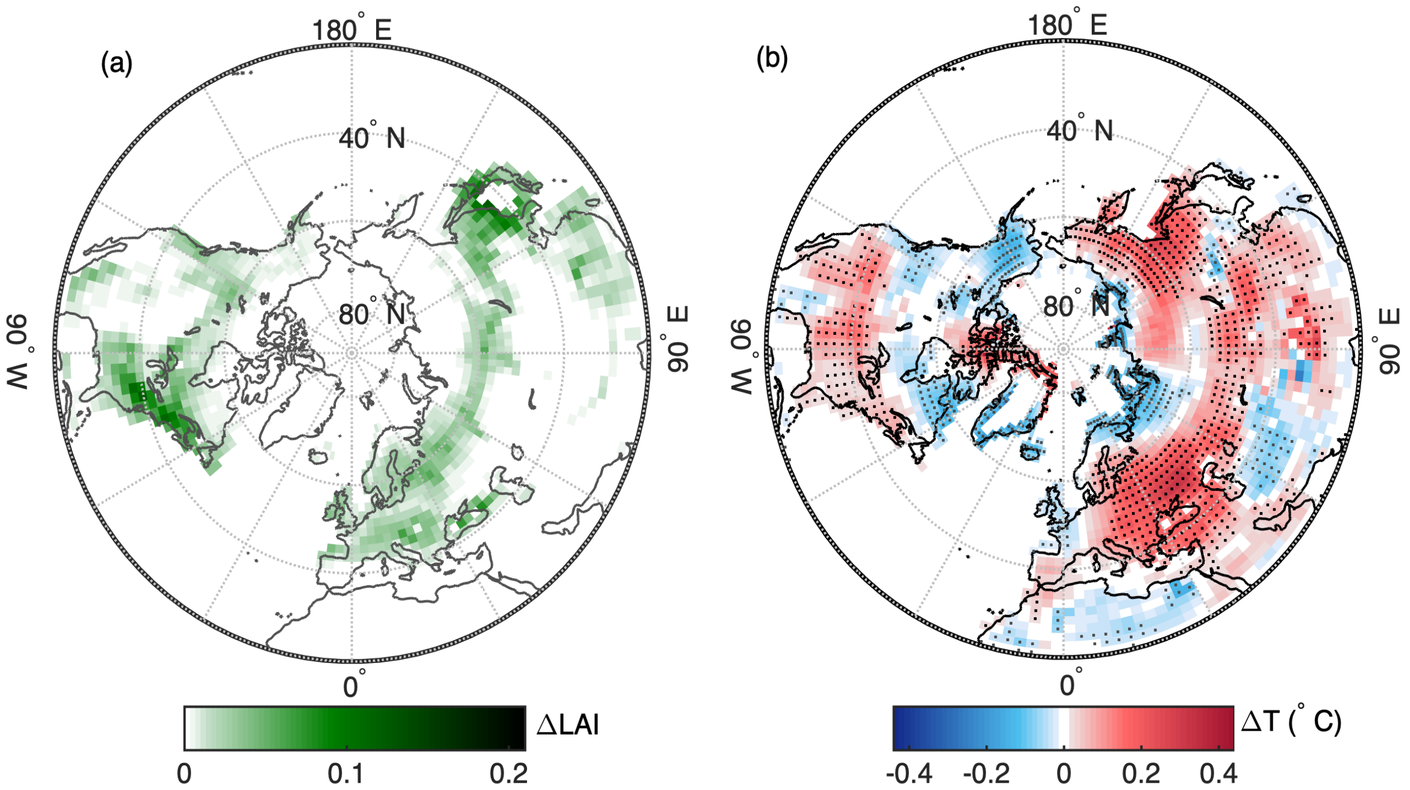
Polar Vegetation-Climate Interactions

Vegetation-Snow-Ice-Clouds, taken at Spitsbergen Island in July 2018, In courtesy of Jinfeng Li

Vegetation changes, i.e., biome and phenology shift, greening or browning have been recorded in response to climate change in northern high latitudes. In turn, vegetation changes modify climate by altering the surface energy, water and carbon budgets. Our pilot study showed that earlier spring leaf-out in temperate and boreal vegetation can amplify the high-latitude warming due to enhanced water vapor greenhouse effects, snow-albedo and cloud-radiative feedbacks. We seek to understand how does climate feedback to vegetation changes in polar region through moisture, snow, sea ice and cloud feedbacks by coupled model simulations.



CESM CAM-CLM coupled simulation:
The increased vegetation greening (ΔLAI) in spring due to advanced leaf-out in both boreal and temperate plant functional types (PFTs) (a) and annual mean air temperature anomalies (ΔT_a). ΔT_a here is the ensemble mean temperature anomalies for leaf-out advancement in boreal, temperate PFTs and both. The pixels are highlighted when leaf-out advancement in all three scenarios leads to the same sign of temperature anomalies and the temperature anomalies are statistically significant (t-test, $p<0.001$).

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