

# GOES-R and GeoXO

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## A Note from Pam Sullivan, GOES-R System Program Director:



Look at that beautiful picture of GOES-T! After successful Pre-Ship and Operational Readiness Reviews, our newest satellite is ready to ship to the Cape

and is on track for a Feb. 16 launch. GOES-U also had a big quarter, completing the ABI environmental test program and selecting the launch vehicle, this time a Falcon Heavy. Meanwhile, our GeoXO team completed Key Decision Point A and is preparing for the Milestone 1 review, which will formally initiate the new program. GeoXO also awarded Phase A study contracts for the Sounder instrument, starting us on the path to make hyperspectral sounding operational over the U.S. for the first time and leading to improved forecasting. Another highlight this quarter was the first-ever GOES-R Hackathon, during which teams of college students developed innovative solutions to contemporary environmental issues using GOES-R Series satellite data. The first-place team developed a smart phone app that uses GOES-R data to 3D print images of storms, hurricanes and other natural phenomena. As always, I am so proud of our team's accomplishments, and looking forward to what comes next!

## PROGRAM HIGHLIGHTS

**GOES-T completed a successful Pre-shipment Review on Aug. 18 and final pre-shipment testing.** The satellite is now in storage at Lockheed Martin in Littleton, Colorado, awaiting shipment to the Astrotech satellite processing facility in Florida to begin final preparations for launch. GOES-T is scheduled to arrive in Florida on Nov. 10.

**The GOES-T Operational Readiness Review was conducted Sept. 1-2.** The review established that the system is ready to transition into an operational mode. The flight and ground systems are ready to support pre-launch, launch, early operations, and post-launch testing. The Standing Review Board commended the program's high state of readiness, very experienced and engaged team, and the status of the data products, facilities, and plans.



GOES-T after completing environmental testing. Credit: Lockheed Martin

## DID YOU KNOW?

[September 10 is the climatological peak of the Atlantic hurricane season.](#) Around 75% of Atlantic seasons since the beginning of the satellite era in 1966 have had at least one named storm on September 10 and about 50% of seasons have had at least one active hurricane on that date.

## PROGRAM HIGHLIGHTS (CONTINUED)

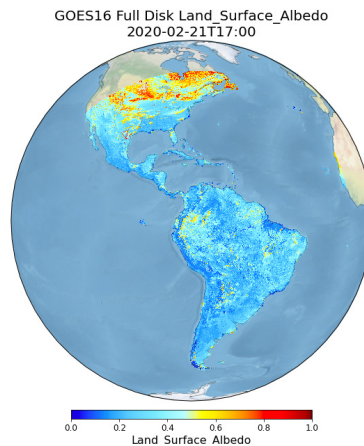
### **GOES-T is now scheduled to launch on Feb. 16, 2022.**

Changes to launch dates in missions scheduled ahead of GOES-T prompted NASA, NOAA, and United Launch Alliance to [coordinate the new target date](#) to optimize launch schedules for missions flying from Space Launch Complex-41 at Cape Canaveral Space Force Station in Florida.

**The GOES-T team conducted several rehearsals and tests to prepare for the upcoming launch.** Mission Rehearsal 3 was held July 12-26 and covered launch and orbit-raising nominal and contingency operations. Mission Rehearsal 4, conducted Sept. 13-17, focused on launch and orbit-raising critical events, including launch, backup orbit-raising plans, and geosynchronous station acquisition. Mission rehearsals use a satellite simulator and the ground system to train operations personnel and test the readiness of operational products and the ground system. The second GOES-T data operations exercise took place July 19-30 and covered the generation and distribution of GOES data products. During the second GOES-T countdown readiness test, conducted Aug. 18-20, the launch team exercised the launch countdown script in detail to prepare for deviations that could jeopardize launch integrity.

### **The GOES-16 and GOES-17 Advanced Baseline Imager (ABI) land surface albedo and bidirectional reflectance factor products are now provisionally validated,**

following a successful Peer Stakeholder – Product Validation Review (PS-PVR). Once a product reaches provisional maturity status, it is ready for operational use but is not yet fully validated. These products are now distributed through the Product Distribution and system and Comprehensive Large Array-data Stewardship System to the broader user community.

