VISUALIZATION OF MARS DATA SETS: VIEWS FROM HELLAS BASIN. Leslie F. Bleamaster, III[1], Varun V. Bhartia[1, 2], and David A. Crown[1], [1]Planetary Science Institute, 1700 E. Ft. Lowell Rd., Suite 106, Tucson, AZ 85719, lbleamas@psi.edu, [2]University of Arizona, Lunar and Planetary Laboratory, 1629 E. University Blvd., Tucson, AZ 85721.

Introduction: Our objectives are to provide students, science teachers, and the public an opportunity to experience the scientific endeavor of investigating the surface of another planet, all within the broader context of understanding maps, developing map skills, and the creation and use of maps by both terrestrial and planetary geologists. In the first year of our MAPS (Mapping Planetary Surfaces) education and public outreach (E/PO) program, we are currently in the process of developing a comprehensive GIS database of the Hellas basin consisting of Viking Orbiter, Mars Global Surveyor, and Mars Odyssey datasets, and USGS map publications, to be used for both scientific research and outreach. Our E/PO products will eventually be available for use in the classroom, through the Internet, and in museum settings. Additional teacher training workshops will be developed and provided through established programs by our E/PO partners: the Flandrau Science Center, the Challenger Learning Center of the Southwest, and the Adler Planetarium.

Specific Objectives: Our E/PO efforts focus on two fundamental disciplines: geography and geology. It is our aim to provide the fundamental background information necessary for participants to understand the importance of maps as they pertain to both society as a whole and to science. This is accomplished through a series of short exercises that introduce maps. Participants are asked to measure horizontal and vertical distances and calculate slopes, orient maps and determine directions and angles, and evaluate spatial relationships on maps of various scale. We will also expose participants to the scientific method through investigations of existing, and the generation of new, maps of Earth and Mars. This includes an introduction to the basic principles of geology and geologic mapping, emphasizing fundamental concepts used for relative dating on Earth and on other planets: superposition, original horizontality, cross-cutting relationships, fossil succession, and impact cratering.

Hellas Geology: The Hellas basin and surrounding highlands provide an excellent field area for the geologist in training. This region of the Martian surface exhibits landforms shaped by a diversity of geologic processes and has a well-preserved geologic record, with exposures of units from throughout Martian history. Previous and ongoing geologic mapping studies and geomorphic analyses will be incorporated into the MAPS curriculum. Specific areas of interest may include: highland degradation styles and regional stratigraphy [1-5], explosive volcanism associated with the Hadriaca and Tyrrhena Paterae [6-8], emplacement of Tyrrhena Patera lava flows [6, 9-10], the development of valley networks [2, 11], formation of canyon systems [2, 12-19], geomorphology of lobate debris aprons [20], and the morphologies and population characteristics of impact craters [21, 22].

Visualization: Of critical importance in geology is the ability to understand 3-dimensional relationships and how they change over time. For some, this type of thinking is hard-wired; however, others require several opportunities to develop this sense of intuition or visualization. In a terrestrial setting, we can easily go into the field and expose one to the myriad of geological relationships that exist in the naturally occurring 3-D world. For planetary data, three-dimensional thinking is a little more abstract since most products available come in 2-D form (i.e., topographic and geologic maps, satellite images). Advancements in image processing techniques, graphical software, and data storage capacity, provide new opportunities to easily integrate our planetary datasets, aiding in the creation of 3-D perspective worlds where a viewer may become a part of the environment. Use of ArcScene™ software allows full integration of Martian datasets and the ability to warp these data over MOLA DEMs (Figures 1 and 2). These 3-D views provide enhanced scientific understanding as well as the ability to convey geologic relationships to students and the public.

