News Releases

NASA's Grace Gravity Mission Weighs in on Earth's Changing Climate
September 09, 2004

For the first time, scientists have demonstrated that precise measurements of Earth's changing gravity field can effectively monitor changes in the planet's climate and weather.

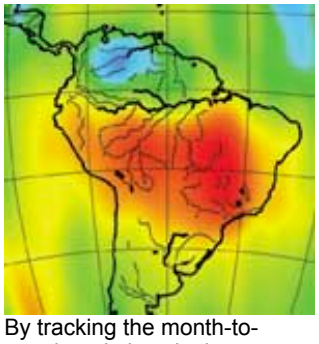
This finding comes from more than a year's worth of data from the Gravity Recovery and Climate Experiment, or Grace. Grace is a two-spacecraft, joint partnership of NASA and the German Aerospace Center.

Results published in the journal Science show that monthly changes in the distribution of water and ice masses could be estimated by measuring changes in Earth's gravity field. The Grace data measured the weight of up to 10 centimeters (four inches) of groundwater accumulations from heavy tropical rains, particularly in the Amazon basin and Southeast Asia. Smaller signals caused by changes in ocean circulation were also visible.

Launched in March 2002, Grace tracks changes in Earth's gravity field. Grace senses minute variations in gravitational pull from local changes in Earth's mass. To do this, Grace measures, to one-hundredth the width of a human hair, changes in the separation of two identical spacecraft in the same orbit approximately 220 kilometers (137 miles) apart.

Grace maps these variations from month to month, following changes imposed by the seasons, weather patterns and short-term climate change. Understanding how Earth's mass varies over time is an important component necessary to study changes in global sea level, polar ice mass, deep ocean currents, and depletion and recharge of continental aquifers.

Grace monthly maps are up to 100 times more accurate than existing ones, substantially improving the accuracy of many techniques used by oceanographers, hydrologists, glaciologists, geologists and other scientists to study phenomena that influence climate.


By tracking the month-to-month variations in the distribution of water around the globe, such as in South America's Amazon basin, Grace data give scientists a powerful new tool to study Earth's climate and weather.
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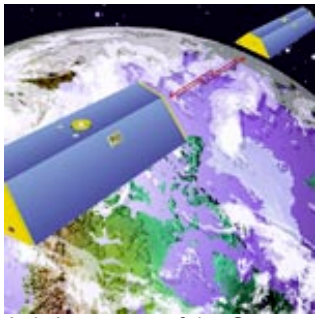
Artist's concept of the Grace spacecraft.
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"Measurements of surface water in large, inaccessible river basins have been difficult to acquire, while underground aquifers and deep ocean currents have been nearly impossible to measure," said Dr. Byron Tapley, Grace principal investigator at the University of Texas Center for Space Research in Austin, Texas. "Grace gives us a powerful new tool to track how water moves from one place to another, influencing climate and weather. These initial results give us great confidence Grace will make critical contributions to climate research in the coming years," he added.

"The unparalleled accuracy of the Grace measurements opens a number of new scientific perspectives," said Dr. Christoph Reigber of GeoForschungsZentrum Potsdam in Germany. "Observations of mass variations over the oceans will assist in interpreting annual signals in long-term sea-level change that have become an important climate change indicator," Reigber said.

Dr. Michael Watkins, Grace project scientist at NASA's Jet Propulsion Laboratory, Pasadena, Calif., said the results mark the birth of a new field of remote sensing. "Over the past 20 years, we've made primitive measurements of changes in Earth's gravity field over scales of thousands of kilometers, but this is the first time we've been able to demonstrate gravity measurements can be truly useful for climate monitoring," he said.

"The Grace gravity measurements will be combined with water models to sketch an exceptionally accurate picture of water distribution around the globe. Together with other NASA spacecraft, Grace will help scientists better understand the global water cycle and its changes," Watkins added.

The University of Texas Center for Space Research has overall mission responsibility. German mission elements are the responsibility of GeoForschungsZentrum Potsdam. Science data processing, distribution, archiving and product verification are managed under a cooperative arrangement between JPL, the University of Texas and GeoForschungsZentrum Potsdam.

For more information
about Grace on the Internet, visit http://www.csr.utexas.edu/grace or http://www.gfz-potsdam.de/grace. For information about NASA programs on the Internet, visit http://www.nasa.gov.

Other public affairs points of contact for Grace partner organizations include Margaret Baguio at the University of Texas, Austin, at (512) 471-6922; Vanadis Weber, German Aerospace Center, at 49 (0) 2203/601-3068; and Franz Ossing, GeoForschungsZentrum Potsdam, at 49 (331) 288-1040.

JPL is managed for NASA by the California Institute of Technology in Pasadena.

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