

H. Education and Outreach

Science On a Sphere® (SOS) Program

After amazing viewers in museums and conferences for almost a decade, Science On a Sphere® is now a central component of the White House initiative's Back-to-School Climate Education Event.

White House Office of Science and Technology Policy

For Immediate Release

August 20, 2015

FACT SHEET: Obama Administration Engages Students, Educators, and Leaders on Climate Education and Literacy

Washington, DC

Administration Commitments

Expanding Science On a Sphere® to Include Renewable Energy Data and ClimateBits Videos.

[Science On a Sphere® \(SOS\)](#) is a global display system, developed by National Oceanic and Atmospheric Administration (NOAA) researchers, that uses computers and video projectors to display planetary data onto a six-foot-diameter sphere, analogous to a giant, animated globe. The Department of Energy (DOE) is announcing the release of new energy-related SOS datasets—representing wind, solar, and geothermal energy—to help people learn about renewable energy resources around the world via visualizations. Today, the following members of the Association of Science Technology Centers will begin presenting these new resources to their visitors:

- Boonshoft Museum of Discovery, Dayton, OH
- Children's City, Dubai, United Arab Emirates
- Danville Science Center, Danville, VA
- Denver Museum of Nature and Science, Denver, CO
- Imagination Station Science and History Museum, Wilson, NC
- 'Imiloa, the Astronomy Center of Hawai'i, Hilo, HI
- International Museum of Art and Science, McAllen, TX
- Maryland Science Center, Baltimore, MD
- McWane Science Center, Birmingham, AL
- Nurture Nature Center, Easton, PA
- Oregon Museum of Science and Industry, Portland, OR
- Orlando Science Center, Orlando, FL
- Science Central, Fort Wayne, IN
- South Florida Science Center and Aquarium, West Palm Beach, FL
- Techmania Science Center, Pilsen, Czech Republic
- The Wild Center: Natural History Museum of the Adirondacks, Tupper Lake, NY

Additionally, NOAA, the University of Maryland, and NASA's Goddard Space Flight Center have collaborated to produce a series entitled *ClimateBits*, minute-long videos that explain and visualize key concepts in climate science. These resources are available around the globe through NOAA's [SOS network](#), which has more than 120 member institutions worldwide, including many of the world's largest science museums, visitor centers, zoos, aquariums, laboratories, and schools.

GSD developed this "power-hitter" in the world of NOAA education and outreach and continues to infuse leading-edge technologies into the SOS system to enhance its visual impact and increase access to earth science information by audiences around the world. Science On a Sphere® is a gleaming 6-foot-diameter, carbon-fiber globe invented by Dr. Alexander E. MacDonald to educate, inspire, and wow any onlooker with the science it presents. This spherical movie screen was patented (2005) for its extraordinary multiyear design and software development accomplished initially by the late David Himes. It is a visualization tool that provides very high impact for every educational exhibit it enhances.

Now in 125 locations worldwide and still growing, SOS informs millions of people daily about the fragility of our planet with the most current science available. NOAA Boulder is the home of SOS, housed in the "David Himes Planet Theater." SOS is used extensively in our organized outreach efforts and provides a spectacular finale for nearly every visitor to the David Skaggs Research Center (DSRC) in Boulder, Colorado.

On September 7, 2015, GSD released a desktop version of SOS called SOS Explorer. SOS Explorer creates a 3-D interactive Earth on a flat screen display including projection on walls, computers, and other large displays. This provides teachers, students, and the public access to a library of selected Science On a Sphere® datasets and movies. The visualizations show information provided by satellites, ground observations and computer models and rapidly animate through real-time global data. In addition, tools included in the application allow users to zoom into, probe, and graph the data, as well as add supplementary material including websites, videos, pictures, and place marks. In order to make the product more accessible for teachers, lesson plans and pre-programmed tours through standards-relevant topics are provided.

Education and Public Outreach

NOAA-Boulder reaches out to the public and schools in the area in an organized effort through the Boulder Outreach and Coordinating Council and the ESRL Outreach Team. Global Systems Division has strong representation in these groups that coordinate informal and formal educational activities on and off site with the goal of enhancing public awareness and understanding of the broad research conducted at our labs in Boulder. Since occupying the DSRC, these outreach groups have successfully attracted a rapidly growing number of visitors ranging from 2nd graders to senior citizens.

