



Science Mission Directorate



SMD E/PO Policy

to the CCMC Biennial Users' Group Meeting

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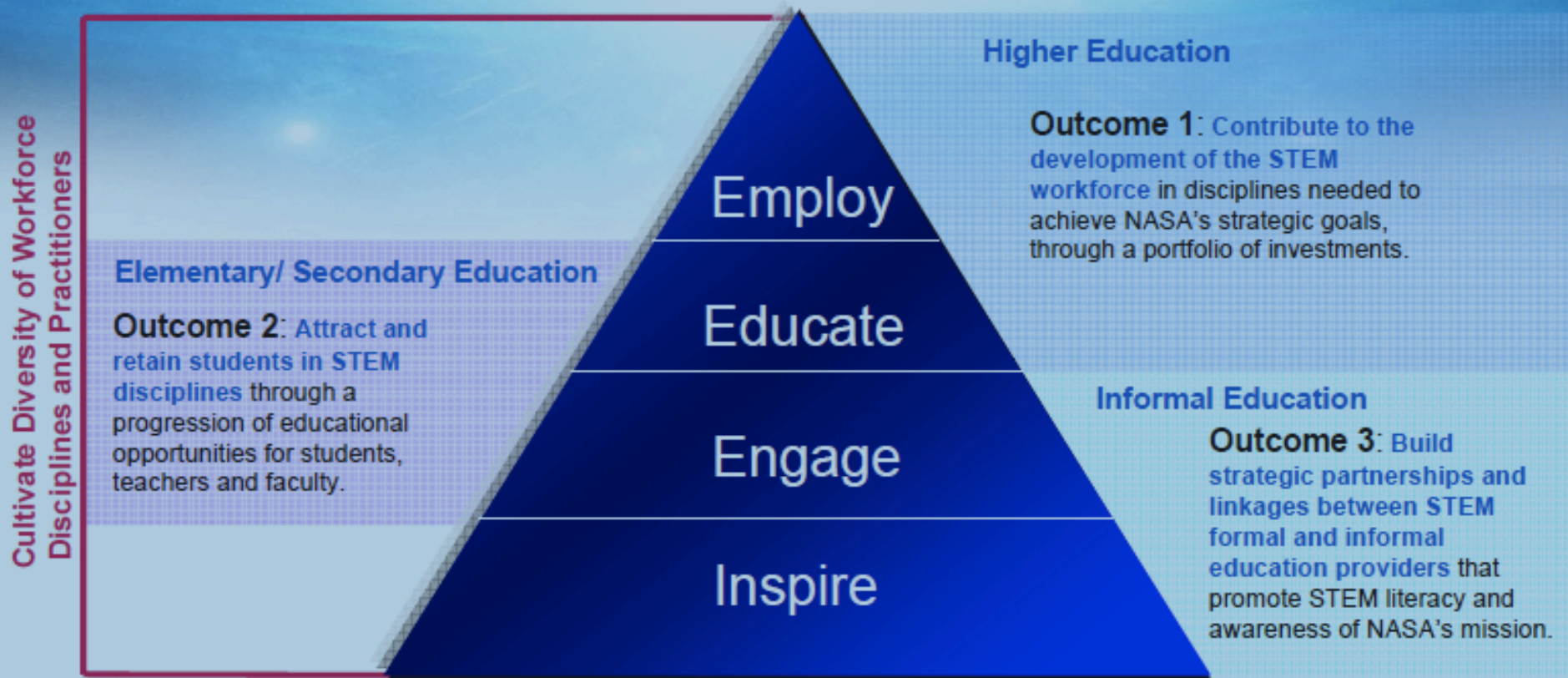
SMD E/PO Mission and Vision



- SMD fosters the broad involvement of the Earth and space science research communities in E/PO and contributes to NASA's three education goals and outcomes:
 - Strengthen NASA and the Nation's future workforce;
 - Attract and retain students in science, technology, engineering, and mathematics (STEM) disciplines; and
 - Engage Americans in NASA's mission.
- SMD's vision for E/PO is:

To share the story, the science, and the adventure of NASA's scientific explorations of our home planet, the solar system, and the universe beyond, through stimulating and informative activities and experiences created by experts, delivered effectively and efficiently to learners of many backgrounds via proven conduits, thus providing a return on the public's investment in NASA's scientific research.

Education Portfolio Strategic Framework



* Science, Technology, Engineering and Mathematics (STEM)



NASA Education Goals and Outcomes



- Where did these come from?
 - Developed by the NASA Education Coordinating Council and approved by OMB
- Who's Watching?
 - OMB
 - Congress [House and Senate Committees]
- What are they interested in?
 - That we demonstrate that NASA investments in Education and Outreach are achieving the intended results
 - Improving the effectiveness and efficiency of the program
- How do we do that?
 - Data Driven Decision Making based on project performance
- Where will we get the data?
 - Office of Education Performance Management System



SMD E/PO Outcomes



SMD E/PO programs include:

- **Higher education** programs that provide research support to outstanding students pursuing degrees in all disciplines engaged in Earth and space sciences and faculty support to strengthen the teaching capacity of relevant subject matters in Earth and space sciences on college campuses across the country;
- **Elementary/secondary education** activities primarily targeted to improve formal science, technology, engineering, and mathematics (STEM) education; and
- **Informal education** activities to inspire and engage learners of all ages through partnerships with informal learning institutions and community-based groups, such as museums and science centers, the Girl Scouts, amateur astronomers and citizen scientists.



