

Isotope tracers in catchment hydrology: How far can we go?

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Abstract. The use of stable isotopes as tracers of water has fundamentally changed the way that we view catchment hydrology. Most importantly, isotope tracers have shown that the mean transit time for water through catchments can be orders of magnitude longer than the timescale of hydrologic response. This recognition of prompt delivery of old water to the stream changes the way we consider catchment response to landuse and climate change. Findings from catchment isotope studies have now matured to the point where such information is informing rainfall-runoff model development and testing and new hydrological scaling theory. So how far can we go with isotope tracers in catchment hydrology? This talk explores future avenues of study made possible by the recent development of laser spectrometers-a technology poised to radically alter the field by facilitating increased sample frequencies in time and space and ultimately, routine and widespread field-based deployment. Examples with laser spectrometers are given that show the power of this approach for understanding ecohydrological interactions, rainfall and snowmelt mixing from the plot to hillslope to catchment scale and finally, for addressing transit time distributions and 'hydrological memory' of catchments.