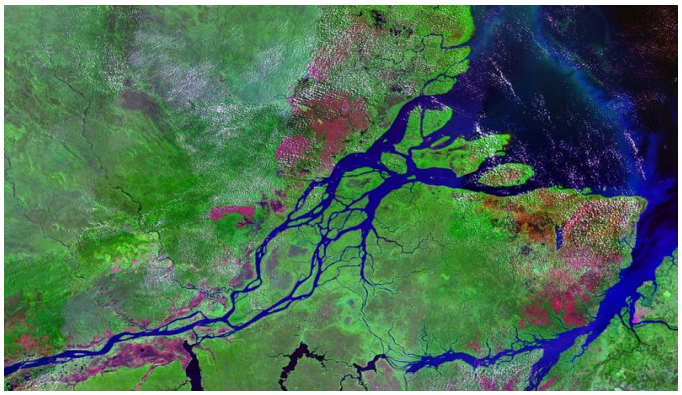
LANDSCAPES

I. Introduction

We can recognise different types of land relief on the Earth's surface. They are caused by geological agents: a cliff, a dune, a valley and so on. We call them as landscapes.
We are going to study different geological agents:

- **Rivers.** They produce fluvial landscapes.



Satellite photograph of the Amazone estuary (source: Wikipedia)

-**Stream and rills**. They produce torrential landscapes.

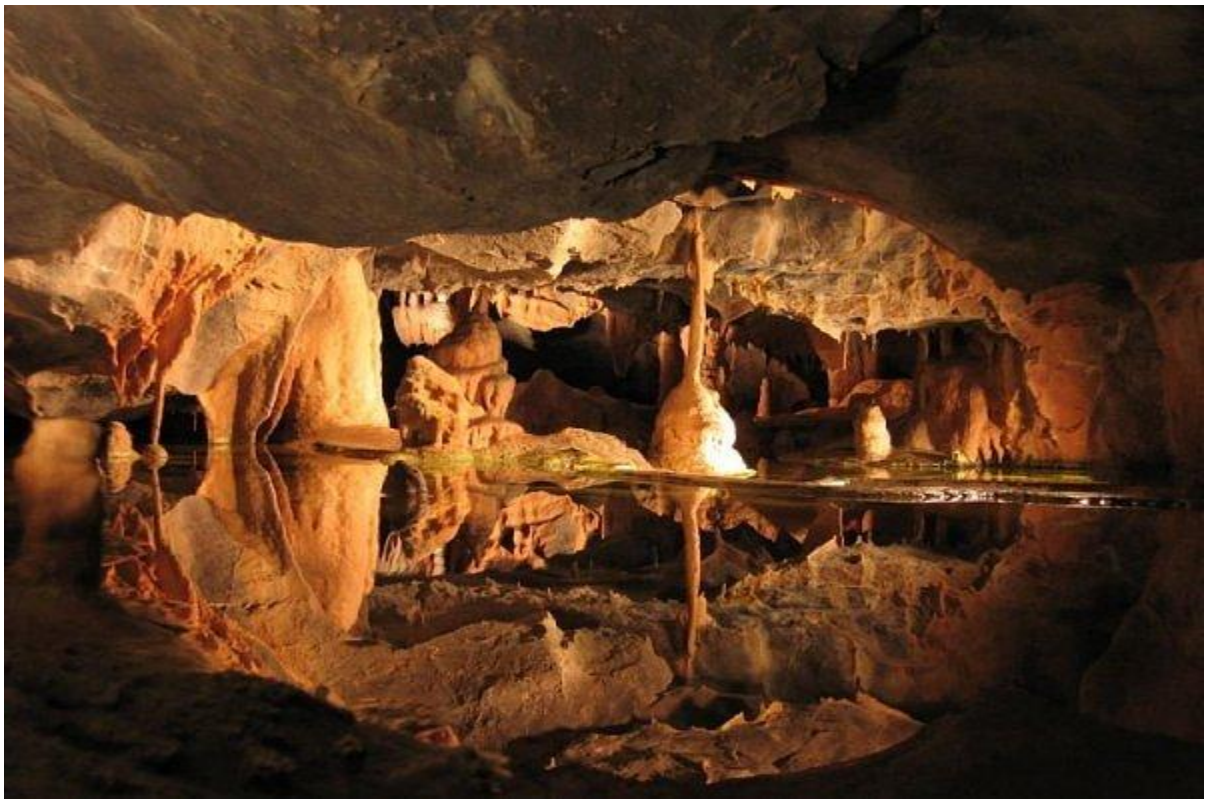
Waves,tides and currents. They produce coastal landscapes.

