Geophysical Research Abstracts
Vol. 18, EGU2016-2807, 2016
EGU General Assembly 2016


# Evergreen shrub traits and peatland carbon cycling under high nutrient load

Tuula Larmola (1,2), Vi Bui (2,3), Jill L. Bubier (3), Meng Wang (4,5), Meaghan Murphy (5), and Tim R. Moore (5)

(1) Natural Resources Institute Finland, Vantaa, Finland (tuula.larmola@luke.fi), (2) Environmental Studies Department, Mount Holyoke College, South Hadley, United States, (3) Department of Biology, Western University, London, Ontario, Canada , (4) Laboratory for Ecological Forecasting and Global Change, College of Forestry, Northwest A & F University, Yangling, Shaanxi, China , (5) Department of Geography and Global Environmental & Climate Change Centre, McGill University, Montreal, Quebec, Canada

The reactive nitrogen (N) assimilated by plants is usually invested in chlorophyll to improve light harvesting capacity and in soluble proteins such as Rubisco to enhance carbon (C) assimilation. We studied the effects of simulated atmospheric N deposition on different traits of two evergreen shrubs Chamaedaphne calyculata and Rhododendron groenlandicum in a nutrient-poor Mer Bleue Bog, Canada that has been fertilized with N as $NO_3$ and NH4 (2-8 times ambient annual wet deposition) with or without phosphorus (P) and potassium (K) for 7-12 years. We examined how nutrient addition influences the plant performance at leaf and canopy level and linked the trait responses with ecosystem C cycling. At the leaf level, we measured physiological and biochemical traits: $CO_2$ exchange and chlorophyll fluorescence, an indicator of plant stress in terms of light harvesting capacity; and to study changes in photosynthetic nutrient use efficiency, we also determined the foliar chlorophyll, N, and P contents. At the canopy level, we examined morphological and phenological traits: growth responses and leaf longevity during two growing seasons. Regardless of treatment, the majority of leaves showed no signs of stress in terms of light harvesting capacity. The plants were N saturated: with increasing foliar N content, the higher proportion of N was not used in photosynthesis. Foliar net $CO_2$ assimilation rates did not differ significantly among treatments, but the additions of N, P, and K together resulted in higher respiration rates. The analysis of the leaf and canopy traits showed that the two shrubs had different strategies: C. calyculata was more responsive to nutrient additions, more deciduous-like, whereas R. groenlandicum maintained evergreen features under nutrient load, shedding its leaves even later in the season. In all, simulated atmospheric N deposition did not benefit the photosynthetic apparatus of the dominant shrubs, but resulted in higher foliar respiration, contributing to stress and a weaker ecosystem C sink. Thus, elevated atmospheric deposition of nutrients to these systems may endanger C storage in peatlands.