

Learning Material

South America – from coast to coast

Grade 7 - 9

Sample Solution

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The exercises of the learning unit are embedded in a superordinated work order. Pupils should use the Online - Tool to later on work on the exercises given in the additional material. Besides questions on the ISS, emphasis is on the exploration of the region as shown in the ISS-Panorama. Moreover pupil will create a map based on minimum distance classification.

Exercise Sheet 1: Earth Observation

Question 1: The ISS (International Space Station) is the largest artificial object in the orbit. How many cameras are installed at the ISS which record images of the Earth 24 hours a day?

Answer: 4 cameras

Question 2: The ISS circles around the Earth several times a day.

a) How many circles does it accomplish each day?

Answer: 16 rotations per day

b): How long does it take for one full circle?

Answer: 90 minutes

Question 3: You can see the ISS from the Earth but it is far away from here. Nevertheless, pictures can give a good impression of what is happening on our blue planet. Zooming in you can also see the single pixels.

a) What is the flight altitude of the ISS?

Answer: 400km/~250miles

b) What is the size of one pixel within the ISS-Panorama?

Answer: 500m x 500m

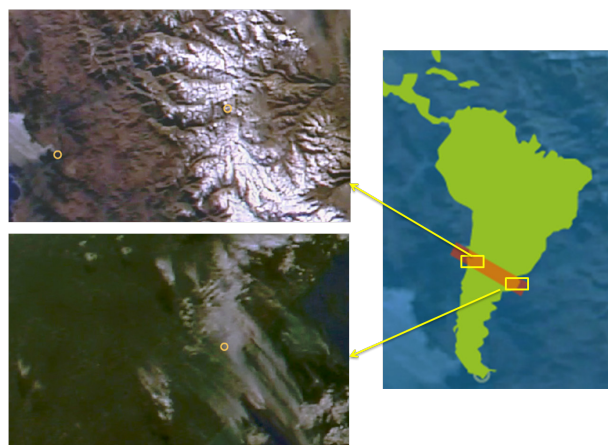
Exercise Sheet 2: Land Surface and Topography

Question 1: Which (land) covers can you see in the image? Go from the coast to the hinterlands and list at least four different surfaces you can spot along.

Possible Answers: Water, Snow, Clouds, Mountain Area, Lowland, Forest, Vegetation, Pampa

Question 2: The two images on the left show extracts of the flyover. The overview map on the right identifies the location of both images.

a) What do you recognize in terms of vegetation? Which extract shows a rather barren area and what can you spot here?



Flyover South America (right), Extracts of Flyover (left)

Answer:

Top: The Andes/Mountains, Snow and Ice due to high altitudes

Bottom: Interior/Lowlands, Vegetation and Cloud Formation

Geospatial location alone helps to assign both images to the right climatic zone which is again linked to topography.

The lower image shows high cloud coverage and a large green vegetated area describing rather warm areas in the interior such as grass steppes (i.e. the Pampa). This information can also be derived via the information points. The image on the top shows the Andes, the Earth's longest mountain range. Tops of the Andes can reach up to 2,000 meters which explains snow covered areas in parts of the mountain range. The landscape around the Andes is rather barren. Due to high altitudes vegetation in these regions differs compared to those in the lowlands as it is much more sparse.

b) What could be the reason for a non-vegetated area versus a very green and vegetated area in the two images?

Answer: As already mentioned in Question 1, the image on the top was taken from above the Andes. Here, altitudes of more than 2,000 meters lead to rather sparsely vegetated and barren land surfaces. Oxygen supply is poorer in regions of high altitudes which limits also vegetation growth. Moreover temperatures are much lower which can also be recognized by snow covered areas. This furthermore also impacts the vegetation. The image on the bottom shows the lowlands up to the Atlantic coast. Besides the Pampa, a grass steppe in the temperate zones, especially the coastal zone, is characterized by a mild winter and a long and warm summer. Pupils can derive this information also via the information points.

Exercise Sheet 3: The Andes

Question 1: The Andes are the Earth's longest mountain range.

a) On which countries does it spread out?

