Mean transit times help understand the volume of catchment water required to sustain streamflow in contrasting southeast Australian rivers

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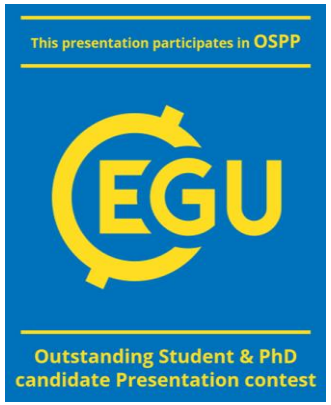
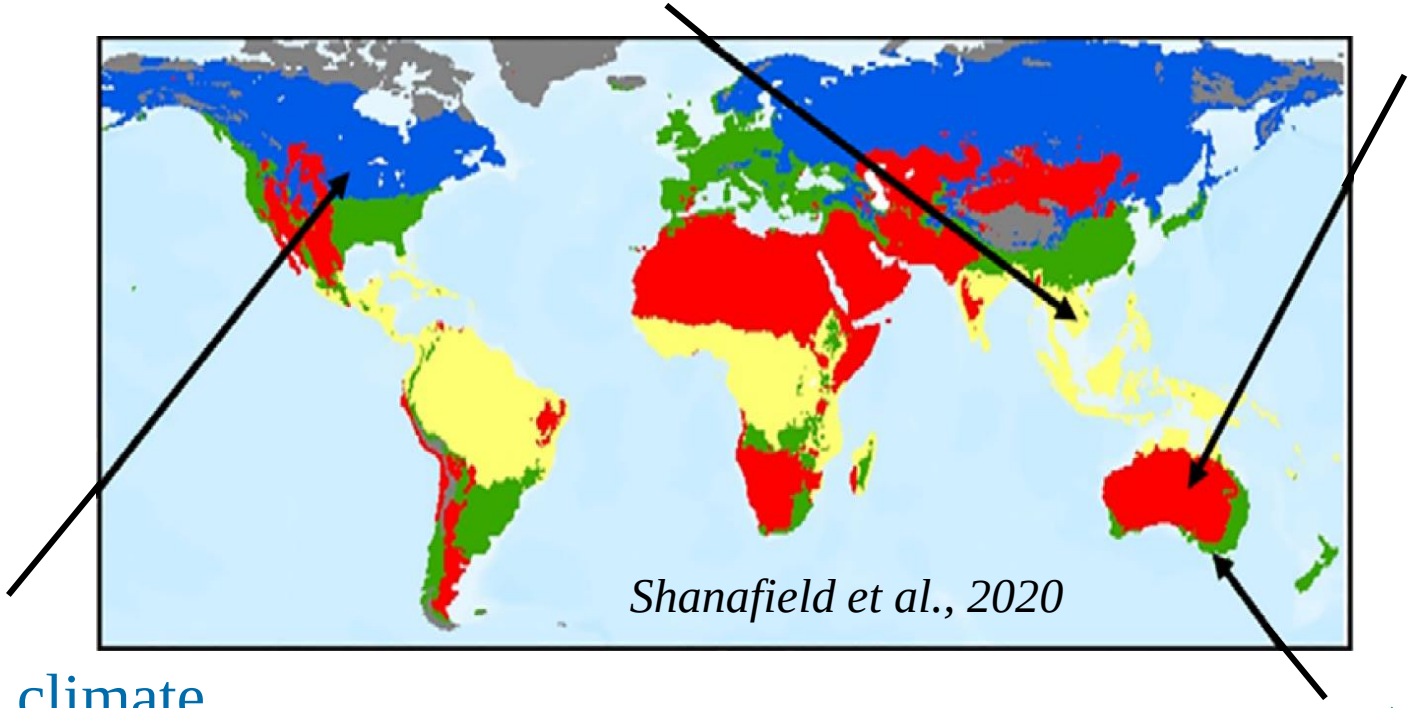


Importance of intermittent streams

- Streams and rivers can be categorized as **perennial** or **non-perennial** rivers globally.
- Perennial rivers consistently flow, even during dry periods of the year.
- In contrast, non-perennial rivers or intermittent rivers do not have continuous water flow. They constitute over half of the world's stream network length.