SMD Outreach



Outreach is an essential aspect of the SMD program. It directly connects to many aspects of NASA Public Affairs and NASA education efforts. It often provides an inspirational spark for participants to seek out education opportunities.

The SMD Outreach Goal is to stimulate interest in science, engineering, and technology relevant to NASA SMD. There are four objectives:

- Increase interest in careers that use science, engineering, and/or technology relevant to NASA SMD;
- Increase understanding by the general public of SMD science, engineering, and technologies;
- Increase participation of citizen scientists in SMD education opportunities;
- Increase public engagement in improving science, mathematics, engineering, and technology education in the United States. Outreach can be directed at any audience including students, teachers, citizen scientists, and the general public.



SMD E/PO Programs



- **Program and Mission E/PO:** Activities embedded in every SMD mission and coupled SMD programs
- **Forums:** Integrated activities organized around one of the science themes
- **Sponsored and Unique Activities:** Larger activities sponsored by SMD at the Directorate or Division level and based on unsolicited proposals or partnerships
- **Mid-size Activities:** PI-led activities selected from among solicited proposals based on competitive peer review
- **Research supplements:** Small E/PO activities by research PIs that augment individual research investigations

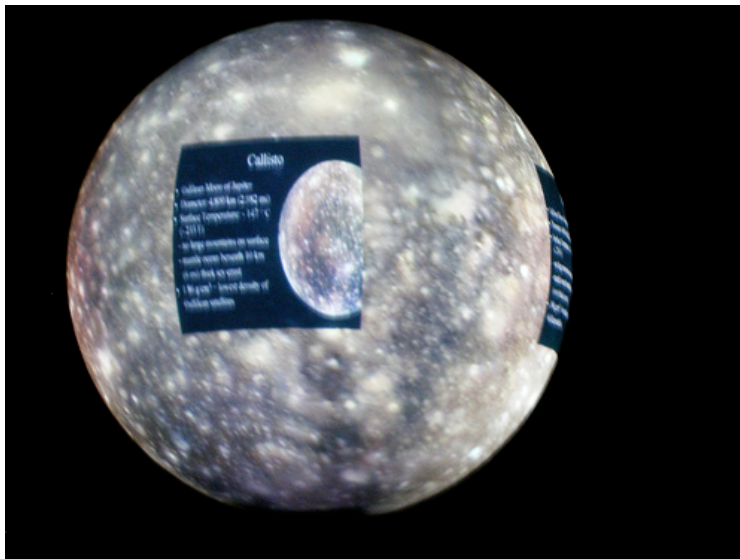


Mid-Size Activities



From Out-of-School to Outer Space: Exploring the Solar System with NASA

"From Out-of-School to Outer Space: Exploring the Solar System with NASA" fills a unique niche in NASA's SMD E/PO portfolio, providing science resources and training adapted for the unique needs of out-of-school time (OST) programs. It stems from recommendations from recent NASA-supported research and collaborative strategic planning with key representatives of the OST community and members of our project team.



Solar System on a Sphere

We will combine science, educational, and visualization expertise to produce one program telling the story of NASA's Solar System exploration and another highlighting the exciting discoveries on Jupiter, with an eye to producing more programs like this in the future. Our objective is to teach general and targeted audiences about the Solar System and NASA's role in its exploration.



E/PO Supplements



Parent Awards

- *Volatiles and Acid Fog from Martian Basalts, Sulfur, Halogens, and Water* Allan Treiman LPI
 - 3 years of summer workshops for K-12 teachers
- *The Origins of Translation and Early Evolution of Life* George E. Fox University of Houston
 - Partnership with Houston Museum of Natural Sciences
- *NEO Follow-up Project* Robert E. Holmes Astronomical Research Institute
 - High School and undergraduate students participate in NEO Observation campaigns



One of three short dome programs developed by the Life in the Universe Project



K-12 Teachers Learn about Mars in the classroom and field during Earth-Based Analogs: Bringing Mars to the Classroom through Educator Field Experiences



High School students from Alexandria, VA search for Near Earth Objects as part of the Killer Asteroids project



Forums



Four competitively selected Science Education and Public Outreach Forums (SEPOF) began work Oct 1 2009

- **Major responsibilities**
 - E/PO Community Engagement and Development
 - Division E/PO Product and Project Activity Analysis
 - SEPOF Coordination Committee Service
- **Science Education and Outreach Forums**
 - **Astrophysics** Science Education and Public Outreach Forum (PI Denise Smith, AURA/STScI)
 - A Forum to Support Excellence in **Heliophysics** E/PO through Sustained Collaboration (PI Laura Peticolis., University of California, Berkley)
 - **Planetary** SEPOF: Extending the Coherence and Reach of NASA Planetary Science and SMD E/PO (PI Stephanie Shipp, USRA/Lunar and Planetary Institute)
 - **Earth Science** Education and Public Outreach Forum: Building a Cohesive and Effective Community (PI Theresa Schwerin, Institute for Global Environmental Strategies)

EOS Cover Story – E/PO

Beth Barbier's brief report on the GSFC Heliophysics Science Division's E/PO program, "Education and Outreach Bring NASA Heliophysics to the Public," was published as a cover article in the Nov. 29, 2011 issue of the AGU's weekly newspaper, *EOS*. She was invited by editor Christina Cohen to write the article.