-**Glaciers**. They produce glacial landscapes.

Click on the image to see more ….

- **The wind**. It produces wind landscapes.

-**Subterranean water**. It produces a very special landscape called "modelado kárstico"



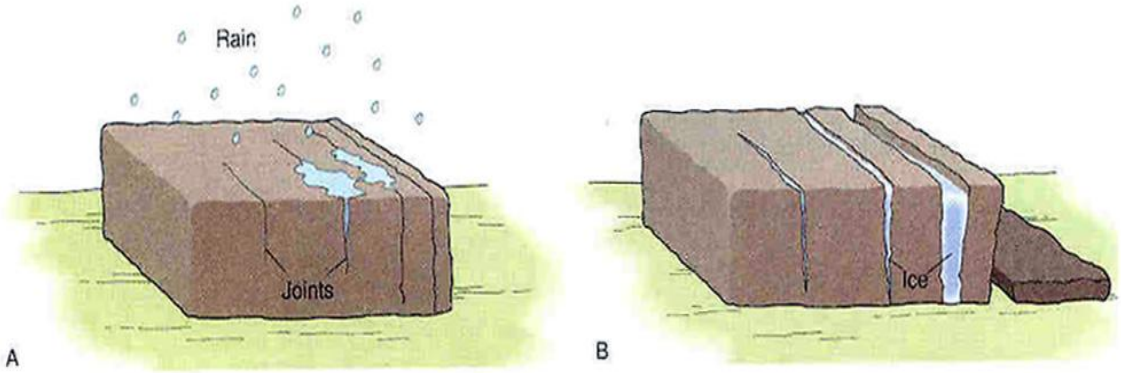
www.agiweb.org/environment/publications/powerpoints/**whatiskarst**.ppt

II. Weathering

Weathering is the process in which materials on or near Earth´s surface break down and change. There are two types of weathering:

1.- Mechanical or physical weathering is a type of weathering in which rocks and minerals break down into smaller pieces. This type does not involve any change in the composition of a rock, only changes in the size and shape of the rock. A variety of factors are involved in mechanical weathering, including changes in temperature and pressure.
www.augusta.k12.va.us/66877372584019/lib/66877372584019/_files/**Weathering** and Erosion.**ppt**

Temperature plays a role in mechanical weathering. When water freezes, it expands and increases in volume. You have observed this increase in volume if you have frozen water in your house. If the water freezes into cracks of the rocks, expands, exerts pressure on the rocks, and can cause the cracks to widen slightly. When temperature increases, the ice melts in the cracks of the rocks. The freeze-thaw cycles of water in the cracks of rocks is called **frost wedging**.



Frost Wedging

2.- Chemical weathering is the process by which rocks and minerals undergo changes in their composition. Agents of chemical weathering include water, oxygen, carbon dioxide, and acid precipitation. The interaction of these agents with rock can cause some substances to dissolve, and some minerals to form. The new minerals have properties different than those that were in the original rock. For example, iron often combines with oxygen to form iron oxide.
The composition of a rock determines the effects that chemical weathering will have on it.

- **Limestone and marble** are made almost entirely from calcite, and they are very affected by **chemical weathering**. Buildings and monuments made of these rocks usually have been **chemically weathering** by acid water and atmospheric pollutants.

- **Water** is an important agent in chemical weathering because it can dissolve many kinds of minerals and rocks.

