TRACING NITROGEN MOVEMENT IN FORESTED WATERSHEDS: PRELIMINARY RESULTS FROM THE SLEEPERS RIVER RESEARCH WATERSHED, VT

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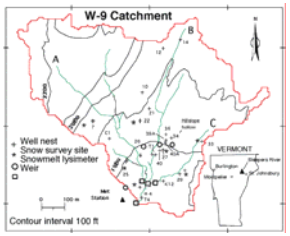
INTRODUCTION

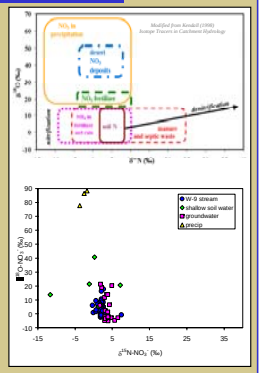
- Human activities have increased N (nitrogen) availability in the environment & stream export of dissolved N has increased in many regions
- Our work assesses how combined hydrological & biogeochemical processes control variation of stream NO_3^- (nitrate) concentrations over multiple time scales (event, seasonal, & annual)
- We used high-frequency measurements (hydrological, chemical, & isotopic tracers) to fingerprint both water flow paths and N sources to the stream from the landscape

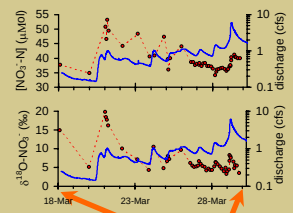


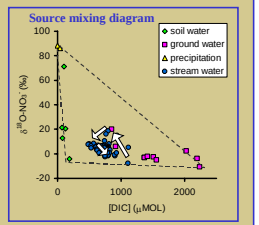
W-9 is a 41 ha forested catchment in the Sleepers River Research Watershed near Danville, Vermont, in the northeast USA.

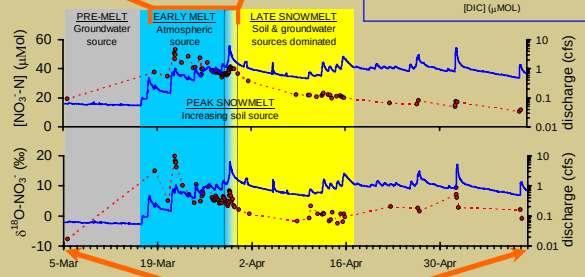
NITRATE ISOTOPES & SNOWMELT

- Stream NO_3^- concentrations were strongly influenced by atmospheric NO_3^- during early snowmelt
- During peak snowmelt, NO_3^- was from atmospheric & soil (microbially nitrified) sources
- In late snowmelt, stream NO_3^- was from soil & groundwater NO_3^- sources



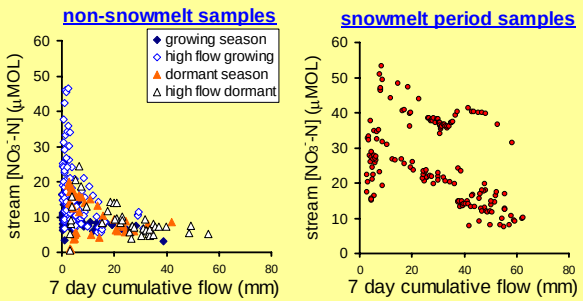






NITRATE & ANTECEDENT DISCHARGE

- NO_3^- concentrations in the stream are highest when soil N concentrations are highest, highlighting the importance of terrestrial-aquatic linkages
- Soil NO_3^- is highest during the dormant season when biotic uptake is minimal & creates a pool of N that is available to flush to streams with snowmelt
- NO_3^- is higher in soils & streamflow after dry antecedent moisture conditions than after wet



Cumulative flow of water at the W-9 weir was calculated for the 7 day interval prior to water sampling. Low cumulative flow indicates low water fluxes and dryer conditions prior to sample collection

IMPLICATIONS

- Stream NO_3^- variation is influenced by hydrological flushing of source areas that vary with wetness
- Highest NO_3^- concentrations occur with the first pulses of high flow after dry periods, highlighting moisture controls
- During high flow, water moved rapidly to streams via preferential flowpaths (overland & shallow subsurface) and thereby shortcuts retention in the landscape
- Atmospheric deposition is an important N source to the landscape as reflected in stream chemistry and especially during early snowmelt when infiltrating water has a short residence time in the landscape