Geophysical Research Abstracts
Vol. 20, EGU2018-5981-1, 2018
EGU General Assembly 2018

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

Foteini Doukalianou (1), Kalliopi Radoglou (2), Alessandra Lagomarsino (3), Alessandro Elio Agneli (3), Kiriaki Kitikidou (2), Elias Milios (2), and Michail Orfanoudakis (2)

(1) Decentralized Administration of Macedonia & Thrace, Xanthi Forest Service (Greece), (2) Department of Forestry and Management of the Environment and Natural Resources, Democritus University of Thrace (DUTH) (Greece), (3) Council for Agriculture Research and Economics (CREA) (Italy)

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 CO_2, 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 CO_2 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 CO_2 fluxes. Finally, regarding GWP, selective thinning appeared to have the best performance in terms of GHG emissions, saving 3875 kg CO_2eq ha-1 compared to unthinned and 3112 kg CO_2eq 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

References

Navarro, F. B., Romero-Freire, A., Del Castillo, T., Foronda, A., Jiménez, M. N., Ripoll, M. A., ... & Fernández-Ondoño, E. (2013). Effects of thinning on litterfall were found after years in a Pinus halepensis afforestation area at tree and stand levels. Forest Ecology and Management. Vol. 289, pp. 354-362.
Selig, M. F., Seiler, J. R., & Tyree, M. C. (2008). Soil carbon and CO_2 efflux as influenced by the thinning of loblolly pine (Pinus taeda L.) plantations on the Piedmont of Virginia. Forest Science. Vol. 54(1), pp. 58-66.
Shengzuo Fang, Da Lin, Ye Tian and Senxian Hong. (2016). Thinning Intensity Affects Soil-Atmosphere Fluxes of Greenhouse Gases and Soil Nitrogen Mineralization in a Lowland Poplar Plantation. Forests. Vol. 7, pp. 141
Yamulki, S., & Morison, J. I. (2017). Annual greenhouse gas fluxes from a temperate deciduous oak forest floor. Forestry: Vol. 01, pp. 1-12.

Acknowledgement

Supported by European FoResMit Project (LIFE14 CCM/IT/000905) «Recovery of degraded coniferous forests for environmental sustainability Restoration and climate change Mitigation».