

Home

Online Library HESS

- Recent Final Revised Papers
- Volumes and Issues**
- Special Issues
- Library Search
- Title and Author Search

Online Library HESSD

Alerts & RSS Feeds

General Information

Submission

Review

Production

Subscription

Comment on a Paper

Impact
Factor
2.270

ISI
indexed

ARCHIVED IN

PORTICO

▣ Volumes and Issues ▣ Contents of Issue 3

Hydrol. Earth Syst. Sci., 13, 423-439, 2009
www.hydrol-earth-syst-sci.net/13/423/2009/

© Author(s) 2009. This work is distributed
under the Creative Commons Attribution 3.0 License.

Spatial and temporal dynamics of stream chemistry in a forested watershed

K. B. Piatek¹, S. F. Christopher², and M. J. Mitchell³

¹West Virginia University, Division of Forestry and Natural Resources, P.O. Box 6125, Morgantown, WV 26506, USA

²State University of New York College at Buffalo, The Great Lakes Center, Buffalo, NY 14222, USA

³State University of New York, College of Environmental Sciences and Forestry, 1 Forestry Drive, Syracuse, NY 13210, USA

Abstract. Spatial dynamics of solute chemistry and natural abundance isotopes of nitrate (¹⁵N and ¹⁸O) were examined in seven locations and at the watershed outlet in 2001 and 2002 in a forest watershed in the Adirondack Mountains of New York State, USA. Temporal dynamics were examined during five discharge periods: winter, snowmelt, spring, summer, and fall, based on discharge levels at the watershed outlet. Solute concentrations were variable across space and time with significant ($p \leq 0.05$) interaction effects. Year*period was significant for pH, NH₄⁺, NO₃⁻, total N, DOC, and total Al suggesting that inter-annual variability in discharge levels was more important for these solutes than intra-annual variability. Period*sampling point was significant for pH, Mg²⁺, Ca²⁺, sum of base cations, Si, and total Al suggesting that the differences in concentration of these solutes among sampling points were moderated by discharge levels. In general, groundwater sources located in upper watershed controlled stream chemistry at higher elevations with highest pH, Ca²⁺, sum of base cations, Si, and SO₄²⁻ concentrations, with higher values in summer, and dilution effects during snowmelt. Two low elevation wetlands had a substantial influence over stream chemistry at those locations contributing lowest NO₃⁻ and highest DOC. Snowmelt exhibited among the lowest pH, sum of base cations, and SO₄²⁻, and highest NO₃⁻, total N, and total Al; snowmelt appeared to dilute groundwater, and flush stored soil-derived solutes. Summer discharge, composed mainly of groundwater, exhibited the lowest flow, among the highest Mg²⁺, Ca²⁺, and lowest DON, DOC, and total Al concentrations. Isotopic analysis indicated that NO₃⁻ was microbial with primary source in upper watershed soil, from where it was flushed to stream under high discharge-conditions, or drained to groundwater which became its secondary source when discharge was low. Watershed outlet did not exhibit specific solute levels found at source-areas, but represented solute dynamics in the rest of the watershed well.

▣ [Final Revised Paper](#) (PDF, 1091 KB) ▣ [Discussion Paper](#) (HESSD)

Citation: Piatek, K. B., Christopher, S. F., and Mitchell, M. J.: Spatial and temporal dynamics of stream chemistry in a forested watershed, Hydrol. Earth Syst. Sci., 13, 423-439, 2009. ▣ [Bibtex](#) ▣ [EndNote](#) [Reference Manager](#)

 Copernicus Publications
The Innovative Open Access Publisher

Search HESS

Library Search

Author Search

News

- ▣ New Service Charges
- ▣ Financial Support for Authors
- ▣ ISI Impact Factor: 2.270

Recent Papers

01 | HESSD, 28 Apr 2009:
Integrating field and numerical modeling methods for applied urban karst hydrogeology

02 | HESSD, 28 Apr 2009:
Analyzing the relationship between peak runoff discharge and land-use pattern – a spatial optimization approach

03 | HESSD, 27 Apr 2009:
Dynamically vs. empirically downscaled medium-range precipitation forecasts

