QUARTERLY NEWSLETTER ■ APRIL-SEPTEMBER 2024 ■ ISSUE 46

A note from Pam Sullivan, GEO director:

We successfully launched the final satellite in the GOES-R Series! Congratulations to the team for achieving this milestone! After reaching geostationary orbit on July 7, GOES-U was renamed GOES-19. Post-launch testing is underway, and I look forward to GOES-19 becoming GOES East next April. GOES-19 hosts a new space weather instrument, CCOR-1, on behalf of NOAA's Space Weather Follow-On Program, which will observe the solar corona and provide critical data for space weather forecasting. There has also been a lot of progress on GeoXO. We selected vendors to build the spacecraft and the ACX, OCX and LMX instruments and are on track to complete the Mission Definition Review in late 2024. As we work to close out one program and turn our focus to the next generation, I'd like to extend my gratitude to everyone who makes our mission a resounding success.

GOES-R HIGHLIGHTS

GOES-U lifted off at 5:26 p.m. EDT on June 25, 2024, from NASA's Kennedy Space Center (KSC) aboard a SpaceX Falcon Heavy rocket. At 10:18 p.m., mission managers confirmed the first-stage deployment of the satellite's solar array, and the spacecraft began operating on its own power. View additional launch photos and watch videos of the launch. Watch the NASA GOES-U launch broadcast, co-hosted by NOAA's Alek Krautmann.

The SpaceX Falcon Heavy rocket carrying NOAA's GOES-U satellite lifts off from Launch Complex 39A. Photo credit: SpaceX

The SpaceX Falcon Heavy dual side boosters land on SpaceX Landing Zones 1 and 2 at Cape Canaveral Space Force Station in Florida. Photo credit: SpaceX

DID YOU KNOW: **GOES-U was the first NOAA satellite to launch on a Falcon Heavy rocket.**

On May 29, 2024, NOAA held a GOES-U virtual media briefing. Experts from NOAA, NASA, Lockheed Martin and L3Harris previewed the GOES-U mission and upcoming launch and answered questions from the media. View video of the media briefing.

The mission operations team conducted the final GOES-U mission rehearsal on June 4-6, 2024, at the NOAA Satellite Operations Facility in Suitland, Maryland. This event was a dress rehearsal for flight and ground launch and orbit-raising support and final practice for flight operations ahead of the June 25 launch.

On June 6, 2024, NOAA and NASA hosted a media availability to view and photograph the GOES-U satellite at the Astrotech Space Operations payload processing facility in Titusville, Florida. Subject matter experts from NASA, NOAA, Lockheed Martin and L3Harris Technologies provided a mission overview and answered questions about the satellite's capabilities to assist meteorologists with predicting, observing, and tracking hazardous weather events on Earth and in space. The event gave the media a last look at the final satellite in NOAA's GOES-R Series before technicians prepared it for launch.

Members of the news media had an up-close look at the GOES-U satellite inside the Astrotech Space Operations Facility in Titusville, Florida. Photo credit: NASA/ Kim Shiflett

Encapsulation of GOES-U in the rocket fairings. Credit: NASA/Ben Smegelsky

On June 13, 2024, technicians encapsulated the GOES-U satellite inside two payload-fairing halves in preparation for connecting it to the Falcon Heavy rocket that would launch the satellite into space. During the ascent phase of the launch, the fairing halves protected GOES-U from aerodynamic pressure and heating. Once GOES-U no longer required this protection, approximately four minutes after liftoff, the halves were jettisoned and returned to Earth, where SpaceX crews recovered them for future missions.

NOAA and NASA experts discussed the GOES-U mission and upcoming launch as part of the NASA Goddard Space Flight Center (GSFC) "Engage" series on June 13, 2024. Organized by the Goddard Office of Communications, "Engage" connects GSFC employees with the center's missions, programs and projects. The GOES-U event consisted of a panel discussion, followed by questions from the audience.

