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Analysis of isotope and organic carbon signatures in hillslope hydrographs

Jaromir Dusek, Tomas Vogel, Michal Dohnal, Jakub Jankovec, Martin Sanda, and Jana Votrubova
Czech Technical University in Prague, Prague, Czech Republic (dusek@mat.fsv.cvut.cz)

Headwater catchments are among the most important areas for investigation of isotope and carbon fluxes because their small sizes best enable separation of above- and below ground compartments for improved understanding of the respective transport mechanisms. So far, only few studies utilized stable isotope information in modeling and even fewer linked dissolved carbon fluxes to mixing or transport models. Stable isotopes of water and dissolved organic carbon provide basis for studying transport processes ranging from soil profile scale to hillslope and catchment scale. In this study, stormflow dynamics of oxygen-18 and dissolved organic carbon was analyzed using a physically based modeling approach. One-dimensional dual-continuum vertical flow and transport model, based on Richards and advection-dispersion equations, was used to simulate the subsurface processes during significant rainfall-runoff episodes of a summer season. Water flow and transport of solutes were assumed to take place in two mutually communicating continua, the soil matrix and the network of preferential pathways. Oxygen-18 and dissolved organic carbon were observed in soil water, stormflow discharge in the experimental hillslope trench, and stream discharge at the catchment outlet. In the present study, we analyzed the transformation of input solute signals into signatures observed in the stormflow discharge.

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