Quantifying Groundwater Discharge to Subalpine Streams Using Radon

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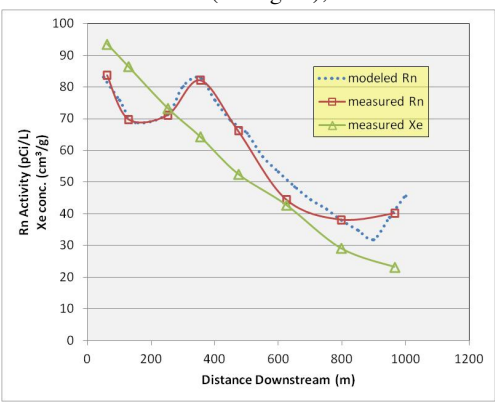
Climate change is likely to impact the amount and timing of groundwater influx to streams in high elevation basins. Earlier runoff may lead to cessation of late season baseflow, which is crucial for maintaining riparian ecosystem health. The goals of this study were to identify locations or reaches where groundwater enters streams and to quantify groundwater influx along two subalpine streams in the Tahoe Basin of the Sierra Nevada, California. Radon, a naturally-occurring, dissolved gas isotope found in surface water only in proximity to groundwater inputs, was measured along a 3 km reach of Squaw Creek and a 1 km reach of Martis Creek. A mass balance model of stream radon activity that considered only groundwater discharge as a radon source, and gas emanation as a radon sink was used to fit observed radon stream activities by varying groundwater discharge along the length of the streams. To quantify the gas emanation rate, we continuosly introduced a xenon tracer at a single station via submerged gas permeable silicon tubing and measured its concentration at 8 downstream locations. In Martis Creek (see figure),we used the smoothly



decreasing Xe tracer profile to determine the gas transfer velocity for this 1-km reach. Radon also decreases, but at a rate less than predicted from gass loss. Radon mass balance requires groundwater influx of 3 m^3/m/d upstream to 2 m^3/m/d downstream along this reach.