Answer: The Andes spread out along the western coast of South America including the countries Venezuela, Colombia, Ecuador, Peru, Bolivia, Argentina and Chile.

b) Which part of the Andes can be seen in the ISS-Panorama?

Answer: The part of the mountain range in Chile

Pupils can also use the web for this question. Moreover this topic can be integrated in the teaching content of the class. E.g. by using a physical map of South America. It could also be interesting to explore the altitudes of the Andes so that the characteristics of the mountain range become more clear to the pupil.

Question 2: How were the Andes formed?

a) How is the leading process for most topographical characteristics of the Earth called?

Answer: Plate Tectonics

b) From which particular process originate the Andes?

Answer: Subduction

c) Shortly explain which plates were involved by the creation of the Andes (linked to Question 2b).

Answer: The oceanic Nazca Plate and the continental South American Plate were involved in the creation of the Andes. As oceanic plates have a higher density than continental plates they are pushed below the continental plates. By this a rift emerges in the sea as the Nazca-Plate slides under the South American Plate. This process is called subduction. Due to subduction the land mass of the continental plate (South American Plate) is pushed up (see also Figure 5 in the Accompanying Commentary). This is exactly how the Andes are formed.

Exercise Sheet 4: The Classification

Question 1: Use the tool and make a classification. Choose the extent area which is depicted right at the beginning when you open the tool (place the slider to the very left). Create four surfaces: water, clouds, ice and mountains/land. Also check the instructions below the tool. You

can display or hide them to get the instructions on how to make your map.

Answer/Work Order a)-c): The conduction of the classification is described in the accompanying commentary as well as within the Online-Tool itself. Below the tool map instructions can be faded in and out. All steps on how to make the classification with the ISS-Panorama are described here as well. Moreover, symbols with different applications can be faded in and out.

Question 2: Test the classification with different training areas and compare them. Again, choose the same areas as for Exercise 1 (place slider to the very left).

Ascertain how big the area covered with ice is.

Answer: 5,000 bis 7,000 km²

Note: The total area for the classification should always be around 129,000km². As you have to zoom out when you click „create map“ and also when you afterwards click „save map“ you should get back to the previous extent before you conduct a different classification to make the different classifications comparable.

Exercise Sheet 5: Regions and Phenomena in South America

Question 1: Why is the Salt Lake „Salinas del Bebedero“ that salty?

Answer: Due to a very arid and hot climate, evapotranspiration in this region is relatively high. Salts and minerals furthermore enter the sea via the inflows. If water evaporates, salts and minerals remain in the sea area. The salts are also important for this region as they are skimmed.

Even though gains due to salt are economically an advantage, the high salt content has also negative aspects: Salts can also be ablated by wind, soils can get alkalified and unusable if the salt content

is increasing. The process described here is called „salinization“ and represents an indicator of land degradation. This case can be related to the shrinking of the Aral Sea.

Question 2: Río Quinto vs. Río Elqui

a) Which region does the Río Quinto run through?

Answer: The Río Quinto runs through the Pampa, which is located in Argentina's center.

b) Where does the Río Elqui originate?

Answer: The Río Elqui originates in the Andes and enters the Pacific Ocean.

c) Inform yourself of the two rivers via the information points, locate them in the ISS-Panorama and describe their characteristics.

During the rainy season which is usually in April, the Río Quinto grows to the double of its size. The name inherits from the Spanish conqueror Conquistadores who lived in the 16th century. The Río Quinto was the fifth important river which offered the opportunity to get to the center of the continent.

The Río Elqui is the giver of life in the Chilean region of the Andes. Among others he makes vineyard cultivation in the usually very barren lowlands possible. Multiple space agencies moreover settled down here due to the low cloud forming.

Question 3. The Pampa – what are the characteristics of this region? Shortly describe climate and vegetation.

Answer: The Pampa is the name of the grass steppe in Argentina. Steppes can be found in partly arid regions in the temperate latitudes. Water availability is mostly rather low which is the reason for sparse grass and bush vegetation. The continental climate is characterized by cold winters and very hot and arid summers.