# 2025 ANNUAL PROGRESS REPORT

NASA Science Mission Directorate Science Activation Program

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**Signature of Submitting Official (not required by NASA)**

# I. ACCOMPLISHMENTS

The American Museum of Natural History (AMNH) is pleased to submit its tenth yearly update concerning the achievements of *OpenSpace: An Engine for Dynamic Visualization of Earth and Space Science for Informal Education and Beyond*. The primary mission of the OpenSpace project is to create and foster a pipeline that conveys visualized science data from various NASA SMD divisions to Informal Science Institutions (ISIs) and the wider public. A crucial element of this mission is the creation of the open-source software called OpenSpace, along with advocacy for its use in non-formal educational environments through a collaboration with a range of ISI partners.

In the tenth year of the project, AMNH made significant progress toward these goals through ongoing code improvements, new content, enhanced visualizations, public presentations, and active community engagement. A detailed overview of our Year Ten activities is provided below.

## Software Development

The OpenSpace software has continued to improve in Year Ten through cooperative development at AMNH, Linköping University and Norrköping Visualization Center C,[1] New York University Tandon School of Engineering, and the University of Utah Scientific Computing and Imaging (SCI) Institute. Faculty, software engineers, and graduate research associates at each of these locations have worked together to improve the software by developing efficient code and algorithms to manage data-intensive tasks, integrate new data sets from NASA and other sources, and enhance the user interface.

During this period, OpenSpace had one major software release: version 0.20.0, which was launched on June 19, 2025. Additionally, three minor releases, version 0.21.1, version 0.21.2 and version 0.21.3 were released to improve stability and address bugs.. Full changelogs can be found in *Section IX*.

Major new features and computational improvements include:

- *A More Flexible Interface:* The OpenSpace user interface has been completely redesigned to be more flexible, easier to use, and highly customizable. Dockable, resizable windows allow users to arrange panels to meet their needs and toolbar controls allow users to display only the panels they need, simplifying the interface. Key menus such as scene and property menus are better organized for quicker navigation.

[1] The activities at Linköping University are not funded by this grant, but are supported by the Knut & Alice Wallenberg Foundation, the Swedish Research Council (Vetenskapsrådet), and the Swedish e-Science Research Centre.

First-time users are guided by a built-in “Getting Started Tour” when launching OpenSpace on a new computer, and clear notifications help surface important warnings and errors as they arise.

- *New Presentation Tools*: A new “ShowComposer” tool allows users to create their own custom control panels (http://localhost:4680/showcomposer) with narration scripts for presenters.
- *Night Sky Features:* A new panel ideal for constellation and other night sky planetarium shows was developed with feedback from users.
- *Easier File Handling & Content Loading:* File handling and content loading in OpenSpace are now simpler and more intuitive. Users can drag and drop files or folders directly into the application, and map files (WMS) and assets are loaded from a dedicated user folder for globebrowsing content. The Launcher has also been improved with dark mode support, enhanced options for saving profiles, clear icons that distinguish user-created content, and new keyboard shortcuts to improve managing window layouts.
- *Improvements for Custom Datasets*: OpenSpace now includes new tools for creating and customizing content, such as dome overlays, screen blackouts, time-linked image displays, and dashboard widgets. Scripted content has been expanded to run on a schedule, reload without restarting OpenSpace, and monitor system memory usage. Lua scripting has also been enhanced with safer, sandboxed execution enabled by default, along with streamlined navigation and focus functions, improved tagging, and more flexible content reordering.

## Content Development

The development of new content is continually influenced by our users’ needs and feedback and is enriched through partnerships with NASA agencies and infrastructure, along with external scientists and institutions, as detailed below.

OpenSpace currently offers 25 preset profiles. This year we introduced two new profiles and made improvements to several existing ones.

**New Profiles**

- *Today’s Sun:* This profile visualizes current solar magnetic activity
- *Calibrator*: This profile is used to verify that a multi-channel dome is calibrated correctly

**Enhanced Content for Existing Profiles**

*New Assets*

- Exoplanets now have labels for star systems, color-coding based on planet type (e.g., super-Earth, gas giant) and optional surface textures

- Kuiper satellite constellation
- High-resolution maps of Titan and Phobos
- ESRI Wayback Earth map layers that enable users to access multiple versions of World Imagery captured over time
- Stars can now move over time using real motion data, if available
- Updated datasets and visuals for exoplanets, brown dwarfs, Neptune, Uranus, the Moon, and constellations

## Accessibility

A main focus of the OpenSpace SciAct 2.0 project has been to improve the user experience. Major progress was achieved in Year Ten with the release of a new user interface. Accessibility and usability across the user interface have been enhanced with full keyboard navigation using TAB and ENTER, making it easier to move through controls without a mouse. Improved contrast and more consistent color use increase overall readability, while new options allow users to customize background and text colors on buttons. Support has also been added for future interface translation and localization, and UI hints are now shown only on focusable objects to reduce visual clutter.

## Stakeholder Meetings

Throughout Year Ten, several meetings were held involving OpenSpace stakeholders.

**Informal Science Institution (ISI) Network**
Our annual ISI Network meeting was held at AMNH on July 30, bringing together partners from the six funded ISI institutions, along with project evaluators and developers. This event provided a platform for sharing innovative software applications and fostered direct feedback between ISI superusers and the software development team. A key focus of the meeting was discussion of how our funded partners are integrating OpenSpace programming in their institutions' outreach plans. The agenda for this meeting is found in *Section VIII*.

**OpenSpace User Meeting**
In Year Ten, the first in-person OpenSpace User Meeting was held at AMNH on July 31 and August 1. The two-day meeting brought together 59 participants representing 34 institutions. Attendees participated in a range of developer-led technical training sessions and user lightning presentations, with concurrent tracks designed to support both new and experienced OpenSpace users. Post-event survey feedback was overwhelmingly positive, demonstrating strong community engagement and value of the in-person meeting format. Participants highlighted the meeting's supportive atmosphere, practical training opportunities, and balance

of depth and accessibility. As one attendee noted, “This was probably one the most useful conferences I've been to in years! It was well scheduled, organized, and just all around fantastic.” Based on this success, we look forward to hosting future in-person user meetings, funding permitted, to continue strengthening and expanding the community.

2025 OpenSpace User Meeting attendees

**OpenSpace Trainings**

Hands-on training sessions continue to be instrumental in developing the skills of OpenSpace users. Through the online booking page, Micah Acinapura, Software Integration Engineer at AMNH, offered 40 training sessions spanning 15 different institutions upon request.

In addition, we continued “OpenSpace Community Monthlies” to share updates with all OpenSpace users, from novice to expert level. This group has become an important source of feedback before and after software releases with attendances ranging from 5 to 25 people. Making these sessions available as a video-on-demand furthermore increases the reach of these community-building events.

## Year Ten ISI Partner Network Activities

**Adler Planetarium**

This year, the Adler Planetarium engaged both the public and professionals through exhibitions, theater experiences, and online programs. Additionally, it expanded the use of OpenSpace in online content, exhibitions, and its publicly-accessible Space Visualization Lab. (Audience numbers will be available in the Final report.)

**American Museum of Natural History (AMNH)**

In Year Ten, OpenSpace users at AMNH continued to grow and use the software in the planetarium, exhibition hall, classroom, and beyond reaching **17,495 people** onsite.

Monthly public programs continued in the Hayden Planetarium to explore topics related to Earth and space science in OpenSpace. The family friendly “Astronomy Live” programs showcased a range of topics from updates on JWST and Vera Rubin's First Light. The more science-focused “Frontiers Lectures” invited Subject Matter Experts to share breaking science with adults in programs like Lunar Volcanoes and NASA’s Nancy Grace Roman Space Telescope.

During this year, the museum introduced new programs that expanded the use of our immersive spaces. Two Relaxed Astronomy Live programs were presented in the planetarium for neurodiverse youth audiences, where AMNH educators led a sensory-friendly field trip to the Moon and Mars and investigated how worlds are formed. OpenSpace was also used in the 360-degree immersive Invisible Worlds Theater for Pride Night at the Museum and two Planet Rock programs developed with artist-in-residence, Mark Hines.

In addition to public programs in the Hayden Planetarium, OpenSpace was used in internships, to develop exhibition content, and in pre-service teacher preparation and other education programs:

> *Internships:* The Museum maintained its collaboration with the Bergen Academy for Technology and Computer Science, working with three high school interns under the supervision of Co-Investigator Carter Emmart. These interns developed visualizations of the

Perseverance Rover in the Jezero Crater by compiling Mars terrain models and animating the Perseverance Rover and Ingenuity Helicopter.

*Exhibition Content:* OpenSpace was used to generate videos for two interactives and a backdrop graphic featured in the Museum's newest temporary exhibition, *Impact!*


*Pre-service Teacher Preparation:* The Museum's Masters of Arts in Teaching Earth Science Residency Program (MAT-ESRP) consistently integrates OpenSpace into the training of its ≈20 graduate students. Upon graduation, these teachers commit to serving high-needs 7th–12th grade public school classrooms in the U.S., with most choosing to teach in New York City. Throughout their studies, the students use OpenSpace in various capacities, including for required coursework and as part of an astrophysical research capstone project. *Outreach:* Developer Micah Acinapura collaborated with NASA Space Apps Challenge NYC to present multiple talks on using NASA datasets within OpenSpace and contributing to the open-source project. A local prize at the 2025 NASA Space Apps Challenge NYC recognized the best use of OpenSpace; the prize was awarded to the team *Merge Conflicts* who presented their integration of asteroid data in OpenSpace in the Hayden Planetarium. *Other Education Programming:* OpenSpace was also used in the Museum's Digital Universe Flight School where over 100 middle school students learned to pilot the software. The software was regularly used in classes such as Astro Camp.

As part of the TEAMS II-funded Urban Skies Project led by Michigan Science Center, AMNH engaged 68 students in Junior and Senior Navigators, courses utilizing the newly developed youth-learner interface for OpenSpace. Students used this interface to present their own Earth and space science topics for family and friends in the Big Bang Theater.

Finally, project staff at AMNH organized several training sessions, demonstrations, and conference presentations, which are further detailed below.

