



Sveriges lantbruksuniversitet Swedish University of Agricultural Sciences

Highest DOC peaks were linked to years with most severe frost and icing during winter, but low winter precipitation, previous summer precipitation and warmer autumns

BACKGROUND

Extreme weather and climate events are predicted to increase in frequency and severity in the near future.

The processes that regulate the production and transport of key solutes, like dissolved organic carbon (DOC), can be altered by episodes of extreme temperature and/or precipitation.

Increases in soil DOC production have been linked to warming temperatures, changes in soil moisture and variation in the timing and intensity of precipitation.

Multiple factors under normal climatic influence DOC production and export, but none explicitly addresses the significance of climate extremes on these losses.





OBJECTIVES

To show that the magnitude of spring DOC concentrations will be more strongly regulated by winter climate extremes that affect soil conditions (via freezing or insulation), when compared to the other seasonal extremes.

METHODS

- . Define ecological seasons
- 2. Identify climate extremes (temperature, precipitation) and discharge in seasons and their relations to each other using a PCA
- 3. Link extremes spring DOC peaks over 23 years using clusture analysis

4. Determine the most significant variable for explaining DOC peaks using PLS

How does extreme climate affect stream Chemistry?

Tejshree Tiwari¹, Ryan A. Sponseller², and Hjalmar Laudon¹

1Department of Forest Ecology and Management, Swedish University of Agricultural Sciences, SE-901 83 Umea, Sweden 2Department of Ecology and Environmental Sciences, Umea University, 901 87 Umea, Sweden.

Lowest DOC peaks were linked to years with high summer precipitation, colder autumns, and high winter precipitation

Winter climate is important for influencing spring DOC concentration as well as the potential lag effects of previous seasons

chemistry

RESULTS

Spring Peaks

2003- Highest peak (31 mgL^{-1})

2013- Lowest peak (19 mgL^{-1})

Long-term Average- 22 mgL⁻¹)

PCA six component Model

Winter variables were most significant Intensity, frequency adn duration of winter were significant Two autumn temperature extremes were significant

Three Summer extreme were significant

Six Clusters with 66% Similarities

Group 1- Highest DOC dominated by cold winter extremes

Group 4- Lowest variability dominated by wet winter and summer extremes



from 18 mg L⁻¹ to 30 mgL⁻¹. (B) outliers in the regression model (C) significant loadings.



Tiwari T, Sponseller R, Laudon H, 2018, Extreme climate effects on dissolved organic carbon concentrations during snow melt, Journal of Geophysical Research: Biogeosciences, doi: 10.1002/2017JG004272

WMO Expert team of Climate Change Detection and Indices (ETCCDI) (http://etccdi.pacificclimate.org/list_27_indices.shtml) commissioned by the World meteorological for climatology ((CCI)/CLIVAR/JCOMM



The intensity, frequency, and duration of extreme events shows both interactive and countervailing effects on stream

PLS gradient of high to low DOC concentrations

High peaks - Winter frost, icing days, Cold autumns, wet previous summer

REFERENCES