GOES-U GSFC "Engage" session. Photo credit: NOAA

On June 15, 2024, GOES-U, encapsulated in its protective payload fairing, arrived at NASA KSC and SpaceX's hangar at Launch Complex 39A. Crews began transporting the satellite from the Astrotech Space Operations Facility in Titusville, Florida, on June 14, with the operation finishing early on June 15. Next, the encapsulated GOES-U was connected to the SpaceX Falcon Heavy rocket ahead of rolling the stack out to the launch pad.

GOES-U leaving Astrotech for Space Launch Complex 39A. Photo credit: NASA/ Ben Smegelsky

NASA, NOAA, SpaceX, and GOES-U mission managers met on June 20, 2024, to conduct a Flight Readiness Review at KSC. During the review, teams provided a mission status update and certified the readiness to proceed with final launch preparation activities.

NASA and SpaceX gave the 'go' for the launch of NOAA's GOES-U satellite following a successful Launch Readiness Review at KSC on June 24, 2024.

The SpaceX Falcon Heavy rocket carrying NOAA's GOES-U satellite rolled out from the hangar to the launch pad at Space Launch Complex 39A at NASA's KSC on June 24, 2024. View additional photos of the rollout and the rocket vertical on the launch pad.

The Falcon Heavy carrying GOES-U rolls out from the hangar toward the launch pad. Photo credit: SpaceX

On June 24-25, 2024, KSC invited digital content creators to experience the GOES-U launch and promote it to their followers. The content creators interacted with NOAA and NASA experts, participated in tours of KSC, saw the Falcon Heavy rocket carrying GOES-U at the launch pad, attended a special event with NOAA Hurricane Hunters, and watched the launch from the KSC press site. A NASA Social panel discussion was live-streamed on June 24.

GOES-U NASA Social participants with a NOAA G-IV Hurricane Hunter aircraft at NASA's Launch and Landing Facility at KSC. Photo credit: NASA

The NASA EDGE live GOES-U prelaunch show aired on June 24, 2024. The show featured footage of the GOES-U rollout to the launch pad and live and pre-recorded interviews with NOAA and NASA experts.

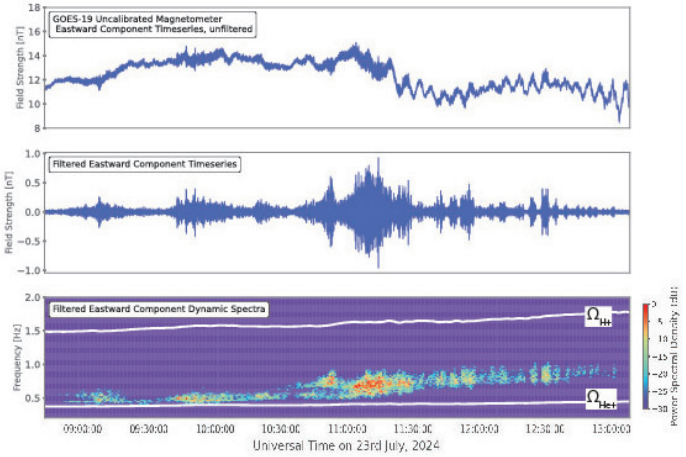
GOES-U science briefing panel participants. Photo credit: NASA/Kim Shiflett

Two GOES-U pre-launch press briefings were held at KSC on June 24. The GOES-U science briefing and prelaunch news conference featured high-level officials and subject matter experts from NOAA, NASA, Space X and the U.S. Space Force 45th Weather Squadron discussing the science behind the mission and the upcoming launch. Panelists also answered questions from the media.

NOAA and NASA conducted a media live shots/morning news event on the morning of the GOES-U launch on June 25, 2025. During this event, media virtually conducted short interviews with subject matter experts from NOAA and NASA about the GOES-U mission and upcoming launch. Subject matter experts participated in 95 interviews in both English and Spanish, with local, national and international media outlets.

