

IPY Arctic Observing Networks. Collaborative Research: Study of Arctic ecosystem changes in the IPY using the International Tundra Experiment.

Steven Oberbauer, Robert Hollister, Julia Klein, and Jeff Welker

Among the earliest signals of climate warming in the Arctic have been changes in the seasonal timing of life cycle events (phenology). In many regions, plants are leafing, flowering, and fruiting earlier than ever recorded. Because phenology and physiology are tightly coupled, ecosystem functions such as primary production, as well as the outcome of competition depend on phenological responses. Species phenological and physiological responses to warming differ, causing changes in community composition, biodiversity, and ecosystem function. Changes in phenology and species abundance being reported across the Arctic are consistent with the findings of the long-term experimental warming of the International Tundra Experiment (ITEX) network, a plot-scale, nondestructive, warming experiment conducted across the tundra biome beginning in 1990. The ITEX network was specifically designed to study phenology and community composition, and has also been used effectively to study ecosystem processes. In this project, results from field campaign of phenology and plant community composition measurements and indicators of ecosystem function on warmed and control plots conducted during the IPY are being compared with ITEX data from 10-15 yr ago. The phenology data from these campaigns across the network have been the subject of an intensive project-supported synthesis workshop conducted in October 2009, and the community composition data are being compiled for a workshop in Spring 2010. Site-specific data from some sites show clear trends of earlier flowering and leafing. Site-specific data on plant community structure and composition reveal taller canopies with increased shrub growth and reductions in poikilohydric plants compared to measurements in the 1990's.