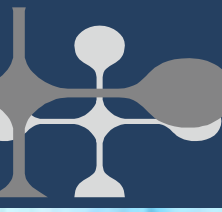


# Trends and Heterogeneity of Beaufort Sea Lagoon Sea Surface Temperature: 1982-2022

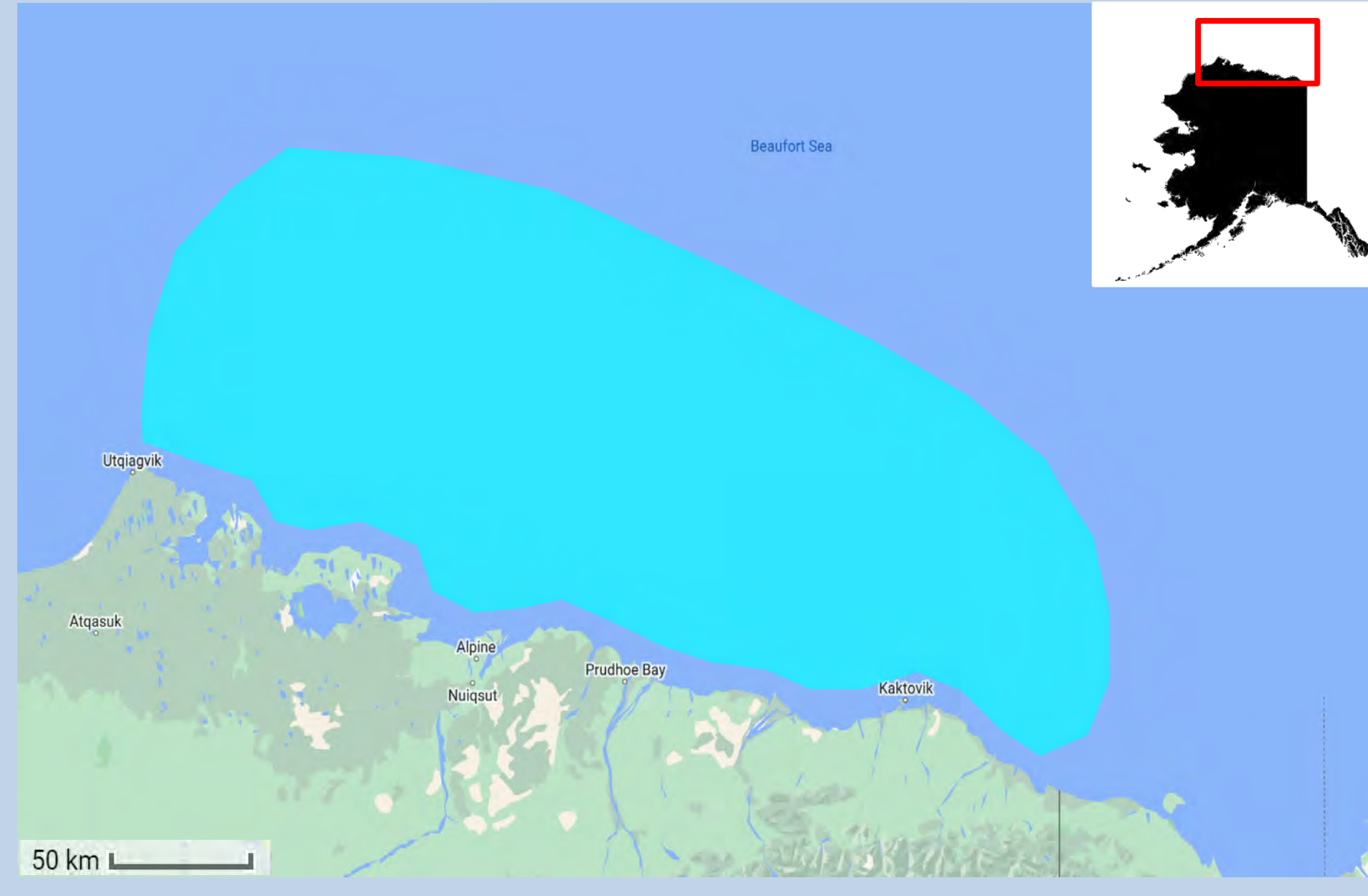
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## Introduction

Rising sea surface temperatures (SSTs) play a large role in altering air-sea interactions in open ocean and in near-shore marine ecosystems. This research investigates the change in SST trends and spatial patterns across both open ocean and near-shore environments at high latitudes.

