Using Tide Gauge and GPS Data to Quantify the Effects of Short and Long-term Glacial Rebound and Adjustment on the Local Sea Level Budget of Greenland and Northeast Canada.

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As the effects of climate change become increasingly observable, the research of sea level rise for coastal communities has become a top priority. Greenland is an area of interest due to the non-uniform local effects of a nearby changing ice sheet, including the gravitational effect the ice sheet has on the ocean surface and glacial isostatic adjustment (GIA), resulting in differing levels of present day and projected sea level change around the country**.** We build upon previous research by using longer tide gauge and GPS datasets to assess modern day glacial isostatic adjustment (GIA) models and update relative sea level (RSL) change estimates for Greenland. Extending the analysis to the present day is especially important because of the acceleration in Greenland Ice Sheet melt since the end of the historical tide gauge record which imparts non-linear changes to the individual components of local sea level budget. We used these longer datasets to estimate the RSL budget to calculate a sea level "fingerprint" for Greenland.

We extended the analysis of tide gauges around Greenland and Canada by combining historical data with more recent tide gauge data hosted by PSMSL. Using ARIMA (Autoregressive Integrated Moving Average) and SARIMAX (Seasonal AutoRegressive Integrated Moving Averages with eXogenous regressors) models, we create projections for both the tide gauge and GPS datasets. These projections let us quantify the seasonality of the datasets and explore non-linear long-term trends. By using an ordinary least square (OLS) linear regression method, we obtained the elevational change of GPS sites around Greenland and Canada. We then use the results of the OLS method in the GIA component of our RSL budget equation in order to calculate the RSL rate of change for Northern Greenland and Northeast Canada. We compare RSL components of two nearby GNET sites near Thule, Greenland. Comparing vertical land motion rates of a coastal site and a site at the edge of the ice sheet, reveals the relative importance of modern-day elastic response to Greenland's ice melt and longer term post-glacial rebound. Lastly, a comparison of the same Greenland sites with GPS stations and tide gauge data in Northeast Canada highlight the recent acceleration in mass loss by the Greenland Ice Sheet.