1. CO_2, CH_4 and N_2O flux from a larch forest soil in Central Siberia

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Abstract

Larch forest in Central Siberia was characterized by low temperature and precipitation, and the presence of permafrost. Especially, the ground surface was characterized by well-developed mound-trough microtopography with various lichens and mosses. CO_2, CH_4 and N_2O flux from the forest soil could be influenced by these climate and soil condition. The purpose of this study was to characterize the relationship between these gases fluxes and soil properties in a larch forest in Tura (64° 12' N, 100° 27' E), Central Siberia. The forest consists mainly of Larch (*Larix gmelinii*) trees 105 years old. Patches of lichens and mosses, mainly *Pleurozium* sp., *Aulacomnium* sp. and *Cladina* sp., cover the forest floor. Six chambers were set on the patches those all vegetation was cut in July 2005. The gas flux measurements by applying a closed chamber technique were carried out nine times in a day. Soil temperature at a depth of 10 cm in the *Aulacomnium* (6.4 ± 2.5 °C) site was significantly lower than that in *Pleurozium* (9.0 ± 3.4) and *Cladina* (8.6 ± 3.2) sites. Soil moisture in the *Aulacomnium* (0.31 ± 0.10 m^3 m^{-3}) site was significantly higher than that in *Pleurozium* (0.17 ± 0.10) and *Cladina* (0.20 ± 0.09) sites. There were significant differences among the mean CO_2 fluxes of different sites. CO_2 fluxes for each site were in the following order: *Pleurozium* (110 ± 36 mg C m^{-2} h^{-1}) > *Cladina* (85 ± 21) > *Aulacomnium* (68 ± 21). CH_4 (*Pleurozium*; -3.0 ± 2.4, *Cladina*; -1.6 ± 3.8, *Aulacomnium*; -3.4 ± 3.7 µg C m^{-2} h^{-1}) uptakes and N_2O (*Pleurozium*; 1.0 ± 1.7, *Cladina*; 1.2 ± 1.1, *Aulacomnium*; -0.4 ± 2.8 µg N m^{-2} h^{-1}) fluxes were very small. There were no differences among the mean CH_4 and N_2O fluxes of different sites. The values of the CO_2 emission and CH_4 uptake were lower than those previously reported 64 - 389 mg C m^{-2} h^{-1} and -17 - -13 µg C m^{-2} h^{-1} for a forest in eastern Siberia, respectively. CO_2 flux was positively correlated with soil temperature ($r=0.75$ $p<0.01$) and negatively correlated with soil moisture ($r=-0.52$ $p<0.01$). However, both CH_4 and N_2O flux was not correlated with these factors. Rain and melted water could be gathered in *Aulacomnium* site depend on relatively lower microtpography, and prevented to increase soil temperature. So that, the CO_2 emission in the *Aulacomnium* site was the smallest among the sites. However, the effect of low soil temperature and high soil moisture on CH_4 and N_2O emission was not clear.