## Initial Analysis



The first region of interest is in the Beaufort Sea and includes open ocean areas 10 Km from the coastline or barrier islands.

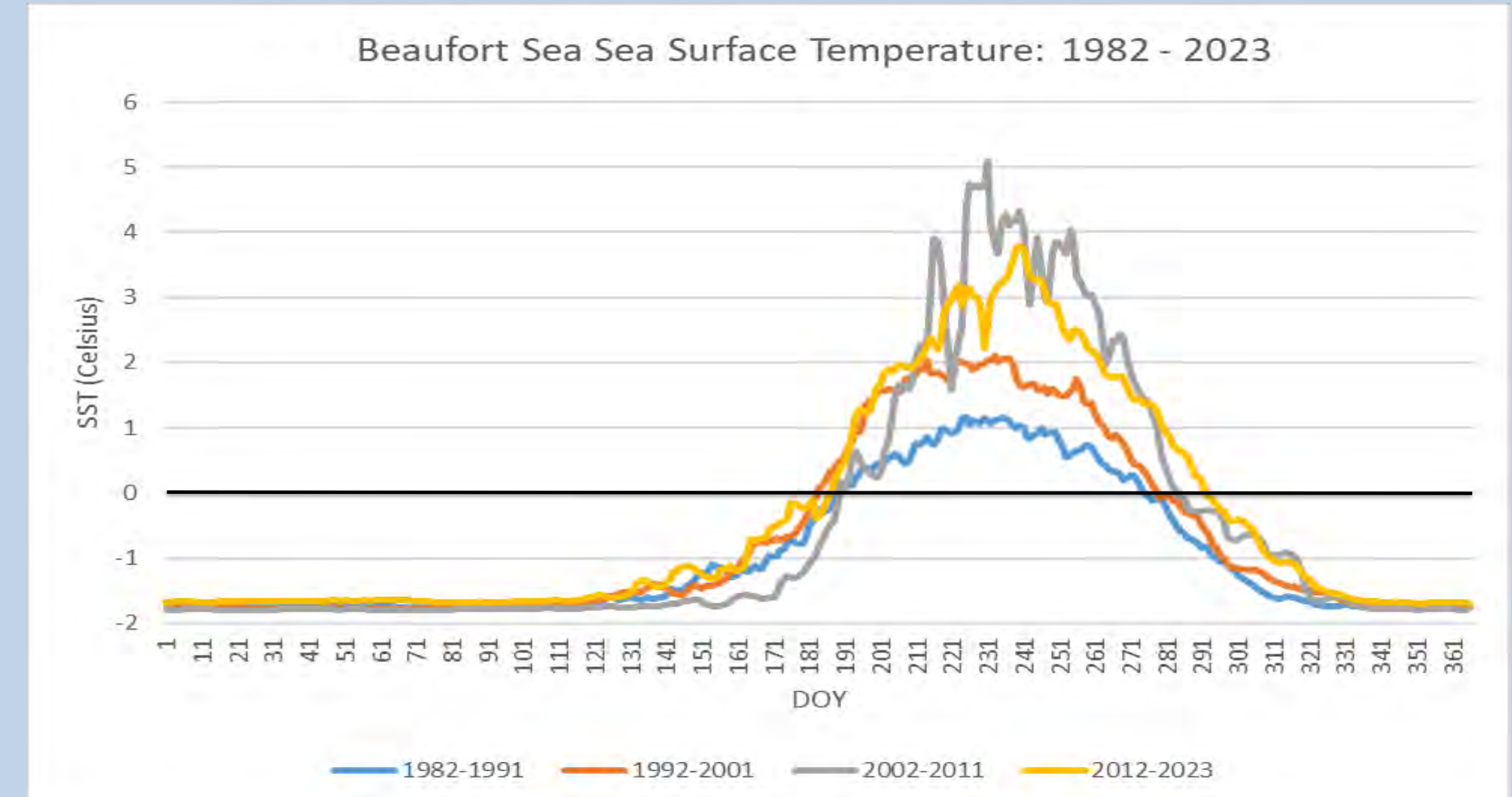
## Data

• Level 4 SST daily data comes from NOAA's 0.25 spatial resolution, daily Optimum Interpolation Sea Surface Temperature V2.1 (OISST) dataset.