**California Academy of Sciences (CAS)**

In Year Ten, the California Academy of Sciences expanded its reach by continuing to adapt its live presentations of OpenSpace in Morrison Planetarium and beyond to a variety of different venues across the institution, reaching over 2,000 visitors in-person and approximately 1,500 online. The Benjamin Dean Astronomy Lecture Series continued to be a vital channel for the communication of new NASA research, leveraging OpenSpace in each of its monthly installments highlighting content experts describing their work. Year Ten topics included *Searching for Technological Life in the Universe* with Dr. Sofia Sheikh, SETI Institute and *The Sun and the Earth: A Magnetic Connection* with Dr. Rebecca Robinson, SETI Institute: MUSE Mission Outreach. More intimate, facilitated experiences at the Academy's Science in Action exhibit allowed for interactive programming with museum visitors. The Academy also hosted 15 informal science educators, planetarium professionals, and community college astronomy professors from the San Francisco Bay Area for two days of OpenSpace trainings. This workshop was beneficial in planning the OpenSpace User Meeting at AMNH.

**Denver Museum of Nature & Science (DMNS)**

In Year Ten, Denver Museum of Nature & Science scientists continued to use OpenSpace in *Digital Earth* live lectures at their home institution as well as "on the road" at other science centers and museums (437 attendees). They also gave other miscellaneous presentations in the Gates Planetarium that included a star talk for a teacher professional development workshop (25 attendees) and an annual DMNS fundraiser (120 attendees). OpenSpace was flown live during a distance learning class that reached 560 students across the US (with the video recording notching to this date another 246 views on YouTube). After 17 of DMNS' Educator Performers (EPs) were given software training this year by co-PI KaChun Yu (with a total of 21 EPs having received training), the education division started using OpenSpace in its live "Travelin' the Universe" show on DMNS' *Space Odyssey* exhibit floor. Through 16 Dec 2025, the EPs delivered 200 separate OpenSpace presentations and reached 5055 adults and 5168 children for a total of 10223 visitors.

**Houston Museum of Natural Science (HMNS)**

The Houston Museum of Natural Science continued to integrate OpenSpace into a wide range of educational and public-facing programs, reaching over 31,500 in Year Ten.

HMNS hosted 20 high school interns and expanded the OpenSpace lab to 20 interactive stations. Monthly star parties on the museum's garage roof allowed participants to discover

features on the moon in OpenSpace before observing the moon through a telescope. These events drew approximately 200 people each night.

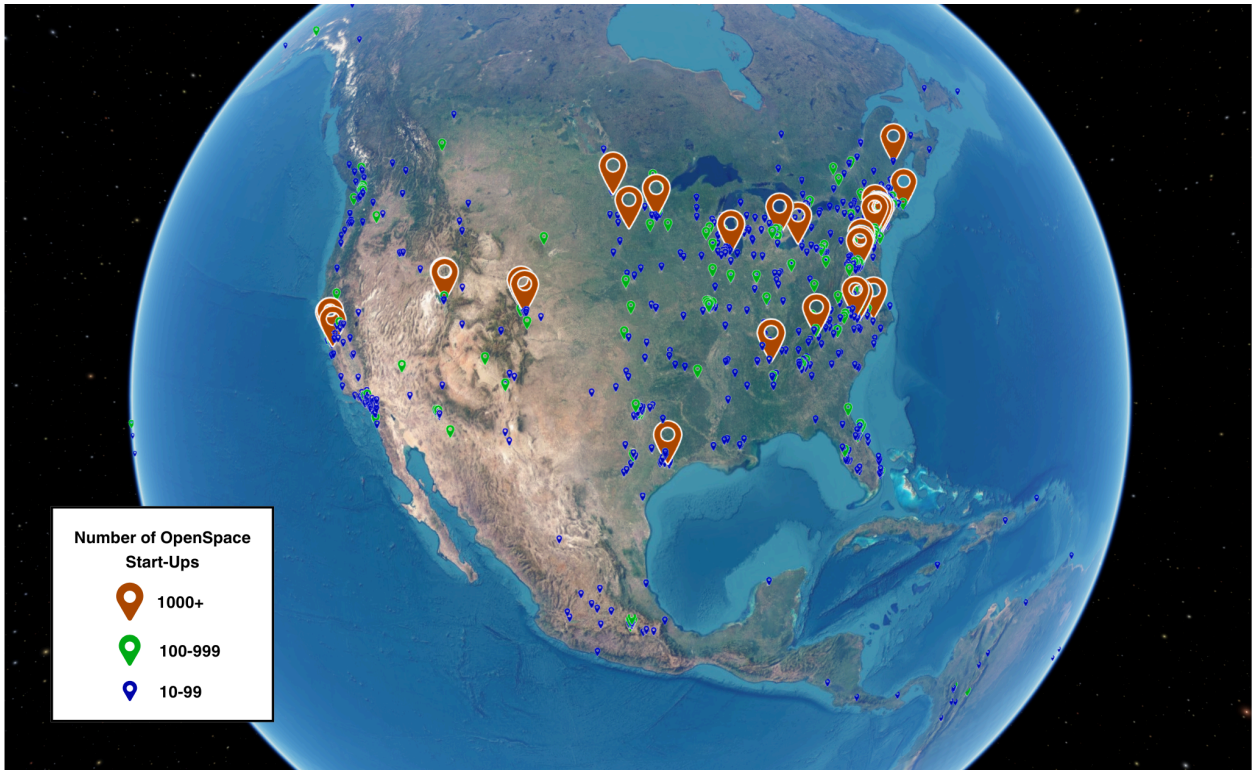
HMNS also integrated OpenSpace into the user interface of ePlanetarium's portable Discovery Domes, greatly expanding the potential reach of the software, including among youth in grades k-3 that experience OpenSpace in HMNS's painted Discovery Dome – a more welcoming and friendly environment for very young learners than the standard black 4-meter dome.

**North Carolina Museum of Natural Sciences (NCMNS)**
In Year Ten, NCMNS leveraged OpenSpace to enhance visual storytelling across public programs, in community and school presentations, and in exhibition content including new Geology Carts that paired OpenSpace with physical specimens. Together, these efforts reached more than 266,000 people during the year. A highlight of the year was Día de la Ciencia y la Cultura (Day of Science and Culture) which was held on July 26th and attracted 7,000 visitors. Talks and activities were designed for bilingual (Spanish-English) audiences, including a live OpenSpace presentation and interactions in the astronomy lab.

Dr. Smith is an avid promoter of OpenSpace, and has expanded its reach to multiple institutions, including the Appalachian State University and Museum of Life and Science, and the Osher Lifelong Learning Institute at North Carolina State University.

## Instances of OpenSpace Start-ups

The above ISI uses are known to the project team through regular reporting, however there are many more instances of OpenSpace being run around the world. Some of these we become familiar with through colleagues, conferences, or our public Slack channel. Others remain unknown to us. The map below is a comprehensive snapshot of OpenSpace software startups for North America since 2021.




## Additional Year Ten Community, Academic, and ISI Activities

The following is a sampling of known activities using OpenSpace **beyond the funded partners** listed by geographical area. The project team is continuously learning about the growth of the project beyond known users and it is therefore impossible to paint a complete picture of OpenSpace's reach and impact. **New users are denoted with an asterisk *.**

UNITED STATES

**Appalachian State University (Boone, NC)**

NCMNS Co-Investigator Dr. Rachel Smith incorporated OpenSpace into her spring 2025 Astrobiology course for 17 undergraduate students. OpenSpace was used to present Earth in the context of the universe and to support lecture content through video clips, including exploring impact craters on Earth, the asteroid belt, the Moon, Europa and other moons, and Mars. Additionally, Dr. Dan Caton, fellow professor and director of Appalachian State's Dark Sky Observatory, used OpenSpace in his public observing nights, engaging 420 participants with tours of the night sky and 60 undergraduate students in his Introductory Astronomy course.

**City College of New York (CCNY) Planetarium (New York, NY)**
In Year Ten, CCNY Planetarium continued its OpenSpace programming through free weekly public shows. Across 25 live-flight shows, CCNY reached more than 350 visitors, including CCNY students, K-12 students as well as the NYC community. Additionally Dr. Hedberg continued to make short educational videos for Instagram and other social media channels using OpenSpace to illustrate astronomy concepts.

**Lower Eastside Girls Club (New York, NY)**
The Lower Eastside Girls Club reached more than 1,280 visitors through its 36 programs featuring OpenSpace in Year Ten. In addition to scheduled space programming, the Girls Club hosted students from Pre-K to Grade 12 for field trips, as well as adult community members, through monthly special events and tours. A PhD graduate in Astrophysics – identified through networking connections made at this year's OpenSpace User Meeting – was hired to help design and facilitate curriculum utilizing our planetarium and OpenSpace. In the fall, the Girls Club piloted a brand-new course about Planetary science and Astronomy, utilizing OpenSpace for 5th grade through middle school youth members. Based on its success, the club will be expanding to three additional classes, which will include high school members in 2026.

**Museum of Life and Science (Durham, NC)**
The Museum of Life and Science, a partner institution of NCMNS, has continued to collaborate with Co-I Dr. Rachel Smith to highlight OpenSpace. In Year Ten, the museum's lunar surface video rendered in OpenSpace permanently on display in the Aerospace exhibit reached over 134,800 people. The museum also collaborated with developer Micah Acinapura to further develop their OpenSpace Tilt-a-Table installation.

**Museum of Science, Boston (Boston, MA)**
In 2025, the Museum of Science, Boston, premiered a new live program series, "Beyond the Telescope,"using OpenSpace to bring cutting-edge science and technology from astronomers and research institutions to the immersive environment of the Charles Hayden Planetarium. The series featured sessions such as "Earth, the Transiting Exoplanet" with Dr. Jackie Faherty, "Space Travel in the Milky Way" with Dr. Alyssa Goodman, and "Unveiling the Invisible Milky Way with AI" with Dr. Lina Necib, reaching a total of 545 visitors.

**Paulucci Space Theater (Hibbing, MN)**
In Year Ten, the Paulucci Space Theater expanded its use of OpenSpace in its space science programming. OpenSpace was utilized in planetarium programming in live-flight demonstrations guided by audience participation. These spontaneous 15-30 minute space shows focus on a variety of space content including Earth, the ISS, the Moon, and planet tours. Paulucci Space Theater also features a pre-recorded flight which ventures from the Sun, through

the Solar System, and out past the galaxies and set to music. A program featuring the constellations of each night's sky in OpenSpace is in the works for the coming year. Through these programs, OpenSpace reached 3,517 visitors.

**Planetarium at P-Tech (Paterson, NJ)**
Through planetarium programs, portable dome visits, community STEM events and regional Solar System Ambassador outreach, the Planetarium at P-TECH reached nearly 6,500 students and families in Year Ten.

