

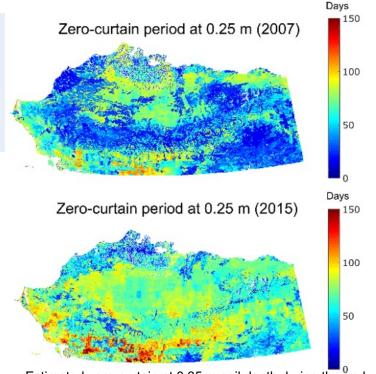
Accelerating Sensitivity of Active-Layer Freezing to Snow Cover in Arctic Alaska



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.



Estimated zero-curtain at 0.35 m soil depth during the early snow season over northern Alaska in 2007 and 2015.

Yi, Kimball, Chen, Moghaddam, and Miller, 2019: Sensitivity of active-layer freezing process to snow cover in Arctic Alaska, *The Cryosphere*.