

Activity: Climate Time Machine

The Climate Time Machine allows you to investigate four areas of data that illustrate information around climate change events. The machine allows you to control the setting by moving the cursor along the x axis of the picture showing what happens as this variable changes. The four dimensions discussed are: Arctic Ice, Sea Level, Carbon Emissions, and Average Global Temperatures. Please read the short paragraph that occurs with each image to help orient you to the system. Answer the questions with each category.

Arctic Ice

Is the information shown about Arctic ice actual data or a scientific model?

What happens to the image as the date moves from the past toward the present date?

What factors might influence this happening?

What question(s) do you have about this information?



MOST*

MATERIALS NEEDED

Computer with Internet Access

Students should be able to:

Describe the variables in each of the graphs

Manipulate each of the graphs portrayed

Describe the changes in each of the graphs

Determine if the graph is a model or made with actual data

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New York State Standards

Standard 1: Math:

- Key Idea 1: M1.1a, M1.1b, M1.1c
- Key Idea 2: M2.1, M2.1a, M2.1b
- Key Idea 3: M3.1, M3.1a

Standard 1: Scientific Inquiry:

- Key Idea 1: S1.1, S1.1a, S1.1b, S1.2c

Standard 1: Information Systems:

- Key Idea 1: 1.2, 1.5
- Key Idea 3: 3.2

Standard 6:

- Key Idea 2: 2.2, 2.3
- Key Idea 3: 3.1
- Key Idea 4: 4.2
- Key Idea 5

Standard 4: Physical Setting:

- Key Idea 1: 1.1e
- Key Idea 2: 2.1a, 2.1d, 2.1j, 2.2i, 2.2j, 2.2r

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Sea Level

Is the information shown about sea level actual data or a scientific model?

What happens as the sea level rise increases from one meter to six meters?

What do you predict will happen in the next ten years?

What question(s) do you have about this information?



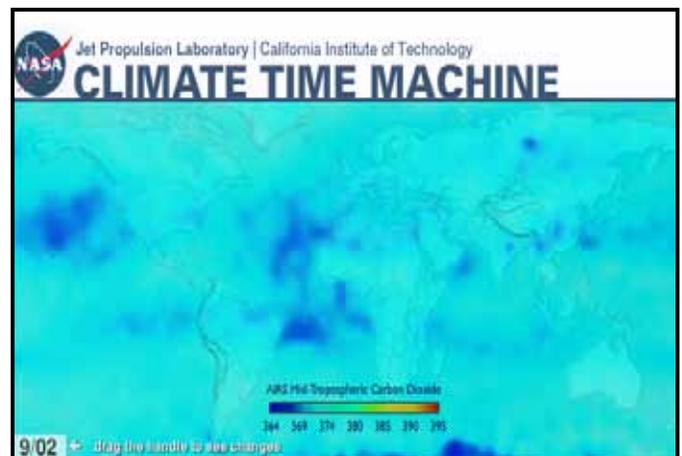
Carbon Emissions

Is the information shown about carbon emissions actual data or a scientific model?

What are the units of measurement used in this slide?

What is indicated by the change of color from yellow to red?

What is indicated by the change of color from blue to green?



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What happens as time goes by from the year 2003 - 2009?

Why do you think this is occurring?

What question(s) do you have about this information?

Average Global Temperatures

Is the information shown about global temperatures actual data or a scientific model?

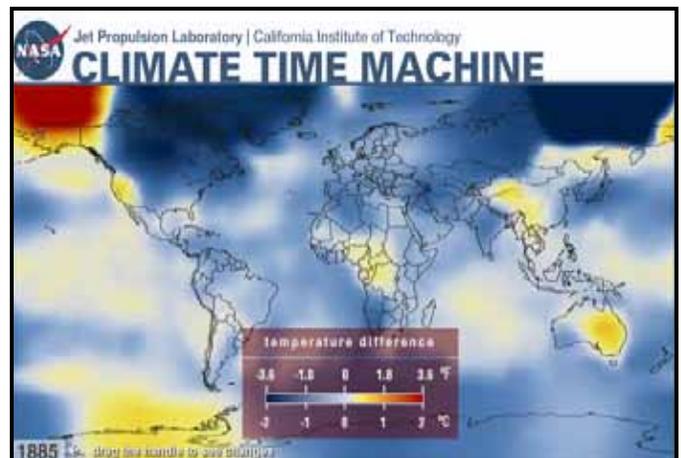
What is indicated by dark blue?

What is indicated by red?

As you move from 1895 to 2007, what happens to the data?

Why do you think this occurs?

What question(s) do you have about this information?



To complete this activity it would be best to reserve the computer lab with internet connection. Go to the NASA Climate website - <http://climate.nasa.gov/>, click on the tab at the left hand side labeled interactive and select "Climate Time Machines". Prepare the students' computers in advance to the correct webscreen, "Climate Time Machines". Have your students divided into pairs for this activity. Give a brief description of the Climate Time Machine and explain that the design allows them to control the variable in the situation. Ask the students to complete the worksheet based on the four scenarios shown.

Discussion:

Sea Ice:

What seems to be occurring in this scenario?

The Sea Ice seems to be getting smaller in area as time moves toward the present.

Is this information from real measured data or from a model created by scientists?

Explain that the information is from real satellite data and is an accurate representation of what has been happening.

What is causing this to occur?

Scientists believe that this is occurring due to the warming of the earth's atmosphere. The past decade is the warmest in recorded history.

Sea Level:

Is this visualization based on actual data or a scientific model?

The visualization is a scientific model based on scientific evidence but we are still unsure about how much the ice on the arctic land forms will melt and therefore how much the sea level will rise in the future. It is only the ice on the land that melts that will cause a sea level to rise. The ice on the water will not impact the sea level rise. To demonstrate this principle have a cup of water with ice in it filled to the brim and watch what happens to the cup of water as the ice melts.

Carbon Emissions:

Is the information in this visualization actual data or a scientific model? *It is actual data captured by satellite information. The information viewed is all factual data showing the changes over time.*

What does this visualization of data show us about the carbon dioxide levels in our atmosphere over time? *There has been a dramatic increase in the number of carbon dioxide molecules, parts per million (PPM), that we observe in our earth's atmosphere.*

Why do you think the carbon dioxide levels are rising? *Vehicle exhaust contains carbon dioxide emissions, burning fossil fuels, other burning scenarios, various forms of pollution. The primary source of carbon dioxide in the United States is combustion of fossil fuels to generate electricity. The secondary source is a byproduct of transportation of people and goods in the United States. The increasing carbon dioxide level is compounded by the fact that once it is in the atmosphere it will stay there for 50 to 200 years while more carbon dioxide continues to be added.*

Average Global Temperatures:

Is the temperature information represented part of a real data set or a scientific model? *The temperatures represented on this visualization are actual data that we have been recording throughout history at various locations on the earth. Currently we obtain a great deal of climate data through the use of satellite information. Surface temperatures are still taken by weather stations around the world.*

What has happened to the average global temperature over the past 100 years? *The temperatures have been warming.*

What factors might influence this happening? *Scientists believe that this has been occurring due to the green house effect. The increase in the green house gases in the atmosphere impacts the heating of the planet. Human input of the gases into the atmosphere has greatly increased over the past 100 years. This will be discussed in more details throughout the activities. The green house gases include water vapor, carbon dioxide, methane, nitrous oxide and ozone.*

Make a list of the student generated questions. If you need some assistance with the students questions call the MOST for assistance and we will help you track down the information. Nancy Volk 315-425-9068 ext. 2147