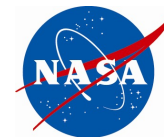


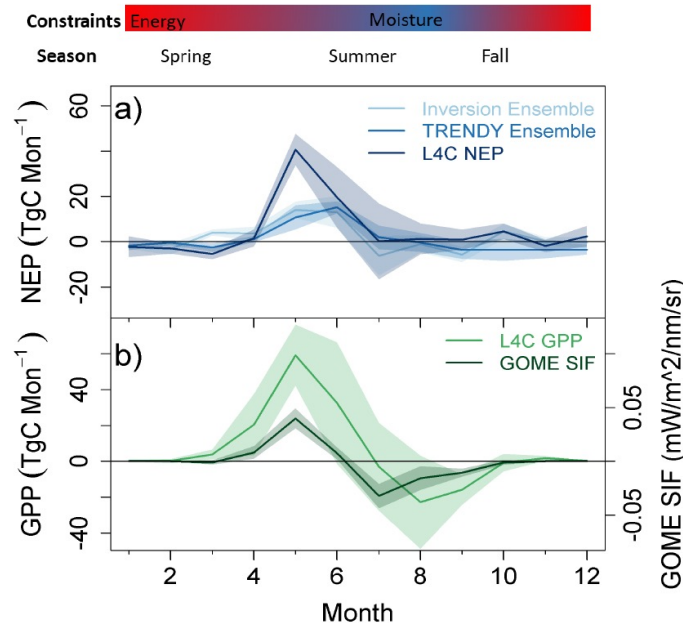
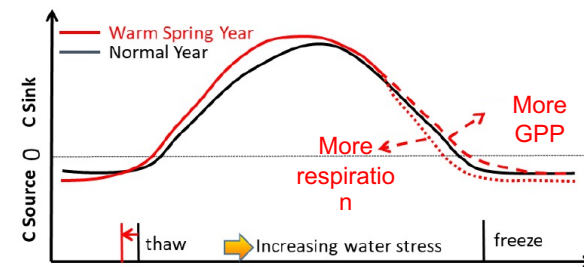
# Respiration Carbon Losses Offset Photosynthetic Gains During Anomalous Boreal-Arctic Warming



**Problem:** Boreal-Arctic ecosystems strongly impact the global carbon budget; whether they act as a net annual sink or source for atmospheric CO<sub>2</sub> (C) depends on seasonal climate sensitivity, which is highly uncertain.

**Finding:** Photosynthetic C-gain in warmer springs offset by winter respiration C-losses, resulting in near-neutral annual C-balance; temperature is dominant control on C-exchange in spring & winter, while soil moisture is dominant in the fall, with greater moisture limitations in boreal forest than tundra.

**Impact:** Improved understanding of seasonal climate sensitivity of the boreal-Arctic C-cycle, incl. both soil moisture & thermal constraints on C-sink activity.



Conceptual seasonal C-response to warm spring, where net ecosystem production (NEP) and component GPP (gross primary production) vs respiration enhancement depends on available soil moisture (Top). Observed C anomalies over the regional domain from SMAP L4C, GOME-2 SIF (proxy for GPP), Atm. C-inversions and TRENDY ESMs (lower).