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Total water storage (TWS) is a key indicator of ecosystem water availability, and its standardized anomalies are widely used to assess hydrological drought and recovery. Global system models are extensively applied to simulate TWS and predict hydrological drought recovery dynamics. However, their performance remains unclear, partly due to uncertainties in subsurface water responses to drought, especially as droughts become more frequent under climate change. Here, we detect hydrological drought recovery events using GRACE/FO TWS observations from 2002 to 2021 and compare them with corresponding events simulated by eight ISIMIP models. We analyze drought onset, duration, and intensity across models and observations. The analysis reveals systematic biases: models tend to delay drought onset, advance recovery timing, and underestimate both drought duration and severity relative to GRACE/FO. These discrepancies indicate that global models systematically underestimate hydrological drought impacts, emphasize the need for caution when using model outputs for drought assessment, recovery analysis, and water resource planning.
Presentation file
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