On July 7, 2024, GOES-U executed its final engine burn, placing the satellite in geostationary orbit 22,236 miles above Earth. Upon reaching this milestone, GOES-U was renamed GOES-19. GOES-19 performed its second-stage solar array deployment on July 8. A series of maneuvers were conducted in the following days to place GOES-19 in its 89.5 degrees west longitude initial checkout position. The Post-Launch Test Readiness Review was completed on July 24 and post-launch testing and calibration are now underway.

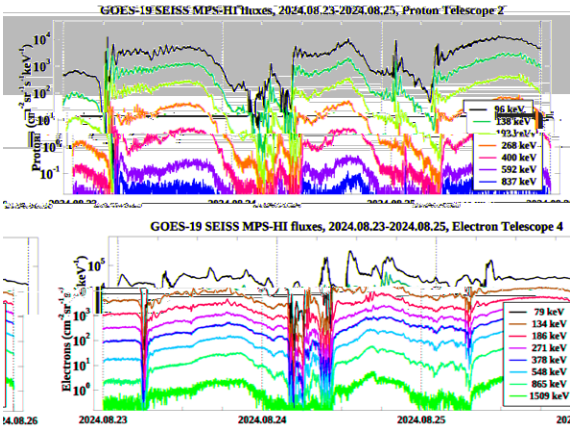
NOAA shared the first data from the GOES-19 Goddard Magnetometer (GMAG) instrument on Aug. 13, 2024. On July 23, 2024, the GOES-19 GMAG captured a space weather phenomenon known as electromagnetic ion cyclotron waves. These waves play a significant role in controlling the levels of dangerous energetic particles that can cause damage to satellites and harm astronauts. GOES-19 GMAG data will help NOAA's Space Weather Prediction Center (SWPC) better forecast the likelihood that elevated levels of dangerous energetic particles will occur during space weather events.



First public GOES-19 GMAG data: Image credit: NOAA/NASA

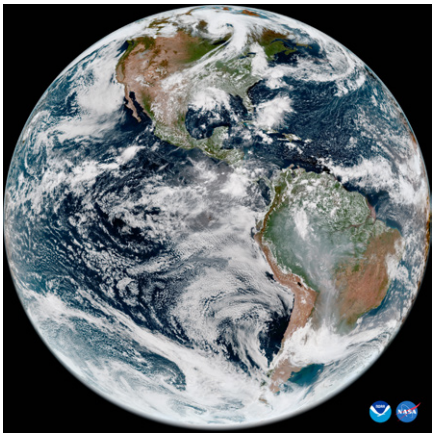
On Sept. 4, 2024, NOAA released the first data from the GOES-19 Space Environment In-Situ Suite (SEISS) instrument. The GOES-19 SEISS detected several radiation belt disturbances on Aug. 23-25, 2024. The radiation belts are regions of space around Earth filled with energetic electrons and protons that can damage or interfere with satellite

electronics. Forecasters at SWPC will use GOES-19 SEISS data to issue solar radiation storm and radiation belt alerts.



First public GOES-19 SEISS data. Image credit: NOAA/NASA

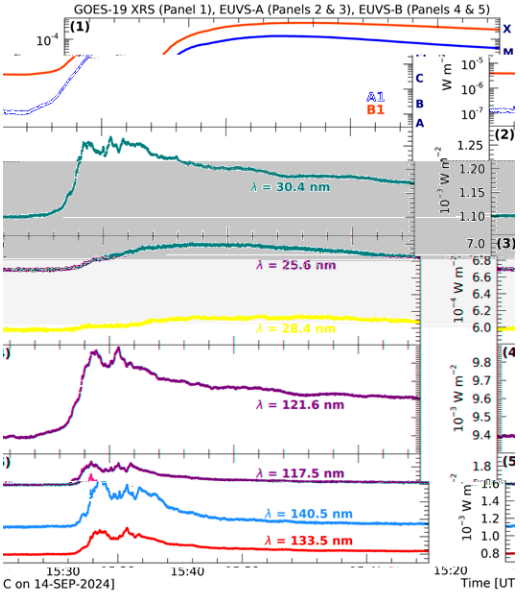
On Sept. 18, 2024, NOAA debuted the first Advanced Baseline Imager (ABI) imagery from GOES-19. ABI observed many weather events, environmental phenomena and striking views of Earth. Wildfires in the Midwest and the Amazon blanketed nearby areas with smoke. Storms flared up over the Southeast and a low-pressure system over Canada brought severe weather. Tropical Storm Francine formed in the Gulf of Mexico and quickly developed into a hurricane, making landfall in Louisiana.