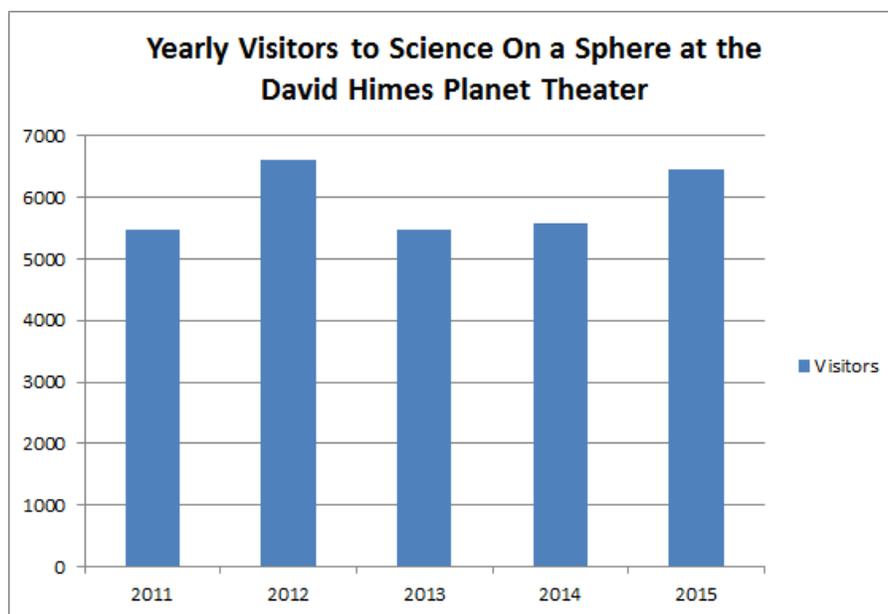
Accredited Classes for Teachers

Over the last three years, Science On a Sphere® education has trained 70 teachers in accredited classes. “Integrating SOS Data Visualization into your Teaching” and “The Colorado Flood: A Lasting Teaching Moment” are a couple of the programs offered between a half day to three days in length. Credits for the professional development workshops and in-service days were provided by University of Colorado Continuing Education and Boulder Valley School district as graduate and continuing education units.

On-site Visits

The general public has been on site in mass during several of the larger science open house events hosted over the years. In addition to the weekly lab tours open to the public, there is an organized effort to arrange customized local school tours. Every tour includes a stop at GSD’s David Himes Planet Theater, which houses Science On a Sphere.

The following chart displays SOS’s popularity as reflected in the numbers of nearly every announced visitor to NOAA Boulder.



Note: Attendance figures not available before 2011

Visitors to the David Himes Planet Theater in the past five years have included a large range of groups from second graders to senior citizens to government officials. Below is a sampling of groups that have visited to give an idea of the breadth and diversity of visitors:

8th Grade Science Day
Academy Summer Camp
Air Force Research Laboratory
Angevine Middle School

Army Command and General Staff College
Bear Creek YMCA Summer Camp
Boulder High School
Boy Scout Pack 673
Boy Scout Troop 1057
Bring Your Child to Work Day Attendees
Carbon Valley Senior Center
Children's Commerce Center
Chilson Senior Center
CISM Summer School Grad Students
Civil Air Patrol High School Students
Colorado Academy Summer Space Camp
Colorado International School
Colorado State University Atmospheric Science Students
Congressman Jim Bridenstine
CU Summer Science Program
Department of Transportation
Emerald Elementary School
Fairmount Elementary
Fairview High School
Finland Young Ambassadors
Flagstaff Academy
Foothills Elementary School
Fort Collins Classical School
Global Monitoring Annual Meeting
History Book Club
Kyffin Elementary School
McLain High School
Mesa Elementary
Metivier
Montessori School of Denver
NASA's Living with a Star Program
National Weather Center Undergrad Interns
Nederland Elementary School
NIST Summer Students
NOAA Headquarters Central Region Annual Meeting Attendees
NWS Agricultural Observations Budget Office Visitors
Roads Scholar Program
Rochester Community and Technical College
Rock Canyon High School
Rocky Mountain School for Expeditionary Learning
Ryan Elementary School
Strategic Environmental Research and Development Program
SWPC Space Weather Week
Trail Blazer Elementary School
UCAR/CSEP Climate Teacher Workshop

UK Meteorological Weather Service Staff
University of Colorado Atmospheric Science Students
Vice Admiral Brown
Watershed School
Whittier Elementary School Reading Camp
Windsor High School Geographical Information Science Class

Starting in 2013, the Science On a Sphere® group in GSD has hosted yearly SOS Teacher Workshops for local school teachers. These workshops are designed to help teachers bring SOS content into their classrooms for regular use and to design field trips to NOAA that build upon what they learn in the classroom. <http://sos.noaa.gov/workshop/>

Off-site Outreach and Service

Staff from the Global Systems Division support off-site outreach and service, helping to spread the word about the science and the activities conducted by NOAA and GSD in order to educate and inspire the public. Examples include:

- Shilpi Gupta, Beth Russell, and Hilary Peddicord volunteered for Girls in Science Day at the the Denver Museum of Nature and Science on February 7th, 2015. This involved creating interactive activities centered around Science On a Sphere (SOS). The activities included basic programming tasks for SOS and drawing maps and displaying them on SOS.
- Hilary Peddicord conducted a series of workshops in September 2014 for the one year anniversary of the Boulder floods. She gave the talks to middle school earth science students at Casey Middle School and Centennial Middle School in Boulder Valley School District. They consisted of three full day presentations for 150 students each day answering the most pressing questions about the 2013 Historic Floods by using NOAA data.
- In 2014 and 2015 Hilary Peddicord worked with Casey Middle School over a period of four weeks to lead a Math on a Sphere workshop where students learned programming basics through a NSF project.
- Beth Russell served as a judge at the Ryan Elementary School Learning from 2011 through 2015 and served as a symposium presenter for the afterschool STEAM Symposiums 2011 through 2015. Each symposium was an hour long session that included a lesson and hands on activities.
- Hilary Peddicord participated in Women In Science at the University of Wyoming to give 3 one-hour Workshop for girls aged 14-18 from all over Wyoming getting them excited about careers in science in May of 2013, 2014, 2015.
- Hilary Peddicord participated in October 2014 in the Broomfield Heights career day, giving three one-hour talks with 7-8th grade students about her experience and careers in science education.

- In February 2013 Hilary Peddicord gave a Climate Change talk for local policy makers and politicians in Sheridan, WY at the Over the Moon coffee shop.
- In March 2011 Hilary Peddicord gave presentation at Ryan Elementary that included weather activities.
- Bill Moninger has judged the Colorado State Science Fair for 35 years, often leading the physics judging team, and participating on the best-of-fair team, occasionally serving as the captain.
- Joe Wakefield has volunteered as a judge at the Regional Science Fair at CU each February, including 2010 – 2015.
- John Brown, Meteorologist, is in charge of the Boulder Cooperative Weather Station. He provides information to the Daily Camera on an ongoing basis.
- Tracy Hansen serves as a mentor on the graduate advisory committees of several minority students as part of ISET.
- Tom LeFebvre serves as a mentor for a Boulder High School science student and is helping with his science fair project.
- Scott Nahman serves as Vice President for the 7x24 Exchange Rocky Mountain Chapter- Providing educational forums for those who support mission critical facilities.
- Kevin Manross spoke to Metro State University students about radar meteorology and the recent polarimetric ("dual-pol") upgrade to the NWS NEXRAD network. He also gave a talk to Rock Ridge Elementary (Castle Rock, CO) 5th grade in November 2014 on the atmosphere and where storms come from. It included several hands on exercises.
- Dan Birkenheuer was a judge for the NASA First Robotics Colorado Regional Competitions in 2010. FIRST stands for Inspiration and Recognition of Science and Technology. The organization's mission is to inspire young people to be science and technology leaders, by engaging them in exciting mentor-based programs that build science, engineering and tech
- Lee Cohen volunteers as a judge for the Roche Colorado Regional Science Fair.
- Jeff Smith has been a science and engineering fair judge and helped run the fairs at both Lukas Elementary School 2010-15 and Jefferson Academy in Westminster 2014-15.
- Steve Weygandt taught a Math Olympiads class every Monday morning at a Longmont elementary school in 2010.
- Curtis Alexander served as a student mentor for both high school and Hollings scholarship undergraduate college students.
- Ligia Bernardet served on a Ph.D. committee at the University of Colorado.

