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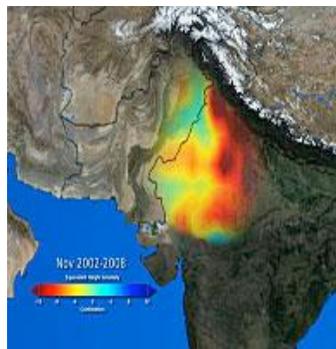
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## Satellites Predict Severe Water Shortages in India

By Jessica Berman  
Washington  
12 August 2009



**Groundwater storage varied in NW India between 2002-2008, relative to the mean for the period. These deviations are expressed as the height of an equivalent water layer ranging from -12 cm (deep red) to 12 cm (dark blue), 12 Aug 2009**

drawn down by heavy irrigation demand, and that this rapid depletion could lead to severe, widespread water shortages for 114 million people living in the country's northwestern states of Rajasthan, Punjab and Haryana, an area that includes the country's capital, New Delhi.

Matt Rodell is a hydrologist with the U.S. space agency's Goddard Space Flight Center in Maryland. Rodell headed up the study looking at data collected by NASA's Gravity Recovery and Climate Experiment satellites, or GRACE. Orbiting the Earth in tandem, the twin satellites are able to measure and map changes in water storage on land and beneath the surface. In graphic representations of water supplies around the globe, GRACE highlights areas of water depletion in red.

Rodell says researchers decided to use GRACE to take a closer look to see what was going on in northwest India where local reports said that peoples' wells were running dry.

New satellite data reveal that groundwater in Northwest India is being depleted faster than it is being replenished by rainwater. Experts say the problem is being caused by farmers' excessive use of groundwater to irrigate their crops, and they warn that the situation could lead to severe water shortages and reduced agricultural yields.

Groundwater is the main source of fresh water for drinking, washing and agriculture in many parts of the world, including India. But a new study concludes that natural underground aquifers are being

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"And one of the things that jump[s] out is this [red] bull's eye over northern India," he said.

Rodell says that using data from GRACE, scientists confirmed that the amount of rainwater soaking into underground aquifers is not enough to naturally replenish what's being sucked out of the ground for agriculture.

He says records showed the amount of water contained in above-ground reservoirs remained the same during the six year study, ruling out the possibility that climate change was causing a reduction in rainfall.

Rodell says 95 percent of the water that's pumped out of the ground in this arid, almost desert-like region of India is used for crop irrigation, and he says there's no doubt now that farmers in the northwest are using too much water on their fields.

"So, averaged over this three-state region, the water levels are declining in the aquifer by about one foot [third of a meter] per year. So, over this entire region, that's equivalent to a groundwater depletion of about 109 cubic kilometers over the past six years," he added.

Put another way, Rodell says, the amount of underground water depletion is about double the capacity of India's largest reservoir.



AP Photo

Rodell says the Indian government is aware of the problem and has begun drafting regulations that would limit groundwater consumption.

"Probably the best thing to do is to use that water more efficiently. As I mentioned, planting crops that require less water and using more efficient irrigation techniques are probably the best way to do that," he said.

**A farmer prepares to plant paddy seedlings in Phoolpur, east of Allahabad, India (File)**

Rodell says researchers are also using GRACE to investigate water supply trends in other parts of the world.

The study looking at the depletion of groundwater in northwest India is published this week in the journal Nature.

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