Importance of intermittent streams

- Tropical climate
- Example: La Vy River, Vietnam

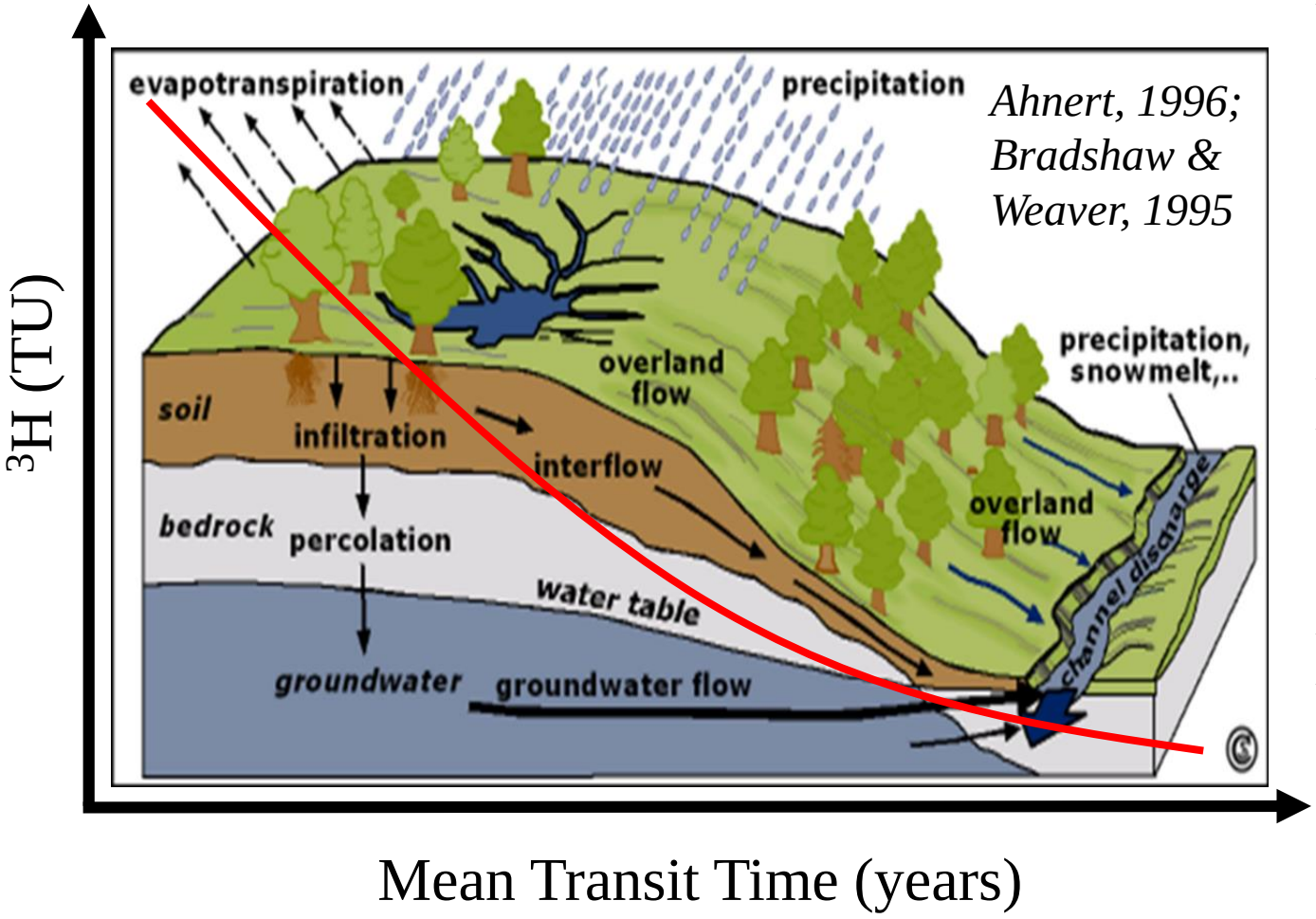


- Dry climate / dryland river
