Recent coastline evolution along the Yukon Coast, western Canadian Arctic

Anna Irrgang (Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research), Goncalo Vieira (Centre for Geographical Studies, Institute of Geography and Spatial Planning, University of Lisbon), Dustin Whalen (Natural Resources Canada, Geological Survey of Canada–Atlantic), Pedro Freitas (Centre for Geographical Studies, Institute of Geography and Spatial Planning, University of Lisbon), Rodrigue Tanguy (b.geos), Pia Petzold (Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research, University of Potsdam), Hugues Lantuit (Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research, University of Potsdam) and Annett Bartsch (Austrian Polar Research Institute (APRI), b.geos).

Abstract

Soft sediment permafrost coasts are well known for their very dynamic nature. In some places their erosion can reach tens of meters, even though the erosion time is restricted to the short open water season of three to four months per year. Due to its high ground ice content, the Yukon coast in the western Canadian Arctic is particularly prone to erosion. Building on results from Irrgang et al., 2018, we continued analyzing shoreline movements along the Yukon Coast using Pleiades satellite imagery covering the whole Yukon Coast from 2018 and 2022, as well as very highly resolved data from UAV overflights covering long term monitoring sites in 2019 and 2022. Using the Digital Shoreline Analysis System (DSAS) Esri ArcMap extension tool, we quantified shoreline movements for the time periods 2011-2018, and 2018-2022 for the entire coastline and for 2015-2019 and 2019-2022 for long term monitoring sites. We used the same transects and shoreline proxies as in Irrgang et al., 2018, to ensure comparability of our results and elongate our observation series. We will show how recent shoreline position changes differ from past ones and will provide possible reasoning for these detected changes. We are using our multi-time-step shoreline change rate dataset of the Yukon Coast for training and validation purposes within the Earth Observation for Permafrost Coasts (EO4PAC) project. The increasing usage of machine learning approaches for automated shoreline delineation and shoreline change rate retrieval opens up new pathways – especially if it comes to exploring large and remote areas. Such datasets which contain on site derived shoreline change rates and manually derived shorelines from (very) high resolution airborne and spaceborne data are crucial for training algorithms, validation of results and thus for the quality improvement of machine learning techniques.