Mapping global water stress from GRACE satellite data

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Illustrative fig: Gravity Recovery And Climate Experiment (GRACE) satellite mission provided a unique hydrological measurement: changes in the total water storage near the surface of the Earth.

A novel metric: Trend to Variability Ratio (TVR)

Fig. 1 standard deviation (mm) of inter-annual signal from the calibrated GLDAS model time-series.

The natural variability varies markedly in space. How to use this information?

Assessing severity of trends

- The hydrological natural variability can be multi-decadal and each catchment has a distinct natural variability. 2

- GRACE time-series are short; trend will include: human intervention, natural variability, and signatures of anthropogenic climate change4. 5

- Inferences on water-storage stress from trend magnitude alone are misleading!

For example, the Indus and the Death valley river catchments have similar trends, but distinct natural variability. The figure below illustrates that TVS change for the Death Valley is not unprecedented, while for the Indus it is exceptional.

Fig. 1: standard deviation (mm) of inter-annual signal

Death Valley

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