

Geostationary and Extended Orbits (GeoXO)

NOAA's **Geostationary and Extended Orbits (GeoXO)** satellite system will advance Earth observations from geostationary orbit. GeoXO will supply vital information to address major environmental challenges of the future in support of U.S. weather, ocean and climate operations. The GeoXO mission will continue and expand observations provided by the [GOES-R Series](#). GeoXO will bring new

capabilities to address emerging environmental issues and challenges that threaten the security and well-being of everyone in the Western Hemisphere.

NOAA is working to ensure these critical observations are in place by the early 2030s as the GOES-R Series nears the end of its operational lifetime.

Advancing NOAA's Mission

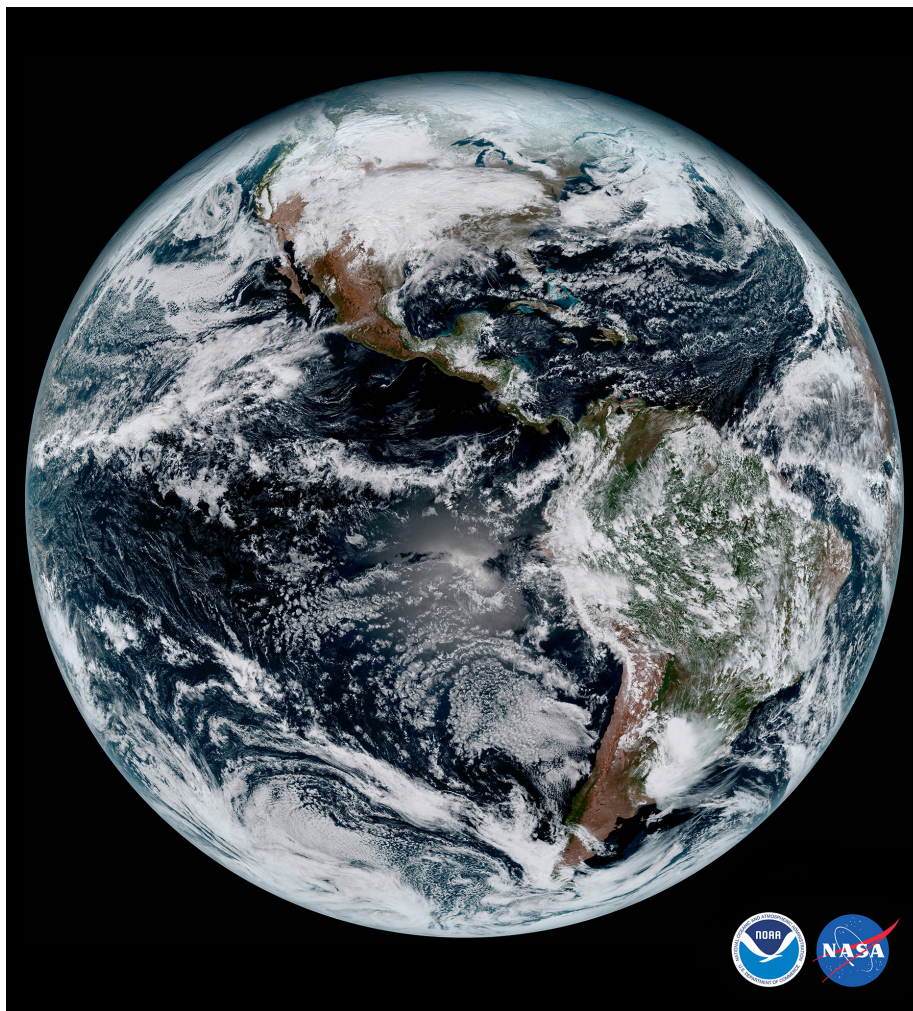
GeoXO will watch over the Western Hemisphere as part of a NOAA observing that supports short-term forecasts and warnings of extreme weather and environmental hazards as well as long-term planning for the effects of climate change. This observing system will deliver information that sophisticated climate-forecasting models use to predict weather patterns, including emerging patterns caused by climate change.

With GeoXO, made-to-order data delivery will allow users to customize data access to facilitate more accessible and usable environmental information. Multiple data delivery options will be available, including an internet storefront, mobile device access, and satellite broadcast. Cloud-based product generation will expand data access, increase community involvement, and continuously evolve service.

New and Improved Observations

New technology and scientific advancements will improve observations for weather forecasting and provide new ocean and atmospheric measurements. GeoXO will provide real-time, high-resolution [visible and infrared imagery](#) for monitoring Earth's weather, oceans, and environment. Data from GeoXO will contribute to weather forecast models and drive short-term weather forecasts and severe weather warnings. GeoXO will also provide advanced detection and monitoring of environmental hazards like wildfires, smoke, dust, volcanic ash, drought, and flooding.

Additional observations are recommended to address our changing planet and evolving user needs. NOAA plans to incorporate nighttime visible imagery, infrared sounding, atmospheric composition, and ocean color, as well as an improved lightning mapper in the GeoXO system, pending program approval. These observations will provide vital data to complement those from NOAA's partners in Europe and Asia, building a critical global observing system.



GOES-16 full disk image from January 15, 2017. GeoXO will continue and improve these observations.

