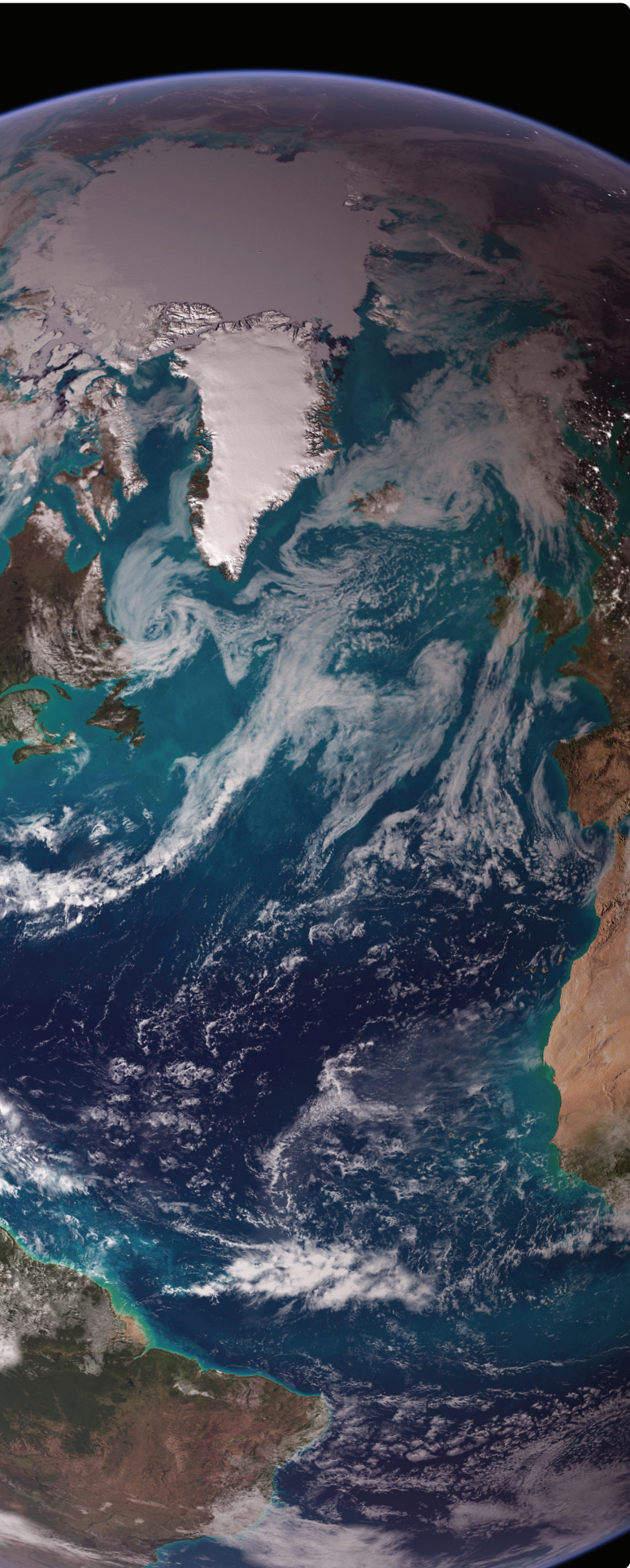


# There's No Place Like Home

EARTH OBSERVATION CAMP EXPERIENCE







# Welcome Earth Observers!

NASA Science is critical for understanding our home planet Earth. This set of hands-on activities, geared toward students in grades 3-5, introduces Earth observation, Earth science processes, and Earth's connection to the Sun. Intended for use in informal education settings such as after school programs, summer camps, STEM nights, and weekend workshops, this Earth Observation Camp Experience can also be easily adapted for use in formal settings, and will bring the excitement of NASA's Earth science and research missions to the next generation of explorers. While NASA is looking to the Moon and beyond with the future Artemis missions, the agency is also doing very important work in learning more about our own home planet – from studying surface water and land use to air quality and agriculture! Several of the activities in this guide are adapted from Elementary GLOBE. If you are interested in additional Earth Science activities and educator training, be sure to visit

[The GLOBE program.](#)



## Connections to the International Space Station

Throughout this guide, you will find connections to the role of the International Space Station in the study of Earth and its climate. Orbiting 250 miles above Earth, the station hosts a comprehensive suite of Earth-observing tools to enhance our understanding of our home planet. These tools include instruments mounted on the exterior of several of the station's modules and Earth-observing CubeSats regularly deployed from the station to study Earth's climate.

