A Combined Noble Gas and Stable Isotope Study to Characterize Groundwater Sources on the Island of Maui, Hawaii

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Recent work in the Galápagos Islands and southeast Michigan indicates that noble gas temperatures (NGTs) in fractured groundwater systems and rainwater do not reflect mean annual air temperature (MAAT), as is commonly assumed in sedimentary systems where NGTs are used as paleothermometers (Warrier et al., 2012, 2013). Developing a new NGT application will lead to a better understanding of fractured groundwater systems and improved water resource management plans in volcanic islands like Maui, where the hydrology is complex and poorly characterized.

The first noble gas study on samples collected from springs, wells, and rainwater in East Maui in June of 2014 suggests that both perched and basal aquifers are relatively separate entities. All samples are consistent with a binary mixing between air-saturated water (ASW) and ice or an ice-like signature. Here, we present the results of noble gas and stable isotope analyses from samples collected in Februray 2016. Noble gases in rainwater samples display different patterns in both sampling seasons, while well and spring samples display more similar patterns. Stable isotope data show that most 2016 samples have excess deuterium compared to the local meteoric water line, consistent with the relatively arid climate for Feb. 2016. For most samples, the combined noble gas and stable isotope dataset suggests that recharge for both types of aquifers takes place at an elevation significantly higher than that of the collection point.

References:

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