

# Exploring the limits of conventional hydrograph separation

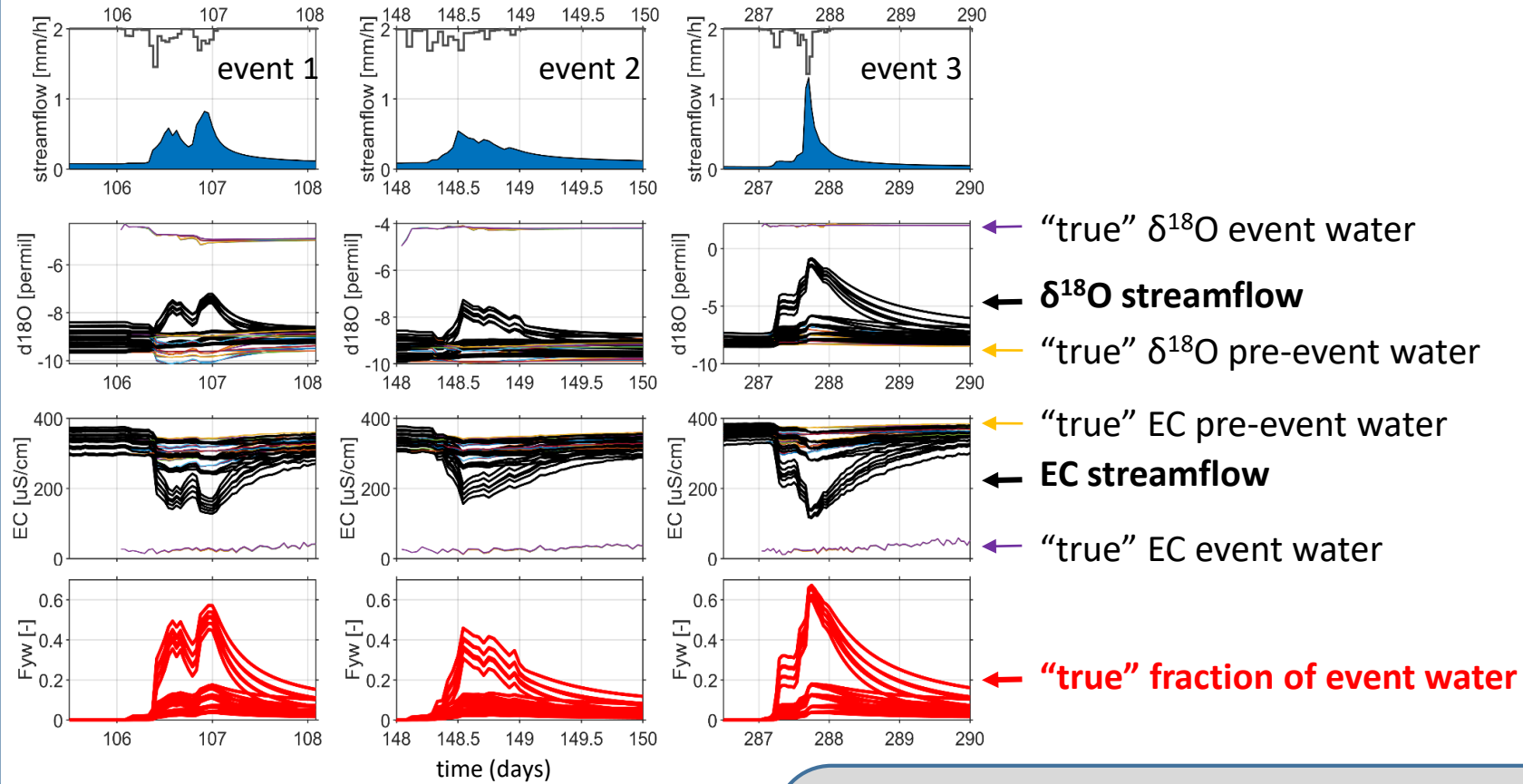
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Tracer-based HYDROGRAPH SEPARATION is based on some assumptions. In particular: **The signatures of the end members are constant through the event (or variations can be measured/characterized)**

But how likely is that the tracer signature of pre-event water is constant during the event?

