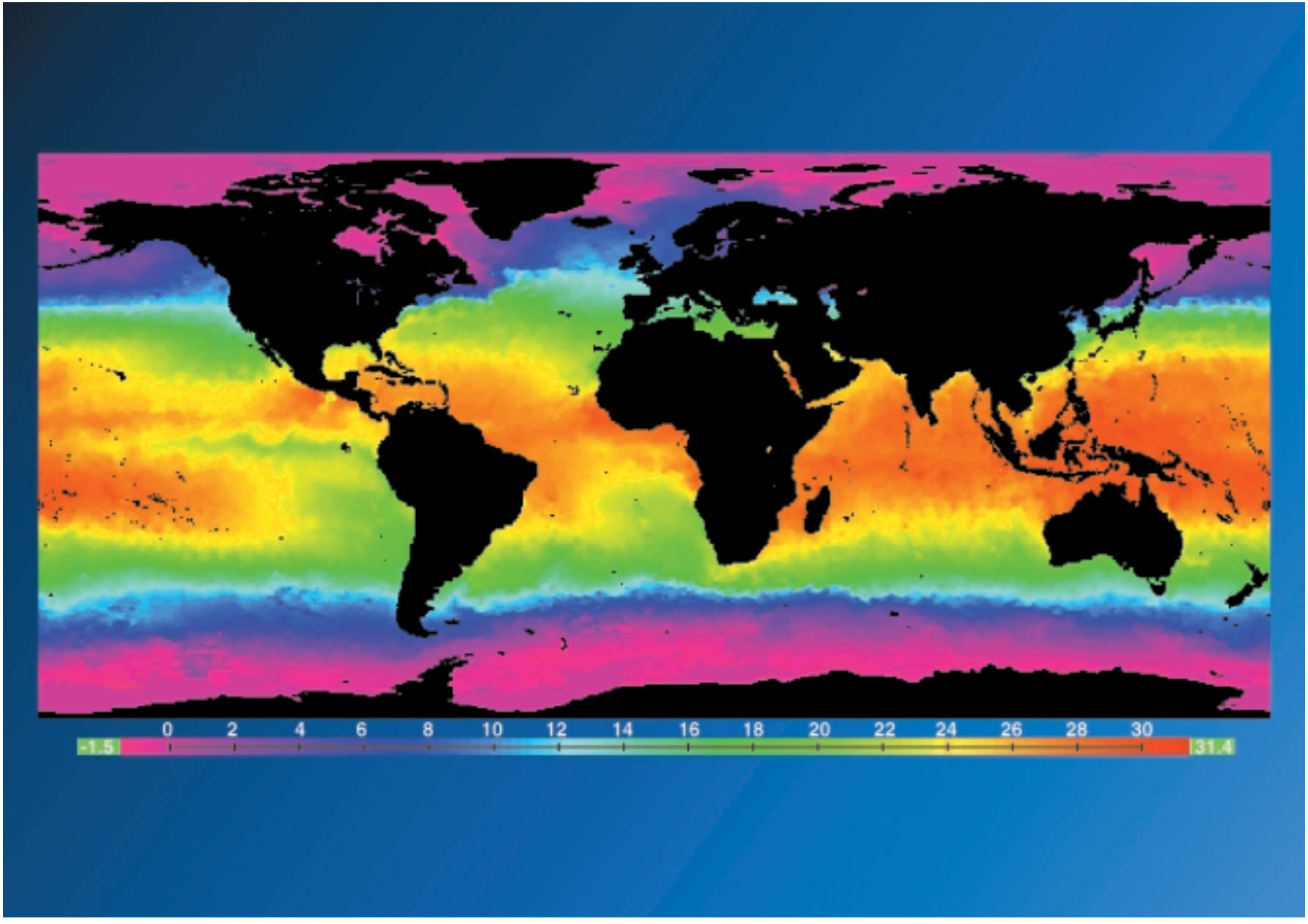
National Aeronautics and
Space Administration
Goddard Space Flight Center

SEA SURFACE TEMPERATURE

National Oceanic and
Atmospheric Administration



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Sea surface temperature products are produced routinely from the Advanced Very High Resolution Radiometer (AVHRR) instrument at global, regional, local, and coastal coverages. The AVHRR flies on all NOAA polar-orbiting satellites.

