teach with space

FROM THE GROUND AND FROM THE SKY

Analysing and understanding images of planet Earth taken from space
Activity 1: The Earth seen from the ISS page 3
Activity 2: Match the photos page 4
Activity 3: Higher up! page 7
**ACTIVITY 1: THE EARTH SEEN FROM THE ISS**

**Did you know?**

The size of a football field, the International Space Station (ISS) is the biggest object ever flown in space! It travels around the Earth at a speed of 27 700 km/h, and circles around our planet 16 times a day. This means that the astronauts onboard get to see 16 sunrises and 16 sunsets... every day! One of the things astronauts onboard the ISS like the most is to spend some time in the Station’s Cupola and enjoy the spectacular view! In the photo on the right you can see ESA astronaut Samantha Cristoforetti taking photos of the Earth from the Cupola.

The Earth looks very different from the International Space Station compared to how it looks from down here on the ground. Photos we take on the ground look quite different from the photos astronauts take, even though they can often be of the same places! In this activity you will be introduced to some breathtaking pictures of our planet taken by ESA astronauts onboard the ISS.

**Exercise**

1. Describe how you would expect the Earth to look from space.

   __________________________________________________________________________________________

   __________________________________________________________________________________________

   __________________________________________________________________________________________

2. Together with your classmates and teacher, look at some photos of the Earth taken from the ISS by ESA astronauts, that your teacher will show you, or that you can find online. Describe these pictures in your own words.

   __________________________________________________________________________________________

   __________________________________________________________________________________________

   __________________________________________________________________________________________
→ ACTIVITY 2: MATCH THE PHOTOS

One way to see the Earth from space is to look at photos taken by astronauts who live onboard the International Space Station. In this activity you will look at photos of various landscapes on Earth, taken from the ground (on Earth) and taken from space (by an astronaut), and try to match the photos of the same places.

Equipment
• Printed photos (optional)

Exercise

1. Look at Photo 1 and Photo A below. They are both pictures of mountains. Photo 1 was taken by someone standing under the Himalayas here on Earth. Photo A, which is also of the Himalayas, was taken by ESA astronaut Tim Peake from the International Space Station.

2. Look at the photos on the next page. Which photo taken from the ground (photos 2–6) shows a desert? Write your answer in Table A1.

3. Which ISS astronaut photo (B–F) shows a desert? Write your answer in the table below.

4. Now do the same for the other places in the table.

<table>
<thead>
<tr>
<th>Place</th>
<th>Photo taken on Earth</th>
<th>Photo taken by an astronaut on the ISS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mountains</td>
<td>1</td>
<td>A</td>
</tr>
<tr>
<td>A desert</td>
<td></td>
<td></td>
</tr>
<tr>
<td>An island</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A city</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A lake</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A river</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Matching photos taken from Earth with photos taken from the ISS
ACTIVITY 2

Figure A3
Figure A8
↑ Photo 2
↑ Photo B

Figure A4
Figure A9
↑ Photo 3
↑ Photo C

Figure A5
Figure A10
↑ Photo 4
↑ Photo D

Figure A6
Figure A11
↑ Photo 5
↑ Photo E

Figure A7
Figure A12
↑ Photo 6
↑ Photo F
ACTIVITY 2

5. Look at the two photos below, which are of the same city, but taken from different perspectives – the first taken on Earth, the second from space.

![Rome, Italy, from the ground during the day](image1)

![Rome, Italy, from space during the night](image2)

6. Describe what you can see in the photo taken on Earth that you cannot see in the photo taken from space.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

7. Describe what you can only see in the photo taken from space and that you cannot see in the photo taken on Earth.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

8. Identify the advantages of each photo for helping us to understand the Earth. Explain in your own words why you think this.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
One way to see the Earth from space is to look at images taken by satellites orbiting the Earth. In this activity you will match and compare photos of various landscapes on Earth, taken from the ground and taken by satellites orbiting the Earth.

**Did you know?**

The International Space Station (ISS) travels around the Earth at about 400 km above our planet. Earth observation satellites are located at various orbits; some are lower than the ISS, others are as far as 36 000 km above the surface of the Earth! Even though they are far away, their powerful instruments enable us to obtain fantastic, detailed images of our planet that allow us to check up on our planet’s features and health.

**Exercise**

1. Look at Photo 1 and Photo A below. They are both photos of mountains. Photo 1 was taken by someone standing under the Himalayas here on Earth. Photo A, which is also of the Himalayas, was taken by an Earth observation satellite.

2. Look at the images on the next page. Which photo taken from the ground (photos 2–6) shows a desert? Write your answer in the table below.

3. Which satellite photo (B–F) shows a desert? Write your answer in the table on the next page.

4. Now do the same for the other places in the table.
<table>
<thead>
<tr>
<th>Place</th>
<th>Photo taken on Earth</th>
<th>Satellite photo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mountains</td>
<td>1</td>
<td>A</td>
</tr>
<tr>
<td>A desert</td>
<td></td>
<td></td>
</tr>
<tr>
<td>An island</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A city</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A lake</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A river</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

↑ Matching photos taken from Earth with photos taken from the satellite

Figure A17  [Image]

Photo 2

Figure A18  [Image]

Photo 3

Figure A19  [Image]

Photo 4

Figure A22  [Image]

Photo B

Figure A23  [Image]

Photo C

Figure A24  [Image]

Photo D
5. Do you think that photos of the Earth taken by satellites in space are useful? Use the sentence starters below to justify your answer.

a) Photos of the Earth taken by Earth observation satellites show us ...

b) A photo taken from the ground is better if you want to ...

c) But a photo taken from space is better if you want to ...

One important fleet of Earth observation satellites are the Sentinels. These satellites watch over the Earth and keep us safe. They work together to explore our home planet, from the seas to the skies. The data they send back will help us tackle all kinds of environmental problems, both natural and human-made.

Did you know?

Earth observation satellite images are extremely useful, for example for making detailed maps, checking for variations in vegetation, monitoring pollution, helping to predict the weather, and much more! Sometimes the final images can look quite strange. For example the image on the right shows a glacier. It is actually made up of three images taken over a period of seven weeks. The grey colours represent parts that have not moved during this period, and the bright colours represent parts that have moved or changed in different ways during this time.