**Stockton Astronomical Society (Stockton, CA)***
A new user in Year Ten, Stockton Astronomical Society used OpenSpace at school STEM events and in the Stockton Astronomical Society (SAS) meetings. SAS reached more than 350 people through 7 programs. In the coming year, SAS plans to increase the frequency of STEM presentations. Stockton Astronomical Society is also presenting videos created using OpenSpace at its "Star Parties". In these public events, which are held once or twice a month and typically attract more than 80 people per event, SAS will present "sky tour" videos of the space objects to be viewed each evening.

**Springfield Science Museum (Springfield, MA)**
Springfield Science Museum continued to expand its space science programming and develop innovative ways to utilize OpenSpace. On Astronomy Day, the museum hosted 68 visitors for a 35 minute live tour of the solar system featuring surface views of Mars and the Moon. Springfield Science Museum also produced a novel program on astronomy connections to the paintings of van Gogh. The 22-minute program featured content rendered in OpenSpace and was shown 104 times to 1672 attendees– the museum's best attended show during the time that it ran. Although regular use of OpenSpace is still limited, the Springfield Science Museum regards it as a significant resource for enhancing planetarium programming.

**Suffolk County (NY) Community College***
Suffolk County Community College hosted a series of workshops designed to introduce local high school students to various ways of working with data in preparation for the NASA Space Apps Challenge. One session introduced 15 students to OpenSpace as a tool for navigating through the solar system and visiting surface features of other worlds (e.g. Olympus Mons).

At a science-themed Halloween event for families in the community in October OpenSpace was used to take about 50 people on a tour through the universe and to answer their questions about astronomy. Additionally, OpenSpace is currently being used by one astronomy major to convert Magellan data into an asset that could be used as a layer for Venus in OpenSpace.

**Tesla Science Center at Wardenclyffe (Shoreham, NY)***

Tesla Science Center used OpenSpace extensively throughout their space science programming, which included four workshops that reached approximately 125 people from the New York metro area and Long Island, including high school students and older adults. OpenSpace has been the key to establishing new partnerships for Tesla Science Center, including with Suffolk County Community College, the Cradle of Aviation Museum, Vanderbilt Planetarium, Custer Institute and Observatory, and Brookhaven National Laboratory.

**Towson University (Towson, MD)**

In Year 10, Towson University held 50 OpenSpace programs reaching 2151 visitors including 739 adults, 966 Pre-K-12 students, and 963 university students. During a climate sustainability teach-in In April 2025, Towson University used OpenSpace in a program to present climate and environmental data. OpenSpace was also featured in a documentary that debuted on November 20 in France titled, *'Oumuamua, l'inconnu venu de l'espace* ('Oumuamua, the unknown from space).

Towson University Planetarium Director, Christian Ready, reports that "OpenSpace is by far the best thing that ever happened to our planetarium. Since we adopted it in 2022, we've seen explosive interest in the planetarium, for everything from K-12 to the general public. Being able to seamlessly present NASA, NOAA, DoE, and NSF data in our planetarium allows us to teach the story of our planet, solar system, and the entire universe in a way nothing else can."

**Versant Power Astronomy Center, University of Maine (Orono, ME)**

Versant Power Astronomy Center held 45 presentations this year, 15 of which were onsite at a variety of locations in Maine, reaching approximately 2,000 people. Versant Power Astronomy continued to use OpenSpace in its programming for visitors of all ages, with 20 programs for k-12 students, 15 for general audiences, and 10 for University of Maine classes.
During the Fall semester, four Computer Science students at the University of Maine used OpenSpace for their capstone projects to pull in weather and climate data from the open-source Climate ReAnalyzer software package developed by Maine climatologist and UMaine professor Sean Birkel into OpenSpace.

**Additional Known ISI Users** (New users are denoted with an asterisk.)

- Anchorage Museum (Anchorage, AK)
- Applied Research Laboratory at the University of Texas at Austin (ARL:UT) (Austin, TX)
- Asheville Museum of Science (Asheville, NC)
- ASU School of Earth & Space Exploration (Tempe, AZ)
- ASU Thunderbird School of Global Management (Phoenix, AZ)

- Austin Community College (Austin, TX)
- Brookhaven National Laboratory (Upton, NY)
- Brooklyn Technical High School (Brooklyn, NY)
- Charleston Planetarium Society (Charleston, SC)
- Como Park Elementary School (Saint Paul, MN)
- Connecticut Science Center (Hartford, CT)
- Fiske Planetarium, University of Colorado Boulder (Boulder, CO)
- Flandrau Planetarium, University of Arizona (Tucson, AZ)*
- Hampden Sydney College (Hampden Sydney, VA)
- Herndon High School (Herndon, VA)
- Hubble Planetarium (Brooklyn, NY)
- Imiloa Astronomy Center (Hilo, HI)
- Institute of American Indian Arts (Santa Fe, NM)
- Intrepid Sea, Air & Space Museum (New York, NY)
- Jewish Museum of Milwaukee (Milwaukee, WI) (Temporary)
- Jim and Linda Lee Planetarium (Prescott, AZ)
- Laurel Highland School District (Fayette County, PA)
- Lawrence Hall of Science (Berkeley, CA)
- Mankato East High School (Mankato, MN)
- Mayo High School (Rochester, MN)
- Michigan Science Center (Detroit, MI)
- Minnesota State University Moorhead (MSUM) Planetarium (Moorhead, MN)
- Muscle Shoals Middle School (Muscle Shoals, AL)
- New Brighton Area Schools (New Brighton, PA)
- New York University (New York, NY)
- Nyx Space (Golden, CO)
- Oakton High School (Oakton, VA)
- One World Immersive (Denver, CO)
- Raritan Valley Community College (Branchburg, NJ)
- Robeson Planetarium (Lumberton, NC)
- Science Museum of Western Virginia (Roanoke, VA)
- Sci-Port Discovery Center (Shreveport, LA)
- Southwest Minnesota State University (SMSU) (Marshall, MN)
- Spherical (Oakland, CA)
- StoryDome (Langley, WA)
- The B612 Foundation (Mill Valley, CA)
- The Human Space Program (Natick, MA)
- The Journey Museum (Rapid City, SD)

- University of Nebraska–Lincoln Ralph Mueller Planetarium (Lincoln, NE)
- University of North Dakota (Grand Forks, ND)
- University of Utah (Salt Lake City, UT)
- University of Washington Planetarium (Seattle, WA)
- Wauwatosa West High School (Wauwatosa, WI)
- West Springfield High School (West Springfield, VA)
- West Virginia University (Morgantown, WV)
- Williamsville Space Lab Planetarium (Williamsville, NY)*

EUROPE

**Norrköping Visualization Center C (Norrköping, Sweden)**

OpenSpace is a core component of Visualization Center C's educational and public programming. In Year Ten, programs for 14-15-year-olds engaged 278 students while programs for preschoolers engaged 131 young learners. These programs offer hands-on experiences with OpenSpace in small groups, engaging students in many aspects of space science. Additionally, outreach activities in the inflatable dome reached 998 people and 8,136 people in the Center's main planetarium through ticketed shows. OpenSpace is also featured in four installations; *TakeOff* (a joystick-controlled space flight experience), *OpenSpace Hologram*, and two touch interface installations. Approximately 120.000 visitors engaged with OpenSpace through these installations. The rendered space show "Vast," which was produced using OpenSpace and takes viewers on an immersive journey through space, was seen by 50,833 people across five venues in Sweden. The show is licensed to five locations outside of Sweden including Dallas, Maine and Utah in the U.S., Lubeck, Germany and Bloemfontein, South Africa. Visualization Center staff also led OpenSpace trainings for 25 external ISI educators and planetarium professionals..

**SpaceDome Mobile Planetarium (Zürich, Switzerland)**

In 2025, the Spacedome presented 114 shows featuring OpenSpace, reaching an audience of 4,385 spectators. The vast majority were elementary school children, along with some high school classes.

This year saw an increasing focus on presentations for the general public withpopular "Stargazer Nights" for families in the Swiss Alps for two weeks. This program included OpenSpace presentations in the planetarium, workshops, and stargazing activities.

Another major highlight this year was the use of OpenSpace during "Museum Night" in Bern, the capital of Switzerland.

In general, SpaceDome staff report that "OpenSpace is an incredibly valuable instrument. It allows us to bring the universe directly to people, enabling us to reach children from

underprivileged backgrounds who would otherwise rarely, if ever, visit a museum or planetarium."

**Tekniska Museet (Stockholm, Sweden)**
Over 10,000 children and families have visited SpaceStation Junior installation which is powered by OpenSpace.

**Additional Known ISI Users**

- Ars Electronica Center (Linz, Austria)
- Astro Group South Sardinia (Castiadas, Sardinia, Italy)
- Astrolab Iris (Ieper, Belgium)
- Bromsgrove School (Bromsgrove, United Kingdom)
- Exploratório - Centro Ciência Viva de Coimbra (Coimbra, Portugal)
- National Museum of Science and Technology (Stockholm, Sweden)
- Naturhistorisches Museum Wien (Vienna, Austria)
- Sonnenborgh (Utrecht, Netherlands)
- Technical University of Munich (Munich, Germany)
- The Admiral Vasile Urseanu Astronomical Observatory (Bucharest, Romania)
- Umevatoriet (Umeå, Sweden)
- Universeum (Gothenburg, Sweden)
- Universidad de Córdoba (Córdoba, Spain)
- University of Groningen (Groningen, Netherlands)
- Malmö Museum (Malmö, Sweden)
- VEGA Haus der Natur observatory (Salzburg, Austria)
- WonderDome (Sheffield, United Kingdom)
- ZOOM Children's Museum (Vienna, Austria)

CANADA

**H.R. MacMillan Space Centre (Vancouver, British Columbia)***
The H.R. MacMillan Space Centre began using OpenSpace for public programs in early November 2025. By November 20, 2025, 3,677 visitors had experienced programs powered by OpenSpace. The planetarium hopes to increase attendance with OpenSpace as its new core programming.

