

Announcing the Availability of **The Unified Lunar Control Network 2005**

We officially announce here to the lunar science community that *The Unified Lunar Control Network 2005* has been completed as of late last year, and is now available as an on-line USGS Open-File Report, no. 2006-1367.

Location: The location of the report is:

<http://pubs.usgs.gov/of/2006/1367/>

Description: The abstract of the report describes this network as follows:

This report documents a new general unified lunar control network and lunar topographic model based on a combination of Clementine images and a previous network derived from Earth based and Apollo photographs, and Mariner 10 and Galileo images. This photogrammetric network solution is the largest planetary control network ever completed. It includes the determination of the 3-D positions of 272,931 points on the lunar surface and the correction of the camera angles for 43,866 Clementine images, using 546,126 tie point measurements. The solution RMS is 20 micrometers (= 0.9 pixels) in the image plane, with the largest residual of 6.4 pixels. The explanation given here, along with the accompanying files, comprises the release of the network information and of global lunar digital elevation models (DEMs) derived from the network. A paper that will describe the solution and network in further detail will be submitted to a refereed journal, and will include additional background information, solution details, discussion of accuracy and precision, and explanatory figures.

Files available include the text report itself, in PDF and Word format, and a general "readme" file describing the rest of the on-line files. The latter includes the original solution input and output files, miscellaneous derived files, and global digital elevation model (DEM) files derived from the control point positions.

Pages 6 and 7 of the text describe possible uses of the ULCN 2005.

Pages 4 and 5 of the text describe global DEM files that have been derived as a by-product of the control network control points.

Supplementary Information: Since several months have passed since the report was completed, we include some additional relevant information here.

* Camera angle information availability - The ULCN 2005 set of Clementine camera angles is available in an ASCII format with the Open-File report files. However, since the report was published we have also placed this information into the more usable NAIF CK file format. Copies of this file are available upon request, and will eventually be distributed as part of the ISIS 3 package and submitted to NAIF. This file can now be used in ISIS 3 to project associated Clementine images onto the ULCN 2005 topographic surface.

* Comments on topographic information - Based on our and others' experience in the last several months in using the topographic information, we make the following points.

1. *Users are cautioned* that the topographic data is very unlike that which many users are familiar with (e.g. topography on Earth, MOLA data for Mars). Differences are: a) the coverage is not uniform in density; b) the coverage is not uniform in precision; c) the Expected Vertical Precision is on the order of hundreds of meters to km (compared to meters); and d) the radii estimates are generally based on the matching of areas of Clementine imagery and are therefore *area averages* (e.g. over craters and other significant topographic variations) and not estimates for the specific point.
2. We have attempted to minimize the size of the vertical errors in the smoothing process used to generate the available DEMs, but for the best possible results in a given area investigators may wish to use the control point coordinates and expected vertical precision information and use their own filtering, interpolation, and smoothing algorithms for deriving topographic models.
3. Still, the derived DEMs, when compared with Clementine LIDAR data, have RMS accuracies similar to the LIDAR data itself, and yet provide global coverage based on about 4 times as many points. Therefore we assume there will be many uses for the topographic data before it is superseded in a few years by altimeter and stereo information from the many planned upcoming lunar missions.
4. Even though we realize the topographic data will eventually be completely superseded, we anticipate that the control network itself will be of value indefinitely since (with further updates) it will serve to rigorously tie the existing datasets to future datasets so that they can be intercompared.

* The future extension and improvement of this network and the creation of a "ULCN 2007" (described in the text pages 8 and 9) is currently on hold due to funding constraints in the NASA PG&G Program budget.

* Under PG&G funding we are creating "warped" versions of the Clementine mosaics, where the original mosaics are transformed by local polynomials from their original geometry (that of the CLCN) to the ULCN 2005. This will substantially improve those mosaics positionally, although the results will not be as good as recreating those mosaics directly in the ULCN 2005 system. See our ISPRS Extraterrestrial Mapping meeting

abstract for details (Archinal, et al., at http://www.dlr.de/pf/Portaldata/6/Resources/dokumente/isprs_2007/Archinal_ISPRS_2007.pdf). These products should be available in a matter of months.

* We are also registering about 29,000 of the approximately 350,000 Cook, Robinson, and Watters Clementine DEM tiles into the ULCN 2005 system, thus generating a new "planet-wide" (i.e., globally distributed but with many holes) 1 km resolution topography model. See our LPSC meeting abstract for details (Rosiek, et al., at <http://www.lpi.usra.edu/meetings/lpsc2007/pdf/2297.pdf>). This product should be available in a matter of months.

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