

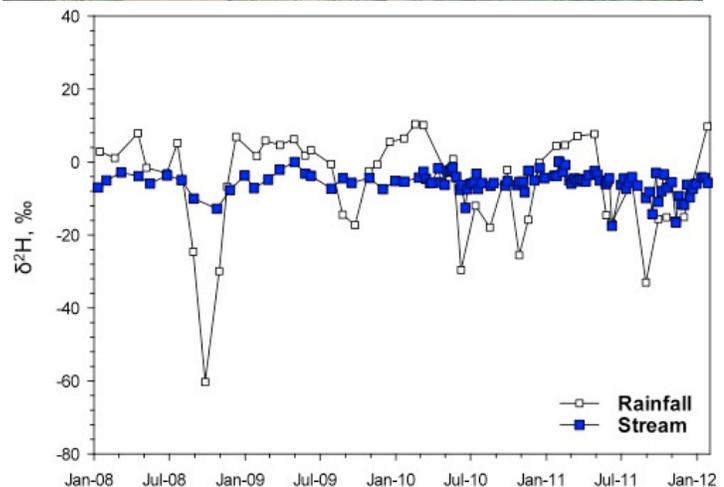
## Old Water from New Storms in Tropical Streams

One persisting question in hydrology is how do catchments store 'old' water for long periods (months or even years), but then release it almost instantaneously (within minutes) during storm events?

The photograph on the top right shows two streams in the Luquillo Critical Zone Observatory merging. When waters mix, their individual chemical and isotopic signatures are combined. The figure on the bottom right shows the isotopic signal of stream water and rainwater for four years in the LCZO.

The rainwater isotopic composition is highly variable (open circles). The geochemical signal in the stream water (blue squares) appears 'buffered' by a large pool of old, isotopically distinct water. Such a scenario was not expected in a tropical setting like Puerto Rico where quickflow ('new water') was previously thought to dominate the total stream flow flux. Evaristo et al. (in prep.), with data from M. Scholl (USGS – Figure bottom right), have posed this old question but have a new solution that potentially resolves this paradox of where and how this might happen.

We propose that prompt discharge of 'old' water is related to an isotopically distinct pool of water in soils that is loosely bound and associated with plants.



**Figure 2.** Anyone observing a stream during a storm can see that the water becomes muddy and the water level rises. The water level rises especially quickly in Puerto Rico and other tropical areas. The photograph at the top shows two streams merging. One stream carries muddy water from a storm event in the headwaters. When, the water level rises so quickly, it is assumed that the rainwater is the water that causes the stream level to rise. In the bottom figure, we see that the rain water (open circles) and the stream water (blue squares) are isotopically distinct. The differences between the two water masses indicate that the water in the stream is mostly 'old' water that has been sitting in soil pore spaces for days or even months. The large amount of old water in soil buffers rainwater signal.