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# Impact of rainfall intensity on GRACE total water storage across Australia

**Amirhossein Shadmehri Toosi**, Okke Batelaan, Margaret Shanafield, and Huade Guan
Flinders University, National Centre for Groundwater Research and Training, College of Science and Engineering, Bedford Park, 5042, Australia

Climate change has a significant impact on the environment by increasing the frequency of extreme precipitation events. Underestimating the potential risks of such events and lack of climate resilience will result in a substantial crisis in terms of water security. Understanding the hydrological consequences is difficult due to complexities and additional environmental feedbacks, depending on landuse/landcover, soil and climate.

The Gravity Recovery and Climate Experiment (GRACE) has provided an unprecedented perspective on global fluctuations in terrestrial water storage (TWS) over the past decade. While numerous studies have correlated different hydrological variables against TWS, no study has tested different rainfall thresholds (intensity) impacting TWS. Existing studies mostly have explored the relationship between TWS anomalies and hydrological variables using individual responses, while few have looked at multi-variable interaction. Single indicators (e.g., standardized precipitation index) may limit ecohydrological understanding of soil-vegetation-atmosphere water transfer, as many factors play essential roles in land-atmosphere interactions. In particular, rainfall characteristics can significantly impact the interaction between hydrological factors by accelerating or slowing processes. Hence, including appropriate temporal resolution of precipitation in analyses is essential; e.g., monthly data are not a good indicator for understanding ecohydrological interactions. Therefore, this research aims to improve our understanding of the spatiotemporal response of TWS to climate change impacts on rainfall characteristics. Monthly GRACE TWS time series anomalies are analyzed against aggregated monthly rainfall with different daily thresholds (intensities). The obtained results are used to find explanatory variables such as land use/land cover, soil type, and climatic zones that determine the significance between TWS and various variables. The methodology provides a valuable insight into the mechanisms in which TWS is affected by rainfall characteristics at different spatiotemporal scales across various hydrological contexts across Australia.