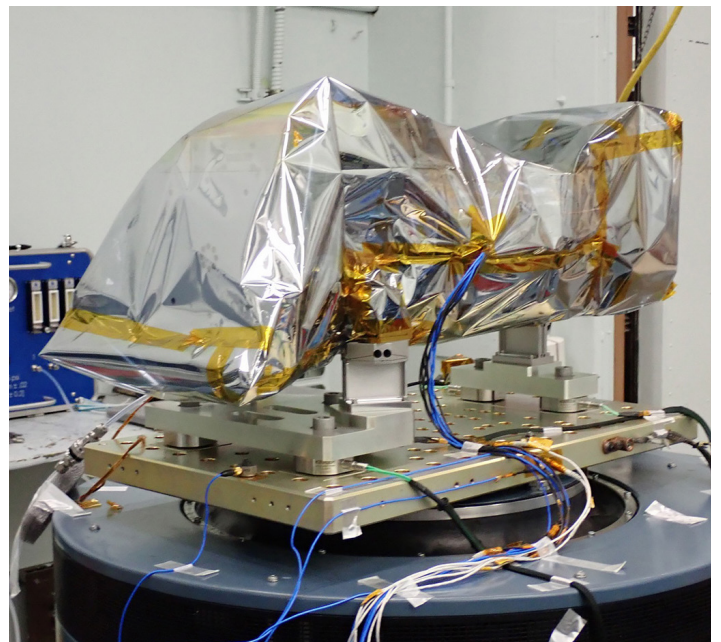


GOES-16 full disk land surface albedo data product. Credit: NOAA

**The GOES-17 Solar Ultraviolet Imager (SUVI) data product reached full validation maturity,** following a successful PS-PVR on Sept. 17. The data product is now fully validated and operational.

**The GOES-U launch services contract was awarded on Sept. 10. [NASA selected Space Exploration Technologies \(SpaceX\) to provide launch services for the GOES-U satellite.](#)** GOES-U is targeted to launch in April 2024 on a Falcon Heavy rocket from Launch Complex 39A at Kennedy Space Center in Florida.

**GOES-U development, testing, and integration continue.** The Compact Coronagraph completed magnetics testing, shock testing, and vibration testing, and the ABI completed additional thermal vacuum testing.



The GOES-U Compact Coronagraph undergoes vibration testing. Credit: NASA Goddard Space Flight Center

## GEOXO

**The GeoXO Program completed a successful Key Decision Point – A review in July.** The program was formally approved to begin the technology and development phase of the mission – Phase A. The joint NOAA/NASA Agency Program Management Council

affirmed the program addresses a critical need, and the proposed mission concept is feasible. During Phase A, the GeoXO Program will develop the final mission concept, system-level requirements, necessary technology developments, and program/project technical

management plans. Formal program initiation will occur following the Department of Commerce Milestone 1 decision gate, currently planned for Oct. 26.

**On July 19, NASA posted the GeoXO Atmospheric Composition (ACX) Request for Information (RFI),** to [seek information related to an instrument for air quality and environmental observations](#) under consideration to be a part of the NOAA GeoXO series of geostationary satellites.

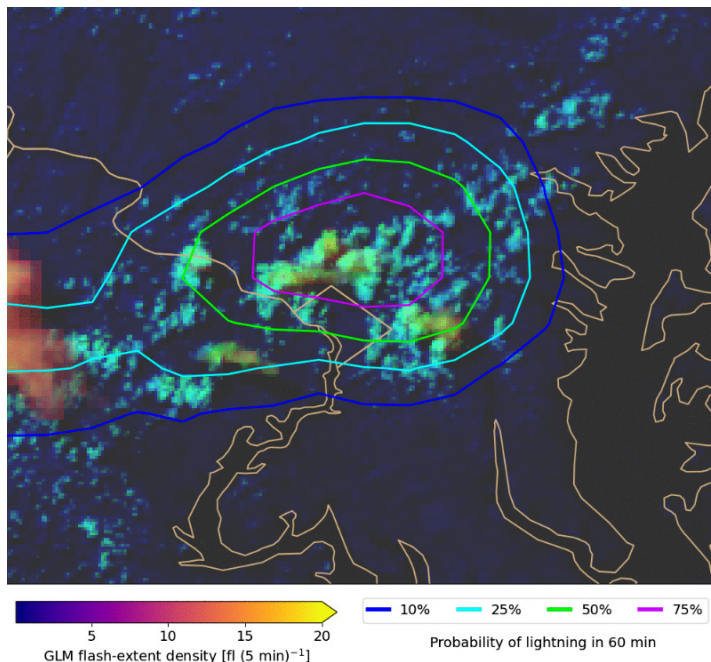
**NASA released the GeoXO Ocean Color (OCX) Phase A Study Request for Proposals (RFP)** on Aug. 25 to [solicit proposals for a definition-phase study of a geostationary Ocean Color instrument](#). OCX is a hyperspectral, ultraviolet

through infrared, passive imaging radiometer used to measure environmental data as part of a 3-axis stabilized, geostationary weather satellite system.

