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NEW INSIGHTS INTO COASTAL EROSION RATES ALONG THE YUKON COAST, CANADA

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Approximately twice as much carbon is stored in permafrost (perennially frozen ground) as is in the Earth's atmosphere. Globally, nearly one third of all coasts are affected by permafrost processes. Erosion of these coasts causes re-mobilization of the stored carbon which then becomes available for the conversion into greenhouse gasses, such as methane and carbon dioxide.

The Yukon Coastal Plain in the western Canadian Arctic is typically composed of ice-rich and unconsolidated sediments, including massive ice bodies for example in the form of ice wedges and segregated ice. This composition and morphology make it highly susceptible to erosion. Recent changes in environmental conditions such as record low summer sea ice extents in the years of 2007 and 2012, and rising sea- and ground temperatures, suggest an increase in coastal retreat and thus an increase in the re-mobilization of carbon.

We present the initial results of a regional study focused on the spatial and temporal changes of coastal retreat along a 200 km coastal stretch of the Yukon Coastal Plain, reaching from the USA-Canada border to Shingle Point. Aerial photography from 1951 to 1996, as well as SPOT and GeoEye satellite imagery from the years of 2009 and 2011, form the basis for GIS analyses using the Digital Shoreline Analysis System (DSAS). The results are supplemented by ground observations at seven coastal monitoring sites maintained by the Geological Survey of Canada. Infrared theodolite and real time kinematic global positioning system data, together with LiDAR (Light Detection And Ranging) data from 2012 and 2013, allow us to estimate the total volumetric land loss along the Yukon coast that occurred over the last 60 years. The temporal and spatial variability in coastal erosion shows that erosion occurs at rates up to 10 m/a around Stokes Point. Western study sites show much lower erosion rates of less than 2 m/a which appear to more adequately represent the overall erosional trend of the coast. The acceleration or deceleration of coastal retreat is highly dependent on the specific location, and varies from west to east. As the overall erosional behavior of the coast is very diverse, no clear response of the coast to changing environmental conditions can be distinguished yet. Further field investigations are planned, to gain a better understanding of how the Yukon coast is responding to environmental changes.