**Additional Known ISI Users**

- Aquatarium (Brockville, Ontario, Canada)
- IMERSS (Galiano Island, BC, Canada)
- Ontario Science Centre (Toronto, Ontario)

SOUTH AMERICA

**Additional Known ISI User**

- Mochileros Astronómicos / Planetario Canopus (Asunción, Paraguay)

OCEANIA

**Additional Known ISI Users**

- New Zealand Astrobiology Network (Carterton, New Zealand)
- Spaceward Bound NZ (New Zealand)
- University of New South Wales Wollongong (Wollongong, Australia)

AFRICA

**The Naval Hill Planetarium at the Centre for Earth and Space (Bloemfontein, South Africa)**
In January 2025, the Naval Hill Planetarium at the University of the Free State (UFS) hosted a five-day OpenSpace training workshop for UFS staff and students, as well as planetarium professionals from the surrounding region. The workshop provided hands-on instruction led by OpenSpace Lead Developer Alex Bock. The workshop was supported by a grant awarded to UFS by the U.S. Embassy.

**Additional Known ISI Users**

- African Circular Business Alliance (Cape Town, Western Cape, South Africa)
- ATTARIK Foundation (Casablanca, Morocco)
- Ghana Planetarium (Accra, Ghana)
- University of Cape Town (Cape Town, South Africa)

ASIA

**Sri Sathya Sai Space Theatre (Puttaparthi, India)**
71,290 visitors have seen  OpenSpace-based show in 495 showings in the Sri Sathya Space Theater. These include 6,060 K-12 students that visited in 83 school groups.

Scripts, videos, control-panels, and other show assets are etc - and made them available to the welcoming openspace community in two ways: - https://github.com/hn-88/openspace-scripts and via https://srisathyasaispacetheatre.blogspot.com/p/resources-for-planetariums.html

**Additional Known ISI Users**

- Traveling Universe (Chiang Mai, Thailand)

Finally, OpenSpace has received interest or started installation conversations with six institutions in Year Ten:

- Air Zoo (Kalamazoo, MI)

- Joseph Moore Museum at Earlham College (Richmond, IN)
- New Jersey State Museum (Trenton, NJ)
- Parque Explora (Medellín, Colombia)
- Planetarium Stellarium Erkrath (Erkrath, Germany)
- Vaughan Planetarium (Laramie, WY)

## Emerging OpenSpace Ambassadors

In addition to use by the above organizations, a growing group of individual astronomy hobbyists is emerging as OpenSpace "ambassadors," actively reaching out to communities outside of traditional ISIs. Standout examples include:

**Brian Levine**
NYC-based educator Brian Levine continued to use OpenSpace to engage public audiences in Year Ten. OpenSpace was featured at Astronomy on Tap NYC, where approximately 40 attendees participated in the "Summer Science Blockbuster" event. In partnership with the Brooklyn Public Library's Greenpoint Branch, Levine led multiple programs for the library's "Exploring the Solar System" and "Astronomy Nights" programming series. These events featured interactive tours of OpenSpace, reaching 16 students, with one teen participant learning the basics of navigating the software firsthand.

**Dan Tell (Tau Immersive LLC)**
In 2024, Dan Tell, former California Academy of Science planetarium professional, founded Tau Immersive LLC to provide third-party installation, training, and program development for museums and immersive venues. In Year Ten, Tau Immersive supported OpenSpace across a wide range of venues including portable planetariums, large-scale immersive theaters, independent cinemas, and multi-channel domes. This work included enabling public programming, staff training, and visualizations. These efforts reached thousands of K-12 students, families, and professionals, while also contributing reusable OpenSpace programs developed in partnership with vendors like Elumenati, extending OpenSpace's reach across hundreds of installations worldwide.

**Sarah Treadwell**
In Year 10, Sarah, who uses the moniker "Space Case Sarah" for outreach and science communication, reached approximately 3,000 people through OpenSpace programs. While her outreach primarily served K–12 students, this year she also expanded programming for adult audiences including an OpenSpace program in collaboration for a nonprofit fundraising event supporting survivors of domestic and sexual violence. Sarah also presented her work at the 2024 American Geophysical Union (AGU) meeting and continued development of a custom

OpenSpace program on the Lost City Hydrothermal Field through a second NASA SCoPE grant. This award enabled the acquisition of a portable OpenSpace system, which she now uses for school-based programs in and around Rockford, Illinois. In the coming year, Sarah plans to incorporate OpenSpace into her PhD research.

### Planetarium Vendors

The OpenSpace project team has continued to foster relationships with vendors to broaden distribution of the software and enable support for users regardless of their technical infrastructure. The Elumenati has continued to invest in OpenSpace as its premiere source for astronomy content and developed new OpenSpace button pages within their WorldViewer software. Additionally, we've teamed up with SSIA Technologies for several dome installations, with our Software Integration Engineer spearheading the OpenSpace updates.

Through collaboration with Cosm, the latest version of OpenSpace includes improved support for the Multiple Projector Common Data Interchange (MPCDI) format facilitating integration with its Digistar systems. This update opens doors for broader distribution across institutions serviced by Cosm / Evans & Sutherland, the leading global planetarium provider. Finally, BWC Visual Technology developed a touchscreen-friendly, public-facing user interface using OpenSpace to explore exoplanet systems.

## II. PRODUCTS

**Website** (www.openspaceproject.com)
The OpenSpace website serves as the primary destination for new and returning users, as well as non-users interested in accessing OpenSpace content and events. The website provides an overview of the project, introduces our team, highlights opportunities for involvement, and offers a direct download of the software. Visitors can also connect to our community Slack workspace, follow us on social media, and explore upcoming events.

Since November 2024, the website has attracted over 79,000 visits, a nearly 7% increase from Year Nine, from more than 61,000 unique users. Leading the way, over 40% of visitors were from the United States, with significant engagement from Germany, Sweden, India, the United Kingdom, Canada, Russia, Australia, China, Italy, France, the Netherlands, and Brazil—each logging over 1,000 visits. In addition, visitors from 45 more countries surpassed the 100-visit mark, illustrating OpenSpace's global reach.

Traffic insights reveal that 53% of visits were direct, while 30% came through search engines like Google, Bing, and DuckDuckGo. ChatGPT served as the top referral source, driving over 2,800

visits. On Google alone, OpenSpaceProject.com earned over 18,900 clicks and 707,000 impressions.

## Support and Community Channels

*Docs* (docs.openspaceproject.com): The OpenSpace Docs site houses the software documentation and allows for multiple versions to be maintained on one site, supporting older versions of the software as well as the latest release. This platform also features code highlighting and callouts that helps users find the most relevant information.

*GitHub* (https://github.com/OpenSpace/): GitHub hosts the public source code for OpenSpace. Both users and developers can report software issues, suggest fixes for bugs, and contribute to the codebase there.

*Reddit* (https://www.reddit.com/r/OpenSpaceProject/): The OpenSpace Reddit acts as an auxiliary support platform and a space to discuss software applications. The number of members increased in Year Ten to 168 members (up from 131 in Year Nine), with discussion predominantly related to support questions.

*Slack* (openspacesupport.slack.com; team-openspace.slack.com): The project has two workspaces on Slack, one used by the project team, and one that serves as a hub for community-led collaboration. The public OpenSpace Support Slack now supports 1,300 members (up from 1,065 in Year Nine), with an average of 113 members actively participating each week.

## OpenSpace Social Media Platforms

*Facebook* (@OpenSpaceVisualization): In Year Ten, the OpenSpace Facebook page grew its follower count to 1,009. Content posted to the account was viewed 1,960 times and generated 1,409 profile visits, marking a 103% increase in profile visits compared to Year Nine.

*Instagram* (@openspaceproj): By the end of Year Ten, our follower count rose to 2,631, with over 600 profile visits. The content posted during this period garnered 4,038 views.

*LinkedIn (@OpenSpace):* The OpenSpace LinkedIn page has served as a platform for sharing industry updates, including participation in conferences. Over the past year, our content reached 189 unique members, while the page recorded 377 views and increased its follower count to 245.

*TikTok* (@openspaceproj): In Year Nine, the OpenSpace Science Communication intern piloted the use of TikTok by repurposing short-form videos initially created for Instagram. These videos were viewed 6,296 times in Year Ten, reaching 2,044 unique accounts.

*YouTube* (www.youtube.com/c/OpenSpaceSoftw-[are): This year, the OpenSpace YouTube channel garnered over 22,900 views and more than 900 hours of watch time (excluding AMNH and other partner channels). Total subscribers rose to 3,649. Approximately 14% of viewers were from the United States, with India as the next largest audience at 1.7%. This year, three new tutorial videos were produced to demonstrate the updated user interface in version 0.21.0. Additional videos are planned to highlight more features of the interface.

## Conferences, Colloquia, and Symposium

American Geophysical Union (AGU) (December 9–13, 2024): OpenSpace was featured across a wide range of oral sessions and posters at the AGU 2024 meeting highlighting its role in research, education, and public engagement. Presentations showcased OpenSpace applications for teacher professional development, planetarium-based education, youth outreach, and science communication, as well as technical advances in visualization, asset development, and the integration of NASA and CCMC simulation models.

American Astronomical Society (AAS) (January 12–16, 2025): Jackie Faherty, Senior Scientist at AMNH, and Mark Popinchalk, a postdoctoral researcher at AMNH, presented OpenSpace at two AAS workshops: the *STEM Learning and Public Engagement with NASA's SciAct Program* workshop and the *Effective Astronomy Visualizations for Engagement, Learning, and Research* workshop.

National Science Teaching Association (NSTA) Conference (March 26-29, 2025): AMNH educators Gio Camano, Abigail Dean, and Kaitlin Schmidt presented OpenSpace in the NSTA exhibit hall in collaboration with ePlanetarium. Over 450 conference attendees experienced the software firsthand through live demonstrations in a portable planetarium. Gio Camano and Abigail Dean also shared their work with OpenSpace during their Share-a-thon presentation, *Urban Skies: Using OpenSpace Technology to Empower Youth to Explore the Cosmos*.

Meteoritical Society Annual Meeting (July 14-18, 2025): Co-I Rachel Smith presented OpenSpace content to the HIVE visualization group at Curtin University, as part of the conference.

Association of Science and Technology Centers (ASTC) Conference (September 5-8, 2025): OpenSpace hosted a booth to highlight the software to ISI professionals, reaching over 75

attendees. The California Academy of Sciences (CAS) showcased how natural history collections can be brought into OpenSpace during the evening ASTC Soirée for conference attendees. Brian Abbott and Hollister Herhold from AMNH visualized the tree of life and 3D insect models in the software, while Ryan Wyatt and Jacque Benitez from CAS presented photogrammetry of coral reefs and wildfire data. The program was attended by over 200 conference attendees.

