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EARTH SCIENCE

SPEAKERS CLUB

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Quantification of storm groundwater into streams using continuous ^{222}Rn activity

Jared Wilson
Department of Earth Science
UC Santa Barbara

^{222}Rn has been used in hydrology as a naturally occurring tracer to identify groundwater intruding into a variety of systems such as near-shore marine environments, marshland environments, or lacustrine environments. This study aims to test ^{222}Rn's capacity to act as a conservative tracer within a stream environment through the creation of a series of storm hydrograph separations. Measurements of ^{222}Rn activity were taken every 10 minutes during initial tests and every 15 minutes during secondary tests to create a high-resolution storm-water discharge dataset. The purpose of these hydrograph separations is to determine how much of the storm-water within a river is groundwater and how much is from precipitation or throughflow. This distinction is made possible by the difference in ^{222}Rn activity between groundwater (1 to 100 Bq/L) and event water (0.001 to 0.01 Bq/L). The results of the ^{222}Rn mixing relations will be compared to two existing methods of creating storm hydrographs: 1) $\partial^{18}O$ and ∂D stable isotope mixing relations, 2) dissolved SiO_2 and SO_4 mixing relations. The introduction of groundwater into the stream during a storm is expected to be directly related to amount of precipitation. More precipitation is expected to lead to loading of the phreatic surface resulting in an increased of groundwater flowing into the stream. The ^{222}Rn measurements are expected to produce similar results to what is seen in the Stable Isotope and Dissolved Tracer methods

Mapping the northern Snake Range fold and thrust system and characterizing strain in lower plate quartzites along the western flank of the northern Snake Range metamorphic core complex, Nevada

Jason Womer
Department of Earth Science
UC Santa Barbara

The northern Snake Range (NSR) metamorphic core complex located in eastern Nevada is a classic example of a Cordilleran metamorphic core complex and is an ideal natural laboratory for investigating the Mesozoic contractional history associated with most Cordilleran metamorphic core complexes. Mesozoic contractional structures appear to be preserved along the western flank of the range and have not been extensively overprinted by Tertiary deformation associated with slip on the northern Snake Range decollement (NSRD). Previous mapping (Lee et al 1999) identified some of these contractional structures, however new detailed geologic mapping at a scale of 1:6000 has revealed a previously unrecognized fold and thrust system located on the northwestern flank of the NSR. These newly identified structures may explain the complicated unit relationships present along the crest of the range and may have played a role in the deep burial associated with the Late Cretaceous metamorphic event described by Miller and Gans 1989 and Cooper et al. 2010. Strain on the northwestern flank of the NSR appears to be of much lower magnitude than that of rocks to the south and to the east but has not been previously characterized. Petrographic analysis of dynamic recrystallization microstructures in the Lower Cambrian Prospect Mountain quartzite (Cpm) has revealed that grain boundary migration recrystallization (GBM) was the dominant recrystallization mechanism implying deformation temperatures at or above 500 oC. Preliminary analysis of the finite strain ellipse associated with this deformation event suggests that strain in the northwestern region of the NSR is older than strain in the southeast and unrelated to Tertiary slip on the NSRD. The map-scale structures and fabrics that are preserved on the western flank of the NSR appear to record a deformation event that is older, lower magnitude, and higher temperature than any deformation observed elsewhere in the range. These structures and fabrics may provide insight into the cryptic contractional history associated with the formation of the northern Snake Range metamorphic core complex.