THE IO MOUNTAIN ONLINE DATABASE, H. Hargitai[1], and P. Schenk.[2] [1]Eötvös University, Faculty of Science, Dept. Physical Geography, Cosmic Materials Space Res. Group, H-1117 Budapest, Pázmány Péter s. 1/a. Hungary, hargitaihenrik@emc.elte.hu, [2]Lunar and Planetary Institute, Houston Tx, USA 77058

Abstract: Io, the most volcanically active body in the Solar System, has more that a hundred mountains whose origin are not fully understood. They cover roughly 3 percent of the surface of Io. We created the first database of the mountains of Io in 1998, when new Galileo images, combined with Voyager data, made possible mapping of more than 50% of the surface. The results of the survey were first presented at LPI in a lecture entitled The Morphology and Distribution of Mountains of Io. Work continued as new Galileo images were released through the end of Io observations in 2000, and the initial results of that survey were published in 2001 [1]

Only some of the data collected by us were published in 2001 [1]. Work started on converting the digital database to an online version in 2002, with the goal of making all our measurements available to the research community. We have used the structure of previous databases available at LPI website [2, 3, 4] and elsewhere [5, 6]. The latest revision of the dataset includes data from all Galileo images, and also a refinement of our classification system. The online database is not only a electronic version of the revised 2001 publication, but it is complete and is continuously updated. The Io Mountain Database is accessible at http://planetologia.elte.hu/io, at the website of the Cosmic Materials Space Research Group of Eötvös Loránd University, Budapest, Hungary.

Structure: The database includes 142 measured individual structures, including 110 classified as mountain, 4 classified as volcanoes (cones or pancakes), 16 candidate mountains (which were not classified due to low image resolution or inability to discern their morphology or verify relief) and 16 layered plains. (A mountain is classified here as an elevated structure (>1 km high) of non-purely-erosional origin.) The database can be searched by the coordinate, height, morphologic type and the name of the structures. Our database compliments that published by Jaeger et al. [7]. They include a few mountains that we classify as layered plains or are less than 1 km in elevation and of uncertain nature. We note that they extrapolate their counts from „high-resolution" mapping areas in order to estimate that there are more than 150 mountains on Io. We reject this claim due to the fact that most mountains cannot be identified within these high-resolution mapping areas (i.e., better than 2 km-pixel resolution), but require either limb, terminator or stereo images for detection and identification. Most of the areas Jaeger et al. cite as "low-resolution" and hence subject to incomplete counts, are in fact equally covered by these auxilliary mapping techniques. Hence we consider our database to be complete and representative of the total mountain inventory on Io to at least the 95% level.

Height Data. Several techniques were used to measure heights of mountains. We measured the length of the shadow cast by a mountain's highest peak to estimate the height of the mountain; 70% of the mountains were measured by shadow height measurement. Similarly we were able to place lower limits of the heights of those mountains tall enough to project into sunlight even though their base was in shadow. Using an automated stereo correlation program, heights were estimated for those mountains viewed in stereo images. In many cases it was possible to use multiple techniques to estimate mountain heights. In the database, all height measurements are included for comparison. A total of 11 mountain peaks exceeds the height of 10 km above the surroundings, 4 of which are unnamed.

Morphologic types. Most of the mountains can be classified as one of 4 major types. *Plateaus*, the most common type, have broad, uneven surfaces while *mesas* have smooth, flat surfaces. Both of these types frequently feature a basal scarp. *Ridges* are characterized by linear or curvilinear ridge crests. Several mountains are characterized by two parallel ridges. Whether these ridged structures are evidence of layering or imbricate fault structures was not resolved by Galileo. Among the highest mountains are *massifs* which generally have steep slopes several kilometers high and rugged but relatively small angular *peaks*. *Layered plains* are smooth topped elevated areas with basal scarps. Such features can be eroded remains of older lava flow layers or could be created by other processes. They have an elevation of <1 km

The following structural types were used in the classification: arcuate, flatiron, striated, asymmetric, eroded, rifted, domical.

Among the mountains are 50 plateaus, 30 ridges, 11 peaks, 11 massifs, 11 mesae, 3 compound mountains, 1 volcanic cone, 3 volcanic mesae, 16 suspected mountains, and 5 mountains that could not be classified. Among them, 8 structures were classified as rifted structural type.

Other data. For all mountains, the following data are included, in addition to height and type: width, length, area, distance to the nearest patera, the presence of deposits (vent, mountain, aureole [light colored deposit around the structure]) presence of other structures (scarp, debris slumps, blocks, ridges), Pic No of images on which the structure is visible (Voyager and/or Galileo), and the origin of name (if named).

Images Orthographic images (tiles) at a common resolution of 1 km and width of 15° were made for each structure in order to measure and compare Io's mountains at uniform map scale and free of viewing angle distortion. We used all available images of the same area taken at different viewing angles and lighting conditions. These different views allowed us to characterize mountain morphology with much greater confidence than using one image. These tiles were used for each measurement of length, width, area and height. In the online version, all used images are available, for each structure: where more images are available for that structure, all can be viewed on the page of that particular structure (fig. 1.). The images has a common resolution of 1 km/px, however, limb images and raw images are also included when necessary. We note that not all high-resolution observations from Galileo orbits I24-I32 have been included as of this writing. We also note that image resolution is highly variable across Io. Some areas north of the equator between 0 and 50° longitude and at the north pole were observed at relatively low resolution. All images can be downloaded at their full resolution.

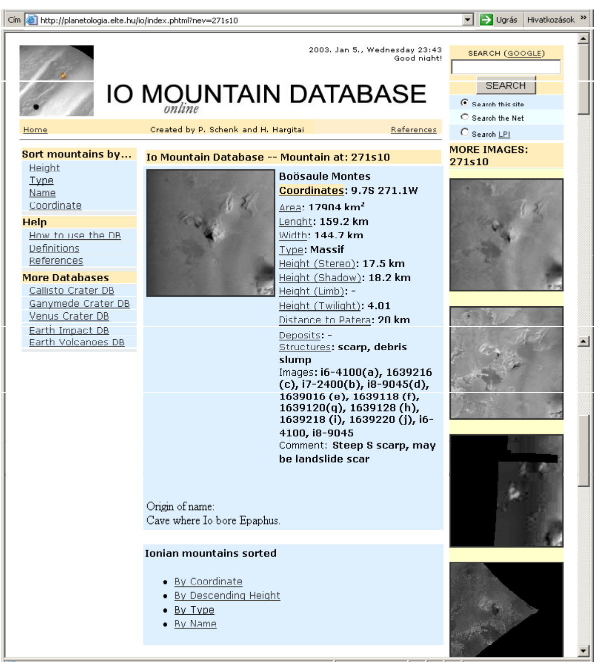

Fig. 1. Io Mountain Online Database.

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[4] Herrick, R., Venus Crater Database http://www.lpi.usra.edu/ research/vc/vchome.html

[5] Earth Impact Database (2003) http://www.unb.ca/passc/ImpactDatabase/

[6] Volcano World, http://volcano.und.nodak.edu/vw.html

[7] Jaeger, W. et al., (2003) *J. Geophys. Res*, **108**, 10.1029/2002JE001946