

Fourth Grade – Planetary Research Station

Play list:

1. The Blue Marble
2. ETOPO 2
3. Real-time (AMSRE) Sea Ice Concentration
4. ETOPO 2
5. Real-time Global Earthquakes
6. Indian Ocean Tsunami model, December 26, 2004

California Science Content Standards

Earth Sciences

5. Waves, wind, water, and ice shape and reshape Earth's land surface. As a basis for understanding this concept:
 - a. *Students know* some changes in the earth are due to slow processes, such as erosion, and some changes are due to rapid processes, such as landslides, volcanic eruptions, and earthquakes.
 - b. *Students know* natural processes, including freezing and thawing and the growth of roots, cause rocks to break down into smaller pieces.
 - c. *Students know* moving water erodes landforms, reshaping the land by taking it away from some places and depositing it as pebbles, sand, silt and mud in other places (weathering, transport, and deposition).

Program Script

1st Projection: The Blue Marble

Welcome to the Planetary Research Station. This exhibit is not only an excellent teaching tool, but helps scientists gain a better understanding of, among other things, how waves, wind, water, and ice shape and reshape the Earth's land surface.

Most of these processes are very slow, so we normally do not see or feel the changes. For example, the land, mountains, rivers, etc., all appear to be unchanging during our entire lifetime, unless a big event, like an earthquake, landslide or flood happens that is too big to ignore. Looking at changes over a long period of time helps us see those changes and look for their causes. This giant sphere was build for just that purpose.

The projection currently on the sphere is called the Blue Marble and shows our planet from space. These images show the true color of Earth with the oceans in shades of

blue, the clouds in white, and the lands varying from green to brown, depending on the amount of plants covering the area. The brown areas are the sands of the deserts. Notice how big the Sahara Desert in Africa is!

The next projection shows the heights and depths of the land and ocean floors.

2nd Projection: ETOPO 2

Notice that on the land, there are only few areas covered by high mountains (shown in deep brownish red colors). However, you might also notice some high mountains under the ocean.

Most of the land's surface is relatively flat ground (colored in shades of yellow and green). Look at the areas along the coasts (where the land meets the ocean); there are strips of land that are colored a pale bluish white. These coastal areas are shallow water areas formed by deposits of dirt carried by many rivers, streams, or even rainwater that flow into the oceans. In some places, these dirt deposits may be 4 – 5 miles (6-8 kilometers) thick.

That is a lot of dirt! Where does it come from? How does it form?

These dirt deposits are made of soil and broken pieces of rocks on land. These rocks are changed by slow moving water, broken by rushing water and slow-moving ice, by the growth of plant roots, by the wind, and by the freezing and melting of ice.

3rd Projection: Real-time (AMSRE) Sea Ice Concentration

Notice for example, on this projection of the Earth's Sea Ice. During certain seasons, there is more ice on Earth due to the colder temperatures. Notice that when it is winter in the Northern Hemisphere, it is summer in the Southern Hemisphere. As winter progresses in the Northern Hemisphere, there is a greater amount of ice in the northern regions, both in the water and on the surrounding land. A large mass of slowly flowing ice is called a glacier. As glaciers move across the land, they can grind up the rocks under them into a powder. As the glaciers melt, they produce a large amount of rushing water which can carry the ground-up rocks into other rivers and into the ocean.

Now, imagine this ice on a smaller scale. As the water freezes into the holes and cracks on the rocks, the ice expands, which can break up the rock into smaller pieces. As the ice melts, it can carry away some of the small bits of rock that have been broken. The process of breaking down rock is called weathering. If we go back to our previous projection:

4nd Projection (repeat): ETOPO 2

We can see that all of this broken rock, or dirt, is carried and deposited along the coastlines by running water (sometimes, melting snow and ice, sometimes rain, and sometimes rivers and creeks). Again, notice the pale bluish white color of these areas. Do you see how there are active processes on earth which are trying to wear down the land? Then, do you think that all of the land eventually will be worn down and carried out to the ocean? You will be correct if you say “No.”

While on one hand, the processes on the Earth’s surface are trying to wear down the mountains, on the other hand, processes inside the Earth are trying to create new mountains. Mountains, as you know, are high grounds that have been pushed up by some forces. The same forces that shake the ground making earthquakes also make the mountains by squeezing, slicing and pushing the rocks. That is why earthquakes happen near where new mountains are forming, even at the bottom of the ocean. Did you notice that the longest mountain chain occurs along the middle of the oceans?

Projection 5: Real-time Global Earthquakes

This projection shows where some earthquakes are happening, right now! Watch the date-line to see if an earthquake has occurred today. The size of the circle shows how strong the earthquake is; the color shows the depth of where the quake started inside the Earth. Most earthquakes occur along breaks in the Earth’s crust, at plate boundaries. Notice that the earthquakes are happening along the edges of the land or along the tops of underwater mountain chains. These areas are where layers of rocks are breaking and mountains are forming, either by the earth pushing together and piling up during earthquakes, or by volcanoes that erupt and deposit new rock material.

Notice the number of earthquakes in California. Can you see the mountain chain that makes up the Hawaiian Islands? Notice the activity near Japan. All of these areas, and more, experience earthquakes.

When a strong earthquake happens on the ocean floor, it may cause giant ocean waves, called “tsunami.”

Projection 6: Indian Ocean Tsunami model, December 26, 2004

A strong tsunami event happened the day after Christmas in the year 2004 in the Indian Ocean near the island of Sumatra in Indonesia. Watch as the giant tsunami waves travel at great speed across the oceans. Within 24 hours, those waves reached all of the major coastlines in the world, producing enormous floods. Those flood waters also reshaped the Earth’s land surface.

We hope you are able to see how the earth processes constantly change the surface of the Earth: making new mountains, breaking down mountains and rocks into dirt, carrying that dirt into our waterways, and depositing it into our oceans. Some of those

processes are fast, like during earthquakes or landslides, and some are slow, like when ice breaks down rocks, but I hope you find it all fascinating. Thanks for visiting and be sure to come again.

If time allows: return to the 1st Projection: The Blue Marble, and answer any questions the students may have.

Current News

Projection: Play list "Chile_Earthquake"

An 8.8 magnitude earthquake (~80 times stronger than the Haiti earthquake of January 12, 2010) hit Chile on February 27, 2010 at 3:15 a.m. local time. The town of Concepcion near the epicenter is reported to have been devastated by the quake. Following that major tremor, there were a series of 5 to 6 magnitude aftershocks in the area as well as along the length of the Peru-Chile trench, a subducting plate boundary along the western margin of South America.

Although the Chilean earthquake was much stronger, the degree of devastation and loss of human life there, by preliminary estimates, are much lower than in Haiti.

I hope this dataset showcase has sparked your interest and that you have learned something new. To learn even more, visit us as often as you can.

Thank you.