Soil transplant experiment: the initial results of coring the original permafrost peatland soils to the “warm” plots

Matvey Tarkhov, Georgy Matyshak, and Lev Bogatyrev
Lomonosov Moscow State University, General Soil Science, Moscow, Russian Federation (tarkhov.mo@gmail.com)

Peatlands located in Russia contribute up to 35% of the global carbon stock in peatlands and it should be focused on due to predictable climate changes. Considering this fact we performed our study to comprehend the permafrost peatland soils initial response to temperature increase by placing the original “cold” soil cores to the “warm” plots (soil transplant experiment).

The 1st field part of experiment was performed in a frozen bog ecosystem in forest-tundra (65°18'55"N, 72°52'34"E). In august 2016/2017 we established two experimental sites with contrasting soils summer daily average temperatures (0-10 cm): “cold site”, 5.5 °C, and “warm site”, 11.8 °C. Undisturbed forest-tundra soil samples in PVC tubes were cored from cold site and transported to the warm site (FTT soils). Other samples from cold site weren’t transported and remained as a control. After 10 days of CO₂ efflux measurements we’ve found the FTT soils CO₂ efflux rate to be 4 times higher comparatively to control (320 and 76 mg/m²*per h. correspondingly). The next year (august 2017) we’ve fixed the FTT soils CO₂ efflux rate being 3 times higher than control (134 and 43 mg/m²*per h.).

During the 2d field part of experiment (october 2016) the control permafrost peatland soils from forest-tundra were transported to identical bog ecosystem in southern taiga (STT soils) (56°1’36”N, 37°11’54”E). CO₂ efflux measurements taken in may-october 2017 revealed the relatively low STT soils CO₂ efflux rate (137 mg/m²*per h.) in contrast to control southern taiga soils (240 mg/m²*per h.).

In summary our preliminary results showed the intensive response of FTT soils: CO₂ efflux rate from "warm" plots was 3-4 times higher as compared to control plots on average both in short-term (10 days) and long-term (1 year) cases. We also note the 2 times lower reaction of STT soils comparably to control. These findings might be taken into account when predicting the peatland soils respiration due to upcoming climate changes in permafrost areas.