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Recent vegetation composition and above ground biomass change in north-eastern Siberia

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Climate change is especially prominent in Arctic and sub-Arctic regions. Therefore, it is of great importance to investigate ecosystem processes and the dynamics of its components in the Siberian high latitudes. Plant biomass assessment is essential for estimating carbon stocks and further carbon balance and wildlife habitat modeling. Our study region in central Chukotka (north-eastern Siberia) is one of the least investigated sub-Arctic regions in terms of vegetation dynamics. We quantified changes in four vegetation classes: (1) larch closed-canopy forest, (2) forest tundra and shrub tundra, (3) graminoid tundra, and, (4) prostrate herb tundra and barren areas. We used Landsat spectral indices (Normalised Difference Vegetation Index (NDVI), Normalised Difference Water Index (NDWI), Normalised Difference Snow Index (NDSI)) to map the vegetation classes in four focus areas in 2000/2001 and 2016/2017. In 2016, we collected field data on foliage projective cover (percentage cover) of dominant taxa from 52 sites along the tundra–taiga gradient. We applied constrained ordination for coupling projective cover with corresponding Landsat spectral indices from 2016/2017. Ordination scores were used in a k-means classification. We inferred significant shrubification in the tundra–taiga zone (20%) and in the northern taiga (40%), as well as notable tree infilling in the northern taiga (9%), and, no significant changes in the treeless tundra area. To estimate carbon stocks and its changes within and between differentiated vegetation classes, we aim to upscale above ground biomass across tundra, tundra-taiga and northern taiga zones and derive above ground biomass change for the 15 investigated years. In 2018, another expedition took part to this region with new 38 sites at witch we described projective cover and representatively harvested total above ground biomass (dominant taxa and rest). This data can be projected in the created previously ordination space with the use of projective cover similarities. Using interpolation, we plan to predict above ground biomass in the whole ordination space. We will further use Landsat data and interpolation results to produce above ground biomass maps for the four focus areas in central Chukotka and derive difference maps from 2000/2001 to 2016/2017.