

ES 106 Laboratory # 5

EARTH-SUN RELATIONS AND ATMOSPHERIC HEATING

Introduction

Weather is the state of the atmosphere at a particular place for a short period of time. The condition of the atmosphere at any place and time is described by measuring the four basic elements of weather: temperature, humidity, air pressure, and wind. Of all the controls that are responsible for causing global variations in the weather elements, the amount of solar radiation received at any location is certainly one of the most important. Investigating the journey of solar radiation and how it is influenced and modified by air, land, and water will provide a better understanding of one of the most basic weather elements, atmospheric temperature.

Temperature is an important element of weather and climate because it greatly influences air pressure, wind, and the amount of moisture in the air. The single greatest cause of temperature variations over the surface of Earth is differences in the amount of solar radiation received. Secondary factors, such as ocean currents, altitude and differential heating of land and water, can also affect local temperatures. The unequal heating that takes place over the surface of Earth is what sets the atmosphere in motion, and the movement of air is what brings changes in our weather.

For life on this planet, the relations between Earth and Sun are perhaps the most important of all of the astronomical phenomena. The amount of solar energy (radiation) striking Earth is not constant throughout the year at any particular place but varies with the seasons. However, the total amount of radiation that the planet intercepts from Sun equals the total radiation that it loses back into space. It is this balance between incoming and outgoing radiation that keeps Earth from becoming continuously hotter or colder.

Goals and Objectives

- Examine what happens to solar radiation as it enters and interacts with the Earth system.
- Explore the effect that sun angle has on the intensity and duration of solar radiation that any particular location receives throughout the year.
- Diagram the relationship between Earth and Sun on the dates of the solstices and equinoxes.
- Compare how the heating of a surface is related to its albedo and contrast the differences in the heating and cooling of land and water.

Useful Websites

- <http://www.physicalgeography.net/fundamentals/6i.html>
- <http://hyperphysics.phy-astr.gsu.edu/hbase/phyopt/albedo.html>
- <http://zebu.uoregon.edu/disted/ph162/l4.html>
- <http://home.iprimus.com.au/nielsens/solrad.html>
- <http://solardat.uoregon.edu/SolarRadiationBasics.html>

Use your favorite internet search tools (e.g. Google, wikipedia), answer the following

5.2

Name_____

Lab Day/Time_____

See Pages 495-498 in Chapter 16 of the textbook reading on Earth-Sun Relations

Pre-lab Questions – Complete these questions before coming to lab.

1. Define the following terms:

A. Equinox

B. Solstice

C. Infrared radiation

D. Albedo

2. The amount of solar energy per unit area hitting the outside of Earth's atmosphere is greater than the amount that actually reaches Earth's surface. Give at least three factors that contribute to the decrease in the amount of energy reaching Earth's surface and explain each.