

## Hydrology trends from short time series are better interpreted using historical variability

### Plain language summary

In the geosciences, short time series are often used to calculate rates of change. However, without consideration of the wider spatial and temporal variability of the process in question, the true severity and significance of short term trends cannot be distinguished from longer term variability.

The Gravity Recovery And Climate Experiment (GRACE) satellite mission was launched in 2002 and has allowed scientists to measure the redistribution of water across the Earth's surface. Since then, GRACE data from has been used to identify regions facing severe water stress. In this paper we illustrate that water storage trends estimated from such a short hydrological time series cannot determine conclusively if the magnitude of recent changes is severe or unprecedented.

To improve interpretation of hydrological time series taken from GRACE, we propose a new measurement, the Trend to Variability Ratio (TVR). This assesses the magnitude of such trends relative to historical natural variability of the region, which provides a more informative and complete assessment of the severity of trends than those taken from GRACE alone.

Using GRACE data complemented by TVR, we find that several regions thought to be losing water at a moderate rate are more endangered when longer term natural variability is considered, and vice-versa. We also estimate that greater than 3.2 billion people are currently living in regions facing severe water storage depletion, and that over one-third of river catchments that lost water in the last decade have suffered unprecedented losses.

*Full paper: Vishwakarma B.D., Bates, P., Sneeuw, N., Westaway, R.M. and Bamber, J. L. (2020). Re-assessing global water storage trends from GRACE time series. Environmental Research Letters (DOI: [10.1088/1748-9326/abd4a9](https://doi.org/10.1088/1748-9326/abd4a9))*