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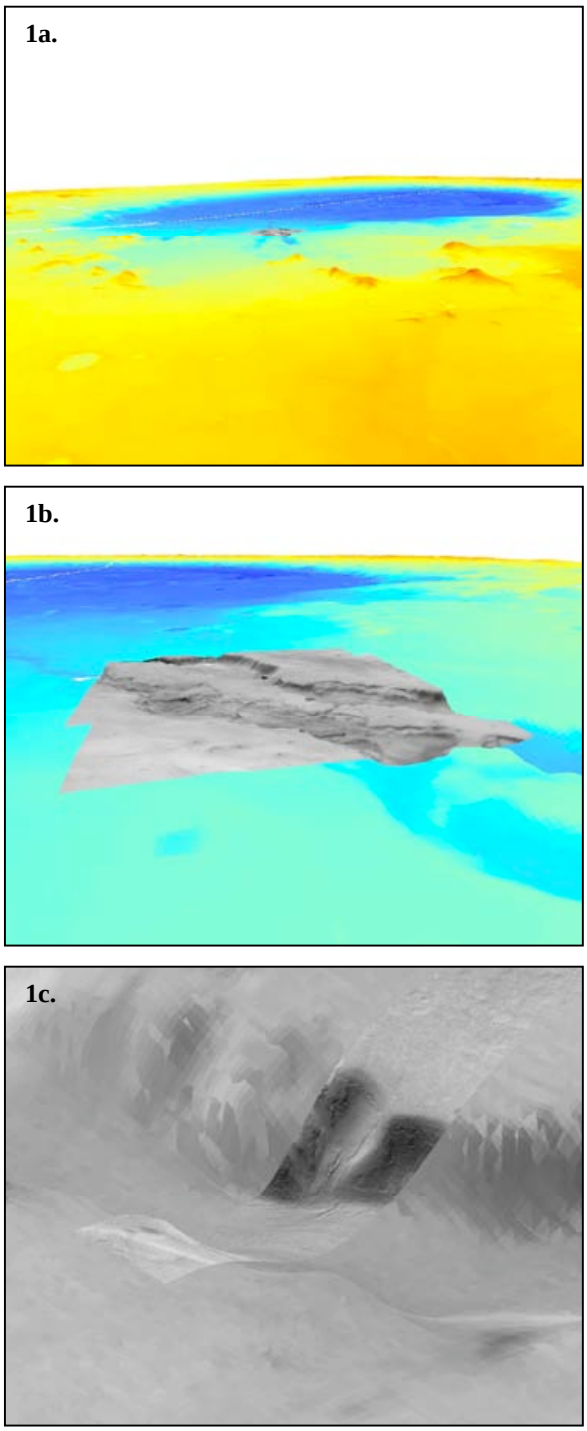

Figure 1. Perspective views looking to the southwest over Hellas basin (a), to the west over Niger and Dao Valles (b), and to the northwest over Dao Vallis and a filled alcove (c) using MOLA 128 pxl/deg DEM, MOC wide- and narrow-angle images. Merging of datasets allows evaluation of topographic and morphologic relationships at a variety of scales. Vertical exaggeration = 3.

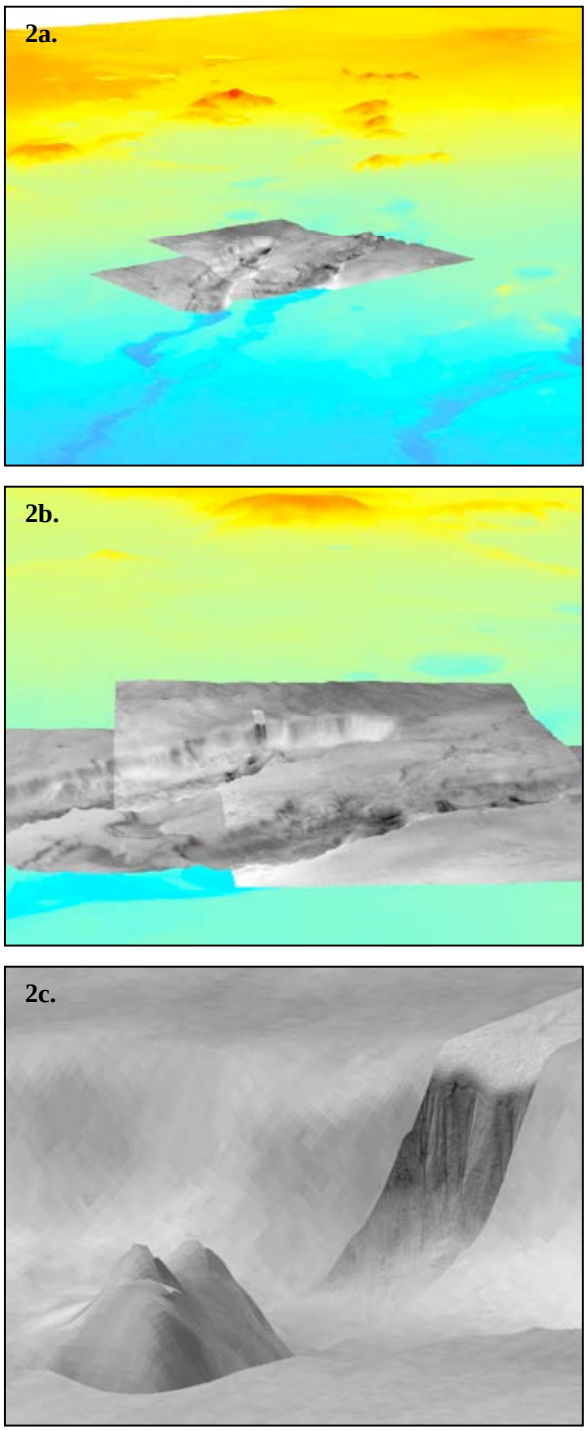

Figure 2. Perspective views looking to the northeast over Dao and Harmakhis Valles (a), to the north over Niger and Dao Valles (b), and to the north over Dao Vallis, an interior knob and gullied wall (c) using MOLA 128 pxl/deg DEM, MOC wide- and narrow-angle images. Vertical exaggeration = 3.