**On Sept. 30, NASA selected [Ball Aerospace & Technologies Corporation](#) of Boulder, Colorado, and [L3Harris Technologies Inc.](#) of Fort Wayne, Indiana, to conduct GeoXO Sounder (GXS) Phase A Studies.** Each company will provide a definition-phase study of a geostationary hyperspectral infrared sounder instrument. The studies cover both instrument design and technology development efforts and are planned for 20 months.

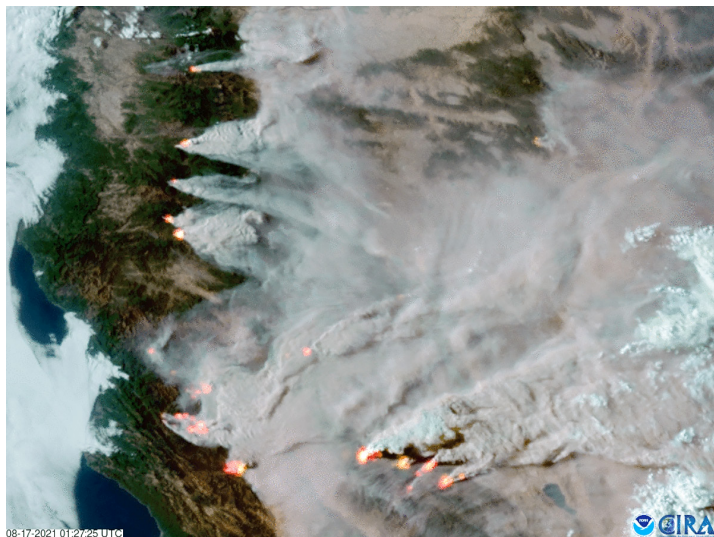
## IMAGERY AND SCIENCE APPLICATIONS

**Lightning is a major hazard.** It's a significant threat to life and property, can ignite wildfires, and impacts travel. The GOES-R Geostationary Lightning Mapper (GLM), the first instrument of its kind in geostationary orbit, has revolutionized lightning detection. [Now, scientists are using data from the GOES-R ABI to predict where GLM will observe lightning in the future.](#) To accomplish this, a sophisticated machine-learning algorithm was trained to recognize complex patterns in GOES-R ABI imagery that often precede lightning activity detected by GLM. The new tool can accurately predict lightning up to 60 minutes before the first observation of lightning flashes.



Probability of lightning over the Washington, D.C. area on July 7. Credit: NOAA

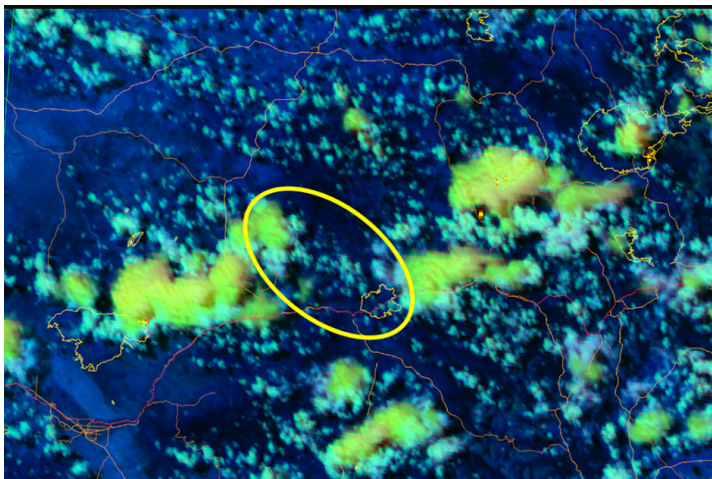
**The western U.S. is experiencing another intense fire season amid extreme heat and drought.** As of Sept. 30, 46,190 fires had burned 5,911,020 acres since the beginning of 2021. GOES-16 (GOES East) and GOES-17 (GOES West) have been instrumental in aiding wildfire detection and monitoring efforts by [detecting heat signatures and pinpointing where and how intense each fire hot spot is.](#) Large swaths of the U.S. were blanketed in thick smoke from the fires and the [satellites provide critical data for monitoring the smoke and its air quality effects as well as informing response efforts.](#) Some of the most intense fires have generated their own weather, with thunderstorms, lightning, and even tornadoes. [GOES satellites detect dangerous pyrocumulonimbus clouds \(smoke-infused thunderstorms\) and monitor ensuing severe weather conditions.](#)



