A NEW LUNAR IMPACT CRATER DATABASE. A. Losiak[1], D.E. Wilhelms[2], C. J. Byrne[3], K. Thaisen[4], S.Z. Weider[5,6], T. Kohout[7,8,9], K. O'Sulllivan[10], and D.A. Kring[11] [1]Michigan State U. losiakan@msu.edu, [2]United States Geological Survey, retired, [3]Image Again charles.byrne@verizon.net, [4]Department of Earth and Planetary Sciences U. of Tennessee – Knoxville, [5]Birkbeck/UCL Research School of Earth Sciences, [6]Rutherford Appleton Laboratory, [7]Department of Physics, U. of Helsinki, [8]Department of Applied Geophysics, Charles U., [9]Institute of Geology, Academy of Sciences of the Czech Republic, [10]Department of Civil Engineering and Geological Sciences, U. of Notre Dame, [11]Lunar and Planetary Institute.

Introduction: To fully leverage the fleet of new spacecraft missions being sent to the Moon, the rapidly increasing volume of data needs to be integrated with the Apollo-era data that provided our first, modern assessment of the Moon. To facilitate that comparison, Apollo data needs to be rendered in formats compatible with modern techniques. The aim of this abstract is to describe a new database of lunar impact craters that shortly will become available at the LPI's lunar website http://www.lpi.usra.edu/lunar. This compilation integrates information concerning the locations and ages of craters, as well as various measured and calculated physical characteristics (such as crater dimensions or ejecta blanket thickness). The current form of the database (a Microsoft Excel file .xls) is compatible with Geographical Information Systems (GIS) programs, thus making it a powerful tool for incorporating old and new data, for both scientific and exploration planning purposes.

Database description: This new lunar crater database [1] is an integration of previously published data. It is based on a list of craters [2] that provides name, location, and diameter. Our database has 8680 entries providing location and basic characteristics, including more than 1600 entries with information about age. Crater diameters range from <1 to >1000 km, although the population of the smallest craters is statistically underrepresented and no attempt has been made to separate primary from secondary craters. Although the new database includes craters from both the far and near side of the Moon, the near side craters are much better represented.

Crater morphology: Various morphological characteristics of the craters are calculated using equations available in the current literature, and are included in the database. These include rim height, ejecta blanket thickness, radial distance of continuous ejecta, and transient cavity dimensions. When more than one conflicting method for quantifying a specific characteristic exists, then the result from each method is available. For example, the thickness of a crater's ejecta blanket can be calculated using equation No. 4 from [3], which is based on [4], but a different calculation uses equations No. 9, 10, and 12 supplied by [5]. Additionally, the radius of continuous ejecta can be calculated using Equation 6.3.1 from [6]. The values are given in various units (usually km or m and lunar degrees), but these can be easily converted to whatever unit is desired. It is important to note that these values are based on modeled results, rather than observations.

Crater ages: Most of the crater ages presented in the database are supplementary to and update [7], based on a recent review by Don Wilhelms [8]. For the Pre-Nectarian system, only those craters that are larger than 60 km in diameter are included because of doubts about the ages of those that are smaller. For the younger stratigraphic systems, the relative ages of craters larger than 30 km in diameter are presented. Other crater ages are based on the data provided on geological maps of the surface of the Moon (e.g. [9]). Additionally, information from a more extensive literature review will be included in the future. If two sources give disparate ages, the more recent source is assumed to be correct, and reported as the crater age, while the other date is reported in a remarks column.

Examples of usage: The database can be used in many different ways. It has already been utilized in the initial stages of selecting potential lunar landing sites for particular scientific reasons during the 2008 Lunar Exploration Summer Intern Program at the LPI. The database allows quick scanning through large numbers of craters, or the selection of those with specific characteristics of interest.

For example, if an aim of a future mission will be to establish a precise absolute chronology for the Copernican period (consistent with goals 1c and 1d from an NRC report of lunar science priorities [10]), a potential strategy for choosing possible exploration sites may be target craters with diameter >50 km. Such craters will be good choices for two reasons: 1) The geographic extent of these features and their ejecta will be greater than that of smaller craters, thus increasing their stratigraphic potential for establishing the relative ages of many nearby surfaces; 2) They will be more likely to contain extensive melt ponds or sheets (due to the greater extent of melting) than smaller craters, from which material with a definitive age can be extracted with more confidence than from distal ejecta deposits. By making use of our new database it is a simple matter to find only those craters that are Copernican and have diameters >50 km (Figure 1 displays craters with diameters >50 km for all ages). This method of selection is very quick and ensures that all relevant features are considered.

