Geophysical Research Abstracts
Vol. 20, EGU2018-13025-1, 2018
EGU General Assembly 2018

Carbon and nitrogen depletion vary with temperature and elevated CO_2 in ectomycorrhizal beech seedlings

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Beech seedlings (Fagus sylvatica L.) were grown in rhizotrons exposed to different temperature, at 17 seedlings per treatment: cold room (15-20 °C) without cooling of roots (CR-) and with additional cooling of roots for 4-5 °C (CR+), greenhouse (GH) with elevated temperatures and outside (OUT), and elevated CO_2 concentrations in the cold room (700 ppm). Isotopic analyses of δ15N and δ13C were analysed with a Thermo-Finnegan Flash HT elemental analyzer at ZALF (Germany). Temperature and elevated concentrations of CO_2 affected δ15N and δ13C values in leaves, stems and nonmycorrhizal roots. Plant tissues and mycorrhiza were more depleted of δ13C in the cooled chamber (-36.83‰ to -31.67‰ than in the greenhouse (-31.09‰ to -29.56‰ and in the outside treatment (-30.92‰ to -27.74‰. Leaves in the cooled chamber (-3.05‰ in CR+ and -3.51‰ in CR-) were 15N depleted compared to leaves in the greenhouse (-1.63‰ and outside (-0.46‰, while roots were 15N enriched (1.79‰ in CR+ and 1.34‰ in CR-) compared to roots in the greenhouse (-0.06‰ and outside treatments (0.33‰. No similar patterns were observed for stems and mycorrhizal roots. The δ13C analyses provide us with an insight into carbon circulation in the air-plant-fungal-soil system, while δ15N values reflect the soil structure and the form of nitrogen uptake of ectomycorrhizal fungi from soil. ACKNOWLEDGEMENTS: The study was financed by the Slovenian Research Agencyv through the research programme group P4-0107 and the PhD young researchers scheme (IŠ), and the projects EUFORINNO(7FW RegPot 315982) and LIFEGENMON (LIFE13ENV/SI/000148).