First public GOES-19 GeoColor full disk image, captured Aug. 30, 2024. Image credit: NOAA/NASA

GOES-19 also captured mesmerizing von Kármán vortices around Guadalupe island, cloud streets over Virginia, and cumulus clouds over the Midwest.

NOAA shared the first data from the GOES-19 Extreme Ultraviolet and X-ray Irradiance Sensors (EXIS) on Sept. 24, 2024. On Sept. 14, 2024, EXIS observed an X-class "extreme" solar flare that erupted from an active region of the sun that had just rotated into Earth's view. Solar flares are huge eruptions of energy on the sun and often produce clouds of plasma traveling more than a million miles per hour. When these plasma clouds reach Earth, they can cause radio communications blackouts, disruptions to electric power grids, errors in GPS navigation, and hazards to satellites and astronauts. This flare resulted in aurorae visible as far south as Texas. EXIS data will provide SWPC with early indications of impending space weather storms so forecasters can issue alerts, watches and warnings.



First public GOES-19 EXIS data.Image credit: NOAA/NASA

GeoXO HIGHLIGHTS

NASA selected vendors for the remaining GeoXO development work. BAE Systems was awarded contracts to develop the Atmospheric Composition (ACX) and Ocean Color (OCX) instruments. ACX will provide hourly observations of air pollutants emitted by transportation, power generation, industry, oil and gas extraction, volcanoes, and wildfires as well as secondary pollutants generated from these emissions once they are in the atmosphere. OCX will observe ocean biology, chemistry and ecology to assess ocean productivity, ecosystem change, coastal and inland water quality, seafood safety, and hazards like harmful algal blooms. NASA selected Lockheed Martin to develop the GeoXO spacecraft and lightning mapper. The GeoXO constellation will include three operational satellites — east, west and center. Each geostationary, three-axis stabilized spacecraft is designed to host three instruments. The GeoXO Lightning Mapper (LMX) will detect, locate and measure the intensity, duration and extent of lightning flashes to help forecasters analyze severe storms, increase warning lead time for hazardous weather, and provide an earlier indication of impending lightning strikes to the ground.

The GeoXO Sounder (GXS) instrument System Requirements Review/System Definition Review was held on July 9-11, 2024. The Goddard Systems Review Team determined the GXS is well-positioned to proceed into the preliminary design phase.

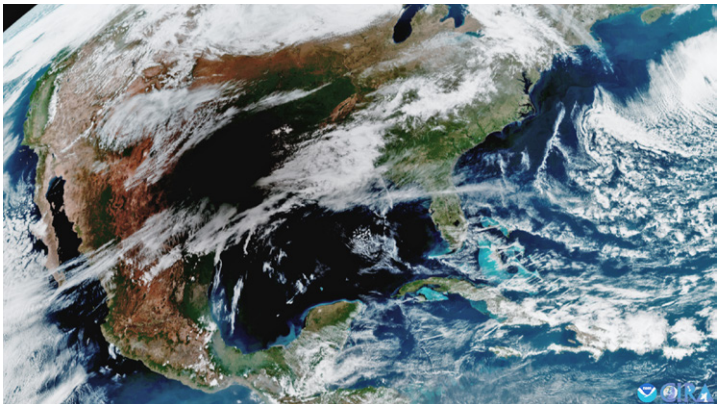
GeoXO HIGHLIGHTS (CONTINUED)

The GeoXO program held a combined ACX and OCX kickoff meeting with BAE Systems on Aug. 20-23, 2024, and a spacecraft kickoff meeting with Lockheed Martin on Aug. 26-30, 2024. The kickoff meetings reviewed the requirements documents for ACX, OCX and the GeoXO spacecraft to ensure the vendor and government teams were on the same page for each requirement.

