# Acclimation of respiration of *Quercus rubra* to long- and short-term changes in temperature

*Danielle Bitterman (Department of Environmental Biology, Columbia University, New York, NY), Stephanie Searle (School of Biological Sciences, University of Canterbury, Canterbury, New Zealand) and Kevin Griffin (Department of Earth and Environmental Sciences, Columbia University, New York, NY)*

Plant respiration is a major source of carbon dioxide, releasing about 60 PgC $yr^1$ into the atmosphere. It has been shown that plant respiration rates initially increase in response to a rising temperature, creating a positive feedback cycle with global warming. However, plant respiration rates may acclimate in the long-term, decreasing the amount of carbon released into a warming world. We studied the effects of long-term temperature changes on mature, field-grown Northern red oak, *Quercus rubra*, a dominant tree species in the forests of the northeastern United States, as well as the effects of short-term heat stress on *Q. rubra* seedlings in a temperature-controlled growth cabinet. We found that the mature plants acclimate their respiration rate in the field by changing their basal respiration rate, ($R_{10}$) and not their temperature sensitivity ($Q_{10}$). The heat-stressed seedlings exhibited reverse acclimation of respiration and acclimated their photosynthetic rates ($A_{net}$) over the twelve-day growth cabinet experiment. We find evidence that *Q. rubra* alters its respiration and photosynthetic rates to maintain its carbon balance, potentially decreasing the magnitude of the positive feedback between temperature and carbon dioxide release through respiration.

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