Abstract: Although it is often assumed that a strong correlation exists between tundra biomass and NDVI (e.g. Goetz et al. 2004), such a relationship has not been previously demonstrated at a biome scale for the tundra or any other biome. We sampled aboveground plant biomass (phytomass) at representative zonal sites along two long Arctic transects in North America and Eurasia. The transects were both about 1800 km long and traversed all five Arctic bioclimate subzones. Both transects exhibited a remarkably similar relationship between total aboveground phytomass and the average maximum Normalized Difference Vegetation Index (NDVI), an index of vegetation greenness derived from Advanced Very High Resolution Radiometer (AVHRR) data from NOAA satellites. The regressions was almost identical for North America and Eurasia, and for NDVI data sets using 1-km ($r^2 = 0.91$) and 8-km ($r^2 = 0.94$) pixels. The NDVI-phytomass relationship was used to make an aboveground phytomass map of the tundra biome, a valuable tool for monitoring Arctic vegetation change. The methods use a new, more consistent NDVI data set for the Arctic (GIMMS3g) and a sampling protocol that employs a consistent methods for site selection, clip harvest, sorting and weighing of plant material, and extrapolation of the results in a way that is meaningful for zonal landscape-level interpretation.

This study has shown:
1. The feasibility of studying and monitoring zonal landscape-level biomass and NDVI across the full Arctic biome scale.
2. It is essential to use careful and consistent methods of biomass harvest and extrapolation to broader landscapes (Raynolds et al. 2011 submitted).

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