

Annual GHG emissions from forest soil of peri-urban conifer forests under different canopy densities in Greece

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The implementation of different forest management practices, such as thinning, can affect the budget of GHG through the alteration of soil characteristics and biochemical procedures. However, due to the high heterogeneity of soil properties and forest biomass, there is lack of knowledge of the effect size of forest management practices on GHG effluxes and therefore on their climate change mitigation potential. In this study, we examined the impacts of three different canopy densities as result of thinning treatments: control-unthinned, traditional (-20,68% change of basal area) and selective (-39,19% change of basal area) on GHG emissions from forest soil in coniferous forests in Greece (Xanthi), one year after thinning implementation, investigating the seasonal and spatial GHG response and the effect size of soil environmental factors (i.e. soil temperature -Tsoil- and moisture -Msoil) on them.

GHG effluxes were measured twice per month intervals using the closed static chamber method. Tsoil and Msoil were monitored also along with the CO₂, CH₄ and N₂O of GHG emissions in each thinning treatment. Estimation also of Global Warming Potential (GWP) of GHG emissions for each treatment was assessed, thus giving an initial picture of mitigation potential of thinning practices against global climate change.

The results obtained showed that there was a statistically significant effect of seasonal variation among treatments on CO₂ and N₂O fluxes, whereas spatial variation owing to thinning implementations affected significantly CH₄ uptake. Regarding soil environmental factors, it has been observed that Tsoil affected significantly CH₄ uptake variability among thinning treatments, whereas both Tsoil and Msoil affected CO₂ fluxes. Finally, regarding GWP, selective thinning appeared to have the best performance in terms of GHG emissions, saving 3875 kg CO₂eq ha⁻¹ compared to unthinned and 3112 kg CO₂eq ha⁻¹ with respect to traditional thinning, contributing largely to climate change mitigation.

Key words: canopy density, thinning, greenhouse gases, Global Warming Potential, climate change mitigation

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