Great Lakes Planetarium Association (GLPA) October 7-11, 2025): Six OpenSpace users collaborated to host an OpenSpace booth at the GLPA/WAC conference. This marked the second time that staff from OpenSpace partner institutions and other ISI users represented the project independently, without AMNH staff present. Users shared their firsthand experiences and enthusiasm for the software with their peers, reaching over 50 conference attendees.

## Academic Publications

Yu, K.C. & Kwasnitschka, T., "Geoscience Visualizations In Fulldome Planetariums," *Planetarian*, 53(4), pp. 10-17, 63. 21-25 July 2024, pp. 491-498.

W. Duchemin *et al*., "A Cosmic View of Life on Earth: Hierarchical Visualization of Biological Data Using Astronomical Software," in *IEEE Computer Graphics and Applications*, vol. 45, no. 5, pp. 93-106, Sept.-Oct. 2025, doi: 10.1109/MCG.2025.3591713.

## Conference Abstracts

R. Kinzler, R. Steiner (2024), *Engaging Middle and High School Science Teachers with OpenSpace – Opportunities and Challenges,* AGU Fall Meeting 2024, id. ED11G-2409.

C. Sumners, P. Reiff, C. Law (2024), *The OpenSpace Interactive Lab,* AGU Fall Meeting 2024, id. ED11G-2421.

A. Lundkvist, M. Kuznetsova, M. Mays, E. Olsson, E. Resnick, E. MacDonald, L. Edson (2024), *Experience the May 2024 Geomagnetic Storm with OpenSpace, CCMC, and Aurorasaurus Citizen Science Reports*, AGU Fall Meeting 2024, id. SA11A-06.

E. Hamilton, M. Vasquez (2024), *Tool and Asset Development for Occultation Full Dome Visualizations*, AGU Fall Meeting 2024, id. ED13E-2507.

E. Olsson, A. Lundkvist, M. Kuznetsova, M. Mays, D. De Zeeuw, M. El-Alaoui, L. Rastaetter, A. Bock, E. Resnick (2024), *CCMC's simulation models in OpenSpace: Visualizations for the public and the experts*, AGU Fall Meeting 2024, id. IN13D-06.

R. Wyatt, J. Benitez, D. Tell (2024), *Planetariums for the People: OpenSpace Software Offers Open-Source Visualization of Planetary Science Data*, AGU Fall Meeting 2024, id. ED22B-03.

C. Sumners, P. Reiff, C. Law (2024), *The OpenSpace Dome*, AGU Fall Meeting 2024, id. ED22B-04.

Yu. K.C. (2024), *Using Digital Planetariums for Geoscience Education*, AGU Fall Meeting 2024, id. ED22B-05.

P. Epstein (2024), *Urban Skies - Equitable Universe: Using OpenSpace to Empower Youth to Explore Their Solar System and Beyond*, AGU Fall Meeting 2024, id. ED23G-08.

S. Treadwell (2024), *From the Depths of the Ocean to the Edges of the Cosmic Shore: Sharing the Science of Interdisciplinary Astrobiology Research Utilizing OpenSpace Planetarium Show Visuals*, AGU Fall Meeting 2024, id. SY31D-2335.

C. Emmart, R. Kinzler (2024), *Visualizing Helio and Space Physics in the NASA Supported Interactive OpenSpace Software*, AGU Fall Meeting 2024, id. SY53D-08.

J. Faherty (2025), *Visualizing the Gaia enabled Milky Way for Science and Education*, 245th Meeting of the American Astronomical Society, id. 205.21.

## Graduate Theses

OpenSpace continues to be a focus of master student thesis projects at Linköping University; NASA Community Coordinated Modeling Center, Goddard Space Flight Center; New York University and University of Utah. The following theses were submitted in Year Ten:

- Brunned, M. and Khuong, C. *Contextual Visualization of Adaptive Meshes using YTContextual Visualization of Adaptive Meshes using YT* (Master's Thesis, American Museum of Natural History). 2024.[2]
- Moradkhani, D. and Olsson, T. *Cloud-Based Tablet User Interface for Real-Time Touch Interaction in OpenSpaceCloud-Based Tablet User Interface for Real-Time Touch Interaction in OpenSpace* (Master's Thesis, University of Utah Scientific Computing and Imaging Institute). 2024.[3]

2 https://liu.diva-portal.org/smash/get/diva2:1975471/FULLTEXT01.pdf

3 https://liu.diva-portal.org/smash/get/diva2:1974447/FULLTEXT01.pdf

- Björkström, W. and Wallberg, E. *An Interactive Black Hole Visualisation in OpenSpace* (Master's Thesis, Linköping University). 2025.[4]

# III. PARTICIPANTS & OTHER COLLABORATING ORGANIZATIONS

A broad collaborative network of contributors is vital to the success of OpenSpace. The following collaborators bring diverse expertise in visualization, research, and public engagement to the project.

## OpenSpace Project Team Members

- Rosamond Kinzler, PI, AMNH
- Vivian Trakinski, Project Director, AMNH
- Carter Emmart, Creative Lead, AMNH
- Alexander Bock, Development Lead, Linköping University
- Micah Acinapura, Software Integration Engineer, AMNH
- Charles Hansen, Project Management, University of Utah Scientific Computing and Imaging Institute
- Claudio Silva, Project Management, New York University Tandon School of Engineering
- Masha Kuznetsova, Project Management, NASA Goddard CCMC
- Mordecai-Mark Mac Low, Scientific Advisor, AMNH
- Denton Ebel, Scientific Advisor, AMNH
- Brian Abbott, Manager of Digital Universe Atlas, AMNH
- Megan Villa, Project Coordinator, AMNH

At the end of Year Ten, Carter Emmart retired from his position as Director of Astrovisualization at the American Museum of Natural History. We are grateful for his vision and leadership, which were instrumental in the creation and development of OpenSpace, and we look forward to his continued involvement as an expert OpenSpace user.

## Informal Science Institution (ISI) Partners

- Andrew Johnston, Adler Planetarium
- Ryan Wyatt, California Academy of Sciences
- Ka Chun Yu, Denver Museum of Nature & Science
- Carolyn Sumners, Houston Museum of Natural Science
- Rachel Smith, North Carolina Museum of Natural Sciences

4 https://liu.diva-portal.org/smash/get/diva2:1974754/FULLTEXT01.pdf

## NASA-Funded SMEs

In Year Ten, 35 NASA-funded Subject Matter Experts contributed to and/or used OpenSpace, including 16 new SMEs (indicated with an *asterisk). This brings the total number of unique SMEs to 122. The table below describes how each SME utilized OpenSpace; in some instances, SMEs used the software in multiple ways.

| Subject Matter Expert | Public Program | Formal Education | For Research | Contributed Data or Code |
|---|---|---|---|---|
| *Giada Arney, PhD (Deputy PI DAVINCI, NASA GSFC) | X | | | |
| *Douglas Caldwell, PhD (Kepler Mission Instrument Scientist & Co-Investigator, SETI Institute) | X | | | |
| *Gregory Cesana, PhD (Research Scientist, Center for Climate Systems Research (CCSR), Columbia Climate School | X | | | |
| *Min-Yang Chou, PhD (Research Scientist, NASA GSFC CCMC) | | | | X |
| *Chris Colose, PhD (Postdoctoral Research Fellow, NASA GISS) | X | | | |
| Jason Craig (Visualization Producer, NASA's Eyes) | | | | X |
| Bart De Pontieu, PhD (PI, NASA Interface Region Imaging Spectrograph (IRIS)) | X | | | |
| Darren De Zeeuw, PhD (Research Associate, NASA Goddard Space Flight Center Community Coordinated Modeling Center) | | | | X |
| Denton Ebel, PhD (Co-I, AMNH) | X | | | |
| Jackie Faherty, PhD (Sr. Scientist and Sr. Education Manager, Departments of Astrophysics and Education, AMNH) | X | X | X | X |
| Ben Feist (Software Engineer, Data Visualization & Informatics) | | | | X |
| *Ann Fridlind, PhD (Physical Scientist, NASA | X | | | |

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|---|---|---|---|---|
| GISS) | | | | |
| *Timothy Glotch, PhD (PI, RIS4E node of NASA's SSERVI) | X | | | |
| Alyssa Goodman, PhD (PI, Harvard University) | X | | | X |
| *Alex Gurvich, PhD (Senior Graphics Designer and Visualization Specialist, NASA GSFC SVS) | | | | X |
| John Keller, PhD (PI, ROSES, University of Colorado Boulder) | X | X | | |
| Masha M. Kuznetsova, PhD (Director, NASA GSFC CCMC) | | | | X |
| Mordecai-Mark Mac Low, PhD (Co-I, AMNH) | | | X | |
| *Elizabeth MacDonald, PhD (Heliophysicist, NASA GSFC) | | | | X |
| Leila Mays, PhD (Deputy Director, NASA GSFC CCMC) | X | | | X |
| *Abel Mendez, PhD (Director, Planetary Habitability Laboratory, University of Puerto Rico at Arecibo) | X | | | X |
| *Matthew Pearce (NASA OSTEM Next Gen STEM Earth Lead, NASA GISS) | X | | | |
| Mark Popinchalk, PhD (NASA SCoPE seed grant awardee) | X | | | X |
| Lutz Rastaetter, PhD (Research Assistant, Fields And Particles, NASA GSFC CCMC) | | | | X |
| *Rebecca Robinson, PhD (MUSE Outreach Lead, SETI Institute) | X | | | |
| Anastasia Romanou, PhD (Research Physical Scientist, NASA GISS) | X | | | |
| *Joy Romanski, PhD (Associate Research Scientist, Center for Climate Systems Research, Columbia Climate School) | X | | | |
| *Alex Ruane, PhD (Research Physical Scientist, NASA GISS) | X | | | |
| *Gavin Schmidt, PhD (Director, NASA GISS) | X | | | |
| Rachel Smith, PhD (Co-I, NCMNS) | X | X | | |
| Mark SubbaRao (Lead, NASA SVS) | | | | X |
| John Wirzburger (Systems Engineer, Parker Solar Probe) | X | | | |

| | | | | |
|---|---|---|---|---|
| Ernest T. Wright (Graphics System Specialist, NASA SVS) | | | | X |
| *Jia Yu, PhD (Research Scientist, NASA GSFC CCMC) | | | | X |
| Catherine Zucker, PhD (Astrophysicist at the Smithsonian Astrophysical Observatory) | X | | | X |

