Geophysical Research Abstracts
Vol. 19, EGU2017-13747-2, 2017
EGU General Assembly 2017

Water storage and mixing in a Californian mountain catchment during a multiyear drought.

Ype van der Velde (1), Ate Visser (2), Melissa Thaw (3), and Mohammad Safeeq (3)

(1) VU University, Hydrology, Amsterdam, Netherlands (y.vander.velde@vu.nl), (2) Lawrence Livermore National Laboratory, Livermore, California, US., (3) University of California, Merced, US

From 2012 to 2016, a five year period of intensive drought hit the Californian Sierra Nevada. We use this drought period as an opportunity to investigate how catchment water storage and mixing differs between prolonged wet and dry conditions using long term datasets of river discharge, evapotranspiration, water quality, and isotopes. Characteristic features of our test catchment include a thick (>5m) unsaturated zone in deeply weathered granite mountain soils, snow melt and events of high intensity rainfall, dry summers and numerous wetland meadows along the stream.

Our data and model analysis suggest that under the driest conditions, river flow predominantly consist of deep groundwater tapped by deeply incised sections of the stream, while the wetlands store their water just below the root system of its shallow rooting vegetation. In contrast, during wet periods, most runoff is generated on the flat wetland meadows, while the regional groundwater system slowly refills itself as water trickles through the thick unsaturated zone, creating a delayed response. These contrasting response timescales of the catchment-wide groundwater system and the local wetland systems seem to weaken as the drought progresses and connectivity between groundwater flow and wetlands decreases.

This work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344. LLNL-ABS-717438