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## Incorporating remote sensing data for high spatiotemporal groundwater management in data limited regions: A case study in India

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Groundwater is a common-pool resource with no ownership, hence taken for granted and depleted recklessly by human societies across continents over millennia. India is one among the highest consumer of groundwater in the world with an estimated annual withdrawal exceeding over 230 km<sup>3</sup>. Besides, agriculture sector consumes over 60% of the groundwater, however methods to assess and regulate groundwater are limited. The government agencies monitor only shallow groundwater levels, while the extraction is mostly from the deep aquifer. In this data limited regions in India, use of remote sensing methods (e.g. Landsat imagery, GRACE, MODIS) to aid groundwater assessment and develop new methods to regulate groundwater use for a sustainable future are warranted. In this talk, the author will showcase groundwater assessment studies conducted in four distinct states in India, in which agricultural groundwater use is of paramount importance. The author will also discuss, with the aid of results from remote sensing analysis, sustainable methods to engage Village Level Groundwater Co-operatives that can operate with limited external guidance, but still provide sustainable groundwater use plans. In addition, groundwater recharge methods that were successful in one region (e.g. Gujarat) have failed in another region (e.g. Rajasthan, which is a neighboring state to Gujarat). The underlying hydrological regime will be analyzed using remote sensing methods and available observation data, and recommendations provided to the central government agencies. In one study in Tamil Nadu (southern State of India), the results show groundwater depletion at the rate of 21.4 km<sup>3</sup>yr<sup>-1</sup>, this is 8% more than the annual recharge rate (19.81 km<sup>3</sup>yr<sup>-1</sup>) owing to the total rainfall of 1016 mm km<sup>3</sup>yr<sup>-1</sup>. More results will be discussed that can increase confidence in remote sensing methods for India, as currently there is no observation data for large scale analysis of groundwater depletion for the nation.

### Biography

Pennan Chinnasamy is a Researcher in Hydrology and Remote Sensing at the International Water Management Institution, which is water based think tank/NGO under the Consortium of International Agricultural Research Centers (CGIAR). After obtaining Master's in Physics from Wesleyan University, CT, USA in 2009, he got his PhD from University of Missouri, USA, in 2012. His current work focuses on water availability, water risk and water futures for Asia, Africa, Australia and USA regions. He has published more than 25 papers in international journals.

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