## Other SMEs

An additional (non-NASA) 34 SMEs used OpenSpace as a tool for exploring and communicating Earth and space science data to broad audiences, including 20 new SMEs (indicated with an *asterisk). This brings the total of unique (non-NASA) SMEs to 74.

| Subject Matter Expert | Public Program | Formal Education | For Research | Contributed Data or Code |
|---|---|---|---|---|
| *Patrick Alexander, PhD (Associate Research Scientist, Lamont-Doherty Earth Observatory) | X | | | |
| *Dimitra Atri, PhD (Investigator, Center for Astrophysics and Space Science, NYU Abu Dhabi) | | | | X |
| *Gurtina Besla, PhD (Professor, Department of Astronomy, University of Arizona) | X | | | |
| *Sean Birkel, PhD (Research Assistant Professor, Climate Change Institute & School of Earth and Climate Sciences, University of Maine) | | | | X |
| *Ron Caplan, PhD (Computational Scientist, Predictive Science) | X | | | |
| *Caitlin Casey, PhD (Professor, UC Santa Barbara) | X | | | |
| Dan Caton, PhD (Professor of Physics and Astronomy, Director of Observatories, Appalachian State University) | X | X | | |
| * Kishalay De, PhD (Assistant Professor, Astronomy, Columbia University) | X | | | |
| Marina Gemma, PhD (Planetary Scientist, Department of Earth and Planetary Sciences, AMNH) | X | | | |

| | | | | |
|---|---|---|---|---|
| *Enrique Gomez, PhD (Associate Professor, Western Carolina University) | X | | | |
| Ariel Marcelo Goobar (Director of Oskar Klein Centre for Cosmoparticle Physics, Stockholm University) | X | | | |
| Trent Hare (Cartographer, USGS Astrogeology Science Center) | | | | X |
| Keith Hawkins (Associate Professor of Astronomy, University of Texas at Austin) | X | | | |
| James Hedberg, PhD (Director, CCNY Planetarium, City College of New York) | X | X | | |
| *John Herrington, PhD (NASA Astronaut) | X | | | |
| *Emily Hunt, PhD (Postdoc, University of Vienna) | X | | | |
| Lisa Kaltenegger, PhD (Director, Carl Sagan institute, Cornell University) | X | | | |
| *Tom Kwasnitschka, PhD (Chief Scientist, Schmidt Ocean Institute) | X | | | |
| *Hannah Liddy, PhD (Senior Staff Associate I, Center for Climate Systems Research, Columbia University) | X | | | |
| Jon Linker, PhD (Senior Research Scientist, Predictive Science) | | | | X |
| Ed Lu, PhD (Executive Director, the Asteroid Institute, B612 Foundation) | | | X | |
| *Phil Marshall, PhD (Senior Scientist, SLAC National Accelerator Laboratory) | X | | | |
| Joachim Moeyens, PhD (Research Software Engineer, University of Washington) | | | X | X |
| *Lina Necib, PhD (Assistant Professor, MIT) | X | | | |
| *Anna Nierenberg, PhD (Assistant Professor at University of California, Merced) | X | | | |
| *Dara Norman, PhD (Acting Director, Community Science and Data Center, NSF's NOIRLab) | X | | | |
| Göran Östlin (Professor, Stockholm University) | X | | | |
| Lucian Plesea (Web GIS developer, ESRI) | | | | X |
| Allan Posner (Astrodynamicist, the Asteroid | | | X | |

| | | | | |
|---|---|---|---|---|
| Institute, B612 Foundation) | | | | |
| Bob Raynolds, PhD (Research Associate, DMNS) | X | | | |
| *Megan Seritan, PhD (Planetary Astronomer and Archivist, SETI Institute) | X | | | |
| *Sofia Sheikh, PhD (NSF-ASCEND Postdoctoral Fellow, SETI Institute) | X | | | |
| *Genaro Suárez, PhD (Postdoctoral Fellow, AMNH) | X | | | |
| *Joel Zinn, PhD (Assistant Professor, Department of Physics and Astronomy, California State University) | X | | | |

# IV. CHANGES/ PROBLEMS

The WebRTC work has proved fruitful in demonstrating the potential for enabling access to OpenSpace from consumer devices such as chrome books in a variety of educational contexts. However, to scale the work, some model of funding the cost of the third-party technical infrastructure, e.g. Amazon Web Services, to host OpenSpace would need to be developed.

# V. CROSS-COLLABORATION AGREEMENT ACTIVITIES

We have had ongoing conversations, development activities, and public programming in collaboration with other SciAct projects.

*Cosmic Storytelling with NASA Data:* This year, we continued working with the CosmicDS team, largely through outreach with a public program at the Museum of Science, Boston.

*Infiniscope*: This year, OpenSpace supported Infiniscope in incorporating OpenSpace visualizations into virtual field trips and other digital learning resources. We also explored the potential use of Infiniscope's Simple Author tool to create step-by-step training guides for OpenSpace software.

*NASA Community College Network (NCCN)*: In February 2025, OpenSpace partnered with NCCN to host a virtual training session to introduce community college astronomy professors to OpenSpace.

*Smoky Mountains STEM Collaborative:* The OpenSpace team provided support to SMSC staff use of the software including brainstorming future programming on Twitch.

*STEM Enhancement in Earth Science (SEES):* The OpenSpace team offered support to SEES mentors to use OpenSpace with SEEs interns.

*Science Through Shadows:* In Year Ten, OpenSpace developer, Micah Acinapura, supported Fiske to use OpenSpace in dome video production efforts.

## Cross-Collaboration with NASA Infrastructure Projects

*Museum & Informal Education Alliance:* OpenSpace collaborated with MIE Alliance to extend professional development opportunities to their audiences.

*NASA's Eyes:* We continued to collaborate with Eyes personnel to exchange data, resources, and strategies for covering upcoming mission milestones.

*NASA Solar System Treks:* This year, OpenSpace continued to integrate terrain layers from NASA Treks into OpenSpace.

*Solar System Ambassadors:* OpenSpace collaborated with Solar System Ambassadors to extend professional development opportunities to their audiences.

*NASA Science Visualization Studio:* OpenSpace continued to integrate 3D models from NASA SVS into OpenSpace programming. In Year Ten, the collaboration focused on bringing Earth Information Center content into an OpenSpace profile, including Science-On-a-Sphere video formats and high-quality models and animations.

In addition to the above formal cross-collaboration agreements, the OpenSpace project team has participated in the Visualization, Rural, Broadening Participation, Diversability, and Learning Communities of Practice. The following informal collaborations also occurred in Year Ten:

*NASA SCoPE*: OpenSpace participated in one mission liaison workshops hosted by NASA SCoPE. Additionally, OpenSpace collaborated on four NASA SCoPE seed grants.

- Dr. Mark Popinchalk's "'The Worlds We Know': An Informal Educational Video Series Using the OpenSpace Planetarium Software" project developed a four-part video series to be used as classroom enrichment for Middle and High School audiences. Videos are being finalized for spring release on the OpenSpace YouTube channel.
- Sarah Treadwell further developed her custom OpenSpace profile on the Lost City Hydrothermal Field through her "The Lost City and Icy Worlds: The Ocean

World's Roadshow" project. Treadwell collaborated with a 3D artist to develop underwater visuals in OpenSpace. The resulting profile was shown in over 50 programs.

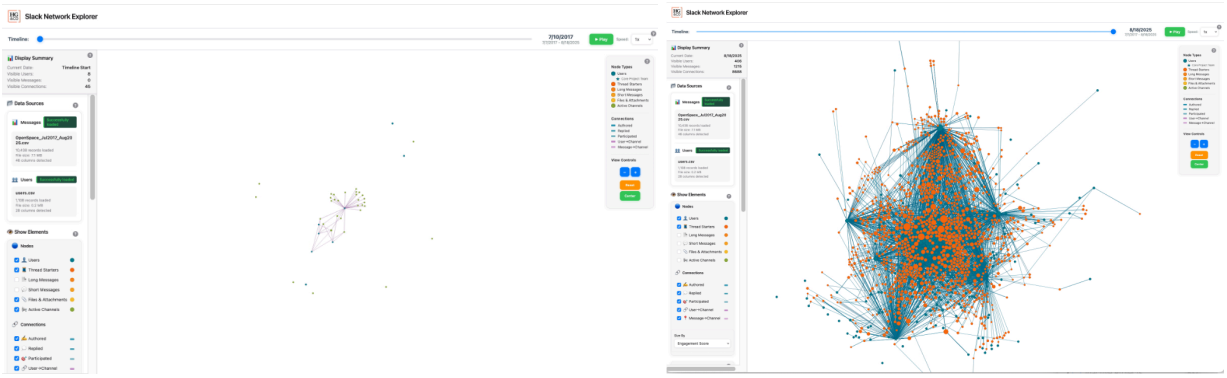
- Kaz Gary, PhD student at The Ohio State University, developed a planetarium program on exoplanets through his "Weird Worlds" project. Several custom assets were developed for the Weird Worlds planetarium show, including planet surfaces, atmospheres, animations and static diagrams.
- Abel Méndez, Director of the Planetary Habitability Laboratory and Associate Professor of Physics and Astrobiology at the University of Puerto Rico at Arecibo, completed the project "Arecibo Wow! Exploring Interstellar Communication." This project produced a Spanish translation of the OpenSpace user interface improving accessibility for Spanish-speaking users. The project also produced printed stellar maps for outreach events and created new assets using data from the Planetary Habitability Laboratory's Habitable Worlds Catalog, giving users an additional way to explore and present potentially habitable exoplanets.

# VI. EVALUATION: IMPACT AND PROJECT OUTCOMES

## Evaluation by HG&Co

The OpenSpace project's external evaluator, HG&Co (118 Franklin Street, Concord, NH; 301-655-1925; kate@hgandco.com), collaborated with the AMNH team in Year Ten to complete several evaluation efforts for OpenSpace and began synthesizing data from across the preceding years. The studies or efforts we completed in Year Ten:

1. **Visualization of the growth of the OpenSpace user network** through a custom-built application across eight years of Slack messages. The visualization demonstrated that not only did the number of individuals posting and responding within Slack grow, but the number of individuals responding directly to one another—in addition to responding to staff at AMNH—also grew, providing evidence of the increasing interconnectedness and strength of the network. The first screenshot below shows the OpenSpace Slack workspace as of July 10, 2017. The second shows the same workspace on August 18, 2025.




