A NEW DATABASE OF LUNAR IMPACT CRATERS. N. G. Barlow[1], S. C. Mest[2,3], D. Buckingham[1], B. Salimkumar[1], J. M. Boyce[4], L. Gaddis[5], T. Hare[5], and R. G. Strom[6]. [1]Dept. Physics and Astronomy, Northern Arizona Univ., Flagstaff AZ 86011-6010 Nadine.Barlow@nau.edu, [2] Planetary Science Institute, Tucson, AZ 85719 Mest@psi.edu, [3]NASA Goddard Space Flight Center, Greenbelt, MD, [4]HIGP, Univ. Hawaii, Honolulu, HI 98622 jboyce@higp.hawaii.edu, [5]US Geological Survey, Flagstaff, AZ 86001 lgaddis@usgs.gov and thare@usgs.gov, [6]Lunar and Planetary Lab, Univ. Arizona, Tucson, AZ 85721 rstrom@lpl.arizona.edu.

Introduction: Impact craters provide direct insights into the shallow subsurface structure of solar system bodies as well as providing estimates of surface formation ages. Impact craters are abundant features on the Moon, and previous studies utilizing ground-based telescopic- [e.g., 1-4] and/or spacecraft-derived [e.g. 5-9] data have allowed most of the impact craters visible on the lunar surface to be observed and analyzed to varying degrees of detail. Ground-based telescopic observations of lunar impact craters are limited to the lunar near side and by the curvature of the Moon, resulting in identification of only a fraction of the total lunar crater population. The Lunar Orbiter series of spacecraft, which were the first to provide near complete image coverage of the lunar surface in the 1960's, enabled significantly more impact craters to be identified in the previously unobservable polar and farside locations. However, extreme shadowing effects of the polar regions caused some areas to remain "unobserved".

The Clementine spacecraft followed in the 1990's, providing image coverage for much of the surface at ~100 m/pixel. Although nearly 100% of the lunar surface has been observed by Lunar Orbiter and Clementine images, morphometric data and location information have been recorded for only a fraction of the total lunar impact crater population, especially for the lunar poles [1-9; also see list of existing lunar crater catalogs, compiled by Charles Wood (http://the-moon.wikispaces.com/Catalogs+of+Lunar+Craters)].

Catalog of Large Lunar Impact Craters: We are compiling a new database of lunar impact craters utilizing Clementine, Kaguya, Lunar Prospector, and Lunar Reconnaissance Orbiter data. All lunar nearside, farside, and polar craters ≥5-km-diameter are being measured and classified in the new *Catalog of Large Lunar Impact Craters*. We are working in ArcGIS, using the Clementine UVVIS 750 nm image mosaic as the basemap. This map is spatially tied to the ULCN 2005 lunar control network [10]. Each crater entry will eventually contain crater identifier, center coordinates, crater diameter, preservation state, ejecta and interior morphology information, crater depth, rim height, and central peak diameter and height. We also are cross-referencing our entries to those in pre-existing catalogs [specifically 1-4, 8, and 9].

Equatorial Region: Our efforts within the ±50° latitude zone are currently focused on the nearside northern hemisphere (0°-50°N latitude, 90°W-90°E longitude), where we have determined updated central coordinates and diameters for over 5700 craters (named and unnamed) using ArcGIS. We have found that most craters listed in the Arthur et al. [1-4], Pike [5-8], and Andersson and Whitaker [9] catalogs are offset from their actual ULCN 2005 positions. Diameters measured for this catalog range from 5 to 1700 km and are typically within 15% of the values cited in the previous lunar crater catalogs.

Polar Regions: For this part of the study, which is focused on craters within 50°-90° north and south latitude and ±180° longitude, the Andersson and Whitaker [9] impact crater database (ftp://pdsimage2.wr.usgs.gov/pub/pigpen/moon/nomenclature/) was imported into the ArcGIS project. Features in the Andersson/Whitaker database were checked against the projected Clementine basemap for accuracy in location, as well as accuracy in identification. Unnamed crater features are being identified, their centers are being located, and their diameters are being measured. With the abundance of new topographic data from Kaguya and LRO, it is anticipated that a new lunar spheroid will be modeled. If this occurs within the timeframe of this project, crater locations and diameters will be remeasured.

For the lunar north and south polar regions, all named craters (2-2600 kilometers in diameter)

and all unnamed craters (D>20 km) have been geolocated in ArcGIS and their diameters measured. The north polar region contains the centers of 791 named craters (D=3-345 km) and 224 unnamed craters (D=20-157 km). The south polar region contains the centers of 1073 named craters (D=2-2600 km) and 195 unnamed craters (D=20-162 km). More than three times as many named craters are located on the nearside (1406) than the farside (458) for both the north and south polar regions, whereas the number of unnamed craters for the nearside and farside are roughly equivalent (193 and 226, respectively).

Impact craters with diameters greater than 10 kilometers are currently being added to the database for both polar regions. When this subset is completed, craters with diameters greater than 5 km will be identified for the database.

Preserving Previous Lunar Crater Catalogs: As part of this effort, we are cross-referencing the crater entries in our new *Catalog of Large Lunar Impact Craters* with those in earlier lunar crater catalogs, specifically the Arthur et al [1-4], Pike [8], and Andersson and Whitaker [9] catalogs. The Arthur et al. ("The System of Lunar Craters") and Pike databases currently are only available in hard-copy format in hard-to-find publications (four issues of the "Communications of the Lunar and Planetary Laboratory" for the Arthur et al. catalog and a USGS Professional Paper for Pike's dataset). To improve accessibility to these datasets by future researchers, we are converting the hard copy information in these catalogs into digital format. Digitizing software has proved ineffective in accurately scanning these datasets, so we are physically transcribing the data into Excel. Transcritpion of the Pike morphometric dataset has been completed and is available in Excel format from author Barlow. The Arthur et al. catalog is currently in progress.

Future Work: Later this fall we plan to begin classifying crater morphology using Kaguya and Lunar Reconnaissance Orbiter Camera (LROC) image data. These high resolution image data will allow us to identify ejecta and interior morphologic features which were not visible or clearly seen in earlier image sets. Next year we plan to begin utilizing LRO Lunar Orbiter Laser Altimeter (LOLA) data to obtain topography information that will dramatically improve the morphometric data available for craters in the catalog. Clementine, Lunar Prospector, and LRO data on composition, Fe and Ti content, and optical maturity of the regolith will begin to be added to the Catalog later next year. The final catalog will be added to the USGS PIGWAD system (http://webgis.wr.usgs.gov/) of online interactive maps and provided to the community through the Planetary Data System. This project also is producing GIS software tools to assist the planetary community in analysis of crater database information.

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