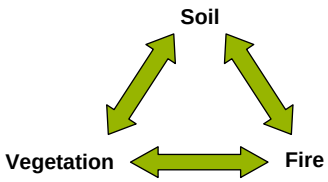
Fire, vegetation change and potential feedbacks to the global carbon cycle

Meaghan Jenkins, Mark Adams and Ross McMurtrie

University of New South Wales, Sydney.

Soils store large amount of carbon, a change in just 10% in soil organic carbon would be equivalent to all the anthropogenic CO2 emitted over 30 years (Kirschbaum, 2000). The carbon stocks of organic matter in soils result from a balance between inputs and outputs of carbon within the belowground environment. Carbon input are primarily from leaf litter fall, root detritus and exudates contributed by the vegetation and the outputs from the CO2 efflux of soil respiration (Davidson & Janssens, 2006), which in turn is strongly linked to plant metabolism and to the recent production of plant litter (Ryan & Law, 2005). Bushfires have the potential to dramatically change carbon fluxes of ecosystem through their influence on not only vegetation structure and composition, but also through direct fluxes caused by burning of plant biomass and litter layer which inturn influence the post fire environment.

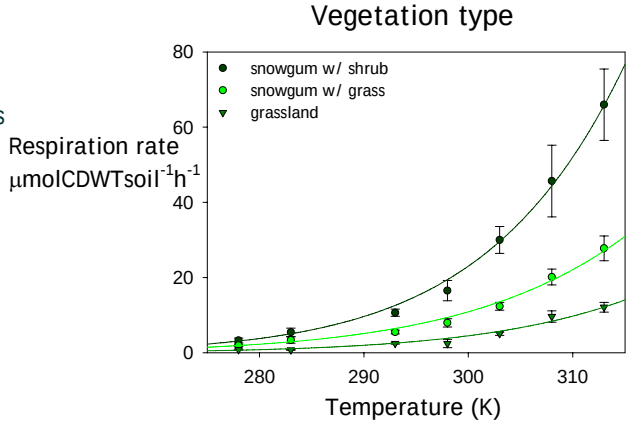


Soil respiration measurements were taken using a system whereby O2 uptake as well as CO2 efflux can be measured dynamically. Using an open flow system combined with a differential oxygen analyser (DOX) and an Infra Red Gas Analyser (IRGA), we can quantify respiratory quotients as well as rates of respiration.

We used this novel system to elucidate environmental and biotic controls of carbon fluxes for three vegetation types - snow gum with shrub understorey, snow gum with grass understorey, and grassland, in the alpine region of NSW.

Initial results show a clear gradient in respiration rates for vegetation type. The Snow gum with a shrub understorey having respiration rates 3.5 times higher than those observed in the grassland soils.

The influence of fire in the carbon balance of montane and sub-alpine ecosystems in Australia is virtually unexplored but clearly of importance given the extent of the ecosystems concerned, their carbon density, and their sensitivity to both fire and climate. Much more research is required, especially research focused on developing clear understandings of the biological processes that govern release of C. This is a crucial *a priori* step in the sensible modelling of fire and climate influences on C balance, at all of: regional, continental and global scales.



Davidson, E.A. & Janssens, I.A. (2006) Temperature sensitivity of soil carbon decomposition and feedbacks to climate change. *Nature*, **440**, 165-173.

Kirschbaum, M.U.F. (2000) Will changes in soil organic carbon act as a positive or negative feedback on global warming? *Biogeochemistry*, **48**, 21-51.

Ryan, M.G. & Law, B.E. (2005) Interpreting, measuring, and modelling soil respiration. *Biogeochemistry*, **73**, 3-27.