***OpenSpace Slack Workspace Data Visualization on July 10, 2017 and August 18, 2025***

1. **Further analysis of the Dome survey**, in which we examined awareness, use, and potential for growth of OpenSpace within universities and colleges, including community colleges. Results show both the opportunity for, and the need for, OpenSpace within these communities.

2. **Analysis of the ongoing multi-site public programs survey data**, including the addition of new sites and survey instruments in both English and Spanish. Results continue to show that OpenSpace is instrumental in supporting the public's understanding of NASA missions and science, as well as in increasing their interest.

3. **A longitudinal impact study** focused on OpenSpace interns and fellows from the past 10 years. In these qualitative, open-ended interviews, participants told us how the experience had shaped them and their careers over the following years.

The longitudinal study has been particularly useful, as the true impact of internships and fellowships was not fully apparent in the data we initially gathered immediately after the experience. We had underestimated the impact of those experiences based on the initial post-experience evaluation. Conducting interviews years after the internship or fellowship allowed us to see the true magnitude and scope of the impact.

One participant who had participated in the internship three years prior said, "It is not an exaggeration to say my OpenSpace internship was life-changing."

Interviewees described gains in confidence, as well as concrete skills and knowledge, and highlighted how the experience impacted participants' career paths.

> *"And the knowledge that I can learn—at first, I thought I couldn't learn about black holes, but then I did. I got this feeling that I can learn, I can climb this mountain and focus on a specific task. It was a mental thing; it was a good experience to know that I can learn. That can be applied to anything in life."*

One female student described having been discouraged from pursuing space science in high school, where male students had repeatedly sabotaged the work of female students. The internship provided the environment and support she needed to continue.

> *"The science museum had a very different culture than my school did. [My high school] was very male dominated…I loved it [space science], but I had to prioritize my mental health... If I hadn't had that experience [the internship], I'm not sure if I would've had that faith in the field. So, it was very, very important for me to have."*

One participant described how the experience gave him knowledge and skills early in his journey, allowing him to succeed further.

> *"I definitely think it had a pretty big impact on my career. It allowed me to obtain higher roles at a younger age. It set me up for success, especially in fields that are becoming more competitive, like engineering and coding."*

That interviewee also described how the internship impacted his views on the value of research.

> *"One way is that it made me more interested in academia—reading research papers and incorporating that into my own work. I never really thought about research developments affecting today's world… It made me realize how research is actually practical and can affect people and the world."*

Another participant noted that they came from a lower-income, disadvantaged background, and that the internship opened the door to other opportunities.

> *"Yeah, absolutely. I think a big reason I've gotten a lot of scholarships was because I was able to do that internship. That's an experience that caught people's attention."*

For some interviewees, participation opened up career paths they had not previously considered, such as the individual who said, "*It definitely impacted my career. I was interested in engineering before, but I still didn't know what to do. It opened my mind and gave me more experience. I'm completing a degree in aerospace engineering and graduating next May."*

During the interviews, prior participants described gains in critical thinking skills, scientific habits of mind, collaboration in scientific work, and presentation skills as a result of their OpenSpace internships and fellowships. These skills persisted regardless of whether individuals went on to schooling or careers in Earth or Space Sciences, with those in other career paths noting how valuable and applicable the skills gained from OpenSpace were in their chosen fields.

> *"It really helped me in problem solving and analytic skills and to adapt quickly. And basically, how to communicate complex ideas to people... So, I would say it also gave me confidence in learning new tools and adapting quickly, and it's a skill I rely on every day when tackling new challenges."*

Further details and updates on these activities will be provided in the Summative Evaluation Report.

## Top-Level Metric Projections

In the initial funding phase, OpenSpace's primary metric for success was the number of interactive NASA data "profiles" integrated into the software. For Phase II, we transitioned to measuring project growth by tracking the number of active OpenSpace users, aiming to reach 100 institutions by Year Ten. At the close of Year Ten, the OpenSpace community has passed this milestone with 104 institutions actively using OpenSpace.

## SciAct Alignment

The OpenSpace leadership team collaborated with the evaluator to align the project with the SciAct portfolio-level activities led by PRE. This collaboration ensured alignment with mid-level objectives and identified specific program indicators corresponding to these objectives.

OpenSpace is currently aligned with SciAct MLOs 1b, 1c, and 3c:

1b) Provide opportunities for participants to engage with the disciplinary content related to NASA science and engineering.

1c) Increase the number of and frequency with which NASA SMD assets are used by learners across the US.

3c) Engage participants in learning experiences that promote development of skills for STEM careers.

(1b, 1c) This report highlights OpenSpace's goal to broaden public engagement with NASA's science and engineering through Informal Science Institution (ISI) initiatives tailored for all age groups. In Year Ten, OpenSpace was used in over 1,255 programs and 12 exhibits to communicate scientific and engineering concepts, with 302 of these events delivered by the OpenSpace ISI Partner Network supported by NASA SciAct funding. To date, OpenSpace has driven a cumulative total of 3,595 programs. This year alone, these programs and exhibits reached 1,050,023 individuals on-site, bringing total on-site engagement to 4.5 million.

(1b, 1c) This year, online engagement saw a decrease but continued to play a significant role, with audiences accessing live sessions, recorded programs, and curated video content. Over 100,000 individuals were reached online through OpenSpace. Through the OpenSpace website and its social media channels, the digital outreach reached an additional 35,571 individuals, elevating the overall digital footprint of OpenSpace owned content to exceed 6.6 million.

(1b, 1c, 3c) In Year Ten, the OpenSpace funded partners hosted 23 interns, spanning from high school to undergraduate levels, across diverse durations including multi-week and semester-long internships. These interns received mentorship in data visualization and code development. To date, 313 internships have utilized OpenSpace.

*Total Activity, Years 1-10*

| | NASA SMEs | ISIs and other organizations | Programs | On-site reach[5] | Online reach[6] | Other online reach[7] |
|---|---|---|---|---|---|---|
| Y10 | 35 | 104[8] | 1,255 | 1,050,023 | 141,046 | 35,571 |
| **Y1-10 Total** | **122** | **122** | **3,595** | **4,598,167** | **76,874,948** | **6,665,279** |

[5] On-site reach includes programs and exhibition experiences on-site at funded and non-funded ISIs and other public institutions.
[6] Online reach includes views of online programs, recordings of these programs, and produced videos.
[7] Other online reach includes visits to the OpenSpace website, the reach of OpenSpace social media, and views of OpenSpace content.
[8] Six of the public institutions are new to the project in Year Ten.

# VII. Appendix - OpenSpace Profiles

These profiles are available for every OpenSpace user and do not include any custom profiles created by users.

*Apollo:* This profile contains models and trajectories for the NASA Apollo 8 mission circling the Moon, including when the iconic “Earthrise” image was photographed. It also contains additional datasets showing the landing sites of Apollo 11 and 17, and photogrammetry of boulders from Apollo 17 station sites.

*Artemis*: This profile visualizes NASA’s Artemis 1 mission. The profile starts focusing on the Artemis I Orion spacecraft as it approaches the Moon on Monday, November 21, 2022. An updated Mission user interface allows the user to jump to relevant mission milestones.

*Asteroids:* More than 936,000 asteroids and comets from JPL Horizons Small-Body Database, including: Amor Asteroids, Apollo Asteroids, Aten Asteroids, Atira Asteroids, Centaur Asteroids, Chiron-Type Comets, Encke-Type Comets, Halley-Type Comets, Inner Main Asteroid Belt, Jupiter Family Comets, Jupiter Trojan Asteroids, Main Asteroid Belt, Mars Crossing Asteroids, Outer Main Asteroid Belt, Potentially Hazardous Asteroids, and Trans-Neptunian Asteroids.

*Bastille Day 2000:* This profile shows the Coronal mass ejection (CME) that occurred on Bastille Day, July 14, 2000. The visualizations to highlight the CME include: a volume rendering of the density of the material ejected from the sun; field lines showing the Sun’s magnetic structure; magnetograms which are texture layers on the sun showing variation in strength of the magnetic field; an extreme ultraviolet (EUV) image sequence layer shown on the sun; a light speed indicator to compare the speed of the CME; cut plane sequences showing the flux values of the CME, one equatorial cut plane and one meridional. Also there are flux nodes that show flux values, which are accompanied by a legend describing the color scheme.

*BepiColombo:* This profile shows the spacecraft and trajectory of ESA’s BepiColumbo as it is continuing the discovery process started by the MESSENGER mission. The data for this profile was the result of a collaboration with ESA’s SciFleet and the ESA SPICE Service.

*Calibrator:* This profile places the camera inside of a calibration cube. This profile can be used to verify that a multi-projection display environment is set up correctly. If a setup is correct, the different windows/viewports should show the correct parts of the surrounding cube accurately and without any unwanted distortion.

*Dawn:* This profile contains a 3D model and trajectory of the NASA Dawn spacecraft, and bodies and trajectories for Ceres and Vesta.

*Default:* This profile is enabled on default and provides the ability to look at detailed terrain models of the Earth, Moon, Mars, other planets, and the Digital Universe extrasolar catalog.

Eclipses: This profile includes assets to support telling stories about eclipses. The profile starts focused on Earth with umbral and penumbral shadow cones visible. Additional information on eclipses and an interactive timeline of eclipses in the last century and for the next century are available in the Missions user interface.

*Empty*: This profile does not contain any graphics and is to be used to visualize the user's own 3D models or datasets.

*Euclid:* This profile shows the trajectory and spacecraft model of ESA's Euclid mission that has has its goal to observe billions of galaxies and provide more information about the large-scale structure of our universe. The data for this profile was the result of a collaboration with ESA's SciFleet and the ESA SPICE Service.

*Gaia:* This profile contains a new rendering method to show the dataset from ESA Gaia's Data Release 2 (DR2). By default, it loads 7.224 million stars of the Gaia DR2 that contain radial velocities.

*Juice:* This profile visualizes ESA's JUICE (JUpiter ICy moons Explorer) mission that will explore Jupiter and three of its icy moons. The profile starts on Friday, August 1, 2031, with a focus on Jupiter.

*Juno:* This profile shows a model and approach of the NASA Juno space probe to the Jupiter system and its initial orbits around the gas planet in July 2016. Future work will include visualization of the Juno cam imaging.