Visit [How Scientists Are Using the ISS to Study Earth](#) to learn more.



# CAMP OVERVIEW

NASA is exploring Earth now more than ever! NASA's Earth System Observatory provides data on climate change, severe weather and other natural hazards, wildfires, and global food production. Developing programs for Earth-focused missions is the responsibility of NASA's Science Mission Directorate (SMD) Earth Science Division. These programs help us understand our planet's interconnected systems, from a global scale down to the smallest processes, and scientists from all over the world can use this data to learn more about the globe and their own communities. The activities in this guide highlight several key Earth Science focus areas, including aerosols and water quality, and allow participants to consider the connections between local observations and Earth science observation from air and space.

The activities open with an opportunity for discussion around why and how NASA observes Earth Systems with a brief video and icebreaker. The first activity, adapted from the Elementary GLOBE sundial resource, builds learner confidence in construction local sensors and monitoring data over time. While practicing observation and environmental data acquisition skills, learners make connections to the Participants construct a sundial and use it to observe and record the movement of the Sun through the sky over the course of a day. They will revisit the site on a subsequent day to use their sundial and estimate the time of day.

The second activity allows participants to learn about air pollution and particulate matter. Since air pollution is caused by solid and liquid particles and certain gases that are suspended in the air, it can be difficult to see what is floating around. NASA uses satellites orbiting Earth and airborne remote sensing instruments to keep an eye on air pollution. Air quality forecasters use information about aerosols from a suite of NASA satellites, providing important health-related information to community members. The second investigation directs participants to work in groups to construct a simple adhesive aerosol sensor to observe airborne particles, collect data, and estimate the extent of

aerosols present in their surrounding outdoor and indoor environments.

The third activity in this guide focuses on water resources, with a particular focus on availability of clean water. NASA Earth Science Missions, like the **Surface Water and Ocean Topography (SWOT mission)**, will collect measurements from space that will help communities monitor and plan for changing water resources as well as the effects of sea level rise. The camp guide activity allows participants to graph data on Earth's global water supply and discuss the implication of the finite amount of consumable freshwater resources available to humans. Participants will observe macroinvertebrates from local freshwater resources as an indicator of water quality, making connections to their role as global stewards in protecting Earth's water sources.

The fourth activity invites participants to develop an "aerial" map of environmental data to inform local solutions. Participants will discover how NASA uses instruments aboard numerous satellites to learn more about our ever-changing planet and how our planet's systems work together. Using the data these satellites provide, scientists are able to make more informed decisions on the current and future state of our planet. In this final activity, participants will work in teams to collect data about an environmental issue that is affecting their local area, such as a nearby schoolyard or park. The teams will then compile their data into a single map of the area to visualize the environmental issue. Participants will draw conclusions and make recommendations on how to improve the environmental issue they are studying.



[Learn more about NASA Earth Science research](#)



[Learn about additional ways NASA shares science with learners](#)



# CAMP OVERVIEW

## There's No Place Like Home: Earth Observation Camp Experience

### Activities (Adapted from the [GLOBE Program](#))

1. Making a Sundial
2. Aerosol Sensor
3. Water, A Journey Through Time
4. Mapping Local Solutions

### Sample Camp Schedule (1 Day Camp Option)

8:00 to 8:10 a.m. .... Welcome – NASA's Earth Minute: [Why Does NASA](#)

#### Study Earth?

8:10 to 8:30 a.m. .... Icebreaker – [Make a Stained Glass Earth](#)

8:30 to 9:30 a.m. .... Introduce Activity 1\*

9:30 to 10:00 a.m. .... Break

10:00 to 11:00 a.m. .... Introduce Activity 2\*\*

11:00 to 12:00 p.m. .... Lunch/Recess

12:00 to 1:00 p.m. .... Activity 3

1:00 to 1:15 p.m. .... Break

1:15 to 2:45 p.m. .... Activity 4

2:45 to 3:15 p.m. .... Wrap up

3:15 to 3:30 p.m. .... NASA's Earth Minute: [Mission to Earth](#)

\*Sundial will be constructed and visited several times the first day and if time allows, can be revisited on subsequent days for a multi-camp event.

\*\*For multi-day camp events, the aerosol sensor can be visited each day.