GOES-17 imagery of numerous fires burning in California on Aug. 17, combines GeoColor imagery and fire temperature data to highlight both the fires' hotspots and smoke plumes. Credit: NOAA/CIRA

## IMAGERY AND SCIENCE APPLICATIONS (CONTINUED)

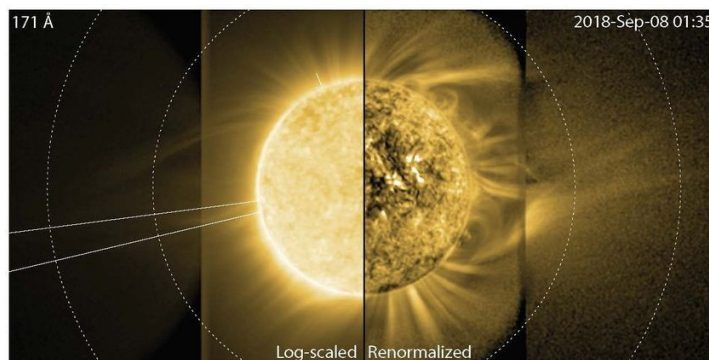
**Burn scars across the western U.S. pose a considerable flash flood and debris flow threat for years following a wildfire.** A wildfire completely changes the hydrology of the landscape due to loss of ground cover and altered soil chemistry. Given the considerable threat, forecasters in National Weather Service (NWS) offices must closely monitor shower and thunderstorm development around burn scars. [Satellite imagery is a vital tool for monitoring convective development near burn scars.](#) Considering many western fires occur in remote, high-terrain regions, radar is often degraded or not available to forecasters. This makes satellite data even more important during burn-scar flash flooding events. One-minute GOES imagery has particular value in these rapidly evolving situations, allowing forecasters to diagnose boundary interactions and convective trends as early as possible.



GOES-16 day cloud phase distinction imagery over west-central Colorado on July 3, utilized by NWS forecasters to assess the potential for severe weather around a burn scar and inform the decision to issue a flash flood watch. Credit: NOAA

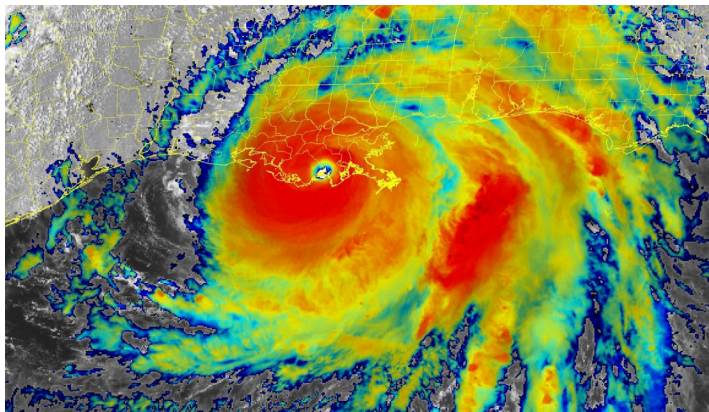
**Researchers at NOAA's National Centers for Environmental Information captured the first-ever images of dynamics in the sun's elusive middle corona, using GOES-17's Solar Ultraviolet Imager (SUVI).** During an extended coronal imaging experiment, scientists used SUVI in a novel way to view the sun's middle corona. They created a larger field of view for SUVI by taking images from one side of the sun, pointing directly at the sun, and then imaging the other side of the sun. They tiled the images together to view an area of the corona that had been difficult to see. [These SUVI observations reveal how](#)

[the middle corona influences the solar wind and eruptions from the sun,](#) a finding that could improve space weather forecasting. [Nature Astronomy published the study on Aug. 2.](#)