- Keith Searight serves as a web development instructor at Monarch High School, Louisville, CO.
- Joe Olson is a volunteer for the Ocean Science Bowl.
- Jason English
 - Served as climate modeling and climate change classes teacher, Chinook West High School
 - Served as Earth Explorer volunteer for sixth grade class, Trail Ridge Middle School
 - Served as high school teacher training instructor on Clouds Aerosols, and the Arctic
- Christina Holt serves as member of the Hurricane Weather Research and Forecasting (HWRF) Model Developers Committee.
- Jennifer Mahoney served as a presenter of science programs to students at Boulder-area schools.
- Kevin Manross served as mentor/advisor for Significant Opportunities in Atmospheric Research and Science (SOARS) undergraduate student and Hollings Scholarship undergraduate student.
- Pallavi Marrapu served as mentor/advisor, homework grader, and provider of laboratory/project guidance for 75 undergraduate and graduate students in classes on Introduction to Thermodynamics and Green Chemical and Energy Technologies.
- Tanya Peevey
 - Serves as a writing mentor for a SOARS Program summer student
 - Served as coordinator for a Girl Scouts at NCAR event in Boulder
 - Served as a volunteer/organizer/coordinator a Physics Camp at the University of Texas - Dallas held by the Women in Physics campus group
- Bernadette Pfau serves as a CoCoRaHS (Community Collaborative Rain, Hail, and Snow Network) observer.
- Jim Ramer serves as an elementary school homework helper - Boulder, Colorado Family Learning Center.
- Ed Szoke served as presenter on Colorado Front Range weather for the Boulder County Search and Rescue Group and Colorado Mountain Rescue Dog Group.
- Zoltan Toth served as Expert for BARC on Numerical Weather Prediction (NWP) forecasting issues; as Advisor for Ph.D. student's dissertation research; served as Section Editor for Overview of weather and climate systems. In: *Handbook of Hydrometeorological Ensemble Forecasting*, Ed. Qingyun Duan, Springer, in preparation.
- Will von Dauster serves on, and served as Chair of, Boulder Labs Diversity Council.
- Betsy Weatherhead served as an advisor/mentor for a PostDoc scientist from Denmark, sponsored by the International Fulbright Foundation and served as a coach for NASA's Odyssey of the Mind for K-12 Education.

- Yuanfu Xie served as a guest editor for a special issue of “Data Assimilation in Numerical Weather and Climate Models” and served as an advisor/mentor for 20 different undergraduate and graduate students, visiting scientists, and PostDoc researchers

GSD Educational Outreach at Conferences

GSD has always had a strong presence at the annual American Meteorological Society and American Geophysical Union conferences. There we may help staff the NOAA booth, organize “Meet the Scientist” talks, and hand out materials about our science. We participate regularly in the following conferences/events distributing educational materials, conducting presentations, workshops, demos, etc. and informing a broad range of the public about NOAA and how the agency affects their lives:

National Science Teachers Association
National Broadcasters Association
National Middle School Teachers
National Get Outdoors Day
Colorado Science Convention
Women in Science
The SC (Super Computing) Conference Series
Internet2
Science On a Sphere Users Collaborative Network Workshop
Meteorological Technology World Expo

Web Presence and Social Networking

In the past 5 years, GSD has created the following new web sites:

1. Flow-following finite-volume Icosahedral Model-- <http://fim.noaa.gov/>
2. NOAA Earth Information System-- <http://esrl.noaa.gov/neis/>
3. High Impact Weather Prediction Project-- <http://hiwpp.noaa.gov/>
4. Integrated Hazard Information Service-- <http://integratedhazards.noaa.gov/>

Science On a Sphere®

Website Analytics--sos.noaa.gov:

2012 - 208,350 page views (analytics installed in July)

2013 - 469,204 page views

2014 - 522,085 page views

2015 - 258,787 page views (through beginning of July) (projected would be 517,574)

Science On a Sphere® Facebook--<https://www.facebook.com/scienceonasphere>

Likes on Dec 31, 2013 - 4522

Likes on Dec 31, 2014 - 9225

Likes on June 30, 2015 - 27,947

MOST POPULAR POST - video of 2014 sea ice concentration - 3,915,449 views

Science On a Sphere® YouTube Channel--<https://www.youtube.com/user/scienceonasphere>
437,458 views: 90 videos

April 22, 2014 USPS Postage Stamp Featuring SOS

A NOAA Science On a Sphere dataset showing global sea surface temperatures was featured on a United States Postal Service international forever stamp: <http://uspsstamps.com/stamps/global-sea-surface-temperatures>

Science Community Education by the Developmental Testbed Center collaboration between NCAR and GSD

In addition to annual tutorials on the HWRP and NMMB models and GSI/EnKF data assimilation, the DTC also holds science community events. Since 2012, the following events have been held in Boulder, Colorado:

Mesoscale Modeling:

- Annual WRF Users Workshop (June 2012-2015)
- Parameterization of Moist Processes for Next Generation Weather Prediction Models Workshop (2015)
- MMET instructional session at WRF Users Workshop (June 2015)

Hurricanes:

- Workshop on Numerical Prediction of Tropical Cyclones (May 2014)
- HWRP instructional session at WRF Users Workshop (June 2015)

Data Assimilation:

Joint DTC-EMC-JCSDA GSI Workshop (August 2013)

Ensembles:

- Mini-workshop w/ GIFS-TIGGE working group (June 2012)
- DTC-NUOPC Ensemble Design Workshop (September 2012)
- 6th NCEP Ensemble User Workshop (March 2014)

Verification:

- Instructional Lectures at WRF Users Workshop
- Introduction to Verification Methods (June 2012)
- Topics in Advanced Verification Methods (June 2013)

Global:

MPAS Workshop (September 2014)