GeoXO spacecraft team at the kickoff meeting in August 2024. Credit: Lockheed Martin

SCIENCE

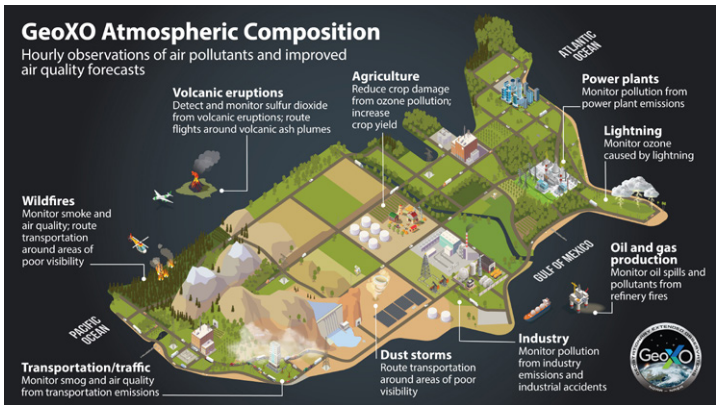
On April 8, 2024, the moon moved directly between Earth and the sun, completely blocking the sun's light and causing a total solar eclipse. During this event, the moon's shadow passed over parts of Mexico, the United States, and Canada, and millions of people were treated to a celestial show where the sky darkened as if it were dawn or dusk throughout its path of totality. NOAA satellites play a crucial role in observing solar eclipses and their effects. GOES-16 (GOES East) and GOES-18 (GOES West) watched the moon's shadow pass over Earth. The satellites also captured the eclipse shadow's effects on surface weather, including the drop in land and air surface temperatures, and the dissipation of clouds.



GOES-16 GeoColor imagery of the moon's shadow over the U.S. during the Apr. 8, 2024, total solar eclipse. Image credit: NOAA/CIRA

NOAA conducted the GOES-R and JPSS (Joint Polar Satellite System) Hazardous Weather Testbed 2024 spring experiment from May 13 through June 7, 2024. During the experiment, National Weather Service (NWS) forecasters evaluated five experimental satellite data products in a real-time simulated short-term forecasting, decision support service, and warning environment. Visiting scientists also attended the experiment to provide additional product expertise and interact directly with operational forecasters.

A new web feature highlights the importance of future atmospheric composition observations from NOAA's next-generation GeoXO satellite system. By providing continuous observations and measurements of atmospheric composition, ACX data will improve air quality forecasting and monitoring and mitigate health impacts from severe pollution and smoke events, such as asthma, cardiovascular disease and neurological disorders. ACX will provide scientists with finer-scale atmospheric data to better understand the subtle links between Earth's atmosphere, weather and climate.



ACX capabilities infographic. Image credit: NOAA

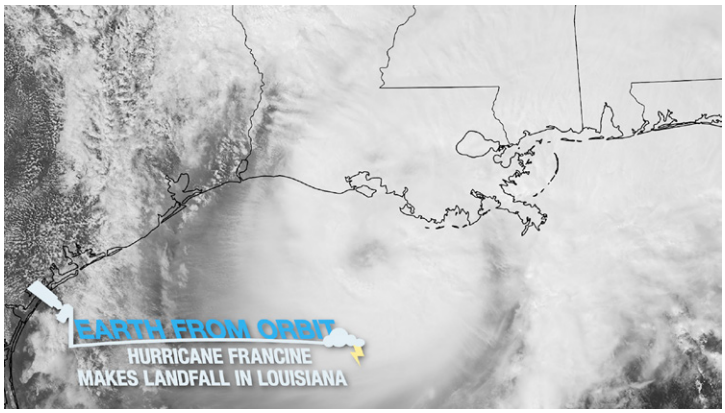
From their unique view, satellites can observe the deep swirling hues and colors of the ocean. With data from NASA's PACE (Plankton, Aerosol, Cloud, ocean Ecosystem) mission now available, NOAA and NASA are collaborating to develop applications for monitoring various indicators of ecosystem health. NOAA is also preparing for a more advanced ocean color instrument to be flown on its future GeoXO mission. OCX will continuously monitor and provide fine-scale data about U.S. coastal waters and the Great Lakes. Its higher-resolution imagery will improve observations of water clarity, chlorophyll concentrations,

and help distinguish different types of phytoplankton. OCX observations will support ecological forecasters, marine resource managers, fisheries, health departments, water treatment managers, and the commerce, recreation, and tourism industries.

