EGU2020-12491
https://doi.org/10.5194/egusphere-egu2020-12491
EGU General Assembly 2020
© Author(s) 2021. This work is distributed under
the Creative Commons Attribution 4.0 License.

Incorporating groundwater disequilibrium in large-scale, isotopically-constrained water budgets

Gabriel Bowen[1], Scott Allen[1], and Stephen Good[2]
[1]University of Utah, Geology and Geophysics, Salt Lake City, UT, United States of America (gabe.bowen@utah.edu)
[2]Department of Biological and Ecological Engineering, Oregon State University, Corvallis, OR, United States of America

Stable isotope ratios of H and O in water are powerful tracers that have supported estimation and partitioning of hydrological fluxes at scales from individual catchments to the globe. Most studies, however, assume for simplicity and lack of constraints that isotopic fluxes associated with groundwater recharge and abstraction are in balance. We present a critical assessment of this assumption based on new gridded, 3-dimensional maps of the isotopic composition of groundwaters across the contiguous United States. These show that 1) the isotopic composition of shallow (recently recharged) groundwater differs from that of incident or basinally-integrated precipitation across much of the study area, implying selective recharge of precipitation, and 2) the approximate production-weighted isotope ratios of groundwater differ substantially from recently recharged water in many regions, implying an imbalance in isotope fluxes to/from the subsurface. Accounting for these imbalances leads us to revised estimates of the relative roles of various runoff generation processes and evapotranspiration sources in US-wide isotope mass balances.