The SUVI experimental enhanced coronal imaging study provided the first-ever imagery of the sun's elusive middle corona in extreme ultraviolet (EUV) light. These observations revealed the structure, temperature, and nature of EUV emissions from this region. Credit: Dan Seaton, CIRES/NCEI

**GOES-16 has been monitoring an active Atlantic hurricane season.** To date, there have been 20 named storms and seven hurricanes, four of them major hurricanes (Category 3, 4 or 5 on the Saffir-Simpson Hurricane Wind Scale). [Hurricane Ida struck Louisiana near Port Fourchon on Aug. 29 as a powerful Category 4 storm,](#) with maximum sustained winds of 150 miles per hour. The storm made landfall in Louisiana on the 16th anniversary of Hurricane Katrina and matched 2020's Hurricane Laura and the Last Island Hurricane in 1856 for the strongest maximum sustained winds at landfall for a Louisiana hurricane. In just three days, Ida rapidly progressed from a tropical wave to a hurricane.



GOES-16 visible and infrared "sandwich" imagery of Hurricane Ida's landfall southwest of Galliano, Louisiana, on Aug. 29. Credit: NOAA

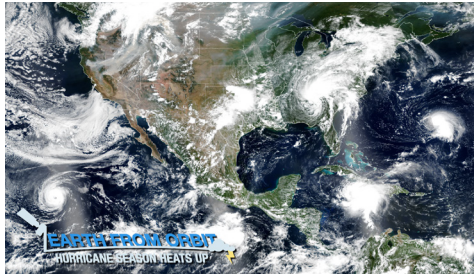
## EDUCATION AND OUTREACH

**The GOES-R Program, in partnership with the Joint Polar Satellite Program, NOAA Satellite and Information Service, NASA Goddard Space Flight Center, and the Cooperative Institute for Research in**

**the Atmosphere produced nine "Earth from Orbit" videos this quarter.** [Earth from Orbit](#) is a series of short videos that showcase a compelling weather event,

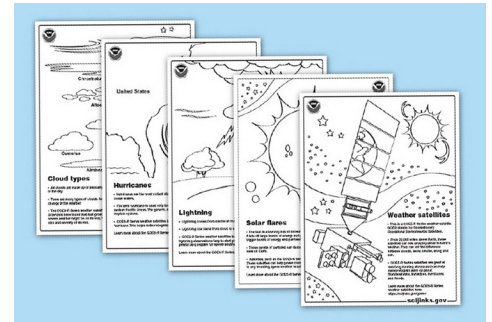
## EDUCATION AND OUTREACH (CONTINUED)

environmental hazard, or interesting meteorological phenomenon, as seen by NOAA satellites. A web article with additional information accompanies each video. Topics highlighted this quarter include wildfires, record heat and drought, satellite applications for solar energy, and tropical storm/hurricane activity.



Earth from Orbit: Hurricane Season Heats Up. Credit: NOAA/NASA/CIRA

**A new set of printable weather coloring pages is now available from NOAA SciJinks, including weather satellites, clouds, hurricanes, lightning, and solar flares.**



Weather coloring pages. Credit: NOAA SciJinks

## CONFERENCES AND EVENTS

**The GOES-R Program conducted its first-ever hackathon from Sept. 24-26.** [During this virtual event, teams of college students collaborated to develop interdisciplinary solutions to contemporary environmental issues using GOES-R Series satellite data.](#) The teams had 48 hours to complete one of five challenges and submit a video presentation explaining the challenge the team decided to tackle, what problem the project aimed to solve, the solution needed to address the issue, and how the project contributes to the solution using GOES-R data. The challenges targeted an array of disciplines, including meteorology, social science, environmental science, computer science, data visualization, and emergency management. Winners were announced in an awards ceremony on Oct. 1. A team of NOAA scientists judged the submissions on creativity and out-of-the-box innovative solutions, feasibility, and thoughtful use of GOES-R products and/or synthesis with external data sources. The first-place team developed an app to allow users to use GOES-R satellite data to 3D print images of storms, hurricanes and other natural phenomena.

**The 2021 EUMETSAT Meteorological Satellite Conference was held virtually Sept. 20-24.** The conference discussed topics including the status of meteorological satellite systems and future evolutions, the impact of satellite data in nowcasting and short-range numerical weather prediction, agrometeorology, oceanography, greenhouse gas monitoring, and evolving data services. There were several GOES-R and GeoXO presentations at the conference.