On July 23, 2024, the Biden-Harris administration announced it is taking additional steps to safeguard western communities in the face of increasingly dangerous and intense wildland fires by building advanced wildfire detection capabilities using satellite technology. The Department of the Interior and the U.S. Department of Agriculture (USDA)'s Forest Service signed an agreement with NOAA to use GOES-R Series satellite data to rapidly detect and report wildfire starts. GOES-R data will enable the Interior and Agriculture Departments to detect wildfires early, provide firefighters a more detailed look at wildfire conditions, allow faster hot spot detection, and provide the ability to track wildfire progression in real time.

EDUCATION AND OUTREACH

The GEO Program, in partnership with JPSS, NOAA Satellite and Information Service (NESDIS), NASA GSFC, and the Cooperative Institute for Research in the Atmosphere (CIRA) produced 11 "Earth from Orbit" videos during the second and third quarters of 2024. Earth from Orbit is a series of short videos that showcase a compelling weather event, environmental hazard, or interesting meteorological phenomenon, as seen by NOAA satellites. A web article with additional information accompanies each video.



Earth from Orbit: Hurricane Francine Makes Landfall in Louisiana. Image credit: NOAA/NASA

On April 13, 2024, NASA GSFC's Visitor Center hosted a "Saturday Science is #ReadyToGOES" event. This event focused on the GOES-R Program, highlighting its benefits and the upcoming launch of GOES-U. During the event, participants heard from NOAA and NASA experts about how GOES-R satellites help us every day, particularly with weather forecasting, severe storm warnings and environmental hazard monitoring. Participants also engaged in hands-on activities and demonstrations to learn more about the science of GOES.

On Apr. 23, 2024, GEO personnel supported the NASA-NOAA STEM (science, technology, engineering and math) Day at DuVal High School in Lanham, Maryland. Aerospace Engineering and Aviation Technology Program students learned about NASA and NOAA programs in the morning, rotating through staffed tables highlighting missions including GOES-U and GeoXO. During a panel discussion with NOAA Hurricane Hunter pilots and NOAA and NASA scientists, DuVal students asked questions of the experts about their careers and experiences at NOAA and NASA. The event helped to foster student interest in pursuing STEM careers.

Panel discussion at the STEM event hosted at DuVal High School on Apr. 23, 2024. Photo credit: NOAA

On May 13, 2024, the Cooperative Institute of Meteorological Satellite Studies (CIMSS) at the University of Wisconsin-Madison announced the winning projects for the 2024 GOES Virtual Science Fair. During the virtual science fair, middle and high school students worked with GOES satellite data to investigate weather and natural hazards and conveyed their projects with scientific posters. High school submissions also required a short video where students explain their project, similar to a poster session at a professional conference. By offering authentic STEM engagement to a pre-college audience, this activity serves as a pipeline to society's scientists of tomorrow and NOAA's future workforce.

The GOES-R Program, NOAA SciJinks and NASA Space Place conducted the GOES-U art challenge in May 2024. The team challenged kids to draw how they imagine

EDUCATION AND OUTREACH (CONTINUED)

lightning looks either within the clouds or striking the ground, from above the sky or from their windows. NESDIS highlighted the winning selections online on June 4, and NASA featured them during the GOES-U launch broadcast.

Collage of GOES-U art challenge selections. Image credit: NOAA SciJinks

A new video and poster from NOAA SciJinks explain space weather for an elementary school audience. The resources highlight how space weather can affect us on Earth and how forecasters at NOAA's SWPC use observations from GOES-R Series satellites to issue alerts and warnings about space weather that could harm satellites, communications, navigation systems and the power grid.

