

# NASA Global Climate Change Education Workshops

November 26 - December 5, 2012

High school and middle school science teachers in the Poudre and Greeley school districts are invited to collaborate with researchers from Colorado State University in a series of four workshops focused on the science of climate change. These workshops will introduce teachers to current research on climate change using remote sensing data from NASA and classroom activities developed by local science teachers that are easy to integrate climate science into your existing curriculum. The Prequel and all four modules are aligned with both Colorado state and National science standards.

You will be compensated for your participation in this project! Compensation requirements are outlined below.

## Module Implementation Teacher responsibilities:

- Attend a module training workshop (\$75 each) – you may attend up to 4 training workshops
- Give a pre- and post- assessment to your students (\$100)
- Implement in your classroom the Prequel Module and 1 of the NASA Modules during the 2012- 2013 school year (\$300)
- Fill out and return a Post-Implementation Feedback Form by May 31, 2013 (\$50)
- Attend an End-of-School Year meeting to provide feedback (\$75) – Date TBD

To **register** for one or more of the workshops, please send an email to: Terry Cochran at [tcochran4aintry@yahoo.com](mailto:tcochran4aintry@yahoo.com) no later than 5:00 p.m. on Wednesday, November 21, 2012. Please indicate which workshop(s) you are interested in attending.



## NASA Prequel: Introduction to Remote Sensing and Electromagnetic Energy

**Target Grade Levels:** 6-12 Earth Systems Science

### Topics Covered:

- Absorption, emission and reflection of energy from various materials
- Satellites
- Remote sensing
- Abilities, applications and limitations of satellite data
- Electromagnetic spectrum
- Gravity, velocity and momentum

**Description:** This segment is an introduction to each of the four modules that comprise the NASA Global Climate Change Education project. It will introduce students to the technological advances achieved through the use of satellite imagery. Students will learn about the collection of remote sensing data and how it is used to study the earth and the universe.

## How Does Climate Change Impact the Earth's Four Spheres?

**Target Grade Levels:** 9-10 Earth Systems Science

### Topics Covered:

- Biosphere
- Hydrosphere
- Atmosphere
- Geosphere

**Description:** Students will use NASA data sets to examine how the Earth's four spheres (biosphere, hydrosphere, atmosphere and geosphere) are impacted by climate change. Each data set is accompanied by a lab or activity to reinforce the impact of climate change on our planet. This module is designed for students to realize that local anomalies are the result of global changes. The module will also include an overview of accompanying labs/activities.

**Date:** Monday, November 26, 2012

**Time:** 4:00 – 7:00 p.m.

**Location:** Fossil Ridge High School, 5400 Ziegler Road, Fort Collins, CO 80528 (Computer Lab N110)

## Oceans, Ice and Climate Change

**Target Grade Level:** 6th Grade Earth Systems Science and Oceanography

### **Topics Covered:**

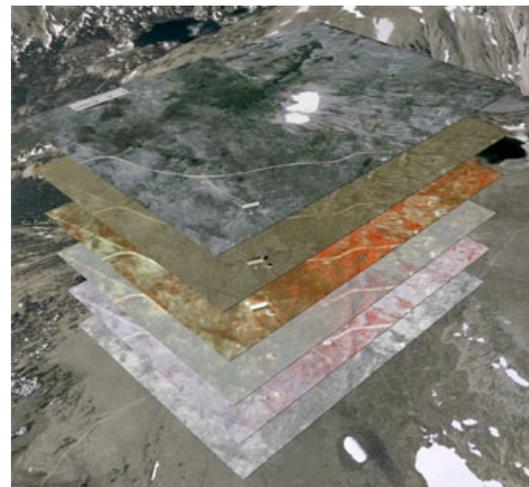
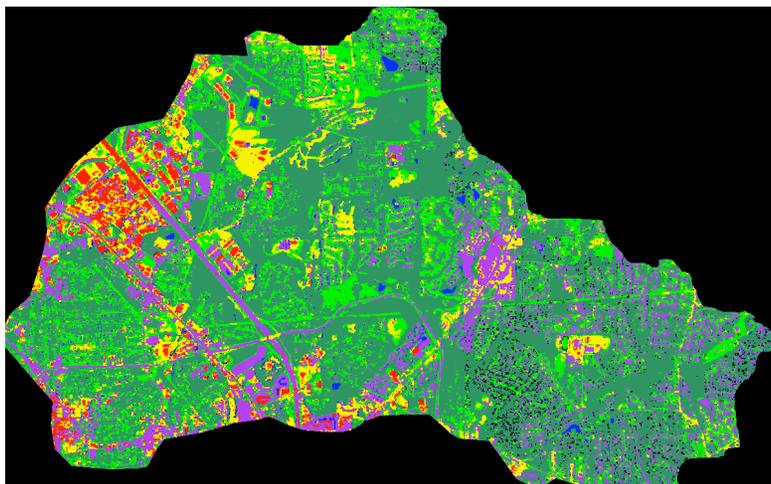
- Oceans
- Glaciers, sea ice and land ice
- Temperature
- Rising sea levels
- Oxygen and carbon dioxide
- Climate vs. weather
- Satellites

