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# The impact of snow cover on nutrients dynamics in Western Siberia territories

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Monitoring of climate parameters performed in Siberia over the last decades has revealed a general increase in temperature and an increase in winter precipitation leading to a thicker snow pack. Climate models predict an amplification of these trends and indicate that the huge territory of the western Siberian plains will become suitable for agriculture. However, these projections do not consider soil fertility—a key issue for agricultural sustainability. The intention of our study is to test whether the predicted increase in snow precipitation will change soil water fluxes, soil organic matter (SOM) decomposition, and the rate of nutrient release in relation to reduced soil freezing.

Investigations were performed in forests and grasslands both in the steppe-forest zone (Barnaul) and in the subtaiga zone (Tomsk). Average air temperatures in Barnaul and Tomsk are 2.6°C and 0.9°C and amounts of precipitation are 495 mm and 568 mm, respectively. A pair plot experiment was conducted in winter 2013-2014 to investigate the effect of snow thickness on soil temperature, moisture, and on the release of nutrients during SOM decomposition. Snow cover was artificially increased in the treatment plots and was undisturbed in the control plots. The impact of snow thickness on soil moisture and temperature has been continuously monitored over one year.
Permanent snow cover occurred not before late December 2013. It reached about 60 cm in control plots and 1 m in the treatment plots, for a period of time expanding from mid-February to mid-March 2014. In spring, the snow cover persisted two weeks longer in treatment plots than in control plots. The minimum air temperature reached −35°C end of January 2014 at Tomsk and Barnaul, while minimum soil temperature at 5 cm depth was -1°C at Tomsk and -8°C at Barnaul. During winter, soil temperatures were slightly higher in the plot with additional snow compared to the control plot, indicating an insulate effect of the snow cover. At snow melt, soil moisture was higher in plots treated with additional snow.

A second snow manipulation was set up in winter 2014-2015. For this second snow manipulation, enzyme activities relevant to the release of nitrogen (N) and phosphorus (P) from SOM will be measured regularly throughout 2015. Information on the release of N from decaying litter will also be obtained using 15N isotope tracing.

First measurements of enzyme activities performed in fall 2014 showed no effect of the winter 2013-2014 snow manipulation, but land use did matter somewhat.Phosphatase activity was higher in forest than in grassland. Lower laccase and leucine-aminopeptidase activities were observed in plots suspected to be former cropland, potentially fertilised in N.

According to the data we already obtained on the impact on snow treatment on pedoclimate, we expect to detect differences in enzyme activity between the plots treated with additional snow and the control plots at the 2015 snow melt.