- Example: Woodforde River, Australia

- Continental climate
- Example: Kings Creek, USA

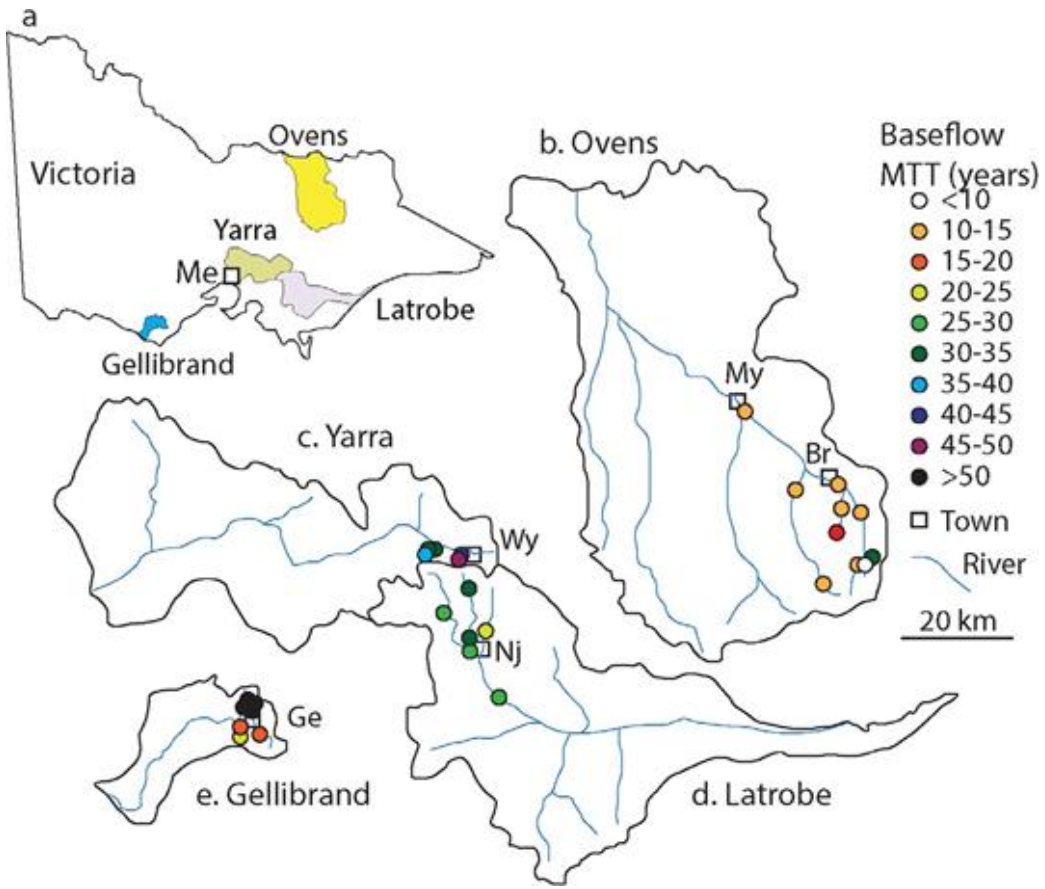
- Temperate climate
- Example: Pedler Creek, Australia

