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Modeling the Groundwater Dynamics in a Hard Rock Aquifer Influenced By Boundary Fluxes, Spatial and Temporal Variability in Pumping/Recharge in a Semi-arid, Intensely Irrigated Agricultural Basin

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Regional groundwater modeling is important for assessing the groundwater balance and proper management of groundwater system especially in semi-arid regions of hard rock aquifers. Interesting feature of some of the sub basins and basins in the southern peninsular India is decline of groundwater levels and reduction in surface water flows due to impact of land use and climate changes. Some of the sub basins in this region are affected by intensive cultivation from groundwater pumping. Excessive decline in groundwater levels in specific zones of such sub basins due to imbalance between rainfall recharge and groundwater pumping, are significantly affected by lateral groundwater flows due to the higher structural control in these granitic gneissic hard rock aquifers. The development of such higher pumping regions close to recharge zones of the sub basins may require to consider the hypothesis of inter-basin transfer of subsurface flow and the relevance of appropriate boundary conditions apart from spatial and temporal variations in pumping and recharge while modeling the regional groundwater system.

The present paper looks into these issues while modeling the groundwater dynamics of Gundal river sub-basin (~ 1000 km^2) , which is located in the semi-arid portion of the Cauvery river basin (India), which is intensively cultivated through irrigated canal command in its northern part (discharge region) and through groundwater in the recharge and intermediate regions. Significant part of the recharge zone belongs to the ecologically sensitive Bandipur National Sanctuary. The interesting feature of this sub-basin is the dramatic decline of groundwater levels in some areas close to recharge zones due to the impact of land use and land cover changes.