



NGEE Arctic

Next-Generation Ecosystem Experiments in the Arctic

What Is NGEE Arctic?

NGEE Arctic is a multiphase project to improve predictive understanding of carbon-rich Arctic system processes and feedbacks—from bedrock to the top of the vegetation canopy—to the climate system at the scale of a high-resolution Earth system model grid cell. The NGEE Arctic project is driven by six science discovery questions to inform model predictions. The questions range across scales from microbial greenhouse gas production to landscape organization, and emphasize important processes such as shrubification, wildfire, and whether the future arctic will be wetter or drier.

Why Study Arctic Ecosystems?

An important challenge for Earth system models is to represent land surface and sub-surface processes and their complex interactions in a changing climate. This is true for all regions of the world, but it is especially important for Arctic ecosystems, which are projected to warm at a rate twice that of the global average by the end of the 21st century. The distribution and dynamics of Arctic vegetation reflect the interplay of permafrost, hydrology, and topography, which in turn has a critical influence on the carbon and energy budget of tundra landscapes.

Research Questions



Landscape
Heterogeneity



Soil
Biogeochemistry



Plant Traits



Shrub Dynamics



Watershed
Hydrology



Disturbance



Research Design

NGEE Arctic seeks to improve the representation of tundra ecosystems in Earth system models through a coordinated series of model-inspired investigations. In Phase 1, NGEE Arctic tested and applied a multiscale measurement and modeling framework in polygonal tundra on the North Slope of Alaska. In Phase 2, the team established new sites on the southern Seward Peninsula of Alaska to confront models with tundra ecosystems with differing climate, topography, and glaciation history. In Phase 3, the team delivered a series of arctic-informed model modules to the Energy Exascale Earth System Land Model. Phase 4, which began in 2024, will "take the model on the road" to simulate data from long-term research sites across the Arctic to quantify improvements in model prediction of climate–ecosystem feedbacks.



6

334
PUBLICATIONS

SCIENCE
QUESTIONS

YEARS ACTIVE: 2012 TO
PRESENT

Research Locations

NGEE Arctic research was conducted in landscapes near Utqiagvik (formerly Barrow) and Nome, Alaska, on land stewarded by five Native communities. These landscapes featured tundra ecosystems with continuous or discontinuous permafrost. In Phase 4, the team will assess model improvements by evaluating an arctic-improved model around the pan-Arctic including long-term research sites in Norway, Sweden, Canada, and the United States (Alaska).



More Information

NGEE Arctic
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