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Organic Carbon and Nitrogen Storages of Soils Overlying Yedoma Deposits in the Lena River Delta

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The Lena River Delta (LRD) is located in northeast Siberia and extends over a soil covered area of around 21,500 km^2. LRD likely stores more than half of the entire soil organic carbon (SOC) mass stored in deltas affected by permafrost. LRD consists of several geomorphic units. Recent studies showed that the spatially dominating Holocene units of the LRD (61 % of the area) store around 240 Tg of SOC and 12 Tg of nitrogen (N) within the first meter of ground. These units are a river terrace dominated by wet sedge polygons and the active floodplains. About 50 % of these reported storages are located in the perennially frozen ground below 50 cm depth and are excluded from intense biogeochemical exchange with the atmosphere today. However, these storages are likely to be mineralised in near future due to the projected temperature increases in this region.

A substantial part of the LRD (1,712 km^2) belongs to the so-called Yedoma Region, which formed during the Late Pleistocene. This oldest unit of the LRD is characterised by extensive plains incised by thermo-erosional valleys and large thermokarst depressions. Such depressions are called Alases and cover around 20 % of the area.

Yedoma deposits in the LDR are known to store high amounts of SOC. However, within the LRD no detailed spatial studies on SOC and N in the soils overlying Yedoma and thermokarst depressions were carried out so far.

We present here our "investigation in progress" on soils in these landscape units of the LRD. Our first estimates, based on 69 pedons sampled in 2008, show that the mean SOC stocks for the upper 30 cm of soils on both units were estimated at 13.0 kg m^2 $\pm$ 4.8 kg m^2 on the Yedoma surfaces and at 13.1 kg m^2 $\pm$ 3.8 kg m^2 in the Alases. The stocks of N were estimated at 0.69 kg m^2 $\pm$ 0.25 kg m^{2}and at 0.70 kg m^2 $\pm$ 0.18 kg m^2 on the Yedoma surfaces and in the Alases, respectively.

The estimated SOC and N pools for the depth of 30 cm within the investigated part of the LRD add to 20.9 Tg and 1.1 Tg, respectively. The Yedoma surfaces (1,313 km^2) store 17.1 $\pm$ 6.3 Tg SOC and 0.9 $\pm$ 0.3 Tg N, whereas the Alases (287 km^2) store 3.8 $\pm$ 1.1 Tg SOC and 0.2 $\pm$ 0.05 Tg N within the investigated depth of 30 cm.

Further analyses of the soil core material collected in 2013 will provide SOC and N pool estimates for a depth of 100 cm including both, the seasonally active layer and the perennially frozen ground. With continuing advanced analyses of an available digital elevation model, slopes will be designated with their extents and inclinations since the planar extents of slopes derived from satellite imagery do not correspond to the actual slope soil surface area, which is vital for spatial SOC and N storage calculations as well as trace gas release estimates. The actual soil surface area of slopes will be calculated prior to result extrapolations.