VISUALIZING MARS DATA AND IMAGERY WITH GOOGLE EARTH. M. D. Hancher[1], R. Beyer[1], M. Broxton[1], N. Gorelick[2], E. Kolb[2], and M. Weiss-Malik[2], [1]NASA Ames Research Center (MS 269-3, Moffett Field, CA 94035, USA), [2]Google, Inc. (1600 Amphitheatre Parkway, Mountain View, CA 94043, USA).

Introduction: There is a vast store of planetary geospatial data that has been collected by NASA but is difficult to access and visualize. Virtual globes have already revolutionized the way we visualize and understand the Earth, but other planetary bodies including Mars can be visualized in similar ways as well. Extraterrestrial virtual globes appear poised to revolutionize planetary science, bring an exciting new dimension to science education, and allow ordinary users to explore the increasingly breathtaking imagery being sent back to Earth by modern planetary science satellites.

Mars in Google Earth: The original Google Mars [1] website allows users to view base maps of Mars via the Web, and it is to some degree extensible, but is is not The Google Earth client, which is now also available as a plug-in for websites, is becoming one of the most popular ways to visualize planetary data. We have previously demonstrated the use of Google Earth to display some Mars imagery in a more fluent interface [2]. We will demonstrate several uses of the latest Google Earth and KML features for Mars data visualization. Global maps of planetary bodies—not just visible imagery maps, but also terrain maps, infra-red maps, mineralogical maps, and more—can be overlaid on the Google Earth globe using KML, and a number of sources are already making many such maps available. Coverage maps show the polygons that have been imaged by various satellite sensors, with links to the imagery and science data. High-resolution regionated ground overlays allow you to explore the most breathtaking imagery at full resolution, in its geological context, just as we have become accustomed to doing with Earth imagery. Panoramas from landed missions to the Moon and Mars can even be embedded, giving users a first-hand experience of other worlds.

These capabilities have obvious public outreach and education benefits, but the potential benefits of allowing planetary scientists to rapidly explore these large and varied data collections—in geological context and within a single user interface—are also becoming evident. Because anyone can produce additional KML content for use in Google Earth, scientists can customize the environment to their needs as well as publish their own processed data and results for others to use. Many scientists and organizations have begun to do this already, resulting in a useful and ever-growing collection of planetary-science-oriented Google Earth layers, especially for Mars and the Earth's moon.

We will step through the process of adapting Google Earth for planetary science use, with special focus on using Google Earth to support Mars science. We will present both our own KML layers (available online for anyone to use) as well as an overview of useful layers made available by others. First, KML imagery super-overlays enable us to create a non-Earth planetary globe within Google Earth, and then conversion of planetary meta-data allows display of the footprint locations of various higher-resolution data sets. Once our group, or any group, performs these data conversions the KML can be made available on the Web, where anyone can download it and begin using it in Google Earth (or any other geospatial browser), just like a Web page. Lucian Plesea at JPL offers several KML base maps (MDIM, colorized MDIM, MOC composite, THEMIS day time infrared, and both gray-scale and colorized MOLA). We have created TES Thermal Inertia maps, and a THEMIS night time infrared overlay, as well. Many data sets for Mars have already been converted to KML. We provide coverage polygons overlaid on the globe, whose icons can be clicked on and lead to the full PDS data URL. We have built coverage maps for the following data sets: MOC narrow angle, HRSC imagery and DTMs, SHARAD tracks, CTX, and HiRISE. The CRISM team is working on providing their coverage data via publicly-accessible KML. The MSL landing site process is also providing data for potential landing sites via KML.

These tools will not only allow planetary scientists to more rapidly browse and locate specific data sets if interest and more easily build and share data within the scientific community, but will also provide an easy platform for public outreach and education efforts, and will easily allow anyone to layer other forms of geospatial information on top of planetary data.

References:

[1] Google, Inc. "Google Mars." http://mars.google.com. Accessed 8 January 2008.

[2] Beyer, R. A.; Hancher, M. D.; Broxton, M.; Weiss-Malik, M.; Gorelick, N.; Heldmann, J.; Steber, N.; and Kofman, R. 2007. Google Moon, Google Mars, and Beyond. American Geophysical Union, Fall Meeting 2007, abstract #P41A-0204.