Kevin L. Griffin
Professor
Biology and Environmental Sciences
Columbia University

The inhibition of plant respiration by sunlight and its effect on leaf, plant and ecosystem carbon cycling: Evidence from oxygen isotopes to eddy co-variance

Total plant CO_2 fixation by photosynthesis is not a sufficient basis to predict growth or ecosystem carbon cycling since respiration and other metabolic processes must also be considered. Neglecting these may underestimate the yield from a given amount of CO_2 assimilated by up to 30%. Leaf day respiration plays a central role in this relationship because nutrient assimilation occurs in illuminated leaves (at least in many plants) and is sustained by carbon backbones produced by respiratory metabolism. Unfortunately, modelling and predicting the carbon flux from day respiration remains a difficult exercise. Moreover, independently determining the rates of photosynthesis and respiration in the light is a fundamental challenge in plant physiology. We have developed a new method to accurately measure gross and net oxygen production as a routine gas exchange measurement with isotope ratio mass spectrometry. The results will be discussed in the context of evaluating the technique presented as a unique tool to study and understand leaf physiological traits. I then consider the implications of the inhibition of respiration in the light on carbon exchange from arctic ecosystems as measured by eddy co-variance.