- An important element in chemical weathering is **oxygen**. The chemical reaction of oxygen with other substances is called **oxidation.**

- Another atmospheric gas that contributes to the chemical weathering process is **carbon dioxide**. This is a gas that occurs naturally in the atmosphere as a product of living things. When carbon dioxide combines with water in the atmosphere, it forms a very weak acid called **carbonic acid** that falls to Earth's surface as precipitation.

Activities

1.- Differences between **mechanical** and **chemical** weathering.
2.- Name the main **agents** that cause weathering.
3.- Number the following pictures. What type of weathering has happened? Explain it.

III. Different land reliefs

Water Erosion

The removal of weathered rock and soil from its original location is a process called **erosion**. Erosion transports weathered materials across Earth's surface until they are deposited. After the materials are transported, they are dropped in another location in a process know as **deposition**.

Moving water is perhaps the more powerful agent of erosion. Stream erosion is greatest when a large volume of water is moving rapidly such during thaws and torrential rains. Erosion by water can have destructive results.

Each year, streams carry billions of metric tones of **sediments** and weathered materials to coastal areas. Once a rivers enters the ocean, the current slows down, which reduces the potential of the stream to carry sediment. As a result, streams deposit large amounts of sediments in the region where they enter the ocean. In this way sediments form **deltas**.

Wave action

Erosion of materials also occurs along the ocean floor and at continental shorelines. The work of waves, tides and currents produces cliffs, arches and so on. Besides, sand particles accumulate on shorelines and form **dunes** and **beaches**.

Sand Dunes Puntapaloma- Tarifa, Spain

Glacial erosion

Glaciers left their mark on much of the landscapes on the past, and their erosion effects are large and dramatic because they can move as dense, enormous rivers of slowly ice. Glaciers have the capacity to carry huge rocks beneath them. The features left in the wake of glacial movements include steep U-shaped valleys and lakes. The effects of glaciers on the landscape also include deposition.

Wind erosion

Wind can be a very powerful agent, especially in arid and coastal regions. Such regions tend to have little vegetation to hold soil in place. Wind can easily pick up and move fine, dry particles. The effects of wind erosion can be both dramatic and devastating. One method that can reduce the effects of wind erosion is the planting of wind barriers. These barriers are trees or other vegetation planted perpendicular to the direction of the wind.
Wind can transport the sand of the beach and form coastal dunes.

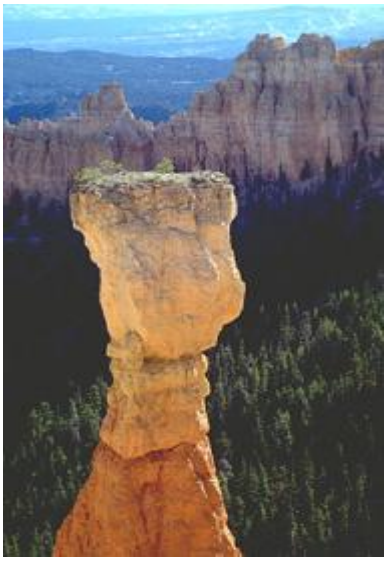
Erosion by Living Things

Plants and animals also play a role in erosion. They move Earth's surface materials from one place to another, for example, when animals burrow into soil.
Planting garden and building a highway are examples of human activities that result in the moving of Earth materials from one place to another.

Activities

1.- Generalize about which type of erosion is most significant in your area.
2.- Discuss how weathering and erosion are related.
3.- Explain the differences between:
- Weathering- erosion
- Chemical weathering- mechanical weathering
- Erosion- deposition

4.- Look at these photographs and say which type of erosion formed them.