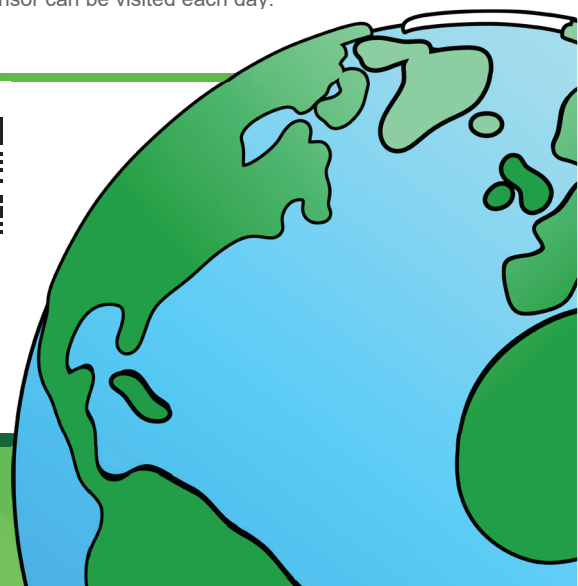
Video: [Why Does NASA Study Earth?](#)



Activity: [Make a Stained Glass Earth](#)



Video: [Mission to Earth](#)



## Activity 1: Making a Sundial

**Prep time:** 10 min      **Activity time:** Hourly measurements lasting 5 minutes during one sunny day; 15 minutes to revisit the sundial on subsequent days; time for discussion.

**Summary:** Participants learn the importance of our own star, the Sun. The Sun is important because it powers all the processes on the Earth and helps all the “spheres” of the planet work together. Participants construct their own sundial and observe the movement of the Sun through the sky. They will also learn what solar noon is and how to use their sundial to estimate the time of day. The sundial will be constructed on Day One and revisited on consecutive days.

**Learning Objective:** Participants will design and conduct a set of simple, quantitative observations to track the daily movement of the Sun across the sky. Participants will be able to describe the role of the Sun in driving the energy of Earth systems.

**Outcome:** Participants will construct and be able to use a simple sundial to estimate solar noon and the time of day.

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## Activity 2: Aerosol Sensor

**Prep time:** 20 min      **Activity time:** 45 to 60 min

**Summary:** NASA uses satellites orbiting Earth to keep an eye on air pollution. Aerosols are tiny particles (e.g., dust, smoke, sea salt) suspended in the atmosphere that have great importance for the quality of the air we breathe. In this activity, participants will learn the basics of satellite remote sensing and will construct a ground-based aerosol sensor to help them understand that there are small particulates in the atmosphere.

**Learning Objective:** Participants will be able to assess data acquired through simple sensors and explain how NASA uses remote sensing tools to observe aerosols in Earth’s atmosphere.

**Outcome:** Participants will work in teams to construct an aerosol sampler (sensor) with simple adhesives to collect data, analyze, and interpret data as they explore the amounts of aerosols present in the air around their learning environment. They will gather information regarding the weather conditions around their surroundings to determine how this affects the number of aerosols present and discuss observed relationships between aerosol measurements and environmental conditions.

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## Activity 3: Water: A Journey through Time

**Prep Time:** 30 min      **Activity Time:** 60 min

**Summary:** Water is one of the most abundant and important substances on Earth. Water sustains plant and animal life, plays a key role in the formation of weather, and helps to shape the surface of the planet through erosion and other processes. It is important that we take care of our environment because pollution can leach into our fresh water. By observing the macroinvertebrates living in the fresh water in our community, we can learn about the ecology and health of the water body.

**Learning Objective:** Participants will observe fresh water from their community and macroinvertebrates and flora living in the water and make connections to Earth Science Missions focused on water quality and security.

**Outcome:** Participants will make a plan for water conservation for themselves, their families, and their communities. In addition, they will make a plan to reduce water pollution for themselves, their families, and their communities.

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## Activity 4: Mapping Local Solutions

**Prep time:** 20 min      **Activity time:** 90 min

**Summary:** Participants will mimic an Earth satellite mission by acting as remote sensors, collecting environmental data about a local outdoor space, and creating a visual map of the area using their data. Then, using their map, they will create a plan to improve the environmental quality of their area.

**Learning Objective:** Participants will apply skills in sensor development and data acquisition to collect local environmental data. Participants will create a map to visually represent observations in a fixed local area. Participants will design data-driven action plans to improve local conditions.

**Outcome:** Participants will create visual representations of collected data and make actionable plans based on conclusions drawn from their data.