Improving Access to Astronaut Photography through Google Earth

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The Johnson Space Center (JSC) Crew Earth Observations Team directs the archiving and geolocational cataloging of Earth images acquired by International Space Station (ISS) astronauts. These images, together with descriptive and camera metadata for each image, are accessible at The Gateway to Astronaut Photography of Earth (http://eol.jsc.nasa.gov). This on-line searchable database is a highly valuable resource of historical and current imagery available to researchers, government, and nonprofit entities; planning and environmental professionals; educators; and the general public in both developed and developing countries. A group comprised of members from the NASA Ames Research Center, JSC, and the NASA Goddard Space Flight Center selects astronaut photographs and related descriptive content. These data provide a key component of the NASA layer in the free geographic browser Google Earth (http://earth.google.com). The astronaut photography comprises a distinct layer within the NASA-provided content in Google Earth. The site is periodically updated with new content. Users can view the cataloged imagery in The Gateway to Astronaut Photography of Earth within the Google Earth environment using on-the-fly .kml file generation, as shown in figure 1.

Geographic and map browsers such as Google Earth are powerful tools that can advance virtual geographic and geologic education. The ability of users to add geolocated placemarks and embed additional content, such as images and html links, greatly enhances the potential for interactive geoscience education. We have developed a Google-Earth-based series of geographic briefing modules for use in training ISS astronauts to recognize major terrestrial features and landforms from low-Earth orbit. The modules, which are designed to accommodate both instructor-driven presentation and automated flyover tour modes, include direct query links to the on-line digital database of astronaut photographs of the Earth.

This direct query functionality provides a wealth of seasonal and multi-resolution imagery of selected locations that augments the available Google Earth imagery. It is also a useful data resource for more detailed geomorphology, structural geology, oceanography, and ecology education.

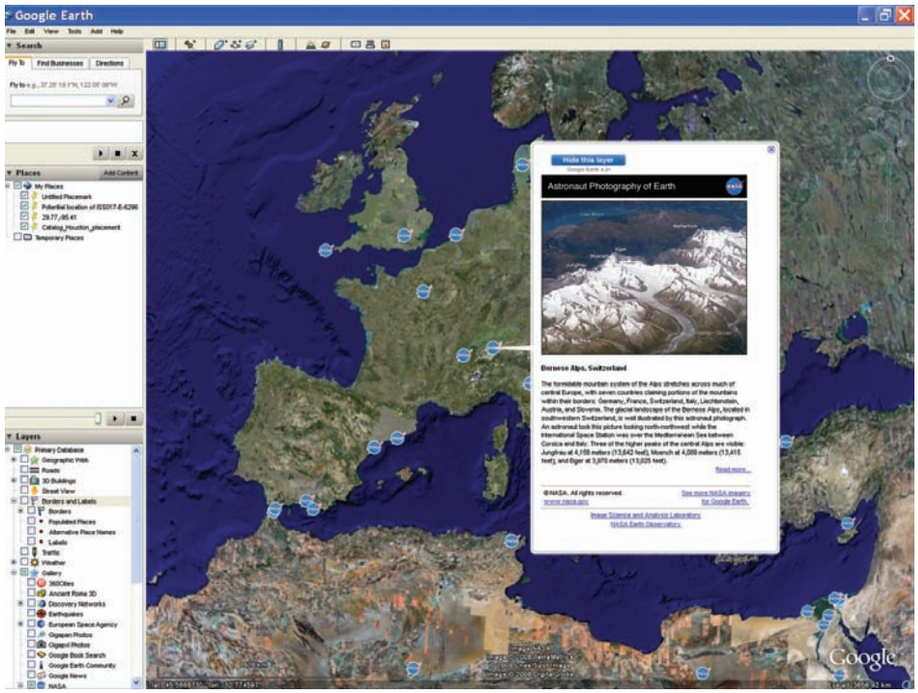

Fig. 1. *Screen capture of Europe in Google Earth with the astronaut photography layer selected. NASA logos indicate locations of image content. One such content item – an image of the Bernese Alps in Switzerland – has been opened.*

The training modules presented to astronauts host a wide range of geographic knowledge, simulating exposure to a broad range of class levels. All components of the modules (Google Earth, Wikipedia, and The Gateway to Astronaut Photography of Earth) are freely available on the Internet, making this a robust and attractive approach to improving terrestrial geographic literacy. In addition, the use of astronaut-acquired remotely sensed data for geoscience education – particularly K-12 – enhances interest in human space exploration and STEM [science, technology, engineering, and mathematics] career paths as shown in figure 2.

Fig. 2. *Google Earth and the astronaut photography database make an effective tool for teaching general geography. This example, from the Africa training module (top), illustrates the training entry for Mount Kilimanjaro (center) and a database entry page accessed through active links in Google Earth (bottom).*

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