Mean transit times (MTTs) and water volumes

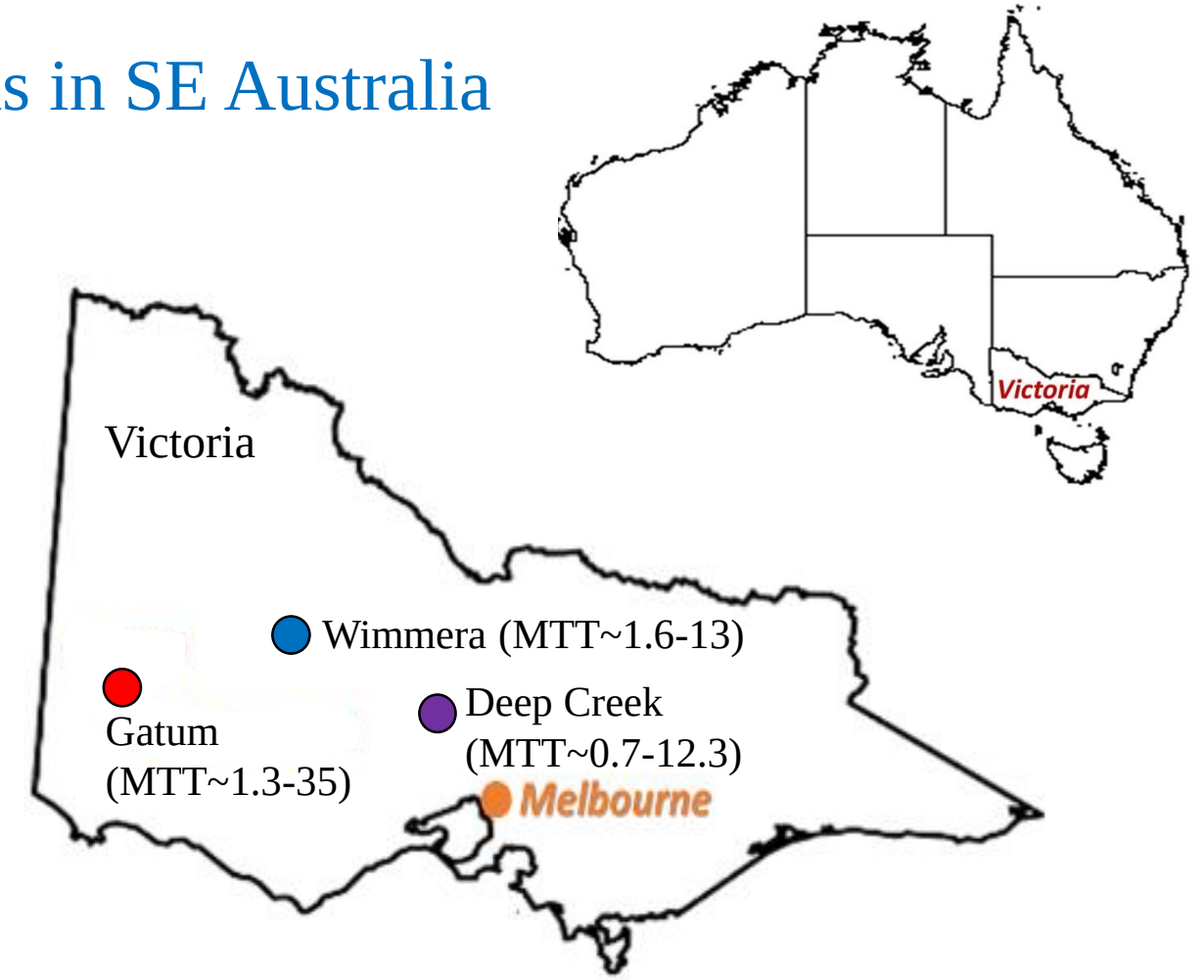


- MTTs represent the time taken for water to migrate from where it is recharged in the catchment to where it discharges into the stream
- MTTs estimated using ^{3}H based lumped parameter models (LPMs)
- The volume (V in m^3) of the water stores that contribute to the river is related to MTT and streamflow (Q in m^3 yr^{-1}) via: $V = Q \times MTT$