**Description:** The overall objective of this module is to increase students understanding of the relationships between oceans, ice and climate change. Students will learn that complex interrelationships exist between Earth's structure and natural processes that over time are both constructive and destructive. Students will gather and analyze data and communicate an evidence-based explanation for the complex interaction between Earth's constructive and destructive forces. Students will learn that water on Earth is distributed and circulated through oceans, glaciers, rivers, ground water, and the atmosphere and will identify problems and propose solutions related to water quality, circulation, and distribution - both locally and worldwide.

**Date:** Wednesday, November 28, 2012

**Time:** 4:00 – 7:00 p.m.

**Location:** Kinard Middle School, 3002 E. Trilby Road, Fort Collins, CO 80528 (Room 303)



## Earth's Energy Budget

**Target Grade Levels:** 9-12 Earth Systems Science

### **Topics Covered:**

- Infrared energy
- Surface materials and their effect on ambient temperature
- Energy absorption, radiation and reflection
- Urban heat effect
- Heat islands
- Greenhouse gases and their impact on Earth's energy balance

**Description:** In this module, students will learn about the ability of different substances to absorb, reflect and radiate solar energy. They will study the impact that different surface materials have on the ambient temperature of urban areas. Students will be expected to design a procedure that measures the temperature above various ground cover materials, collect and analyze data from their procedure and be able to arrive at an evidence-based conclusion about the expected changes in Earth's energy balance. The module will culminate by asking students to apply what they've learned to local phenomena.

**Date:** Monday, December 3, 2012

**Time:** 4:00 – 7:00 p.m.

**Location:** Fossil Ridge High School, 5400 Ziegler Road, Fort Collins, CO 80528 (Computer Lab N110)

## Climate Change, Past and Present

**Target Grade Levels:** 9-10 Earth Systems Science

**Topics Covered:**

- Ocean sediment proxy data
- Warming periods, past and present
- Photon-molecule interactions
- Rates of global warming
- Oxygen isotopes and sediment/ice core link
- Enhanced greenhouse effect
- Innovative solutions to climate change

**Description:** Through an interrupted guided inquiry investigation, students will investigate climate history and previous warming events and relate them to our current warming period. Students will perform hands-on activities inquiring into atmospheric dynamics and potential solutions to global warming. Students will model photon-molecule interactions using a PhET computer simulation. Through video and graphics, students will examine proxy data from the Paleocene-Eocene Thermal maximum and recent data from NASA satellite images. They will compare the rates of each of the global warming periods and their subsequent effects on life. The module will culminate with an investigation of the greenhouse effect, the enhanced greenhouse effect, and a potential solution to global warming involving mirrors designed to reflect incoming solar radiation. Students will also discuss the ethical implications of solar reflection and atmospheric scrubbing of CO<sub>2</sub>.

**Date:** Wednesday, December 5, 2012

**Time:** 4:00 – 7:00 p.m.

**Location:** Fossil Ridge High School, 5400 Ziegler Road, Fort Collins, CO 80528  
(Computer Lab N110)

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