



Anthropogenic N emissions drive C sequestration by forest ecosystems

F. Magnani (1), M. Borghetti (2), M. Mencuccini (3), S. Raddi (4), J. Grace (3)

(1) Department of Fruit Tree and Woody Plant Science, University of Bologna, Italy, (2) Department of Crop Systems, Forestry and Environmental Sciences, University of Basilicata, Italy, (3) School of GeoSciences, University of Edinburgh, UK, (4) Department of Forest Science and Technology, University of Firenze, Italy (fmagnani@agrsci.unibo.it / Fax ++39 51 2096401)

Forests are one of the main biomes on Earth and contribute substantially to C sequestration from the atmosphere, countering the effects of anthropogenic greenhouse gas emissions. In contrast with tropical deforestation, expanding forests in temperate and boreal regions are also immobilizing C in soils and biomass. From the analysis of 60 time-integrated datasets from new (n=31) and established (n=29) forests, we suggest that forest C sinks are determined to a large extent by atmospheric N deposition, largely the result of anthropogenic N emissions from agriculture and fossil fuel combustion. The very high sensitivity of C sequestration to N deposition (C:N = 228:1) stems from the stoichiometry of biomass (and in particular woody biomass), which accounts for 91% of ecosystem C sequestration. The results point to an important negative feed-back cycle, as N emissions could stimulate terrestrial C sequestration and thereby alleviate the effects of anthropogenic CO₂ release into the atmosphere, and have important implications for environmental policies aimed at managing the various components of anthropogenic global change as a whole.