5.- Match these columns:

Fluvial valley	
Glacial valley	Rivers
Desert	Wild water
Cliff	Waves
Beach	Subterranean water
Cavern	Wind
Gully	Glaciers
Dunes	

6.- Copy this chart in your notebook and complete it:

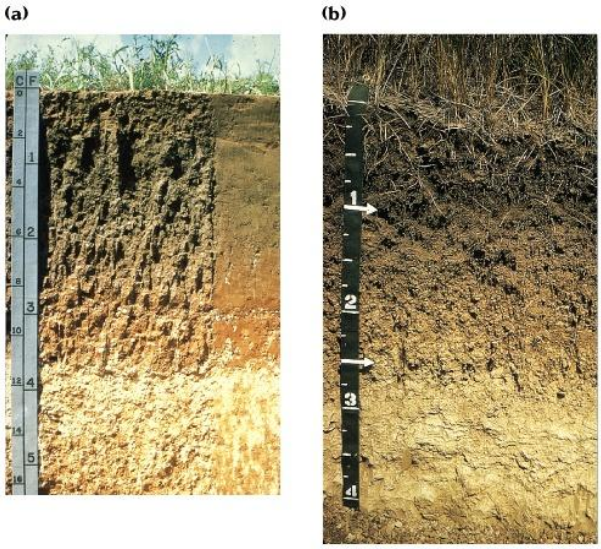
Land relief agent	Description	Examples
Water		

IV. Soil

What is soil? It is found almost everywhere on Earth's surface. Weathered rock alone is not soil. **Soil** is the loose covering of weathered rock particles and decaying organic matter, called **humus**, overlying the bedrock of Earth's surface and it is a medium for the growth of plants. Soil is the product of thousands of years of chemical and mechanical weathering and biological activity.
The soil-development process often begins when weathering breaks solid bedrock into smaller pieces. Worms and other organisms help break down organic matter and add nutrients to the soil. So the texture of the soil changes and the soil's capacity to hold water increases.
http://www.tqnyc.org/2004/NYC040803/buglife02.html

Activities

1.- The figures A and B represent two types of soil.



a.- Which is the most mature? Why?

b.- Compare the soil in a slope and the soil in the bottom of a valley, which is the most mature now? Why?

2.- Say which of these factors are negative or positive in the soil formation.

- Incline
- A few vegetation
- A lot of animals
- A few micro-organisms
- Much time
- Cold
- Much rain
- Weak rock

V. Sedimentary rocks

The formation of sedimentary rocks begins with the accumulation and consolidation of sediment or of rock fragments.
Sedimentary rocks are made up of fragments of other rocks. The deposition of these sediments in layers, in lakes or seas, takes place over millions of years. The deposited sediments are transformed into compact, cohesive rocks. Rocks are fragmented by:

- Weathering. Rocks at the surface of the Earth are broken up by the action of atmospheric phenomena (changes in temperature, rain, acid rain), or by the activities of plants and animals.
- Erosion. These broken fragments of rocks are swept away by running water, glaciers, waves or wind.

Strata in sedimentary rocks can be horizontal or folded. As the Earth's crust moves, the layer of rock get folded up.
Sedimentary rocks sometimes contain remains of living things that lived millions of years ago. These remains are called **fossils**. Fossils become part of the rocks, during the processes of compaction and cementation of sediments. Fossils provide invaluable information about the history of life on Earth.
http://www.youtube.com/watch?v=TuOIDg41MZE&feature=fvw

