Geophysical Research Abstracts
Vol. 19, EGU2017-10389, 2017
EGU General Assembly 2017

Using DNA-labelled nano- and microparticles to track particle transport in the environment

Coy McNew (1), Chaozi Wang (1), Helen Dahlke (1), Steve Lyon (2), and Todd Walter (3)

(1) University of California Davis, Davis, CA, USA, (2) Stockholm University, Stockholm, Sweden, (3) Cornell University, Ithaca, New York, USA

By utilizing bio-molecular nanotechnology developed for nano-medicines and drug delivery, we are able to produce DNA-labelled nano- and microparticle tracers for use in a myriad of environmental systems. The use of custom sequenced DNA allows for the fabrication of an enormous number of uniquely labelled tracers with identical transport properties (approximately 1.61 x 10^{60} unique sequences), each independently quantifiable, that can be applied simultaneously in any hydrologic system. By controlling the fabrication procedure to produce particles of custom size and charge, we are able to tag each size-charge combination uniquely in order to directly probe the effect of these variables on the transport properties of the particles. Here we present our methods for fabrication, extraction, and analysis of the DNA nano- and microparticle tracers, along with results from several successful applications of the tracers, including transport and retention analysis at the lab, continuum, and field scales. To date, our DNA-labelled nano- and microparticle tracers have proved useful in surface and subsurface water applications, soil retention, and even subglacial flow pathways. The range of potential applications continue to prove nearly limitless.