What is space weather? Image credit: NOAA SciJinks

For nearly 50 years, NOAA and NASA have partnered to develop NOAA's geostationary satellites as part of the most sophisticated weather-observing, environmental monitoring and space weather monitoring satellite system in the world. A new video, "From GOES to GeoXO: Past Highlights to Future Horizons," offers a retrospective of the GOES legacy and a look to the future with GeoXO.

From GOES to GeoXO: Past Highlights to Future Horizons. Image credit: NASA Goddard Space Flight Center

On June 25-26, 2024, the NASA KSC Office of STEM Engagement hosted over 100 middle-school students and adult guests from underserved and underrepresented communities across 10 states for the GOES-U launch. Participants engaged in hands-on activities, toured KSC and attended the GOES-U launch. The GEO Program provided a GOES-U mission overview during a series of workshops on June 25.

CIMSS conducted a GOES-U teacher's workshop at the KSC Center for Space Education on June 25, 2024. Twenty-two K-12 educators from across the United States and Puerto Rico attended the four-hour professional development session where they learned about the GOES-U mission from NOAA and NASA subject matter experts. Participating teachers also watched the historic launch of GOES-U from KSC.

GOES-U teacher's workshop participants. Photo credit: CIMSS

CONFERENCES AND MEETINGS

The first NOAA GeoXO ACX Science Team meeting was held May 7-9, 2024, at the NOAA Center for Weather and Climate Prediction in College Park, Maryland. Presentations spanned algorithm development, data assimilation, validation, and value studies of the recently launched NASA TEMPO (Tropospheric Emissions: Monitoring of Pollution) mission and future GeoXO ACX for air quality applications.

GEO user engagement personnel conducted a "roadshow" in South Florida on July 16-18, 2024. The team visited numerous organizations to present information about GOES data products and dissemination and future GeoXO capabilities. They also engaged users to gather feedback on NESDIS data products and services.

CONFERENCES AND MEETINGS (CONTINUED)

The visits provided valuable insight into current user needs and challenges and paved the way for new working relationships.

GeoXO user engagement team with National Hurricane Center personnel. Photo credit: NOAA

The GEO Program user engagement team recently kicked off the NOAA Satellite Applications Symposium Series. On July 29, 2024, NESDIS hosted "The Future of Aquatic Modeling and Productivity for Ocean Health" to advance engagement and readiness for the next generation of ocean color satellites, largely focused on future observations from the GeoXO OCX instrument. On Aug. 13, 2024, NESDIS hosted "GEO/LEO Updates and Our Next Gen Satellites" to provide updates about new data available, satellite instrument development progress, and give users a chance to provide feedback on their changing needs and challenges. This event focused on advancing engagement and readiness for the newest and next generation of NOAA weather satellites.

The GEO Program participated in the NOAA Alaska NextGen Satellite Workshop on Sept. 10-12, 2024, in Anchorage, Alaska. The workshop allowed NOAA satellite data users in Alaska to interact with satellite product developers. Data users communicated their needs for data and services to make good decisions, and product developers highlighted their work and how it can benefit Alaskans. The meeting sparked new partnerships and collaborations and resulted in an increased understanding of what it is like to live in one of Alaska's rural communities.

NOAA held the 2024 Lightning Science Meeting on Sept. 24-26, 2024, in Huntsville, Alabama, and virtually. The meeting highlighted GOES-R and GeoXO program status, updates from international partners, lightning instrument validation studies, lightning modeling information, and many operational uses of Geostationary Lightning Mapper data.

2024 Lightning Science Meeting attendees. Photo credit: NOAA

AWARDS

The GOES-R level 2+ product generation cloud team received the 2024 NESDIS Outstanding Information Technology and Engineering Team Member Award. The team was honored for their outstanding achievements in advancing the capabilities of the GOES-R program through their innovative proof of concept and prototype activities.