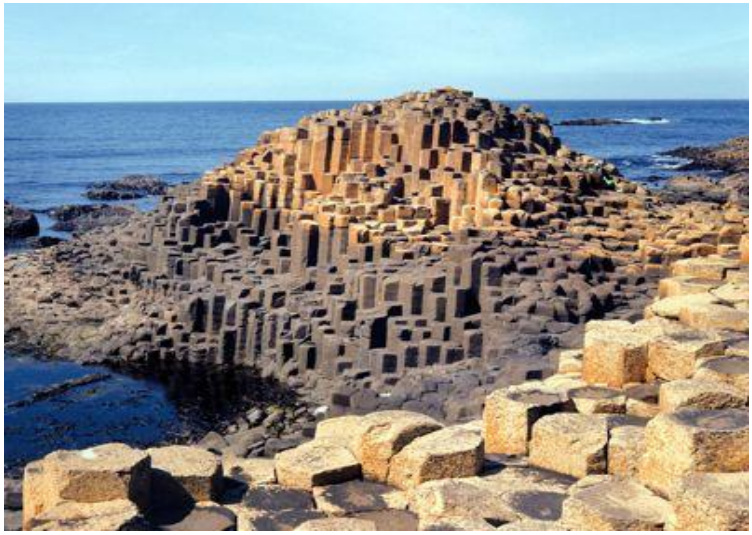
Activities

1. - Where can you find examples of rock erosion in your country? Choose an example and say which natural phenomena caused the erosion.
2. - What two processes transform soft, wet sediment into sedimentary rock?
3. - Can a sedimentary rock be transformed into another sedimentary rock?

PICTURE GALLERY AND REVISION

http://www.classzone.com/books/earth_science/terc/content/visualizations/es1205/es1205page01.cfm?chapter_no=visualization(Erosion pictures feedback)
http://www.frodonz.com/earthscience.html(This page is for feedback)

http://www.soton.ac.uk/~imw/harry.htm

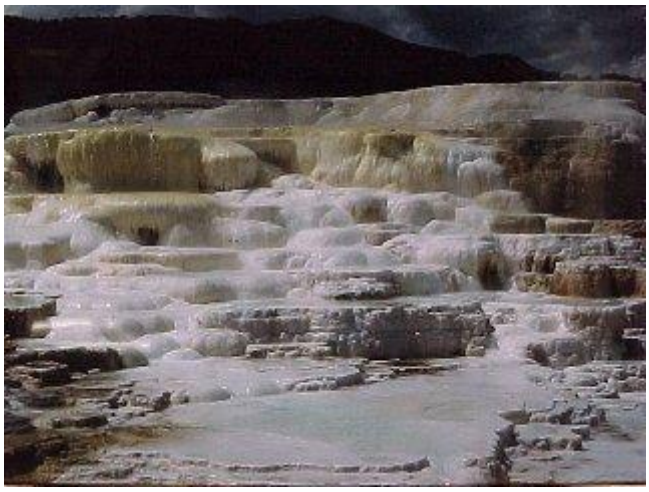


Giantscauseway
http://www.northantrim.com/temporary_map.htm

The Ebro delta

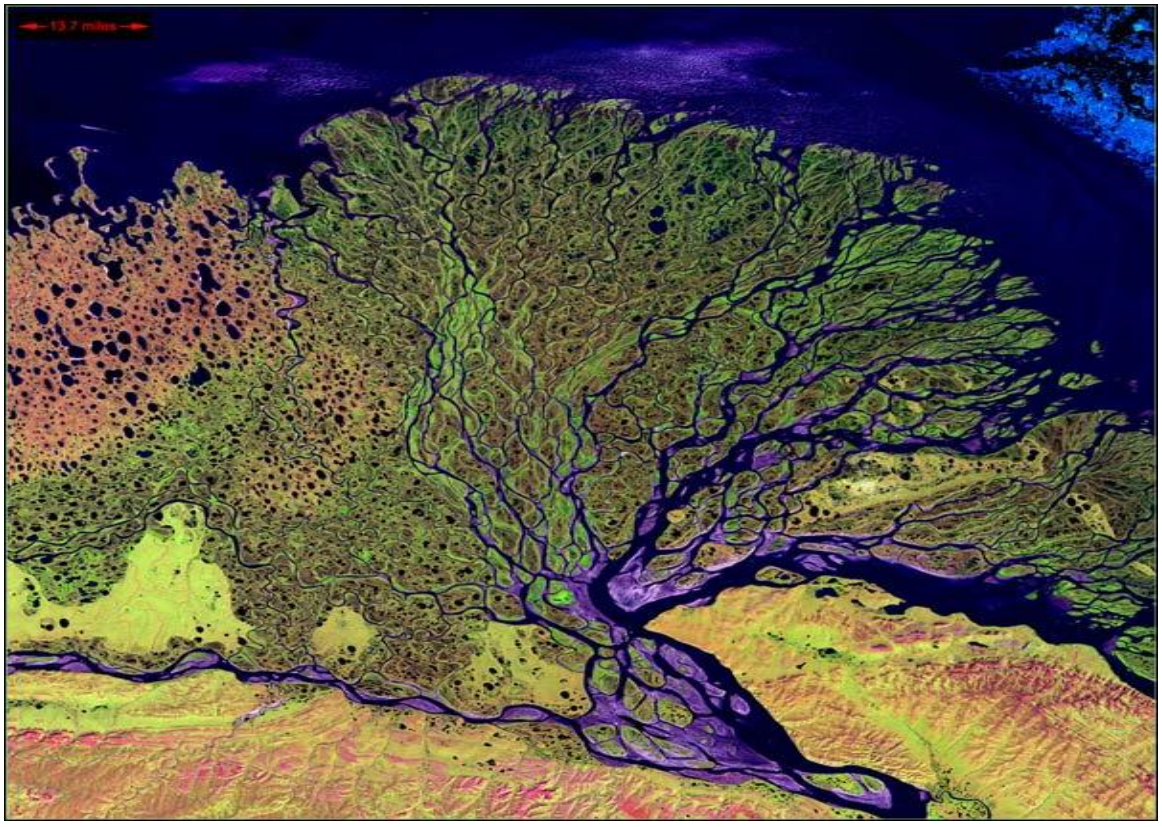
Laitaure delta, Sarek National Park, Laponia