By using the database in combination with GIS software, useful maps can be created, including those necessary for a complex spatial analysis. For example, if the objectives of a particular mission call for the study of basalt deposits through time, it will be necessary to find a single location where a number of temporally diverse basalt deposits can be sampled and studied. Such locations may include craters of different sizes (thus having different excavation depths) within mare basalt deposits. At these sites, material from different original depths can be sampled, without the need for technically-complex manual or robotic drilling.

Conclusion: This new lunar crater database is a powerful tool that will be freely available to the lunar community for a diverse range of science- and exploration-related tasks. We welcome suggestions that will make this database more complete and useful.

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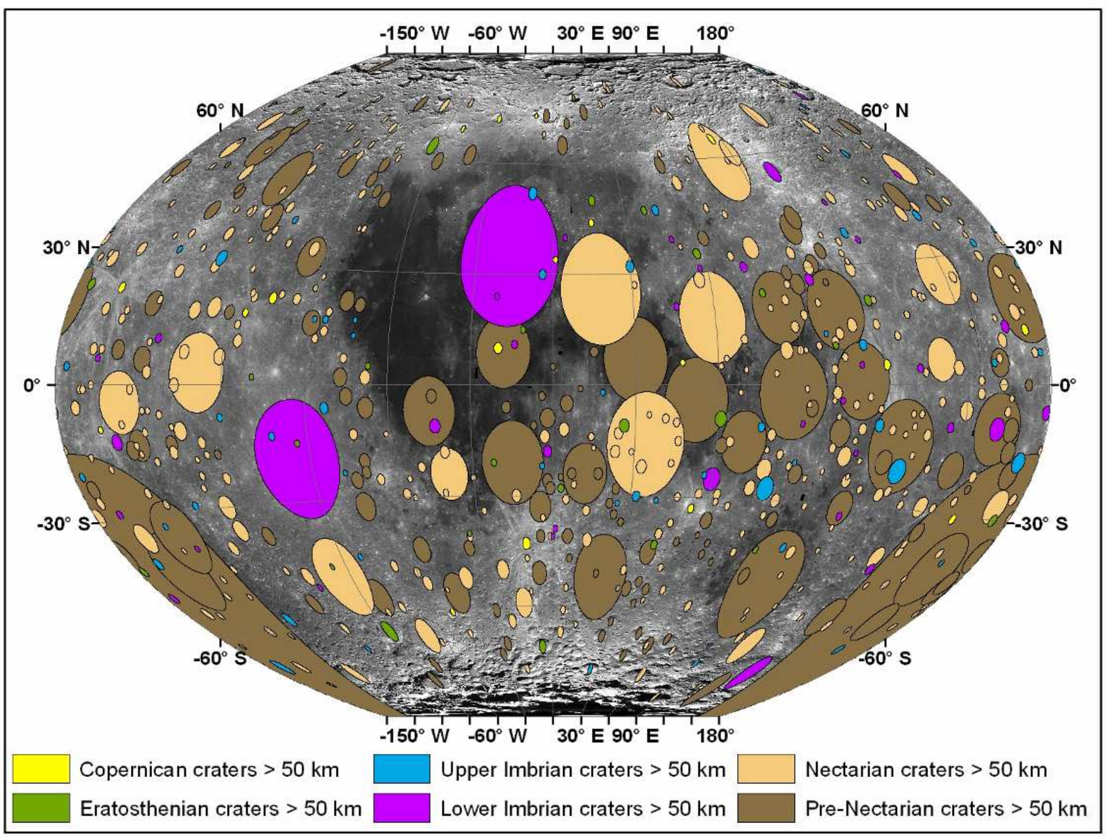

Figure 1: Craters of various ages that are larger than 50 km in diameter. The size of the spot corresponds to the diameter of a crater.