Canopy structural and radiative properties of wet sedges and dwarf shrubs in Kytalyk, NE Siberia

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Dwarf shrub plots were strongly dominated by *Betula nana* (dwarf birch, Figure 1) with some *Salix pulchra* and mosses and lichen below the canopy, wet sedges were almost exclusively *Eriophorum angustifolium* (common cottongrass, Figure 2). We provide the mean numbers per date and plot for all measurements.

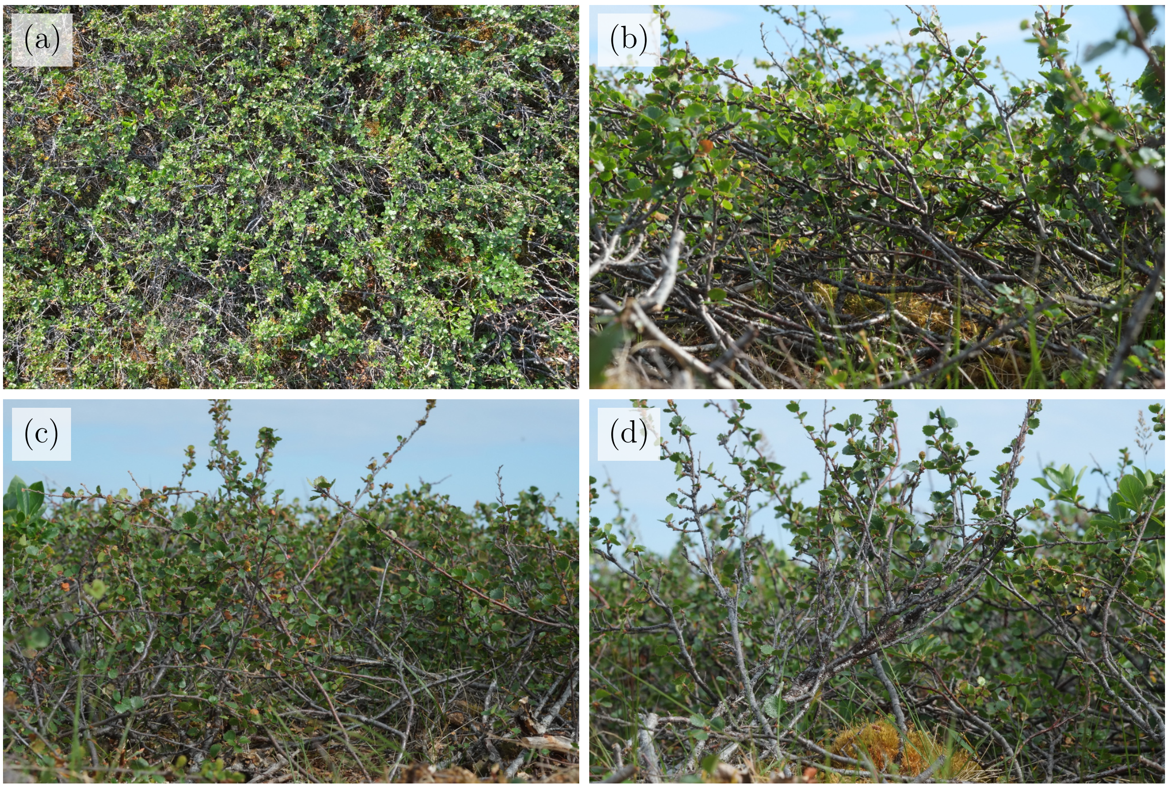

Figure 1: Dwarf birch (*Betula nana*) canopy, (a) topview of about 1×1.5 m and (b–d) profiles; note the large amount of wood as compared to leaves.

