

# Accelerating Sensitivity of Active-Layer Freezing to Snow Cover in Arctic Alaska



**Problem:** Soil respiration in the Arctic remains poorly quantified due to cold season uncertainty from persistent unfrozen soil water (i.e. the “zero-curtain”); snow cover heterogeneity introduces additional zero curtain variability due to strong snow-soil insulation effects.

**Finding:** Earlier snow onset promotes a longer zero-curtain in shallow active layers (<0.4m), whereas zero curtain persistence is directly proportional to the maximum thaw depth in deeper active layers.

**Impact:** Amplified Arctic climate warming is promoting deeper and longer unfrozen active layer conditions, which may lead to greater cold-season soil carbon loss.