*James Webb Space Telescope:* This profile visualizes the NASA-ESA-CAN James Webb Space Telescope, which launched on December 25, 2021. The profile includes two visualizations of the Webb trail: One plotted with respect to the Earth-Sun L2, where it will be stationed; and another with respect to the Sun, as we plot the orbits of the planets. The profile includes a dynamic model of Webb and a time lapse of its deployment and unfolding. The profile includes the capability to point the telescope with an associated view frustum to any celestial coordinates. The orientation can be controlled by entering Right Ascension (R.A.) and Declination (Dec.) on an external webpage.

*Mars:* This profile adds visualizations for the NASA Interior Exploration using Seismic Investigations, Geodesy and Heat Transport (InSight) mission, including a trajectory towards Mars, model of lander, entry into the Martian atmosphere, and subsequent descent and landing on November 26, 2018; and NASA's Mars 2020 mission, including a trajectory and model of Perseverance rover on the surface.

*Messenger:* This profile contains a model and trajectory of the NASA MESSENGER spacecraft with craft pointing data from March to June 2011. In addition, a rendering of Mercury's magnetosphere based on data recorded by MESSENGER can be enabled and viewed around the planet. Along with the mission data, additional maps were added to Mercury showing element abundances on the surface and a multi-color mosaic from the Mercury Dual Imaging System (MDIS) instrument.

*New Horizons:* This profile shows the acquisition of NASA New Horizons' images of the Plutonian system in July 2015. The profile starts at around 10:00 GMT on July 14, about 10 minutes before a new image campaign starts. By selecting Pluto as the Focus and moving time faster, you can see the imprint of the instrument's field-of-view on the planetary surface and see the images being projected. A timer on the top left of the screen shows when the next image is being taken.

*Night Sky*: This profile visualizes the night sky from Earth. The profile starts on Earth, with a camera view of the horizon and night sky. Users can adjust the date and time settings to view the sunrise and sunset.

*Offline*: This profile includes low resolution maps of planets that do not require internet connection.

*OSIRIS-REx:* This profile demonstrates the entire lifetime of the NASA OSIRIS-REx (Origins, Spectral Interpretation, Resource Identification, Security, Regolith Explorer) spacecraft on its way to the 101955 Bennu asteroid and its subsequent journey back to Earth. The profile starts at Earth before the spacecraft's launch and has information throughout the entire mission until the sample's 2023 landing back in Utah. Models of OSIRIS-REx and Bennu are available, as well as a preliminary instrument timing and some of the imaging campaign, which uses the same projection technique as employed in the New Horizons and Rosetta profiles.

*Rosetta:* This profile shows the entire mission of the ESA Rosetta spacecraft around comet 67P, also known as Churyumov-Gerasimenko. The spacecraft's images are projected onto the comet and the separation of the Philae lander is visible as well.

*Solar Storm 2012:* This profile, created in collaboration with NASA GSFC's Community Coordinated Modeling Center (CCMC), shows several coronal mass ejections (CMEs) during July 2012.The interaction of the flow of the solar wind and Earth's magnetosphere is simulated by CCMC's Bats-R-US code, and the ENLIL real-time solar wind application is used as a volumetric dynamic simulation visualization. There is also a one time step of the PFSS model showing the Sun's local magnetic structure.

*Today's Sun:* This profile shows the state of the magnetic field around the Sun.

*Voyager:* This profile contains the NASA Voyager 1 and Voyager 2 missions as they were launched from Earth in the 1970s and observed the gas giants in the solar system. The spacecraft models are included and are pointed accurately throughout the mission. Position and orientation information are available until the second half of the 21st century.

# VIII. Appendix - Attached Information

OpenSpace Funded ISI Partner Meeting Agenda

OpenSpace User Meeting Agenda

OpenSpace

Annual ISI Partner Meeting
July 30, 2025 | American Museum of Natural History
*Room: Studio 2, Gilder Floor 4*

| | |
|---|---|
| 9:00-9:30 am | **Breakfast** |
| 9:30-9:45 am | **I. Welcome** (15 min)<br>*Facilitator: Ro* |
| 9:45-10:15 am | **II. SciAct Grant 2.0 Progress** (30 min)<br>*Facilitators: Ro* |
| 10:15-11:15 am | **III. Look Back & Release Updates** (60 min)<br>*Facilitators: Micah & Alex*<br>● Recap version 0.21.0 |
| 11:15-12:00 pm | **IV. Evaluation Updates** (45 min)<br>*Facilitators: Kate* |
| 12:00-1:00 pm | **Lunch** |
| 1:00-2:30 pm | **V. ISI Partner Share Outs** (1.5 hours; 25 min per partner)<br>● Adler, Cal Academy, DMNS<br>● 15 min presentation plus 10 min discussion for each partner |
| 2:30-2:45 pm | **Break** |
| 2:45-4:15 pm | **VI. ISI Partner Share Outs Continued** (1.5 hours; 25 min per partner)<br>● HMNS, NCMNS, AMNH, Wisdome |
| 4:15-5:00 pm | **VII. Future and Wrap Up** (45 min)<br>● What we know about NASA 3.0<br>● What does the future of OpenSpace post-grant look like for your organization? |
| 5:15-6:45 pm | **VIII. Dome Show** (1.5 hours)<br>● Partners present on dome<br>● Version 0.21.0 highlights |
| 7:00 pm | **Dinner** *Tacombi - 377 Amsterdam Ave* |

OpenSpace

OpenSpace User Meeting
Thursday, July 31, 2025 | American Museum of Natural History

*Room: Davis classrooms, Floor 2*

| | | |
|---|---|---|
| 9:00 am | Breakfast available | |
| 9:30-9:45 am | **Welcome** | |
| 9:45-10:45 am | **Kickoff: Community, Updates & What's Ahead**<br>*Facilitators: Alex Bock, Megan Villa* | |
| 10:45-12:15 pm<br>*Concurrent sessions* | **OpenSpace 101 Workshop**<br>Learning with Data Lab<br>*Facilitator: Micah Acinapura* | **Coding, Scripts & Custom Navigation Workshop**<br>Davis classrooms<br>*Facilitator: Alex Bock* |
| 12:15-1:15 pm | **Lunch** | |
| 1:15-2:15 pm<br>*Concurrent sessions* | **ShowComposer Basics**<br>Learning with Data Lab<br>*Facilitator: Micah Acinapura* | **Content Import (Map layers, GDAL) Workshop**<br>Davis classrooms<br>*Facilitator: Alex Bock* |
| 2:15-3:15 pm | **Creating Rendered Video**<br>*Facilitator: James Hedberg* | |
| 3:15-3:35 pm | **Break** | |
| 3:35-4:15 pm | **Configuration Files**<br>*Facilitator: Alex Bock* | |
| 4:30-5:00 pm | **Encounters in the Milky Way Planetarium Show** \| Hayden Planetarium | |
| 5:15-7:00 pm | **Lightning Presentations** \| Hayden Planetarium<br>● *Carlsbad Caverns and mantle plumes visualizations,* Kachun Yu<br>● *Night Sky*, Ken Murphy<br>● *Making of the Space Show*, Jackie Faherty and Carter Emmart<br>● *Cosmic View of Life*, Brian Abbott, Jackie Faherty, and Hollister Herhold | |

OpenSpace

OpenSpace User Meeting
Friday, August 1, 2025 | American Museum of Natural History

*Room: Davis classrooms, Floor 2*

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|---|---|---|
| 9:00 am | Breakfast available \| Davis classrooms | |
| 9:15-10:30 am | **Lightning Presentations** \| Hayden Planetarium<br>● *Astrobiology,* Hari Mogosanu and Sam Leske<br>● *Houston Museum of Natural Science,* Adam Barnes<br>● *Once Upon the Moon*, Carter Emmart<br>● *Version 0.21.0 updates* | |
| 10:45-11:45 am<br>*Concurrent sessions* | **OpenSpace 101 Continued - Included Profiles Workshop**<br>Davis East<br>*Facilitator: Micah Acinapura* | **3D Models and Trajectory Data Workshop**<br>Davis West<br>*Facilitator: Alex Bock* |
| 11:45-12:30 pm<br>*Concurrent sessions* | **OpenSpace 101 Custom Profiles Workshop**<br>Davis East<br>*Facilitator: Micah Acinapura* | **Jam Session (Add your own assets!)**<br>Davis West<br>*Facilitator: Alex Bock* |
| 12:30-1:30 pm | **Lunch** | |
| 1:30-2:15 pm<br>*Concurrent sessions* | **Portable Planetariums**<br>Davis East<br>● Josh Roberts<br>● *OpenSpace and MediaShow,* Pat Reiff and Adam Barnes<br>● *Tips for Portable Domes,* Micah Acinapura | **Multi-Channel Domes**<br>Davis West<br>● *OpenSpace at Towson University Planetarium,* Christian Ready<br>● *OpenSpace at California Academy of Sciences,* Dylan Salas<br>● *Multi Channel C-Play and C-Troll,* Alex Bock |

OpenSpace

| | | |
|---|---|---|
| 2:15-3:15 pm<br>*Concurrent sessions* | **Engaging Audiences**<br>Davis East<br>● *The Sun's Fury: An OpenSpace Live & Interactive Planetarium Show*, Ellen Thompson<br>● *Guest Driven Exploration with OpenSpace at DMNS*, Vincent Morris<br>● *Presentation Tips*, Jacqueline Benitez<br>● *Public Programming and Exhibits*, Rachel Smith | **Custom Data Examples**<br>Davis West<br>● *HamSCI in OpenSpace*, Kristina Collins<br>● *Visualizing TESS data in OpenSpace*, Mark Popinchalk<br>● *Visualizing Mars Data*, Skylar Herman<br>● *Earth Data*, Micah Acinapura |
| 3:15-3:45 pm | **Break** | |
| 3:45-4:30 pm | **OpenSpace Hub**<br>*Facilitator: Alex Bock* | |
| 4:30-5:30 pm | **Wrap Up** | |
| 5:30-5:35 pm | **Group Photo** | |
| 5:35-6:30 pm | **Invisible Worlds Free Flight**<br>● *Invisible Worlds film*<br>● *Mars,* Brian Abbott<br>● *OpenSpace Requests* | |

OpenSpace

OpenSpace User Meeting
Saturday, August 2, 2025

*Location: Pier 83, New York, NY 10036*

| | |
|---|---|
| 10:45 am | **Arrive to Pier 83** |
| 11:30-1:00 pm | **Circle Line Boat Tour**<br>*1.5 hour tour around lower Manhattan* |