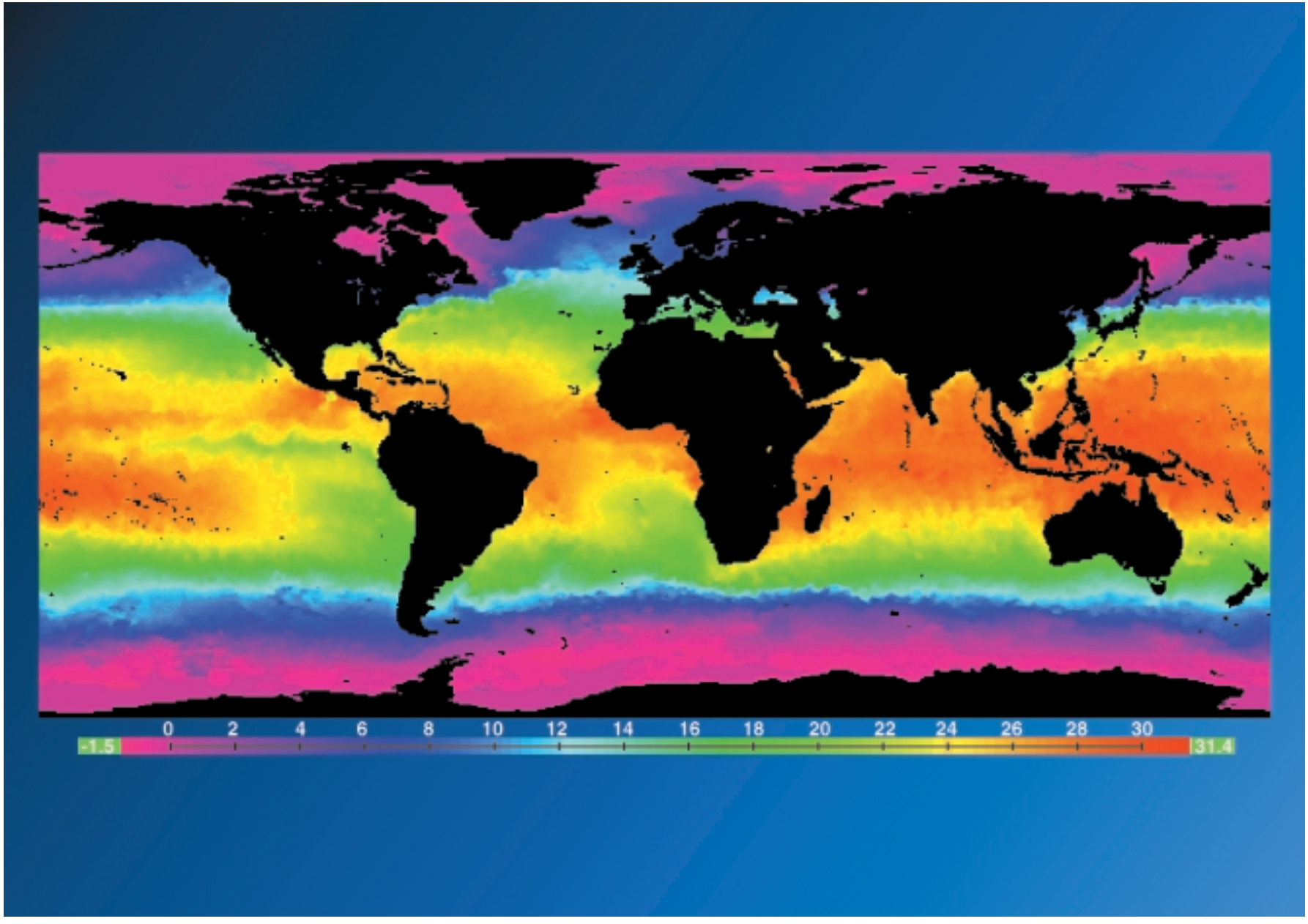
National Aeronautics and Space Administration

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 coverage. 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 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 snowcaps and the sea surface, vegetation growth around the world, and forest fires. From this data, scientists on the ground can determine whether snowcaps 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 U.S. Air Force provides the Titan II launch vehicle. 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 a comprehensive subsystem checkout.

These spacecraft monitor the entire Earth, providing atmospheric measurements of temperature, humidity, ozone and cloud images as they track weather patterns that affect the global weather and climate. The satellites send millions of global measurements daily to NOAA's Command and Data Acquisition stations in Fairbanks, Alaska, and Wallops Island, Virginia, and to its data processing center in Suitland, Maryland, adding valuable information to forecasting models, especially for ocean areas, where conventional ground-based data are lacking.

Currently, NOAA has two operational polar orbiters: NOAA-16, launched in September 2000, into a 2:00 p.m. local solar time orbit and NOAA-15, launched in May 1998, into a 7:30 a.m. local solar time orbit. NOAA-M will replace NOAA-15 in a 10:00 a.m. local solar time orbit. The new 10:00 a.m. orbit will allow NOAA-M to carry the same instruments as the 2:00 p.m. satellite (both cross the equator two hours away from noon), and allows for the generation of the same product suite from each orbit.

NOAA-M is scheduled to be launched in the summer of 2002 and will be renamed NOAA-17 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://www.osd.noaa.gov/POES/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-M, 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-M 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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