

Making Sense of Climate, Global Biogeochemical Cycles and our Energy Future

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Where I will post related animations, links and more:

http://earthguide.ucsd.edu/eoc/special_topics/teach/sp_climate_change/sp_climate_change.html

If you are interested in working with our group to produce an activity for your class, please e-mail me and let me know at:

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A. Why does climate matter?

1. Comparing notes, what you and students think.
2. Who pays to find this stuff out?
3. Who do you trust?
4. Who should set the priorities and how?

RESOURCES

Climate Change, U.S. EPA

<http://www.epa.gov/climatechange/>

Climate Change, NASA

<http://climate.nasa.gov/>

USGS Office of Global Climate Change

http://www.usgs.gov/global_change/

Climate Change in the Pacific Region

<http://www.fws.gov/pacific/climatechange/>

The World Factbook

<https://www.cia.gov/library/publications/the-world-factbook/index.html>

UN Climate Change

<http://www.un.org/wcm/content/site/climatechange/gateway>

NationMaster statistics

<http://www.nationmaster.com/index.php>

Maldives slideshow, MSNBC

http://www.msnbc.msn.com/id/34115298/ns/newspicture_stories/displaymode/1247/?beginSlide=1

The Provocative Predictions of One Scripps Water Researcher,
Article about SIO Researcher Tim Barnett
http://www.voiceofsandiego.org/environment/article_596c1027-3014-55af-b302-f15e23c443dc.html

Ramanathan website
<http://www.ramanathan.ucsd.edu/>

Jeremy Jackson – Coral reefs TED talk
http://www.ted.com/talks/jeremy_jackson.html

B. Matter, energy, and radiation

1. What is carbon? What is carbon dioxide?

RESOURCES

Web elements

<http://www.webelements.com/>

JMOL – The molecule viewer I used
Where to get it: <http://jmol.sourceforge.net/>

The Virtual Museum of Minerals and Molecules – 3D mineral structures
<http://virtual-museum.soils.wisc.edu/displays.html>

2. Where does the carbon dioxide in our atmosphere come from?
 - a. Stars that predate our own,
 - b. Volcanic activity that emits gases,
 - c. Photosynthesis

RESOURCES

Formation of the Solar System movie

http://www.metacafe.com/watch/1111454/formation_of_the_solar_system_great_animation/

3. What are some examples of electromagnetic (EM) radiation?
4. How does the transmission of EM radiation differ from sound?
5. How is EM used in satellite-based observation?

C. The carbon cycle

1. What major parts of the Earth contain carbon?
2. How does carbon transfer from one “reservoir” of carbon to another?
3. Which transfers are fast relative to our lifetime?
4. Which transfers involve a lot of carbon?

5. Which transfers are significant?
6. Which of these processes can we influence?

D. The global energy budget

1. How do we know that the Sun heats the Earth?

RESOURCES

National Weather Service Graphical Forecast

<http://www.weather.gov/forecasts/graphical/sectors/#>

Solar System Exploration – NASA

<http://solarsystem.nasa.gov/index.cfm>

Planetary fact sheet – NASA

<http://nssdc.gsfc.nasa.gov/planetary/>

Sea Surface Temperatures

<http://www.ssec.wisc.edu/data/sst/> Current stills

<http://www.ssec.wisc.edu/data/composites.html> Recent movie with land temperatures

2. How do we know that greenhouse gases control surface temperature in addition to the effects of the distance to the Sun or night vs. day?
3. What happens to the energy in sunlight after it lands on Earth?

RESOURCES

Global energy budget diagram (Draft)

http://earthguide.ucsd.edu/eoc/special_topics/teach/sp_climate_change/p_energy_budget.html

E. Carbon-based energy sources

1. Which energy sources derive their energy from sunlight?
2. Which fuels produce CO₂ as a byproduct?
3. What key process takes the Sun's energy and locks and packages it into a usable form for living things?
4. Since sunlight has been arriving on Earth for ~4.6 billion years, is the Earth getting hotter over time?
5. Which factors set the Earth's temperature?

