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Assessment of Terrestrial Water Storage Recharge using GRACE data for Ganga-Brahmaputra River Basin

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The Ganga-Brahmaputra river basin is one of the most fertile lands of the world. Majorly spreading over India with parts of it extending to China, Nepal, Bhutan and Bangladesh, this river basin is home to 630 million people. Assessment of water availability in this river basin is crucial due to its strategic location, large local population and huge agricultural production affecting the global markets. Recent studies indicate large scale depletion of groundwater in this region due to a combination of anthropogenic and climatic factors. The climatic variable which is often examined in these studies is precipitation. Although it is beyond doubt that precipitation plays a major role in deciding the water availability in a region, it would be worthwhile to investigate the direct effect of temperature as global warming is one of the clearest indications of climate change. In the present study we use Terrestrial Water Storage (TWS) data from Gravity Recovery and Climate Experiment (GRACE) satellite to investigate the effect of the warming climate on TWS recharge in the Ganga-Brahmaputra river basin. The present study tries to find the effect of temperature on a newly defined parameter named as Relative Recharge. Annual Relative Recharge values are related to annual temperature for the years between 2002 and 2017. Results suggest that relative recharge of Ganga-Brahmaputra river basin decreases at a rate of -13.79% per oC (at 95% confidence level). We hypothesize that increase in temperature leads to increased evaporation and transpiration resulting in reduction in relative recharge in a warmer climate. The reduction in relative recharge in a warmer climate will have a serious impact on water availability as high rainfall years will not result in equally high recharge.