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TITLE: The GEO Water Strategy: Advances in Monitoring, Modeling, and Predicting Groundwater Variations at Regional to Local Scales

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ABSTRACT BODY: Groundwater remains one of the most important freshwater resources, especially during droughts and as global warming increases. For informed decisions on managing these resources sustainably, it is important to have sound assessments of the current state of groundwater resources as well as future predictions. This requires reliable groundwater quantity and quality data. However global access to this data is limited. As part of the GEOSS Water Strategy, the International Groundwater Assessment Centre (IGRAC) is therefore implementing the Global Groundwater Monitoring Network (GGMN). The GGMN facilitates periodic assessments of changes in groundwater quantity and quality by aggregating data and information from existing groundwater monitoring networks and regional hydrogeological knowledge (Fig. 1). The GGMN is a participatory process that relies upon contributions from regional and national networks of groundwater experts. Such observation data, along with local well data, surface displacements observed by and GPS data and InSAR, and local in situ gravity data, are necessary for evaluation and simulation of groundwater, leading to improved understanding and prediction of groundwater variations. In conjunction with these observations, regional scale groundwater variations are derived as a residual from land surface-groundwater models through extraction of the total mass of water using geo-rectified Gravity Recovery and Climate Experiment (GRACE) data. Such model-based studies have quantified overdraft and regions at risk of groundwater depletion in parts of Asia, US, and Africa (Fig. 2). We provide an overview of these systems, planned missions, and new model-based approaches toward local-scale methods for assimilation of well data for several regions.

<http://www.un-igrac.org>; <http://geodesy.unr.edu/>

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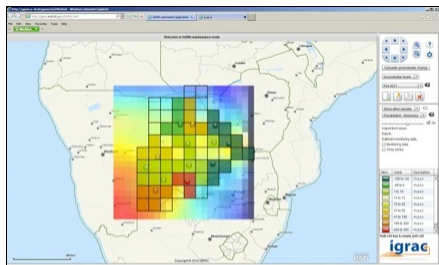


Figure 1. Example of GGMN (Example of Botswana with fictitious data, with local precipitation map)

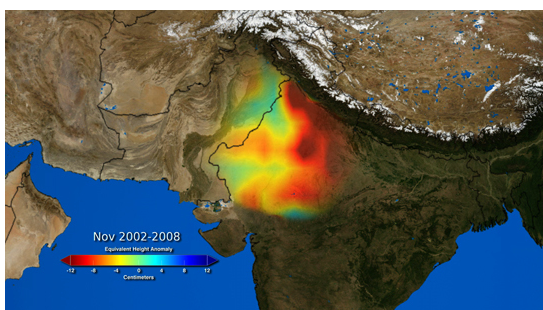


Figure 2. GRACE-derived groundwater storage in northwestern India for 2002 - 2008, relative to the mean. Deviations from the mean are the height of an equivalent layer of water, ranging from -12 cm (deep red) to 12 cm (dark blue). Credit: NASA/Trent Schindler and Matt Rodell

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