



Soil hydrology dependence of methane source-sink behaviour in trees

Vincent Gauci (1), Bertie Welch (1), and Sunitha Pangala (2)

(1) School of Environment, Earth and Ecosystem Sciences, The Open University, Milton Keynes, United Kingdom, (2) Lancaster Environment Centre, University of Lancaster

Forests play an important role in the exchange of radiatively important gases with the atmosphere. Previous studies have shown that in both temperate and tropical wetland forests tree stems are significant sources of methane (CH₄), yet little is known about trace greenhouse gas dynamics in drier, free-draining soils that dominate global forested areas. Here, we examine soil hydrological controls on trace gas (CH₄ and N₂O) fluxes from both soils and tree stems spanning a hydrological continuum of forested wetlands in SE Asia and the Amazon and lowland tropical forest on free-draining soils in Panama, Central America (Barro Colorado Nature Monument), free-draining terra firme Amazon forest, from a deciduous woodland in the United Kingdom (Wytham, Oxfordshire) and boreal forest in Sweden. While trees exclusively behaved as sources in the wet forests, we found that trees behaved as both sources (near the tree base) and sinks (higher up the tree stem) of methane across Panamanian and UK sites however, this pattern was only apparent in a subset of trees in the terra firme Amazon soils where the dominant process was stem CH₄ uptake for the majority of trees. Further, seasonal sampling in Panama demonstrated that soil moisture exerted a temporally variable control over the upland tree CH₄ dynamics. We synthesise these results and those of our N₂O measurements and report the consequences for ecosystem budgets of these gases.