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Human-induced changes in total water storage of the Yangtze River basin estimated from GRACE satellite data and land surface model simulations

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In this study, we use data from the Gravity Recovery and Climate Experiment (GRACE) and combine them with land surface model (LSM) simulations, to evaluate the human-induced changes to the total water storage (TWS) in the Yangtze River basin during the period 2003-2010. The attributed contribution of human changes to the TWS is validated by combining field data with model skills to simulate the human-induced groundwater recharge, and supported by additional data from various resources. Four regions in the Yangtze basin are chosen for further examination and comparison. Our results show that the TWS is continually increasing in the middle and south eastern reaches of the basin, at a mean rate of about 3 cm yr-1. This increment in TWS is attributed to anthropogenic modification of the hydrological cycle, rather than natural climate variability. The dominant contributor to the TWS excess is found to be intensive surface water irrigation, which recharges the water table in the middle and south eastern parts of the basin. Water impoundment of the Three Gorges Reservoir (TGR) is found to account for nearly 20% of the human-induced TWS increment in the region where TGR is located. This study supports previous research to some extent, and further contributes to quantifying the effects of human interference on the local hydrological system, which provide insight in the sustainability of water management in the Yangtze River basin.