## GENERATE “true” tracer data with a transport model

simulations run with *tran-SASv1.0*, by Benettin & Bertuzzo (2018)



and apply conventional  
HYDROGRAPH SEPARATION

$$f_e = \frac{C_p - C_Q}{C_p - C_e}$$

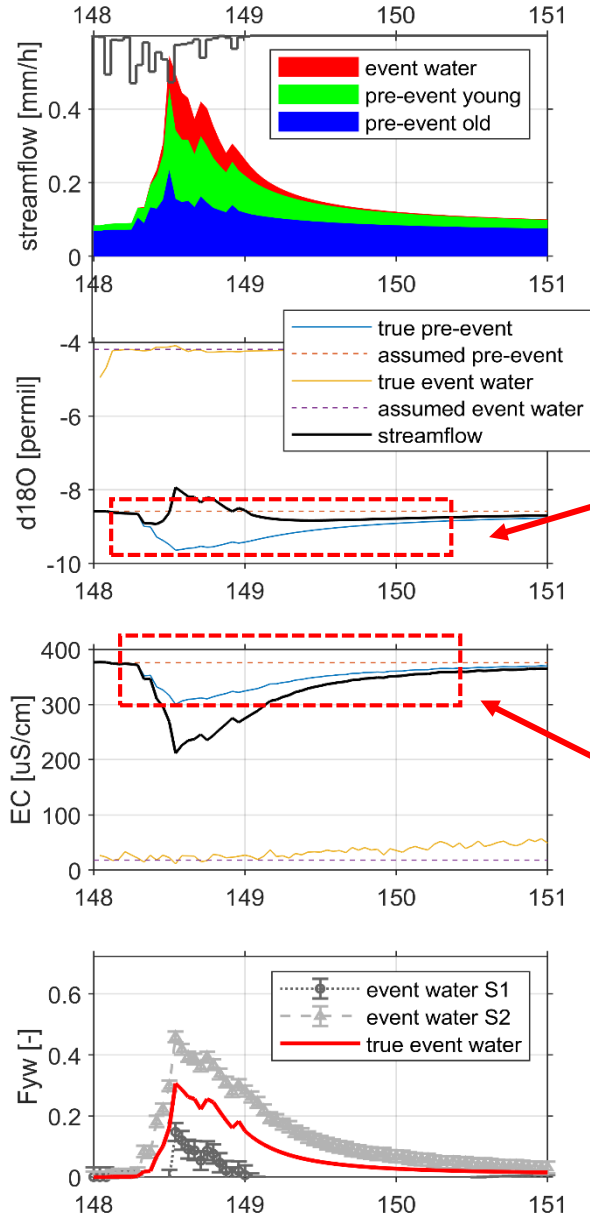
$C_Q$  streamflow tracer composition

$C_e$  event water composition

$C_p$  pre-event water composition, assumed constant

$f_e$  fraction of event water

# EXAMPLES from preliminary numerical tests

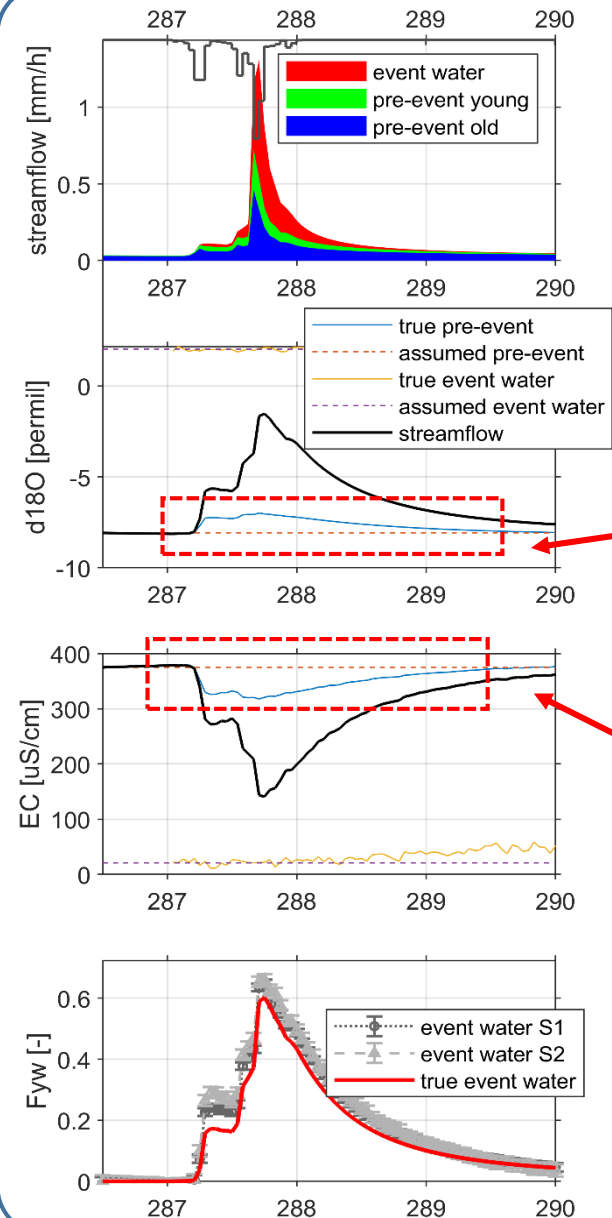


example event #2

$\delta^{18}\text{O}$ : “true” and assumed pre-event water are very different due to input seasonality

EC: “true” and assumed pre-event water are different

✗ event fraction is unreliable

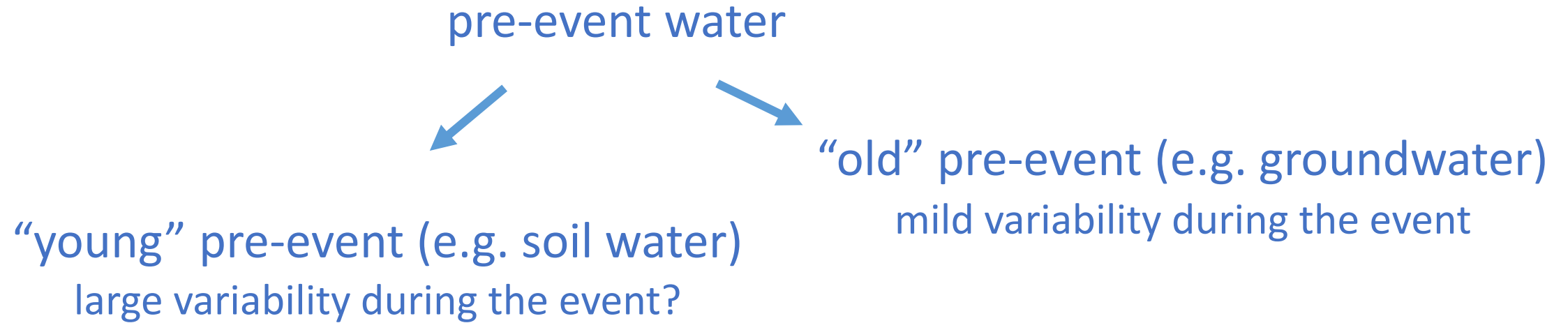


example event #3

$\delta^{18}\text{O}$  and EC: “true” and assumed pre-event water are different BUT this difference is small compared to streamflow variability

✓ event fraction is quite reliable

## KEY point



While the composition of groundwater may not vary significantly at the event scale, soil water composition and contribution can have substantial variability.

## PRELIMINARY conclusions

IF

“young” and “old” pre-event waters have  
**different tracer signatures**

AND

the **relative contribution** of “young” VS “old” pre-event  
water **changes** during the event

THEN

the tracer composition of **pre-event water varies over time**

IS THIS LIKELY TO HAPPEN IN CATCHMENTS?

more research coming soon