

Public Outreach with NASA Lunar and Planetary Mapping and Modeling

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Abstract

NASA's Trek family of online portals is an exceptional collection of resources making it easy for students and the public to explore surfaces of planetary bodies using real data from real missions. Exotic landforms on other worlds and our plans to explore them provide inspiring context for science and technology lessons in classrooms, museums, and at home. These portals can be of great value to formal and informal educators, as well as to scientists working to share the excitement of the latest developments in planetary science, and can significantly enhance visibility and public engagement in missions of exploration.

1. Introduction

This presentation will provide an overview of the uses and capabilities of NASA's Solar System Trek family of online mapping and modeling portals. While also designed to support mission planning and scientific research, this presentation will focus on the education and public outreach capabilities of these web based suites of data visualization and analysis tools.

2. Online Web Portals for Inspiration and Education

NASA's Solar System Treks program of lunar and planetary mapping and modeling produces a suite of interactive visualization and analysis tools. The program is managed by NASA's Solar System Exploration Research Virtual Institute and developed at NASA's Jet Propulsion Laboratory. These tools enable mission planners, planetary scientists, and engineers to access mapped data products from a wide range of instruments aboard a variety of past and current missions, for a growing number of planetary bodies. While originally initiated for

mission planning and science, this technology has demonstrated great benefits for public outreach. As a component of NASA's Science Outreach and Education Infrastructure, they are available as resources for NASA Outreach and Science Education programs, and to the greater outreach and education community. As new missions are being planned to a variety of planetary bodies, these tools are facilitating the public's understanding of the missions and engaging the public in the process of identifying and selecting where these missions will land.

The portals provide easy-to-use tools for browsing, data layering and feature search, including detailed information on the source of each assembled data product. Interactive maps, include the ability to overlay a growing range of data sets including topography, mineralogy, abundance of elements and geology.

There are currently three web portals in the program available to the public: Moon Trek (<https://moontrek.jpl.nasa.gov>), Vesta Trek (<https://vestatrek.jpl.nasa.gov>), and Mars Trek (<https://marstrek.jpl.nasa.gov>). More portals for additional planetary bodies are in the works. As web-based toolsets, the portals do not require users to purchase or install any software beyond current standard web browsers. All of the portals provide analysis tools that facilitate the measurement and study of planetary terrain. They allow data products to be layered and adjusted to optimize data visualization. Visualizations can easily be stored and shared. The new Trek interface provides enhanced 3D visualization and navigation. Standard keyboard gaming controls allow the user to maneuver a first-person visualization of "flying" across the surface of the Moon. User-specified bounding boxes can be used to generate STL and/or OBJ files to create physical models of surface features with 3D printers. Such 3D prints are valuable tools in museums, public exhibitions, and classrooms – notably including

opportunities for the visually impaired. This interface will become the standard across all of the Trek products including the portals for Mars, Phobos, Vesta, and more. The data visualization capabilities of the portals provide easy access to data from NASA and other agencies, allowing the public to personally explore these destination worlds, and become directly engaged in current missions as well as plans for future exploration.

Using the portals, students and members of the public can conduct their own explorations of planetary surfaces, measuring diameters of craters, creating elevation profiles of peaks and valleys, and plotting traverse paths. A collaboration with DLR resulted in the integration of new Mars Express HRSC data into Mars Trek for a very popular interactive guided tour of fictional astronaut Mark Watney's epic journey across the terrain of Mars from the story, *The Martian*.

Along with the web portals, the program supports additional clients, web services, and APIs that facilitate dissemination of planetary data to a range of external applications and venues. Prototype touch table and virtual reality clients being developed by the team are of special interest for museums and science centers. Through its APIs, the portal is serving data to a growing community of digital planetariums. NASA challenges and hackathons are also providing members of the international software development community opportunities to participate in tool development and leverage data from the portals. In the 2016 NASA SpaceApps Challenge, 14 projects were created using the Trek data.

3. Summary and Conclusions

Imagery from the international fleet of spacecraft exploring the solar system provides a unique and particularly effective means to engage, inspire, and educate students and the public. NASA's online, web-based Solar System Trek planetary mapping and modeling portals provide exciting, interactive tools of great value to informal educators, as well as to scientists working to share the excitement of the latest developments in planetary science and exploration. The user community is invited to provide suggestions and requests as the development team continues to expand the capabilities of the portals, the range of data and tools that they provide, and partner in new ideas for their application in

education and outreach. As the EPSC community looks forward to a new generation of surface and orbital lunar robotic activities, as well as preparation for human return to the Moon and the first human missions to Mars, tools such as the Trek portals will become increasingly essential to engage and involve students and the public.

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