NASA recognized several GEO Program individuals with Robert H Goddard Awards for their achievements.

Customer Service

- Dan May
- Steve Kramer

Leadership

- John Deily

Professional Administrative

- Ann Kearney

The GOES-18 split post-launch testing/data interleave team received the 2023 NOAA Administrator's Award for developing the novel GOES-18 split post-launch test campaign and interleave data distribution capability to restore GOES West imagery. The NOAA Administrator's Awards recognize employees who have demonstrated exceptional leadership, skill, and ingenuity in their significant, unique, and original contributions that bring unusual credit to NOAA, the Department of Commerce and the federal government.

Renee Dudley was the September 2024 NOAA Team Member of the Month. Over the past six years, Renee oversaw the development of the new CCOR-1 instrument, the first-ever coronagraph on a NOAA operational satellite. Renee overcame many issues and delays to achieve the successful launch of CCOR-1 on the GOES-U satellite.

MEET THE TEAM

In this issue, meet Andy Latto, GeoXO's user engagement lead. In this role, Andy supports the mission by connecting with users of geostationary satellite data to help inform mission development, ensure users are trained and ready to receive the data, and confirm the data supports their needs. Since the GeoXO constellation is planned to add new capabilities such as those for air quality and ocean color, Andy's role includes coordinating meetings with an array of stakeholders from those within NOAA such as NWS, Fisheries, and the Office of Atmospheric Research to agencies at the state and local levels and private industry.

Andy began working on the GeoXO program in December 2023, during his 15th year of serving NOAA. After graduating from Florida State University with a master's degree in meteorology, his NOAA career began as a meteorologist intern in the NWS at the Weather Forecast Office (WFO) in Flagstaff, Arizona. After serving in Flagstaff, Andy became a forecaster at the NWS WFO in Wilmington, Ohio. There, he issued warnings during numerous severe weather events, including a historic derecho in June 2012. He was heavily involved in the NWS Weather-Ready Nation program, helping to initiate decision support services at the Kentucky Speedway for the popular NASCAR race week. One of his proudest achievements while at that office was the initiation of a cooperative partnership between the Ohio Department of Transportation and the local NWS office, supporting electronic highway road weather advisories, which help to mitigate the loss of life and property during rapid onsets of hazardous weather.

In 2014, Andy joined the National Hurricane Center's Tropical Analysis and Forecast Branch (TAFB), where he developed an outreach webpage and a low-bandwidth display of graphical marine forecast data. The page was recognized with a National Isaac Cline Award, one of the highest achievements within the NWS. While at TAFB, Andy also initiated an annual Mariner's Decision Maker's Workshop and made further improvements to graphical methods of forecast dissemination, including developing briefing capabilities for the U.S. Coast Guard, gaining a Twitter following, and improving the unit's webpage.

Andy joined the Hurricane Specialist Unit in 2018 where he issued track, intensity and wind radii forecasts as well as associated watches and warnings for tropical cyclones in the Atlantic and eastern North Pacific Ocean basins. In the unit, he was involved in numerous outreach initiatives.

In 2022, Latto relocated to Maryland to serve at the NWS headquarters Analysis and Forecast Branch. There, he was a liaison between the field offices, headquarters and the modeling community to improve operations for NWS field forecasters.

When asked about his experience thus far in his position with GeoXO, Andy said, "I would say that my favorite part of my job is to witness the productive discussions between my colleagues who are the scientists responsible for developing the mission and the users of the satellite data."

Outside of his work, Andy focuses on spending time with his 7-year-old son and 2-year-old daughter and helping coach his son's baseball team. He loves to take his son to Jellystone Parks in the region and find new fun family activities to do now that they live in the mid-Atlantic area.

UPCOMING EVENTS

GeoXO OCX and ACX SRR/SDR
Oct. 28 – Nov. 1, 2024

GeoXO spacecraft SRR/SDR
Nov. 12-15, 2024

American Geophysical Union Annual Meeting
Dec. 9-13, 2024

GeoXO Mission Definition Review
Dec. 10-12, 2024

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