Geophysical Research Abstracts
Vol. 21, EGU2019-18669, 2019
EGU General Assembly 2019


# High soil charcoal production temperature greatly reduces nitrification in the boreal forest soils

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Climate change is projected to alter wildfire regimes (i.e. fire intensity, severity and frequency) in Canada's boreal forests. Studies have demonstrated that a change in fire intensity had a significant effect on the physico-chemical and functional properties of biochar. In addition, biochar produced at different temperature had substantial effects on soil microbial and nutrient dynamics. However, these past studies depended on a destructive sampling approach, which prevented us from continuous, long-term monitoring of these dynamic soil properties. To address this, forest floor material were amended with one of six different treatments (n=5): (i) Tannins, (ii) charcoal 450, (iii) charcoal 850, (iv) charcoal 450 + tannins, (v) Charcoal 850 + tannins, and (vi) unamended control. Soil fluxes of inorganic nitrogen (N) were continually monitored over ten months (once monthly) using microdialysis. All treatments showed highest fluxes of N at the onset of the study (i.e. January and February) after which both fluxes of NH4+ and $NO_3$- showed a steep decline returning to background levels throughout the remaining eight months of the study. Further, higher charcoal production temperature and tannins addition lowered $NO_3$- fluxes, while only higher charcoal production temperature reduced NH4+ fluxes in the treatments. Using the non-invasive microdialysis approach we are able to perform a non-destructive, long term, continuous monitoring of soil N fluxes and show that wildfire intensity viz-a-viz biochar production temperature would affect soil N nitrification in the boreal forests in a changing climate.