User Needs Inform GeoXO Capabilities

NOAA, its data users, and industry partners conducted a number of observational capability studies, observation simulation experiments, value assessments, future scenario evaluations, societal and economic benefit evaluations, and user needs workshops, surveys, and interviews to prioritize the observations GeoXO will provide. NOAA evaluated a range of space architecture options to select one that will provide the highest priority observations effectively and efficiently.

GeoXO Core Capabilities	
Visible/Infrared Imagery	Data continuity; spatial and spectral resolution improvements
Data Collection System Ingest	Service continuity
DCS, EMWIN, HRIT Data Rebroadcast	Service continuity; potential use of commercial services
GeoXO Recommended Capabilities	
Lightning Mapping	Data continuity; spatial resolution improvements
Infrared Sounding	New capability for numerical weather prediction and nowcasting
Nighttime Visible Imagery	New capability for nighttime cloud, fog, and smoke tracking
Ocean Color Imagery	New capability for ocean health and productivity monitoring
Atmospheric Composition Measurement	New capability for detection of air quality threats

Visible and Infrared Imagery



High-resolution imagery is the backbone of Earth observations. The GeoXO imager will improve upon the GOES-R [Advanced Baseline Imager](#) by providing more detailed observations and more precise tracking of severe

weather. GeoXO will also detect wildfires four times smaller, potentially increasing the lead time to respond to a blaze before it gets out of control. New channels will better detect water vapor in the atmosphere.

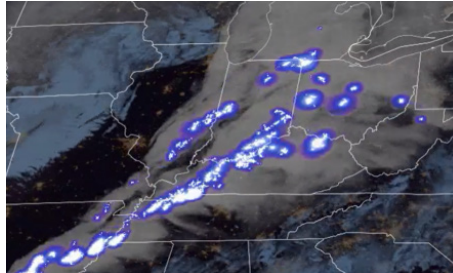
Nighttime Visible Imagery



Nighttime visible imagery from geostationary orbit will dramatically improve the ability to detect and track fog at night, characterize the formation of tropical storms, monitor power outages/recovery in real-time, provide a new lights-based search and rescue utility,

and introduce the ability to detect and track air quality and visibility hazards such as smoke and dust at night.

Lightning Mapping



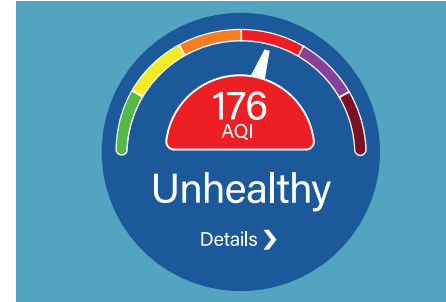
Lightning mapping from geostationary orbit improves severe storm analysis, lightning hazard detection, hurricane intensity prediction, wildfire response, and precipitation estimation as well as mitigates aviation hazards. A GeoXO lightning mapper will potentially improve resolution over the GOES-R [Geostationary Lightning Mapper](#).

Infrared Sounding



A GeoXO infrared sounder will provide real-time information about the vertical distribution of atmospheric temperature and water vapor to feed advanced numerical weather prediction models and improve short-term severe weather forecasting.

Atmospheric Composition



Atmospheric composition measurements from geostationary orbit will improve air quality monitoring to mitigate health impacts from severe pollution and smoke events.

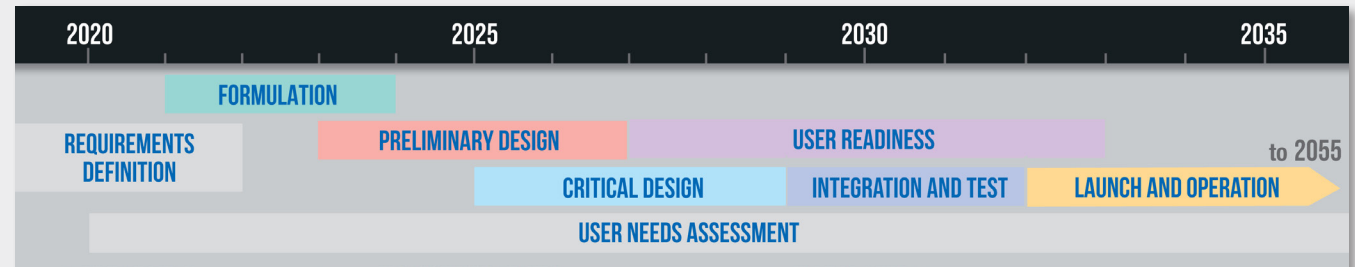
Ocean Color



A GeoXO ocean color imager will provide observations of ocean biology, chemistry, and ecology to assess ocean productivity, ecosystem change, coast/inland water quality, and hazards like harmful algal blooms.

GeoXO Timeline

NOAA assessed user needs and studied a variety of potential observational capabilities for the GeoXO system. These analyses informed key decisions and helped define instrument, spacecraft and system requirements. Formulation is underway, which will lead to the preliminary design of the spacecraft and instruments. As the program moves into the critical design stage, NOAA will begin preparing data users for new capabilities the GeoXO system will provide. The first GeoXO launch is planned for 2032 and the mission will maintain and advance NOAA's geostationary observations through 2055.



Collaboration Delivers the Mission

GeoXO is a NOAA program, supported by NASA. NASA will manage the development of the satellites and launch them for NOAA, which will operate them and deliver data to users worldwide.