MTTs of perennial and intermittent streams in SE Australia

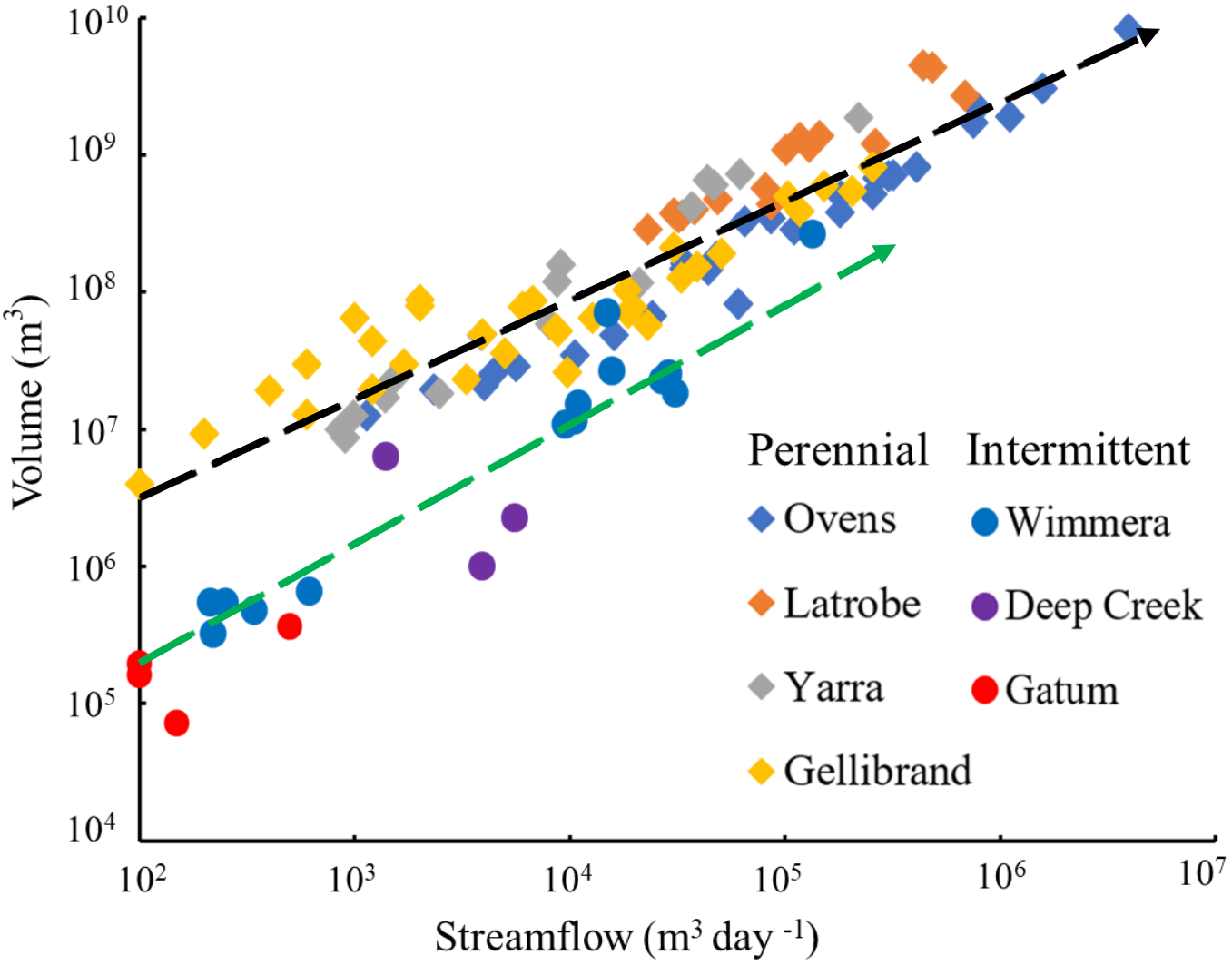


MTTs of perennial streams at baseflow conditions were years to decades *(Cartwright et al., 2020)*



