Ecosystem Properties along a Latitudinal Gradient of the Yamal Region, Russia
Howard E. Epstein1, Donald A. Walker, Patrick Kuss, Elina Kaarlejävi, George Matyshak
1Department of Environmental Sciences, University of Virginia, Charlottesville, VA 22904-4123

INTRODUCTION
An understanding of land-atmosphere and biogeochemical cycling in any system is predicated by knowledge of the spatial distribution of vegetation and soil properties, and the capacity for elements to move among the various system components, including plants, soils, and atmosphere. In many regions of the Siberian arctic tundra, this baseline information on vegetation and soils in a spatial context does not exist in any systematic fashion. As part of a U.S. NASA/NEESPI Land Cover Land Use Change project, we analyzed in detail the vegetation and soil properties of three tundra locations along a latitudinal gradient in forest-tundra and arctic tundra in the Yamal Region of Siberia east of the Ural Mountains.

METHODS
Our locations were situated near Nadym (65° 18' N), Laborovaya (67° 41' N), and Bovanenkova (Vaskiny Dachi – 70° 17'). At a minimum of two sites per location, using 50m x 50m grids, we systematically sampled leaf nutrient concentrations, and soil characteristics.

RESULTS – Vegetation Indices

LAI declines with latitude; high spatial heterogeneity

NDVI relatively constant with latitude; minimal spatial heterogeneity

RESULTS – Plant Community Composition and Biomass

Biomass declines with latitude; high spatial heterogeneity

RESULTS – Plant and Soil Nutrients

CONCLUSIONS
Vegetation biomass declined with latitude, whereas species richness increased between Nadym and the two more northern tundra sites. The LAI of vascular plants declined from an average of 1.08 m² m⁻² at Nadym to 0.36 at Vaskiny Dachi along the 5th latitudinal transect. Average NDVI values of the tundra vegetation did not decline with latitude and were 0.60 for Nadym, 0.67 for Laborovaya and 0.58 for Vaskiny Dachi. This is likely due to the contribution of non-vascular, understory vegetation to the NDVI signal. Related, average foliar nitrogen concentrations were greatest at Laborovaya, the site with the highest NDVI. Soil nutrient concentrations were markedly greater in loamy compared to sandy soils. A key result is that, even along this transect of approximately 500 km, the heterogeneity of vegetation properties within a location can be greater than that over the entire transect. This heterogeneity needs to be considered in estimations of biogeochemical cycling in the Yamal region. Our research plan is to continue sampling further north to encompass a broader arctic transect.