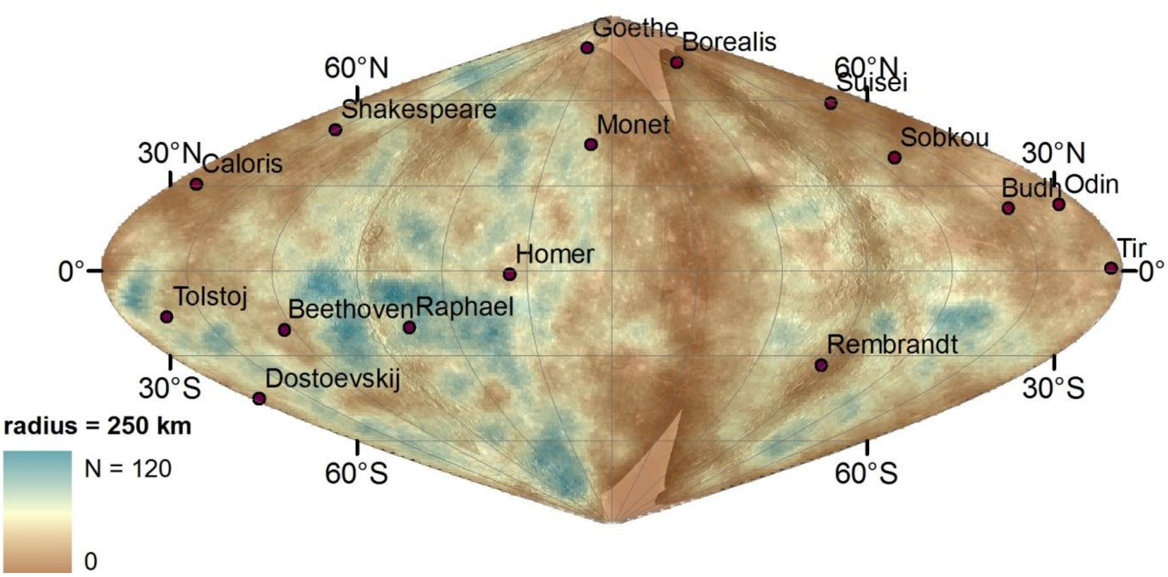

Figure 3. Crater density plot - the number of crater centers in the catalog within a circular region of D = 500 km. Center locations of planitia and named impact basins with D > 300 km are labeled. Map is in sinusoidal projection centered on 0 longitude.