TOPOGRAPHY ANALYSIS AND VISUALIZATION SOFTWARE SUPPORTS A GUIDED COMPARATIVE PLANETOLOGY EDUCATION EXHIBIT AT THE SMITHSONIAN'S AIR AND SPACE MUSEUM. J. H. Roark[1], C. M. Masuoka[2], H.V. Frey[3], J. Keller[4] and S. Williams[5], [1]Science Systems and Applications, Inc. Code 698, NASA GSFC, Greenbelt, MD 20771, jim.roark@gsfc.nasa.gov, [2]St. Vincent Pallotti H. S., Laurel, MD 20707, [3]Planetary Geodynamics Branch, Code 698, NASA GSFC, Greenbelt, MD 20771, Herbert.V.Frey@nasa.gov, [4]Code 691, NASA GSFC, Greenbelt, MD 20771, [5]Smithsonian National Air and Space Museum, Washington, D.C. 20013.

Introduction: The Planetary Geodynamics Laboratory (http://geodynamics.gsfc.nasa.gov) of NASA's Goddard Space Flight Center designed, produced and recently delivered a "museum-friendly" version of GRIDVIEW, a grid visualization and analysis application, to the Smithsonian's National Air and Space Museum where it will be used in a guided comparative planetology education exhibit. The software was designed to enable museum visitors to interact with the same Earth and Mars topographic data and tools typically used by planetary scientists, and experience the thrill of discovery while learning about the geologic differences between Earth and Mars.

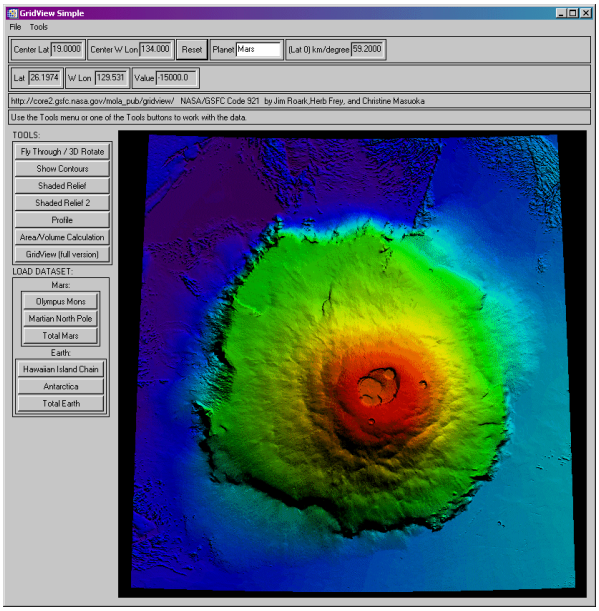

Figure 1. View of the simplified "museum-friendly" interface showing a shaded relief view of the mars volcano Olympus Mons.

Description: This activity is part of a Goddard Space flight Center Directors Discretionary Fund project entitled "Exploring Planetary Topography in the Museum Using 3-Dimensional Models" [1]. Previously in this project, sets of 3-D extruded plastic scale models of various geologic features such as volcanoes, polar caps, fluvial formations and canyons on both Earth and Mars were produced and supplied to several educational institutions. The models, along with written classroom exercises, were used for geology and comparative planetology education.

A "museum-friendly" version of the GRIDVIEW [2] topography analysis and visualization software (figure 1) was designed to be used in conjunction with the plastic model pairs. The program allows users to load, view, explore and measure the topographic data used to produce each of the plastic models (as well as other areas). Users can load the data for each model and graphically display it in many forms typically used by planetary scientists such as: contour, profile (figure 3), shaded relief (figure 1), perspective view (figure 2) and various interactive color maps. The software also supports interactive measurements capabilities such as slope, distance, height, area and volume (figure 4). These program features, along with many of the graphic display options such as rotation, vertical exaggeration and zooming, provide excellent opportunities for data exploration and discovery. For example, a visitor could use the software to zoom into the data for Olympus Mons and examine features such as the caldera, lava flows or surrounding scarps and land slides.

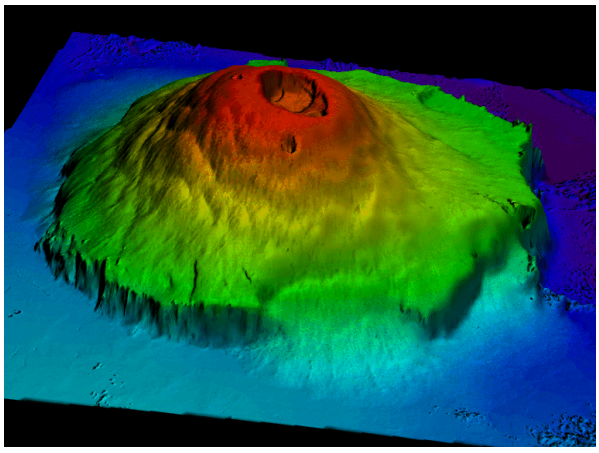
Figure 2. GRIDVIEW produced prospective view of Olympus Mons shown with a vertical exaggeration of 15x.

