Modeling the Earth's Energy Balance

This plan was developed by Liese Murphree and SOCAN's Climate in the Classroom Project for SOREEL's August Institute 2016. (35min for the workshop). Can be adapted for High School.

Overview: Participants will work in grade-level teams to develop a model of the Earth's energy balance in a way that is appropriate for their grade level.

Objective: To increase understanding of the basic science of global warming. To consider how to represent the science in appropriate depth for your grade level.

Grade Level: Teacher education.

Standards:

Science and Engineering Practices

Developing and using models

Crosscutting Concepts

Systems and system models

5-ESS2-1 Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.

HS-ESS2-4 Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.

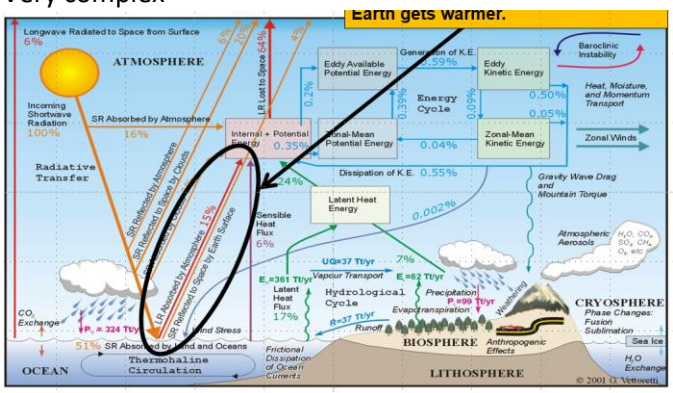
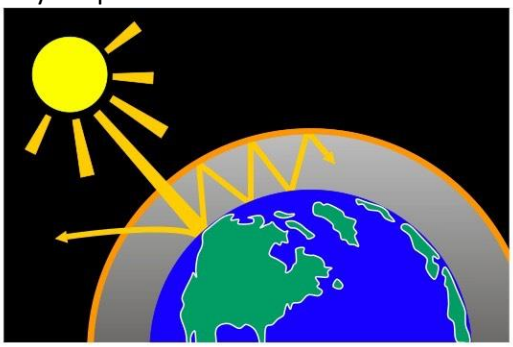
Materials: (For each group) Paper, Markers. (For the workshop) Tape to post models.

Science Terms

- Ultraviolet (UV), visible (Vis), infrared (IR) = different frequencies/energies/wavelengths of light on the electromagnetic spectrum.
- Shortwave (high frequency & energy) radiation = UV
- Longwave radiation (low frequency & energy) = IR = heat

Activity

- Introduction – 2min (think that we need more time for the Intro. Maybe 8 min)
    - One of the first steps in understanding climate change science is to understand what happens to the Sun's energy when it reaches the Earth's atmosphere. This is necessary to understand the *greenhouse effect*. We can call the description of incoming and outgoing energy as the Earth's energy balance (like the balance in a bank account).
    - Models of the Earth's energy balance can be very complex or very simple. If it is too detailed it is not useful because it is too confusing. If it is too simple it is not useful because it does not contain the information you need.

Very complex	Very simple
	

- What are the essential pieces of the model that we need to have in our understanding as teachers? Have the teachers share their ideas. (This is a good time to add info that teachers don't have or to clarify misunderstandings they do have.)

- Build Models – 12min (maybe less)
  - What are the essential pieces of the model that your students need to understand? Working in grade-level groups, develop a model that is appropriate for your students.
- Discuss models – 10min
  - Tape to post the models on the white board in grade order and have a brief discussion about how the model changes as students get older.