

rock, gravel, sand or clay. Groundwater levels respond slowly to changes in weather and can take months or years to replenish once pumped for irrigation or other uses. Data provided by India's Ministry of Water Resources to the NASA-funded researchers suggested groundwater use across India was exceeding natural replenishment, but the regional rate of depletion was unknown. Rodell and colleagues analyzed six years of monthly GRACE data for northern India to produce a time series of water storage changes beneath the land surface. "We don't know the absolute volume of water in the northern Indian aquifers, but GRACE provides strong evidence that current rates of water extraction are not sustainable," said Rodell. "The region has become dependent on irrigation to maximize agricultural productivity. If measures are not taken to ensure sustainable groundwater usage, the consequences for the 114 million residents of the region may include a collapse of agricultural output and severe shortages of potable water." Researchers examined data and models of soil moisture, lake and reservoir storage, vegetation and glaciers in the nearby Himalayas in order to confirm that the apparent groundwater trend was real. The loss is particularly alarming because it occurred when there were no unusual trends in rainfall. In fact, rainfall was slightly above normal for the period. The only influence they couldn't rule out was human. "For the first time, we can observe water use on land with no additional ground-based data collection," said co-author James Famiglietti of the University of California, Irvine. "This is critical because in many developing countries, where hydrological data are both sparse and hard to access, space-based methods provide perhaps the only opportunity to assess changes in fresh water availability across large regions." --- GRACE is a partnership between NASA and the German Aerospace Center, DLR. The University of Texas Center for Space Research in Austin has overall GRACE mission responsibility. GRACE was launched in 2002. Contact: Steve Cole stephen.e.cole@nasa.gov [2] 202-358-0918 NASA/Goddard Space Flight Center

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