Nitrate export response to spatially distributed snowmelt in alpine catchments.
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Abstract

This study explores the stream nitrate response to spatially distributed snowmelt in alpine environments. Green Lakes Valley, CO (GLV4) and Tokapah Basin, CA (TOK) are two geologically and climatologically different alpine watersheds that served as our study sites for hydrochemistry comparisons (focused on nitrate, NO$_3^-$) over a 12 year period (1996-2007). A snow water equivalent reconstruction model was used to estimate daily grids of snowmelt and nitrate flushing for each basin. From a nitrate mass balance, I found that GLV4 exhibited high levels of nitrate-export (i.e. greater stream nitrate-export than snowpack nitrate-loading) for all 12 years. In TOK, years with deeper snowpacks exhibited net nitrate-export from the basin, and years with shallower snowpacks exhibited nitrate-retention. Contributing areas of nitrate (i.e. snowpack and soil flushing) were better correlated with the stream nitrate concentration in TOK than in GLV4. In TOK, as much as 76% of the variability in the stream nitrate pulse could be explained by a spatially distributed snowmelt model. In GLV4, on average only 44% of the variability in the stream nitrate pulse could be explained by this spatially distributed snowmelt model. These results suggest that GLV4 may be potentially less sensitive to snowpack N-loading and snowmelt than TOK. As the snowpack regimes of these alpine catchments are altered by climate change and nitrogen-loading to these areas increases over the next century, it will become increasingly important to understand how these fragile ecosystems may react chemically, hydrologically, and ecologically.