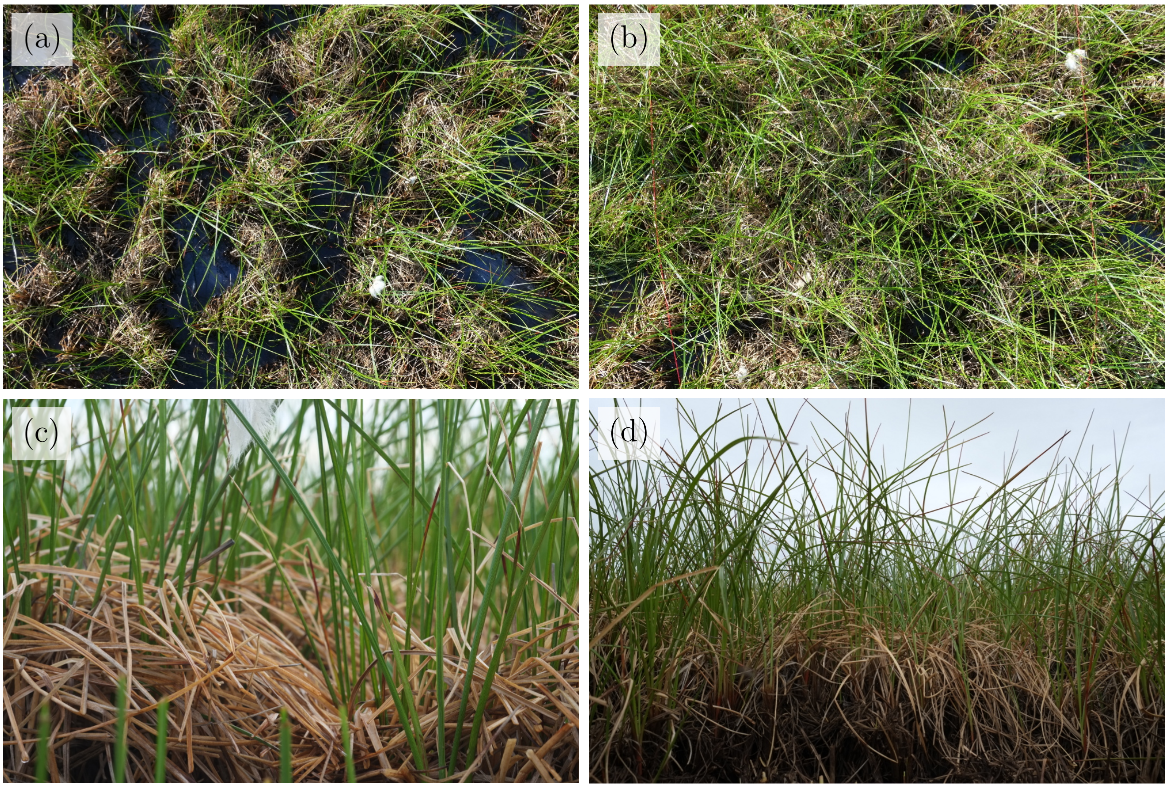

Figure 2: Wet sedge (*Eriophorum angustifolium*) canopy, (a,b) topviews of about 1 × 1.5 m and (c,d) profiles; note the amount of standing dead leaves.

At dwarf shrubs, we measured *projected green leaf area index*, *projected wood area index*, and *background types* using point quadrats of 1 m×1 m with 81 equally spaced points. We vertically inserted a 2 mm thick needle, recorded all contacts with green leaves and wood and the ground cover where the needle hit the soil/mosses/litter/lichen. The remaining background cover is either bare soil or lemming droppings.

We measured *active layer depth*, *canopy height*, and *standing dead leaf height* (in case of wet sedges) using point quadrats of 1 m×1 m with 25 equally spaced points. We vertically inserted a 6 mm thick rod and recorded the distance between the soil/moss surface and (a) the frozen layer, (b) the highest dead leaf, and (c) the average top of canopy of the surrounding 5 cm. We measured *maximum canopy height* in 1 m^2 by vertically inserting a 6 mm thick rod and recording of distance between soil/moss surface and height of tallest living part of the canopy.

At wet sedges, we counted all tillers and the number of leaves in each tiller of 16 squares of 100 cm^2 in a point quadrat grid of 1 m×1 m and extrapolated the *number of leaves* to 1 m^2.

At dwarf shrubs, we converted projected leaf and wood area index (LAI and WAI, respectively) to *total one-sided LAI/WAI* by dividing the projected LAI/WAI by the point quadrat efficiencies of 0.78 (leaves) and 0.76 (wood). This efficiency was calculated from the leaf/wood angle distribution that we measured on levelled photographs as in

Pisek et al. (2011). We had to adjust this method for round and triangular objects. We did two destructive samplings and the estimated LAI agreed well with the second estimate obtained by weighing all leaves and scanning a subset. For wood, it only agreed well in one of the two tests.

At the wet sedges, we estimated *total green LAI* from the number of leaves, the position of the leaves in the tillers, and the canopy height as described in *Juszak et al.* (2016). In three destructive measurements we found that the estimate was accurate within $\pm 0.4\,\mathrm{m}^2\,\mathrm{m}^{-2}$. At the wet sedges, we estimated *standing dead LAI* by multiplying green LAI with a factor of 1.1. This factor was consistently found in our three destructive measurements.

We quantified *PAR transmittance* with ceptometer measurements below canopy at 3-5 locations per plot with a Delta-T Sunscan simultaneously with above canopy measurements with a BFS3 sensor. We provide the mean value of sensors 6-50 along the wand. At wet sedges, we additionally measured above the standing dead leaves to quantify the *PAR transmittance of green leaves*. PAR is photosynthetically active radiation (400 nm to 700 nm). The measurements at time points 1 and 3 were done under clear-sky conditions, at time point 2, the sky was partly cloudy but the measurement location was receiving direct sunlight, at time point 4, the sky was completely overcast.

We measured *canopy reflectance* with an Ocean optics Jaz spectrometer about 1 m above canopy nadir at about 10 locations per plot. We measured exitance and divided it by irradiance measurements with the same instrument and a fiber with cosine corrector right before and after each measurement. We corrected the data and averaged for 400 nm to 900 nm and 400 nm to 700 nm in case of *PAR reflectance*. The measurements at time points 2 and 3 were done under clear-sky conditions, at time point 4, the sky was completely overcast.

References

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