

Modeling Climate Online

All models have advantages and disadvantages. In this activity you will be evaluating the use of various climate models

Strengths

- easier to work with than complex reality,
- can be used to predict the effect of a change of input
- can be applied to other similar situations, help us see patterns
- can be used to visualize really small things (atoms) and really large things (solar system)
- helps illustrate complex concepts and formulate hypotheses.

Weaknesses

- lack detail so predictions may not be that accurate
- your assumptions are wrong
- the model is wrong
- predictions may be inaccurate
- if there are no figures on the models it gives a false impression
- maybe over-simplified which can cause misunderstanding
- may be misleading and affect our understanding.
- vested interests might hijack them politically
- any model is only as good as the data goes in and these may be suspect
- different models may show different effects using the same data

Go to the Concord HASBOT "What is the Future of Earth's Climate

https://authoring.concord.org/sequences/476/sequence_run/e1ba3e88160bb5ac318a631c63d03a7870b078f6

Go to Activity #3 Interactions with the Atmosphere

<https://authoring.concord.org/sequences/476/activities/9336/675be3d6-9493-45ec-9a90-72aecc439840>

Select Slide 1 Solar Radiation

1. Run the model of Solar Radiation. Play with it until you understand how it works, then answer the following questions
 - a. What two things can happen when energy from the sun interacts with the ground?
 - b. How is CO₂ shown in this model?

Select Slide 2 Carbon Dioxide in the Atmosphere

2. After adjusting the amount of CO₂ in the air answer the following questions
 - a. Describe the effect of CO_c on global temperatures.
 - b. on the axis below draw this relationship.

- c. What happens if you remove all of the CO₂ from the atmosphere?

Select Slide 3 Radiation Gas Interaction

3. After watching the model of solar radiation hitting the ground, answer the following questions

- a. What happens when the sunlight hits particles in the ground?
- b. What happens when you increase the heat energy shading?
- c. What happens to solar energy when sunlight hits the Earth?
- d. What happens when infrared radiation hits the greenhouse gases?
- e. How do CO₂ and other greenhouse gases cause the Earth's atmosphere to warm?
- f. Explain the similarities between the molecular model and the Earth system model.

Select Slide 5 Atmospheric Carbon Dioxide over Time

4. What are some causes of the CO₂ increase over the past 50 years?
5. What is the source of the red "wiggles" in the CO₂ plot, compared to the average values shown in black?

Go Back to the Main Menu to Activity 4 - Sources, Sinks and Feedback

<https://authoring.concord.org/sequences/476/activities/9337/pages/120763/0e348126-9eb6-482c-883b-8c8dfc355cfb>

Go to Slide 1 Carbon Dioxide Cycling

1. Which statement is true about biogeochemical cycles?
2. Is there a reservoir in the Earth system that serves only as a sink for carbon dioxide?
Explain your reasoning.
3. Create a hypothesis for what will happen with an increase of temperature on CO₂ dissolving in the ocean.
4. Write a conclusion explaining how temperature impacts carbon dioxide dissolving in the ocean.
5. What happens to the carbon dioxide that sinks to the bottom of the ocean.
6. What is the relationship between atmospheric CO₂ and its absorption by the ocean?
7. Draw a systems diagram of the carbon cycle.

Go to Slide 4 - Water Vapor; A Powerful Greenhouse Gas

1. What is the relationship between water vapor and temperature?
2. When there is more water vapor in the atmosphere, what will happen to the temperature?
3. Which greenhouse raises the temperature faster? How can you tell?
4. The effect of two greenhouse gasses model
 - a. How does the level of carbon dioxide affect the level of water vapor in the atmosphere?
 - b. How does increasing CO₂ impact water vapor? Explain
5. Sketch the positive feedback system that affects Earth's climate.

Models

1. Evaluate the benefits of each model you have tried today?
2. Evaluate the limitations of each model you have used today?