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Satellites used to track world's water supply

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By Michael Kanellos , December 13, 2006

The Congo river has been losing about 21.6 millimeters in depth every year for the past three years, according to two gravity-sensitive satellites that circle Earth.

Researchers from the NASA-sponsored Gravity Recovery and Climate Experiment (GRACE) are using a pair of roving satellites to measure changes in water supply around the world. The two satellites, which fly 130 miles apart, measure the gravitational field of the Earth. Minute changes in the data can then be extrapolated to show where water is distributed and where it is going. Even if the water is captured in snow, rivers or underground aquifers, the satellites can detect the mass and trace its progress.

"The weight of the water underground is not invisible," said Michael Watkins, the GRACE project scientist at the Jet Propulsion Laboratory, during a presentation at the American Geophysical Union taking place this week in San Francisco. "The dominant thing that GRACE sees is continental hydrology."

A more accurate view of the water supply is also something many experts say the world direly needs. Many nations are facing a looming water crisis. The global population tripled in the 20th century, but water consumption went up sevenfold. A lack of clean water will impact agriculture and is already creating massive health problems. Some estimate that half of the hospital beds in the world are filled with people suffering from water-borne diseases.

GRACE has only been tracking world water supplies for three years, so the data can't be used yet to determine where a water problem may emerge next. Watkins said, however, it will take a few more years. Nonetheless, the GRACE team has its eye on a few regions and will study them. Evidence indicates that groundwater is being depleted in the central valley of California, parts of India and in the Nubian Valley in Africa. The central U.S. also seems to be in trouble.

"In the high plains in the central U.S., ground water depletion threatens to occur this century," said James Famiglietti, an associate professor of earth science at UC Irvine.

So far, the data indicates that Africa is losing lots of water. The annual 21.6 millimeter shrinkage in the depth of the Congo translates to 260 cubic kilometers of water between 2003 and 2006, said Famiglietti. A square kilometer contains 264 billion gallons.

Meanwhile, GRACE data says that the Nile has been going down an average of 9.3 millimeters a year while the Zambesi has declined by 16.3 millimeters. (The measurements take into account water flowing in the river, in the soil and groundwater.) Africans consume about 136 cubic kilometers of drinking water a year, so the losses on the Congo over a three-year period are, very roughly, equivalent to two years' worth of

drinking water.

Natural climate variation, however, can raise or lower water in a given period. During the same period, the Colorado River in the U.S. rose by an average of 37.5 millimeters a year.