Nutrient Transformation and Gas Flux along the Eroded Coastline, Arctic Alaska

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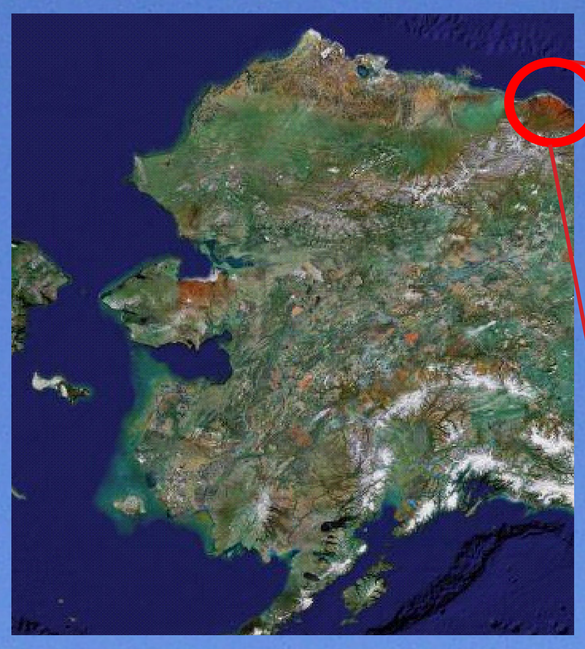
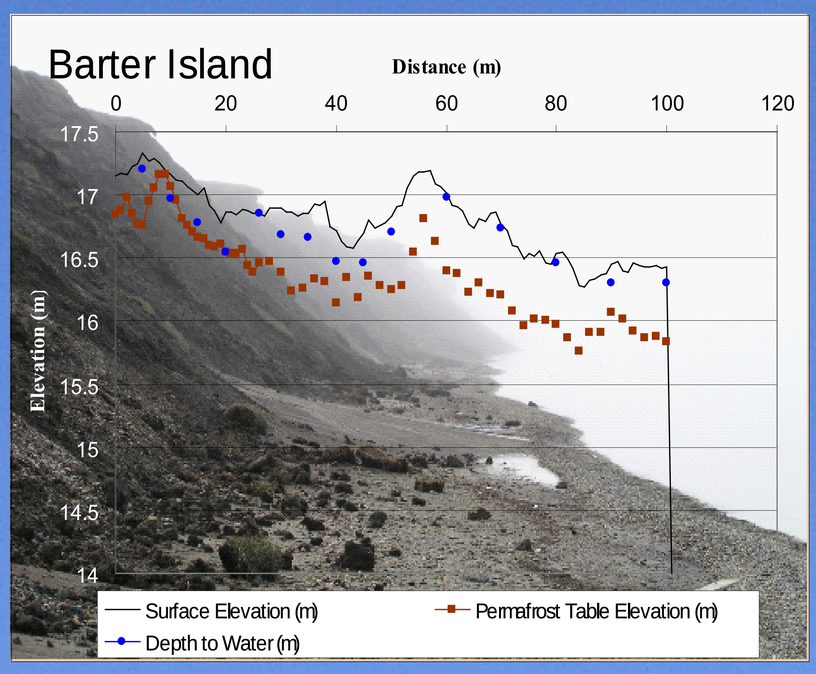
Alaska



Barter Island



Elevation, thaw depth, and water depth profile of transect and upper bluff. Thaw depth follows the contour of ice wedge polygons, and is shallowest over ice wedges and at the center of the polygons (highest micro-topographical points).

Transect 3

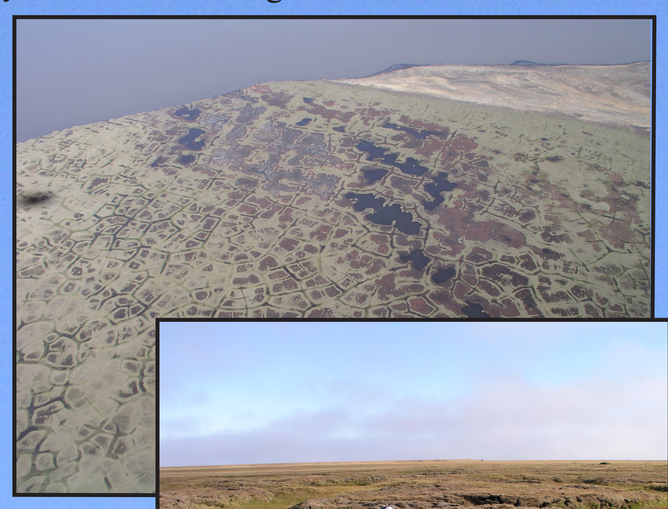
Organic layer over mineral sediment, on left, and ice wedge, on right, at bluff exposure. Sluffed organic material has accumulated at bottom.

Transect 2

Transect 1

Bent soil layers due to ice wedge formation. These deformed layers may evenutally curl over on themselves creating churned, cryoturbated soils.

Ice wedge polygons along the arctic coast.



An example of high-centered polygons showing microtopographical variation. The low areas are underlain by ice wedges. Where ice and soil meet is site of greatest cryoturbation.

Cryoturbation in the active layer. Notice the mixed Oa and Bg layers.

Horizon thickness

	Ave	Range	Stdev
O	14.3	12-19	4.0
B	17.3	15-21	3.2
O	14.7	12-17	2.5
Cryo-turbated	62.7	41-80	19.9

Horizon thickness in the thawed soil layers, or active layer, is fairly consistent along the Barter Island coast. Large variation is found in the cryoturbated permafrost layers where ice wedge formation and frost churning create mixed and bent soil layers.

Due to cryoturbation, OC % follows no consistent pattern, even at surface layers. Release of CH4 and CO2 varies greatly across transects, but are similar at each distance from shore. Shallower depths tend to have higher gas release because of greater current or recent biological activity, and the deeper layers tend to have greater mineral content. Spikes in EC indicate old marine surface layers and/or cation migration at freezing fronts.

Soil pH and moisture % both increase with depth. Parent material in this region is calcareous, originating from the Brook Range, AK. Segregated ice forms deep in the profile due to several reasons: old freezing fronts, preferential flow pathways re-freezing, and wedge ice.