**The 2021 GLM Science Team Meeting took place virtually Sept. 21-23.** Topics covered included program, instrument, and science updates, operational uses of GLM, GLM validation studies, GLM data assimilation, and GLM science and applications. Approximately 75 people attended the meeting.

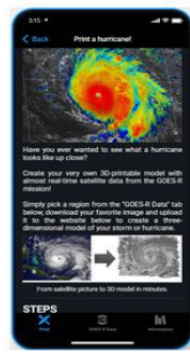
**The American Meteorological Society 2021 Summer Community Meeting was held virtually Sept. 21-23.** The theme of this year's meeting was "Building Forward Together: New Opportunities in Academic, Private, Public Collaboration." During the meeting, professionals from academia, industry and government came together to discuss strategic priorities, identify opportunities to collaborate, and share points of view on pressing topics. GOES-R/GeoXO System Program Director Pam Sullivan participated in the "Future of Satellite Observations and Delivery" session.

Introducing the  
GOES-R 3D Printing App

- **Educate** the next generation of atmospheric scientists
- **Inspire** new ways to use the GOES-R data
- **Create** amazing visual art



Scan QR Code  
to Download!



The GOES-R hackathon winning team created a GOES-R 3D printing app. Credit: Brennen Cordero, Jacky Chen, Ryan Fong, Rex Deming

## AWARDS AND ACCOLADES

The **GOES-R Ground System Remote Access for Development (RAD) team** received the **2021 NESDIS Vision and Creativity award in August**. The team was honored for rapidly deploying the RAD capability, which allows for secure remote access to the ground system. This enhances the GOES-R Program's ability to prepare for the GOES-T launch.



**Tom Feroli and Matt Seybold, along with Thaddeus Johnson (Office of Satellite and Product Operations), Brian Gockel (NWS), and Jordan Gerth (NWS) were awarded the NOAA Bronze Medal** for development and implementation of the GOES-17 ABI cooling timeline, thereby enabling its sole operation as GOES West. The Bronze Medal is the highest honor granted by the Under Secretary of Commerce for Oceans and Atmosphere and recognizes federal employees for superior performance.

## MEET THE TEAM



**In this issue, meet Shobha Kondragunta, research physical scientist at the Center for Satellite Applications and Research (STAR) within NOAA's Satellite and Information Service, and GeoXO atmospheric composition product scientist.**

Shobha develops algorithms to derive air quality data products from satellite observations and works with NOAA line offices and other partner agencies such as the Environmental Protection Agency (EPA) and NASA to optimize product utilization in various

decision-support systems. Shobha is also part of the leadership team within the Committee of Earth Observing Satellites atmospheric composition virtual constellation working group.

After obtaining a doctorate in atmospheric chemistry from the University of Maryland, College Park, and a year of postdoctoral work at the EPA, Shobha joined NOAA in 1999. In 2004, she began leading the newly-formed GOES-R aerosols/atmospheric chemistry/air quality working group. Shobha recently joined the GeoXO team to lead product

development work for the atmospheric composition instrument.

Shobha has been instrumental in NOAA efforts to use satellite data for atmospheric composition and air quality applications. "It appears to me that the golden era for satellite measurements and atmospheric composition is just beginning," she said. "The future looks bright for scientists entering this field."

Shobha's team disseminates NOAA air quality products through the NOAA/NESDIS/STAR [AerosolWatch website](#). These products provide important information on air quality conditions that harm human health and are featured on social, digital, and print media and consumed by the public. Her goal is for warnings and alerts aided by NOAA data to be heeded by the public. "Poor air quality doesn't kill instantaneously like a tornado but it degrades the quality of life to vulnerable populations such as the young, old, and people compromised by respiratory illnesses," said Shobha.

Shobha loves to analyze data and optimize scientific rigor and wishes she had more time for data analysis and publishing innovative research. She's recently taken up hiking and spent time hiking in Alaska over the summer. She's also dabbled in freelance sports writing, publishing articles in Bleacher Report.

## UPCOMING EVENTS

### GeoXO Milestone 1 Review

Oct. 26, 2021

### GOES-T Shipment to Florida

Nov. 10, 2021

### American Geophysical Union (AGU) Fall Meeting

Dec. 13-17, 2021

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