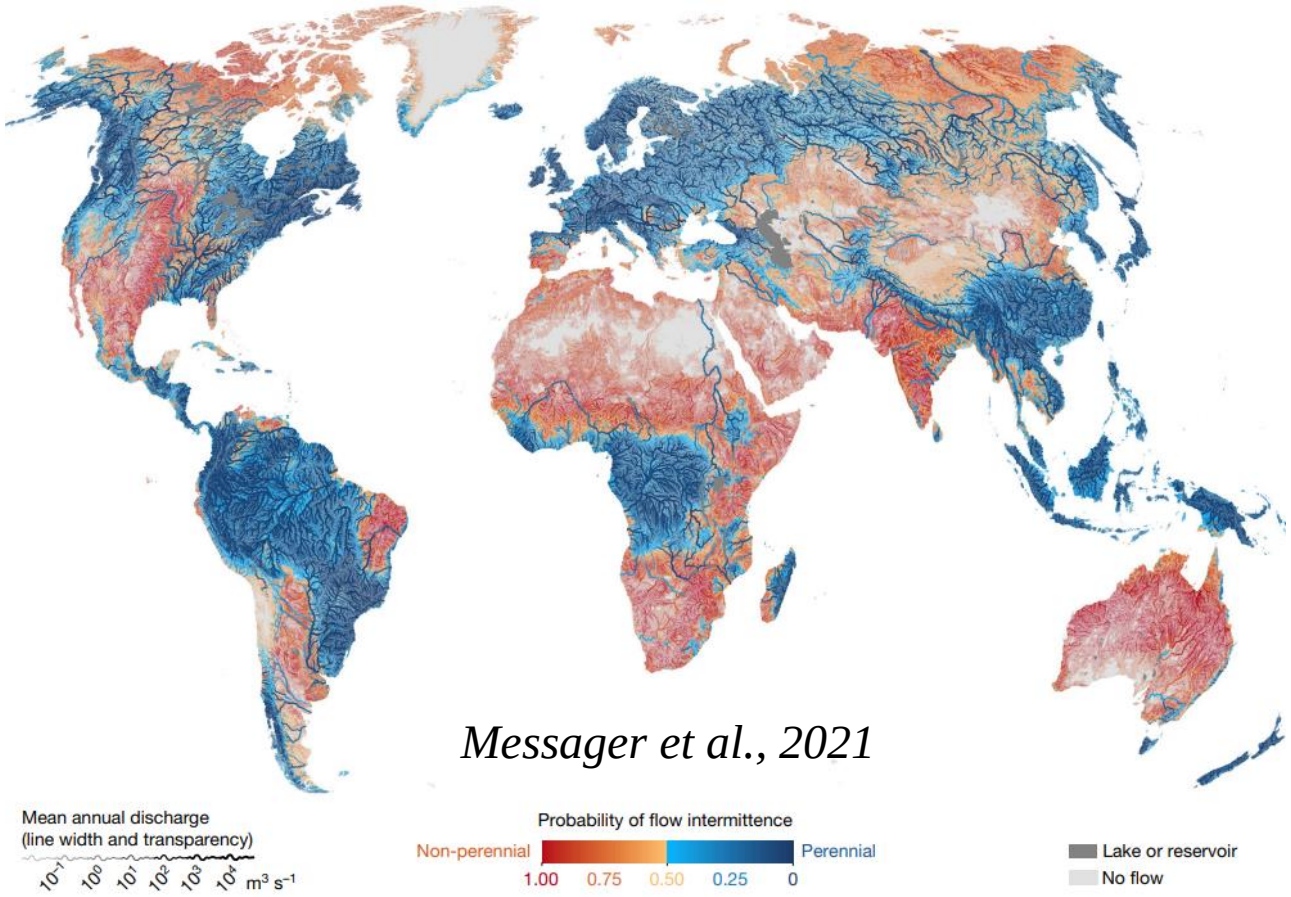
MTTs of intermittent streams at all flow conditions were younger and ranged from <1 to 35 years *(modified from Barua et al., 2022)*

Volume of water in different catchments



- The estimated volumes of water contributing to streamflow in intermittent streams are 3 to 5 orders of magnitude smaller than those in comparable perennial
- These differences reflect the limited connection between the intermittent streams and the deeper regional groundwater system compared with the perennial streams

Implications



Messager et al., 2021

- Intermittent streams are globally distributed in a range of environments, and will become prevalent in the future due to climate change and water stress

- The increased intermittency fundamentally changes the catchment water balance, specifically making regional groundwater less important, and increases the reliance of these streams on more vulnerable small young water stores

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Thank you for your attention!

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