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Using drones to study Arctic landscape variability of NDVI, land cover and carbon dynamics

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Arctic ecosystems show a strong spatial variability of land cover, plant communities and carbon dynamics at local scale. At the same time, the effect of climate change is often monitored and projected at kilometer scale using satellite imagery and Earth System Models. This results in a significant scale discrepancy and makes it hard to translate findings on ecosystem dynamics from plot scale to Earth System Models. Drones can help to bridge this spatial discrepancy by providing data with a spatial resolution at centimeter scale over several hectares. Furthermore, drones can be used for continues monitoring over the growing season and multispectral cameras can provide NDVI data similar to satellite measurements.

Our study aims to bridge this scale discrepancy. We present initial results from fieldwork in a mountainous environment dominated by tundra vegetation in Abisko, northern Sweden. Four study areas with extents of 15-22 ha have been monitored in repeated intervals of $\pm$12 days over the growing season in 2017. In each area, 33 randomly distributed ground control points were set up and surveyed in the same time interval with a handheld NDVI measurement device and vegetation photographs. For each point, biomass and soil organic carbon were sampled. A carbon flux database for several land covers is available. The results will be compared to open access satellite imagery time series with a special focus on data that is commonly being used in Earth System Models. We expect that these results will give new insights in the local variability of NDVI, land cover and carbon dynamics, and their scalability in Arctic ecosystems.