Along with the comparative geology, some additional goals of the exhibit are to teach visitors about

how various graphic representations of the data are used for scientific analysis and also how the data is measured and collected by planetary spacecraft. ETOPO2 topography data [3] from the NOAA National Geophysical Data Center was used to produce the Earth models and Mars Orbiting Laser Altimeter (MOLA) topography data [4] from NASA's Mars Global Surveyor satellite was used to produce the Mars models.

The "museum-friendly" version of GRIDVIEW supports a subset of the functions available in the full version of the software. A primary difference between the two programs is the presentation. A goal for the "museum-friendly" version was to simplify the interface and attempt to make its use a bit more intuitive for the first time user, which will likely be the case in many museum settings. An example of the simplification is that the "pull-down" tools menu was reduced from 32 items down to the 16 most commonly used functions. However, one of the tools options is to start the full version of GRIDVIEW if it has also been installed. Another presentation difference in the "simplified" version is that prominent buttons are provided for the six most common tools and data load commands. This allows easy loading of the data grids that represent the plastic models accompanying the display. The six most commonly used tools are: (1) Fly Through / 3D Rotate, (2) Show Contours, (3) Shaded Relief, (4) Shaded relief 2, (5) Profile and (6) Area / Volume Calculation. The data load set for Mars includes: Olympus Mons, North Pole and the whole planet Mars. The data load set for Earth includes: Hawaiian Island Chain, Antarctica and the whole planet Earth. The whole Mars and Earth data sets are available to allow the user to explore any area of the two planets in exactly the same way as the preselected areas are explored.

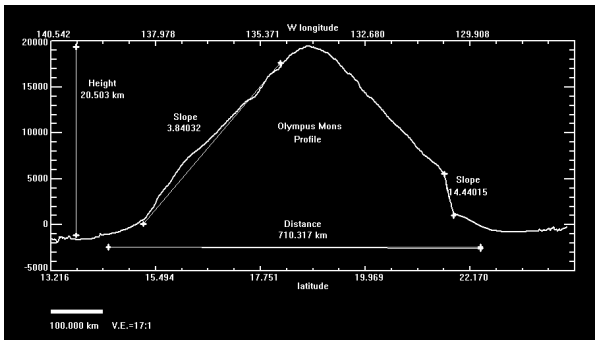

Figure 3. Profile plot of Olympus Mons showing measurements of slope, distance and height.

Another addition, initially designed for the simplified version, is the inclusion of "pop-up" usage hints. The hints are displayed as pop-up text windows and may contain explanations of what a specific tool does or how it can be used. This can help is situations where a guide or tutor is not available. This hints utility has also been incorporated into the latest full version of GRIDVIEW.

Even with the simplifications, GRIDVIEW has many tools and options so it is probably best used in a guided exhibit where users can be introduced to the program by a museum interpreter. In our experience, a ten or fifteen minute interactive introduction of the full version is effective in enabling new users to understand and effectively use GRIDVIEW for research and data exploration purposes.

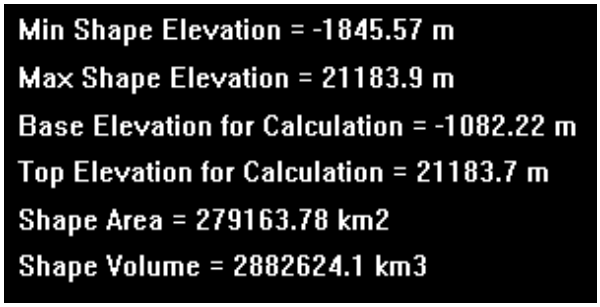

Figure 4. GRIDVIEW produced area and volume calculation results for Olympus Mons.

This project was produced in collaboration with Steven Williams of the Smithsonian's National Air and Space museum where guided exhibits highlighting the recent successful scientific exploration activities on Mars are provided.

The full version of GRIDVIEW is available as a free download on the web at: http://geodynamics.gsfc.nasa.gov/gridview/. The software requires an IDL license or a free IDL virtual machine application available from Research Systems (http://www.rsinc.com). IDL is available for various operating systems including: Windows, Mac OSX, Linux and UNIX. 128 MB RAM is a minimum requirement with additional RAM requirements for loading larger data sets.

References: [1] Keller, J. et al., (2003) *GSA*, Abstract #46-36, [2] Roark, J. et al. (2004) *LPSC XXXV*, Abstract #1833, [3] NOAA, NGDC, (2001) (http://www.ngdc.noaa.gov/mgg/fliers/01mgg04.htm) [4] Smith, D. et al., (1999) NASA Planetary Data System MGS-M-MOLA-5-IEGDR-L3-V1.0.