EOS

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Hydrologic Projections for the Western United States

Motivated by a common interest in establishing data access for climate change impacts analysis, the U.S. Department of the Interior's Bureau of Reclamation (referred to hereinafter as Reclamation) has collaborated since 2007 with federal and nonfederal entities to provide monthly gridded precipitation and temperature data from 112 contemporary climate projections (Coupled Model Intercomparison Project Phase 3 (CMIP3)) over the contiguous United States. The grid data resolution of this downloaded data archive (publicly available at http://hydroscip.ucdavis.org/downloads/cmip3_projections/) is 1/8° latitude × 1/8° longitude (approximately 12 × 12 kilometers) and covers the period 1950–2099 (Maree et al., 2007). Downloading is necessary to develop hydro-climate data (e.g., precipitation and temperature) from a coarse-resolution climate model grid to a higher-resolution grid, and the CMIP3 archive was downloaded using the statistical method of bias correction.

Although approximately 1000 unique users to date have downloaded the precipitation and temperature information contained within the archive (commonly referred to as the bias corrected spatially downloaded, or BCS-D-CMIP3 archive), these temperature and precipitation projections have not been used to consistently generate hydrologic projections over the United States and at fine enough scale to permit hydrologic impact analyses and support local adaptation assessments. Without available hydrologic projections, planners typically develop and apply their own site-specific and local hydrology models to fill this information

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Education and Outreach Bring NASA Heliophysics to the Public

Education and inspiring students, teachers, and the public by communicating advances in heliophysics science is the objective of the education and public outreach (E/PO) specialists at the Heliophysics Science Division (HSD) at NASA's Goddard Space Flight Center (GSFC) in Greenbelt, MD. The specialists carry out NASA E/PO goals to enhance the nation's formal education system and contribute to the broad public understanding of science, math, and technology. HSD E/PO projects exploit community best practices to meet or surpass NASA's requirements, which include attention to quality, longevity through internal and external partnerships, and a focus on customer needs, project feasibility, and audience diversity.

The development of the 1/8° gridded hydrologic projections over the western United States involved using the existing BCS-D-CMIP3 climate archive and available calibrated versions of the VIC model covering most of the "Western Reclamation region (whose boundary is defined by the states of North Dakota, Texas, California, and Washington) including the eight major Reclamation river basins: Colorado, Columbia, Klamath, Missouri, Rio Grande, Sacramento, San Joaquin, and Truckee (Figure 1). The development of these BCS-D-CMIP3 hydrologic projections (a total of 112 covering the period 1950–2099), including analysis for the eight major river basins, was documented (Barber et al., in preparation) in support of Reclamation's Science and Engineering to Comprehensively Understand the System (SECUS) and the National Water Act report to Congress (Barber et al., 2010). Both reports are available at <http://www.usbr.gov/ce/ce/>.

E/PO Staff

The HSD associate director for science leadership efforts to coordinate and advance the most effective methods to reach an array of audiences. The division's eight E/PO specialists bring a wide range of complementary attributes, depth of experience, and valuable par-

multimedia resources are collected on SED's Web site (Figure 1), which won the Prelli International Award for the communication of science and technology in 2004. While SED is currently run by only three part-time HSD E/PO specialists, more than 20,000 participants used resources related to the 2010 program in their own outreach programs, and in 2011 roughly 80,000 people followed the program's Twitter feed. Featuring the "Magnetic Storms" theme that year, the 2010 broadcast from the National Science Teachers Association (NSTA) conference connected with 550,000 the viewers and another 3.5 million through the Web site.

Built around NASA space science discoveries and multimedia resources, SpaceMath@NASA is a growing Web collection of more than 400 math problems. The site receives more than 10,000 visits monthly, and workshops coach math and science teachers on exciting and relevant ways to draw in students. Printed guides with new content are also published each year, with the most recent being "Earth Math," "Space Weather Math," and "Electromagnetic Math," including the National Geographic and History channels as well as local news.



Fig. 1. A screen shot of NASA's Sun-Earth Day Web site. The site is the bridge to a wide range of educational and outreach activities in science, math, and technology related to the Sun, the heliosphere, and space weather (see <http://sunearthday.nasa.gov>).

Screenshots from the EOS online edition at http://www.agu.org/journals/eo/v092/i048/2011EO48_tabloid.pdf