A NEW DATABASE OF CRATERS 5-KM-DIAMETER AND LARGER FOR THE MOON: WESTERN NEARSDIE. R. M. Kinser¹, V. B. Gibbs¹ and N. G. Barlow¹, ¹Department of Physics and Astronomy, Northern Arizona University, NAU Box 6010, Flagstaff, Arizona 86011-6010, USA (rmk85@nau.edu; vbg4@nau.edu; Nadine.Barlow@nau.edu)

Introduction: Impact craters provide insights into ages of surface terrains as well as subsurface properties of other planetary surfaces. Therefore, catalogs of crater morphologic and morphometric properties are extremely useful in various studies of planetary surfaces. The Moon is covered by impact craters which have formed throughout lunar history. These craters have undergone less modification than their counterparts on Earth, Mars, and Venus and therefore provide important insights into the original morphologic and morphometric properties of craters forming on rocky surfaces throughout the Solar System. New data from the Lunar Reconnaissance Orbiter (LRO) are allowing studies of lunar craters in an unprecedented level of detail.

A number of lunar crater databases were produced during the early years of lunar exploration [e.g., 1-6]. These databases were compiled from ground-based telescopic observations and data from the Apollo and Lunar Orbiter missions. These databases suffer from incompleteness, focusing only on craters of certain sizes or locations. Newer crater databases [e.g., 7, 8] also are limited in their coverage or in the information provided. We therefore have undertaken a project to provide a global database of impact craters ≥5-km-diameter.

Our Catalog of Large Lunar Impact Craters is cataloging all impact craters on the Moon using primarily LRO data [9]. The database includes a crater identification number (combination of the longitude and latitude), central coordinates of the crater, crater diameter (major and minor axes if crater is elliptical), ejecta morphology (if any), interior morphology (if any), crater preservation state, geologic unit on which crater occurs, crater depth, rim height, central peak height and basal diameter (if present), azimuthal angle of orientation of major axes if crater is elliptical, elemental and mineralogic data of surroundings, presence/absence of impact melt, and cross-correlation of entries with existing crater databases [10, 11]. This presentation focuses on the database compilation and preliminary results from the western equatorial nearside region; a summary of the results for all equatorial regions completed to date can be found in [11]. An accompanying abstract covers data from the polar regions [12].

Methodology: We are using LRO Wide Angle Camera (WAC) [13] imagery (100 m/pixel resolution) to identify and classify all impact craters ≥5-km-diameter in the 45°N-45°S 270°-360°E region of the lunar nearside. Where available, LRO Narrow Angle Camera (NAC, 0.5 m/pixel resolution) imagery is used to help classify crater morphology. We are using the crater counting routine in the JMars for the Moon software package [14] to measure crater diameters and determine central coordinates of each crater. The crater counting tool is used in three-point mode and the resulting crater data are uploaded to an Excel file. The data are imported into ArcGIS, facilitating comparison of the crater data with information about geologic unit, topography, composition, etc.

We also use the JMars for the Moon software to obtain topographical profiles of the craters in our study areas using the LRO Lunar Orbiter Laser Altimeter (LOLA) data. We take two profiles across each crater at approximately 90° angles to each other. From the resulting profiles we determine an average crater depth relative to the surrounding terrain and compute the depth-to-diameter ratio (d/D) for each crater.

Preliminary Results: To date, we have cataloged 970 craters within the study region (Fig. 1). The area contains both mare materials (with formation ages ~3.0-3.7 x 10⁹ yrs) and highlands materials (dating to ~3.8-4.4 x 10⁹ yrs), allowing us to investigate the role of terrain differences on crater morphometry.

Figure 1: Distribution of craters cataloged to date within the study area.
Craters within the study area range in diameter from the cutoff limit of 5 km up to 920 km. Figure 2 shows a frequency plot as a function of diameter.

**Figure 2:** Number of craters from entire study area within specific diameter bins. Diameter ranges are the standard $(2)^{1/2}$ diameter bins utilized in crater statistical studies.

To date, we have completed depth measurements of 655 craters in the study region. We have divided the craters into those occurring on mare versus highlands materials and computed depth-diameter (d/D) ratios for each. Figure 3 shows the results of this analysis.

**Figure 3:** Depth vs Diameter values for craters between 5 and 30 km diameter on the mare (left) and highlands (right).

**Discussion:** The western equatorial nearside region of the Moon contains both highlands and mare material, allowing us to investigate whether differences in terrain affect crater morphometric characteristics. The mare depth-diameter graph shows considerable scatter and at present we are unable to determine the simple-to-complex transition diameter from these data. The highlands depth-diameter graph is a bit clearer and shows a transition between the steeper slope of the simple craters and the shallower depths of the complex craters occurring near 14 km. This is slightly lower than the commonly cited simple-to-complex transition diameter of ~17.5 km for the Moon [15] and suggests that regional terrain variations may affect crater morphometric characteristics such as the transition diameter.

**Future Work:** We are completing the morphometric measurements and d/D analysis within the study region and will soon move on to classifying ejecta and interior morphologies for each crater using LRO imagery. We will then proceed to the following steps:

1. Completing the classification of ejecta and interior morphologies for each crater using LRO imagery.
2. Using ArcGIS to investigate distributions of these features as a function of elevation, geologic unit, and surface age.
3. Conducting crater size-frequency distribution analysis to determine the formation age of the geologic units within the study region.

The completed crater database will be archived in NASA’s Planetary Data System and through the USGS’s Planetary Interactive GIS on the Web Analyzable Database (PIGWAD) system for access by the planetary community.

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**References:**