Estimating uncertainty in ambient and saturation nutrient uptake metrics from nutrient pulse releases in stream ecosystems

Challenge

- A comprehensive and robust method to propagate and estimate uncertainty in ecosystem measurements is needed.

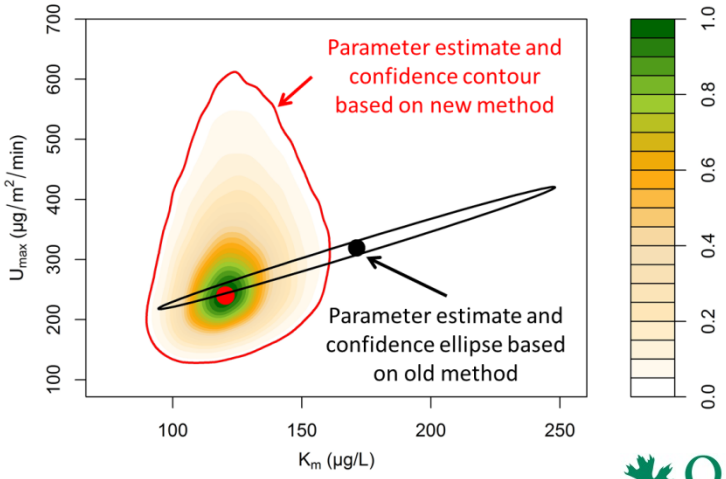
Approach and Results

- We developed a Monte Carlo (MC) method to quantify uncertainty in ambient and saturation nutrient uptake metrics.
- The 95% confidence interval (CI) was estimated for ambient uptake lengths ($S_{w\text{-}amb}$) and maximum areal uptake rates (U_{max}) for 4 nitrogen and 5 phosphorous experiments conducted seasonally in a forest stream in eastern Tennessee, USA.
- Significant differences in nutrient metrics among seasons were found. The MC approach is a robust, assumption-free way to estimate uncertainty.

Significance and Impact

- The advantages of applying Monte Carlo methods to stream nutrient uptake experiments are demonstrated encouraging other scientists to apply the approach to other ecological metrics.

Nutrient cycling coupled with downstream transport constitute a nutrient spiral (above). Measuring nutrient spiraling provides important insights into natural ecosystem function and responses to human impacts in lotic systems. We developed an improved method to estimate nutrient spiraling and its associated uncertainty (below).



Reference: Brooks, S.C., Brandt, C.C., Griffiths, N.A., 2016. Estimating uncertainty in ambient and saturation nutrient uptake metrics from nutrient pulse releases in stream ecosystems. Limnology and Oceanography: Methods, doi:10.1002/lom3.10139