

**Topic: Living in Space**

**Title: Earth Observation from the International Space Station**

**Grade level: 3-5**

**Educator's Resource Guide**

Objective - Students will correctly identify regions, landmarks, and/or the activities presented among the 5 astronaut photographs taken from the International Space Station.

Activity Starter - Introduce students to an overhead perspective of planet Earth from the International Space Station that is approximately 250 miles above the Earth's surface. Go to the *Windows on Earth* website, [www.windowsonearth.org](http://www.windowsonearth.org), and browse photographs taken by astronauts from the cupola on the Space Station.

NGSS Standards- This activity can accompany classroom exploration of any of the following standards.  
3-ESS2.D: (3-ESS2-1) (3-ESS2-2)  
4-ESS2.A: (4-ESS2-1) ESS2.B: (4-ESS2-2)  
5- ESS2.A: (5- ESS2-2)

Teacher Prep- After students complete the activity, use the following questions to lead a group discussion:

Image 1: Why are populations mostly scattered along coastlines?

Image 2: Why do dry areas tend to burn?

Image 3: Why is the Aurora at its brightest in northernmost regions of the world?

Image 4: Why do shallow ocean areas appear to be lighter than darker ocean areas?

Image 5: Why do hurricanes rotate?

Sidebar Info- (Picture 1) The Earth is home to some 6.5 billion people and is projected to have 9 billion by 2050. Most of the world's large cities are located along the coast and the population is expected to continue to grow here. Worldwide, this type of migration will expose 2.75 billion people to coastal threats from climate change such as sea level rise and stronger hurricanes in addition to other natural disasters like tsunamis.

(Picture 2) Islands can form in several ways, including rising water level, growth of coral, and volcanism. As sea levels rise, water submerges land bridges, creating islands out of landmasses that were once connected. Islands may also be formed by hardworking, coral-building sea organisms. Explain that among the creatures living in the seas, there are tiny animals called polyps. Polyps are related to jellyfish, but they live in colonies, and they protect their soft bodies by building limestone walls around them. As these colonies grow, they form reefs. Eventually, these reefs can cover hundreds of square miles. Volcanoes can erupt underwater as well as on land. With each eruption, lava flows build up, harden and form new islands, such as those that make up Hawaii.

(Picture 3) The bright dancing lights of the Aurora Borealis are actually collisions between electrically charged particles from the sun that enter the Earth's atmosphere. The lights are brightest in the air of above the magnetic poles of the northern and southern hemispheres.

(Picture 4) Not all wild fires are bad for forests. Some forests need fire to be healthy. There are two types of forest fire that burns through forests. Each of these fire types affect the forest in

different ways. The low intensity fire burns up the surface tree needles and leaves, shrubs, down wood and many of the small trees, opening up most of the understory. Crown fire spreads rapidly across the forest canopy and usually kills most of the large, overstory trees, while removing the cover provided by the tree foliage.

(Picture 5) - Hurricanes are intense tropical storms with powerful winds and heavy rain. They turn counterclockwise in the northern hemisphere and clockwise in the southern hemisphere due to the Coriolis Effect.



## STUDENT WORKSHEET



### What on Earth is that?

Background- The International Space Station has a cupola that is a dome-shaped room with windows. Astronauts work in this area to control the Space Station's robotic arm, communicate with other crewmembers, and observe spacewalking activities. The cupola is a favorite hangout, and astronauts take hundreds of photos of Earth each day! They use these images for science research, education and public outreach. The photos help us all appreciate our home, planet Earth.

Your Mission- Below are five images of locations on Earth. Pay attention to the details in each one and select the description that best matches each image.

Your Task- See if you can score 100% by selecting the best answer for each image and become an Eagle-Eye Astronaut!

1



1. Florida, U.S.A. at night.
2. Close-up of a city next to mountains at night in Russia.
3. Nighttime in Italy, on the continent of Europe.
4. Fires burning along the coast of islands off the mainland of China.
5. Highway lights at night in Chile, near Patagonia.

2



1. A volcano in Spain.
2. A forest fire in very dry California.
3. An agriculture burn in the Sahara desert.
4. A fire in Brazil to clear land for farming land.
5. A builder clearing land to construct new houses in India.

3



1. Snow swirling on massive ice floes near Barrow, Alaska.
2. Transportation routes between Russia and the United States in the winter.
3. Northern lights (Aurora) over the North Pole in winter.
4. Close up picture of clouds over a mountain range with a city below.
5. A freak snowstorm in a tropical region.

4



1. An island in Antarctica.
2. An island in the Bahama Islands off the U.S.
3. An underwater mountain in the middle of the Pacific Ocean.
4. A very shallow reef off of the coast of South America.
5. The Great Barrier Reef in Australia.

## 5. Bonus Activity



An astronaut on the Space Station photographed hurricane Olaf as the orbiting laboratory passed over the Pacific Ocean, as part of a study being conducted on severe storms.

Hurricanes north of the Equator turn, or rotate, in a counterclockwise direction. Which way do hurricanes rotate south of the Equator?

- a. they do not rotate
- b. clockwise direction
- b. counterclockwise direction

## Extension Activity

### Instructions for Educators:

Objective - Students will create one of the following pieces of artwork from an astronaut photograph that explores how the view of Earth from the International Space Station teaches us about our planet and its systems: 1) 2D drawing; 2) Scaled drawing (older students); or 3) 3D model.

Activity Starter - Go to the *Windows on Earth* website, [www.windowsonearth.org](http://www.windowsonearth.org), and study the photographs taken by astronauts from the cupola on the Space Station.

Teacher Prep - You will need: Large chart paper and drawing materials for student brainstorming, computer with Internet connection, a variety of art materials for student created artwork. Students can utilize mobile devices to help with research. Students can work independently or in pairs to create their artwork. Older students can scale-up and draw (recreate) their printed image from the Windows on Earth website by using the grid method - <http://www.wikihow.com/Scale-Drawings-Using-the-Grid-Method>.

### Instructions for Students:

Your Mission: Scientists are always looking for new views of our planet to learn more about climate, the surface, the cycles, and how humans are impacting the planet. Imagine you are an astronaut capturing images of the Earth from the cupola of the International Space Station. What science do you view in your images, and how could you share your camera view of the planet through artwork?

### Your Task:

#### Part 1- How do we view the Earth from the International Space Station?

Step 1: What is the cupola? Begin by exploring the parts of the International Space Station on the CASIS Academy site. Start with the tour of the Space Station at <http://casisacademy.org/ISSTour.htm>. Keep your eyes open for the cupola, which appears at 1:25 minutes.

#### Part 2: What do images from the International Space Station look like? What do these views show us?

Step 1: Go to the *Windows on Earth* website ([www.windowsonearth.org](http://www.windowsonearth.org)) and find a view of Earth that captures your attention. Do the astronaut photographs of Earth look how you thought they would from space?

#### Part 3: Let's zoom in on an image!

Step 1: Select an image from the "Regions" section of the *Windows on Earth* website to explore in more depth. By beginning in the specific region, you can narrow down your focus. You may want to try comparing the astronaut image to a map view using Google Maps, an iPad map app, or a wall/book map.

Step 2: Use HANDOUT A to sketch out your image and relative location of the area. Research the science and the location about the region or image content (types of cloud/weather, areas of the planet, landforms).

Part 4: Create and Share!

Step 1: Select art materials from the teacher collected materials. You can create a 2D drawing or a 3D model to represent your image.

Step 2: Share your artwork and describe the science you have learned about from researching your image.

## My Image, My View

### Handout A

Draw a sketch of your selected image.	Draw a sketch of the relative location of your image.

Notes about your image:

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