Karst in China



Yellowstone National Park

Caves of Aggtelek Karst and Slovak Karst



The great Lena river of Russia

Iceberg, Santa Cruz, Glaciar Upsala, Argentina.

Ushuaia Argentina

Giant glaciers in the Antartica

Webgraphy

http://www.legos.obs-mip.fr/en/~lebars/work/amazone
http://mail.colonial.net/~hkaiter/wxerosglacier.html
http://library.thinkquest.org/20035/chemical.htm
http://library.thinkquest.org/20035/physical.htm
http://dsc.discovery.com/videos/planet-earth-caves-limestone-erosion.html
http://www.geocities.com/whatsacidrain/pictures.html
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http://www.classzone.com/books/earth_science/terc/content/visualizations/es0604/es0604page01.cfm?chapter_no=visualization
http://web.bryant.edu/~dlm1/sc366/deltas/deltas.htm
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http://www.tqnyc.org/2004/NYC040803/buglife02.html
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http://www.tqnyc.org/2004/NYC040803/index.html
http://www.youtube.com/watch?v=v3yJArifULo&feature=related
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http://commons.wikimedia.org/wiki/File:Research_on_Iceberg_B-15A_by_Josh_Landis,_National_Science_Foundation_(Image_4)_(NSF).jpg#filehistory

http://www.uwsp.edu/gEo/faculty/ozsvath/images/ice_wedging.htm
http://www.kented.org.uk/ngfl/subjects/geography/rivers/river%20articles/source.htm

http://www.canaryzoo.com/Geography%20Glaciation%20Landforms.htm
http://www.soton.ac.uk/~imw/harry.htm
http://www.kidsgeo.com/geology-for-kids/0035-landform-slope.php
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http://www.otsego.org/conservationdistrict/erosion.htm
http://www.princewilliamsoundcruises.com/glacier-photos/pages/4-glaciers-01.html
http://www.scotland.gov.uk/Publications/2005/12/01130314/03149
http://www.perceptions.couk.com/sphy.html
http://www.topnews.in/glacial-erosion-changes-internal-mountain-structure-responses-plate-tectonics-290396
http://www.uwsp.edu/geo/projects/geoweb/participants/Dutch/202slide/GH2OSLID.HTM
http://fotografiaxsatelite.blogspot.com/2008/01/egipto-el-delta-de-rio-nilo-el-desierto.html