GLOSSARY

CHLOROFLUOROCARBONS
Any of several volatile, inert, saturated compounds of carbon, fluorine, chlorine & hydrogen: used as refrigerants, foam-blowing agents, solvents, and formerly as aerosol propellants until scientists became concerned about depletion of the ozone layer.

ENVISAT
Earth observation satellite aimed to improve environmental studies regarding atmospheric chemistry, ozone depletion, biological oceanography, ocean temperature and color, hydrology, agriculture, natural hazards, digital elevation modeling, monitoring of maritime traffic, atmospheric dispersion modeling, cartography and the study of snow and ice.

HYDROCHLOROFLUOROCARBONS
Compounds of hydrogen, chlorine, fluorine, and carbon atoms. HCFCs and their cousins, hydrofluorocarbons (HFCs), were created in the 1980s as substitutes for chlorofluorocarbons (CFCs) for use in refrigeration and a wide variety of manufacturing processes. Because all three of these classes of compounds either destroy the stratospheric ozone layer essential to life on Earth, and/or contribute to an unnatural warming of the planet's climate, international agreements have been organized to eliminate their production.

MESOSPHERE
The region of the Earth's atmosphere lying above the stratosphere and below the thermosphere, from a height of about 50 kilometers (31 mi) to about 80 kilometers (50 mi) above the Earth's surface.

PHYTOPLANKTON
Plankton consisting of free-floating algae, protists, and cyanobacteria. Phytoplankton form the beginning of the food chain for aquatic animals and offset large amounts of carbon, which would otherwise be released as carbon dioxide.

STRATOSPHERE
The region of the Earth's atmosphere from the tropopause to about 50 kilometers (31 mi) above the Earth's surface. The stratosphere is characterized by the presence of ozone gas (in the ozone layer) and temperatures which rise slightly with altitude, due to the absorption of ultraviolet radiation.

TOPOGRAPHY
The three-dimensional arrangement of physical attributes, such as shape, height, and depth of a land surface. Physical features that make up the topography of an area include mountains, valleys, plains, and bodies of water.

TROPOSPHERE
The lowest and densest region of the Earth's atmosphere, extending from the Earth's surface to the tropopause. It is characterized by temperatures that decrease with increasing altitude. At the top of this region, temperatures are close to -55°C (-67°F). The weather, major wind systems, and cloud formations mostly occur here.

ULTRAVIOLET
Relating to electromagnetic radiation having frequencies higher than those of visible light but lower than those of x-rays.

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SYNOPSIS:

The Earth's climate has a long history of drastic fluctuation. From ice ages to long periods of warmth, there are natural occurrences such as volcanic eruptions and changes in the Sun's intensity that affect the climate. More recently, there is wide speculation that activities associated with the Industrial revolution have altered the atmosphere and have negatively affected the climate. This program demonstrates how scientists measure, study and research the health of our planet from the atmosphere to the depths of the ocean.

CURRICULUM UNITS:

- Chemical Enineering
- Chemistry
- Earth Science
- Ecology
- Environmental Science

CAREER OPPORTUNITIES:

- Biologist
- Chemist
- Earth Scientist
- Ecologist
- Engineer
- Environmentalist
- Meteorologist

PROGRAM OVERVIEW:

Scientists have a variety of tools at their disposal for keeping a close watch on the health of the Earth. Satellites, such as the ENVISAT use several onboard instruments, measure things such as atmospheric chemistry, ocean temperature and changes, hydrology, ozone depletion wind patterns, and snow and ice. Analyzing detailed images from space regarding ice sheet characteristics, distribution and dynamics helped researchers identify a problem on the eastern side of the Antarctic Peninsula; A huge chunk of the Larsen B Ice Shelf had shattered and separated. Envisat is equipped with the powerful spectrometer SCIAMACHY, which collects data to help us understand the chemistry and physics of the troposphere, stratosphere, and mesosphere. Scientists have identified gases in the earth's atmosphere that caused the depletion of the ozone layer. These gases include chlorofluorocarbons and hydrochlorofluorocarbons are produced by humans and are not naturally found in the atmosphere.

Some tree species act as indicators of changes in the environment. Scientists measure the levels of carbohydrates and amino acids in the leaves of plants in environments to understand their reactions to local conditions. By comparing data from satellites, weather changes and plant species, scientists can begin to predict how human activity can affect plant life.

ISSUES & CRITICAL THINKING:

1) Research the ice levels of the Chukchi and Beaufort Seas. With declining ice levels, what are the consequences for the ecosystem? How will the loss of ice levels affect sea ice algae and polar bears? (see http://www.espo.nasa.gov/icescape/)

2) Outline how satellite technology has helped scientists to monitor changes in the atmosphere and the oceans.

3) Oil spills are disastrous to marine animals, and affect shoreline ecosystems as well. How are scientists using satellite technology to design plans to react most efficiently to oil spills?

4) What technologies assist scientists as they track the presence of harmful algae blooms (HABs) in an effort to reduce serious health effects on humans, marine organisms, and regional economies?