This image is an example of a global product that was generated from NOAA-14 data on December 21, 1999. It was produced at 50 kilometers (31 miles) resolution. Ground system users produce this type of image twice weekly although the raw data is available each 24-hour period and this type of image could be produced on a daily basis if desired.

This image was generated by combining data obtained during 14 orbits of NOAA-14. The colors in the image and in the scale below represent sea surface temperatures and were inserted into the image by ground processing of the data to graphically show the differences in temperature. The values in the scale are degrees of temperature Celsius. The land masses in this image are rendered in black to highlight the desired data product, which was sea surface temperature. Including land surface temperatures would have required a greater range of temperatures than those found in sea surfaces.

The AVHRR/3, built by ITT-A/CD, is composed of six detectors: three view reflected energy in the visible portion of the electromagnetic spectrum and three view energy in the near-infrared portion of the electromagnetic spectrum. The AVHRR (which is the type of instrument called an "imager") observes vegetation, clouds, the surface of bodies of water, shorelines, snow, aerosols, and ice. It can detect the heat in the environment, the temperature of snow caps and the sea surface, vegetation growth around the world, and forest fires. From this data, scientists on the ground can determine whether snow caps are changing in size, the effects of changes in ocean temperature, and other changes in the environment. The data generated by the AVHRR is used worldwide by scientists, commercial fisherman, teachers, and many others.

Since the 1960s, NASA and NOAA have been actively engaged in a cooperative program to develop and launch the NOAA Polar Operational Environmental Satellites (POES). NASA's Goddard Space Flight Center in Greenbelt, Maryland, is responsible for the construction, integration, and verification testing of the spacecraft, instruments, and unique ground equipment. The Titan II launch vehicle is provided by the U.S. Air Force. NASA checks out the satellite on-orbit performance to assure it meets its requirements. NASA turns operational control of the spacecraft over to NOAA after 10 days of comprehensive subsystem checkout. An on-orbit instrument performance verification period lasts approximately 35 days more.

The NOAA satellites carry instruments that observe our Earth and provide global data for NOAA's operational user requirements including short- and long-range weather forecasts. The operational system consists of two polar-orbiting satellites. One crosses the equator at roughly 7:30 a.m. and 7:30 p.m. local solar time, and the other crosses the equator at roughly 2:00 a.m. and 2:00 p.m. local solar time.

Currently, the system consists of NOAA-14, launched in December 1994, into a 1:40 p.m. local solar time orbit and NOAA-15, launched in May 1998 into a 7:30 a.m. local solar time orbit. NOAA-L, the latest NOAA spacecraft, will be launched in the fall of 2000. It will replace NOAA-14 in a 2:00 p.m. orbit.

NOAA-L will be renamed NOAA-16 after achieving orbit. The satellites receive a letter designation while under construction on the ground and are then renamed with a numerical designation after launch. This is done because the satellites are built in alphabetical order but are not necessarily launched in this same order. Therefore, to avoid confusion, they are numbered upon reaching orbit.

More information on the POES program can be found on the Internet at: http://poes.gsfc.nasa.gov and at http://www2.ncdc.noaa.gov/docs/klm/index.htm.

For the Classroom

One of the most vital tools scientists use to study the atmosphere is remote sensing. In this "long distance seeing" that will be performed by NOAA-L, researchers will use infrared, microwave, and visible spectral data to trace weather patterns and to image cloud cover. To be effective and provide the most accurate results, remote sensing must be performed over a long period of time. NOAA-L will collect data for at least two years and probably longer.

Why must these investigations be so comprehensive and continue for a long period of time? Try this investigation to find out.

Materials Needed:

Notebooks, pencils, paper, graph paper, if available, an instant camera or video camera, with film or videotape

Procedure:

Count the number of students at a central location in your school cafeteria or gym for a 1-minute period several times a day. You can do this by taking a photograph of the cafeteria or gym or by stationing yourself there and counting the number of students that you see. Draw a graph with the times shown on the horizontal axis and the numbers of students on the vertical axis.

Questions:

1. Is there a noticeable difference in numbers of students at various times?
2. Could you make accurate statements about how many students use the cafeteria or gym by looking at the results of only a single observation?
3. What does this tell you about the need for long-term observations from space?

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