

Satellite Detects a Global Sea Rise

Extremely precise satellite measurements of the ocean surface reveal that global sea levels have risen faster in the last 2 years than in previous decades, U.S. and French scientists reported this week.

The TOPEX/Poseidon satellite, launched in August 1992, is the first spacecraft carrying instruments sensitive enough to monitor changing ocean levels around the world, the researchers announced at a meeting of the American Geophysical Union in San Francisco.

"We have, for the first time, the possibility of monitoring the climatic variations in the ocean," says Jean-François Minster of the Centre National d'Études Spatiales in Toulouse.

Data from the joint U.S.-French mission indicate that the average ocean height has increased 3 millimeters per year since late 1992, according to R. Steven Nerem of NASA's Goddard Space Flight Center in Greenbelt, Md.

Carl Wagner and colleagues at the National Oceanic and Atmospheric Administration in Silver Spring, Md., report similar findings in their analysis of the TOPEX/Poseidon data.

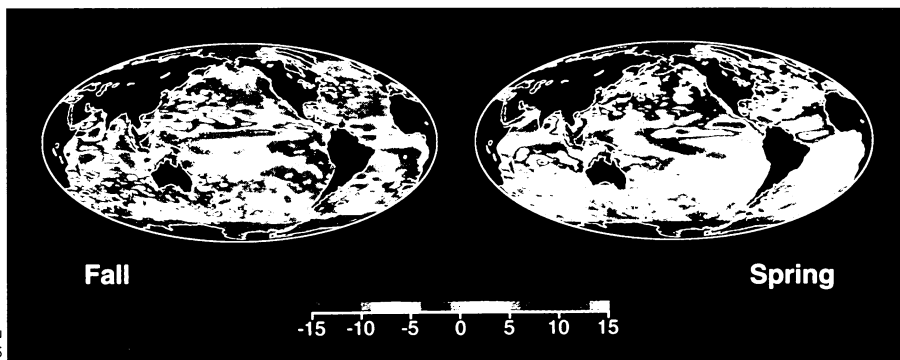
Oceanographers know from tide gauge records around the world that the ocean surface has been rising 1 to 2 millimeters a year over the last century. They believe that rising temperatures over this period have buoyed ocean levels by melting glaciers and heating seawater, causing it to expand.

The tide gauge record has limitations, however, because it tracks sea level only at select coastal sites and does not monitor the vast reaches of open ocean. In addition, the accuracy of tide gauge information is compromised by the rising and sinking of the land surface at various spots as a result of plate tectonics and by a delayed rebound response to the melting of glaciers at the end of the ice age.

From its orbit 1,336 kilometers above Earth, TOPEX/Poseidon measures the ocean surface with two radar altimeters that bounce beams off the water and time the signals' return to the satellite. Previous satellite altimeters have lacked the precision to monitor subtle changes in the ocean surface, Nerem says.

The TOPEX/Poseidon mission has as its main goal the study of ocean currents; scientists did not intend it for monitoring sea levels. "Before launch, actually, we never expected the measurements by the system would be accurate enough to address global sea level change," says project scientist Lee-Lueng Fu of NASA's Jet Propulsion Laboratory in Pasadena, Calif.

When compared with the tide gauge record, the satellite measurements sug-



Measurements by the TOPEX/Poseidon satellite show how sea levels change with the season. Reds indicate areas elevated above the annual average surface, while greens denote regions lying lower than average. Seas in the Northern Hemisphere swell during fall, after summer sunlight has warmed the ocean surface.

gest that sea levels are rising faster now than in previous decades. But oceanographers remain cautious about the new data because they do not know how much the instrument's accuracy has declined since launch. They have already corrected for some instrumental "drift" and are trying to address other problems by comparing satellite data with tide measurements taken at Earth's surface, Nerem says.

Although detection of rising sea levels appears to support the theory that greenhouse gases in the atmosphere are currently warming the climate, researchers caution that the satellite record spans only 2 years — not enough time to iden-

tify long-term trends. Short-term climate fluctuations, such as El Niño warmings in the Pacific, could lie behind the rapid rise in the last 2 years.

"Sea level may go back down next year, because this may be a short-term variation. It may not be the global warming signal that we're looking for," Nerem says.

Continued measurements could tell whether the rate will remain steady, but the TOPEX/Poseidon mission was designed to last only 3 to 5 years. French and U.S. researchers are now lobbying for future satellite altimeter missions to continue the record. — R. Monastersky

Embryo research restricted

The federal government will not support studies that use human embryos created specifically for research purposes, President Clinton announced Dec. 2. He did not address studies that use fertilized eggs discarded by fertility centers.

Clinton stated that federal funding of human embryo research "raises profound ethical and moral questions." He added that the White House will establish a National Bioethics Advisory Commission next year.

Last year, Congress lifted a 1980 ban on government funding of any research involving human embryos.

Two National Institutes of Health committees have recently recommended that the government support experiments on very early embryos, including those using embryos developed solely for research (SN: 10/1/94, p.212). Such investigations might, for example, improve in vitro fertilization by examining what happens to a human egg matured and fertilized in the laboratory, committee members said. Or the

research might evaluate new contraceptives.

At least in the last few years, U.S. scientists have not published a single study that used embryos created purely for research, says NIH panel member Brigid L.M. Hogan of Vanderbilt University School of Medicine in Nashville, Tenn. She bases her conclusion on a brief literature review she conducted. Such studies are being done in other countries, however, says Hogan.

Patricia A. King of Georgetown University Law Center in Washington, D.C., another NIH panel member, views Clinton's decision as only a minor setback, since some embryo research will continue.

The president's decision may succeed in appeasing Rep. Robert K. Dornan (R-Calif.), who had threatened to block federally funded experiments on human embryos. Before taking action, "we'll probably wait and see how broad Clinton's policy is," a Dornan spokesman says. The creation of embryos for research was one of Dornan's main objections to embryo experiments, he notes. — T. Adler