## Initial Results

- DOY analysis indicate a warming trend with maximum average SSTs increasing from 1.1 C in the 1982-1991 average to 3.8 C in the 2012-2023 average.
- The DOY when average SSTs cross below freezing temperatures (0 C) has moved later in the year from 276 (Oct. 3) in the 1982-1991 average to 293 (Oct. 20) in the 2012-2023 average.

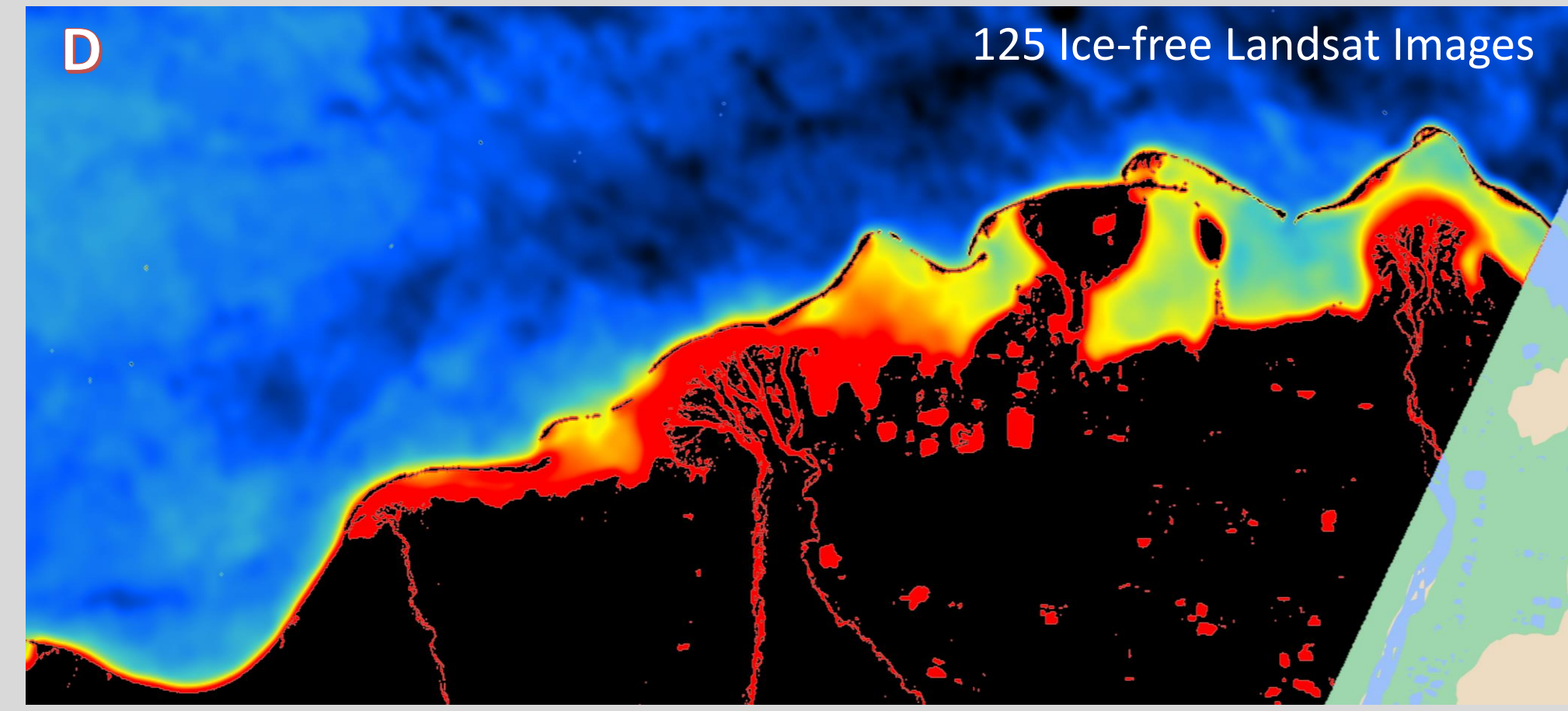
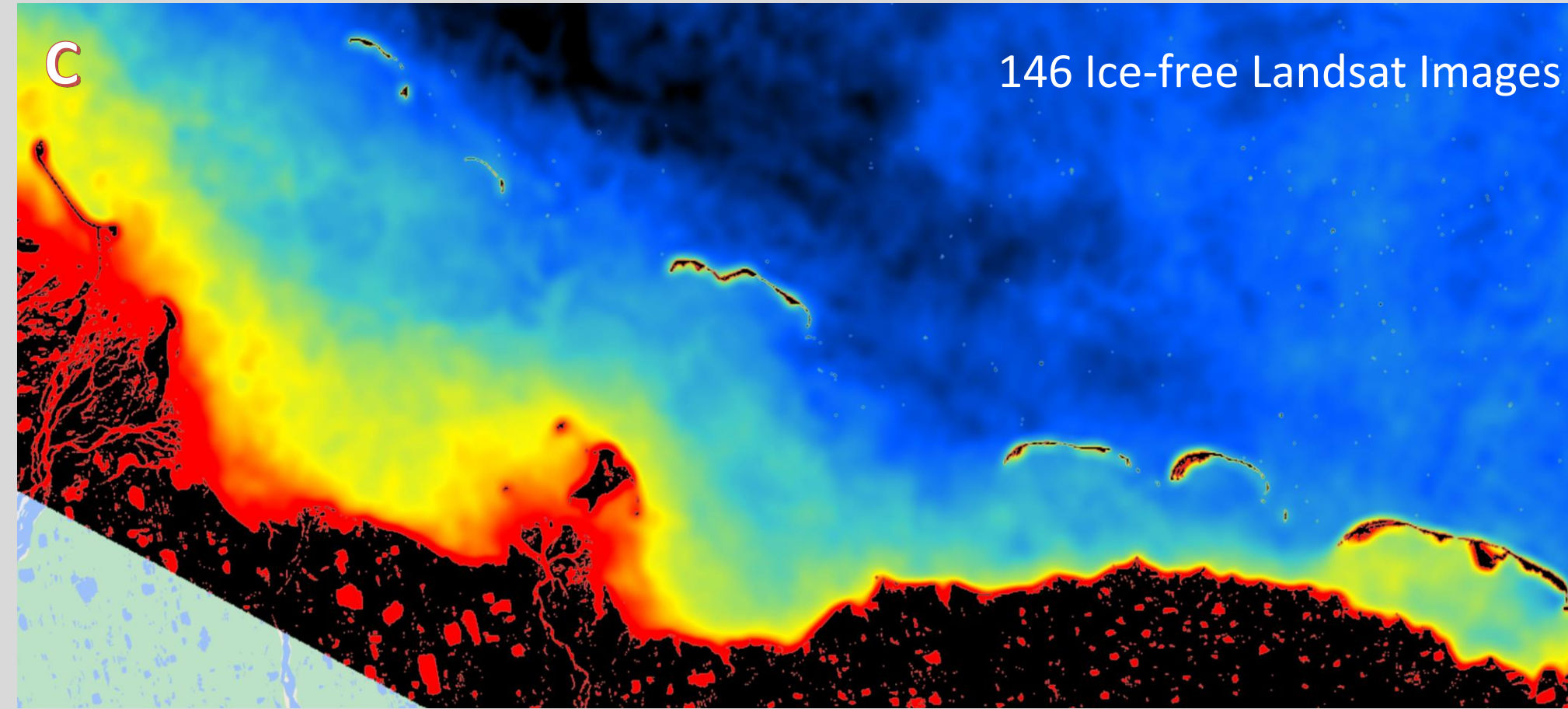
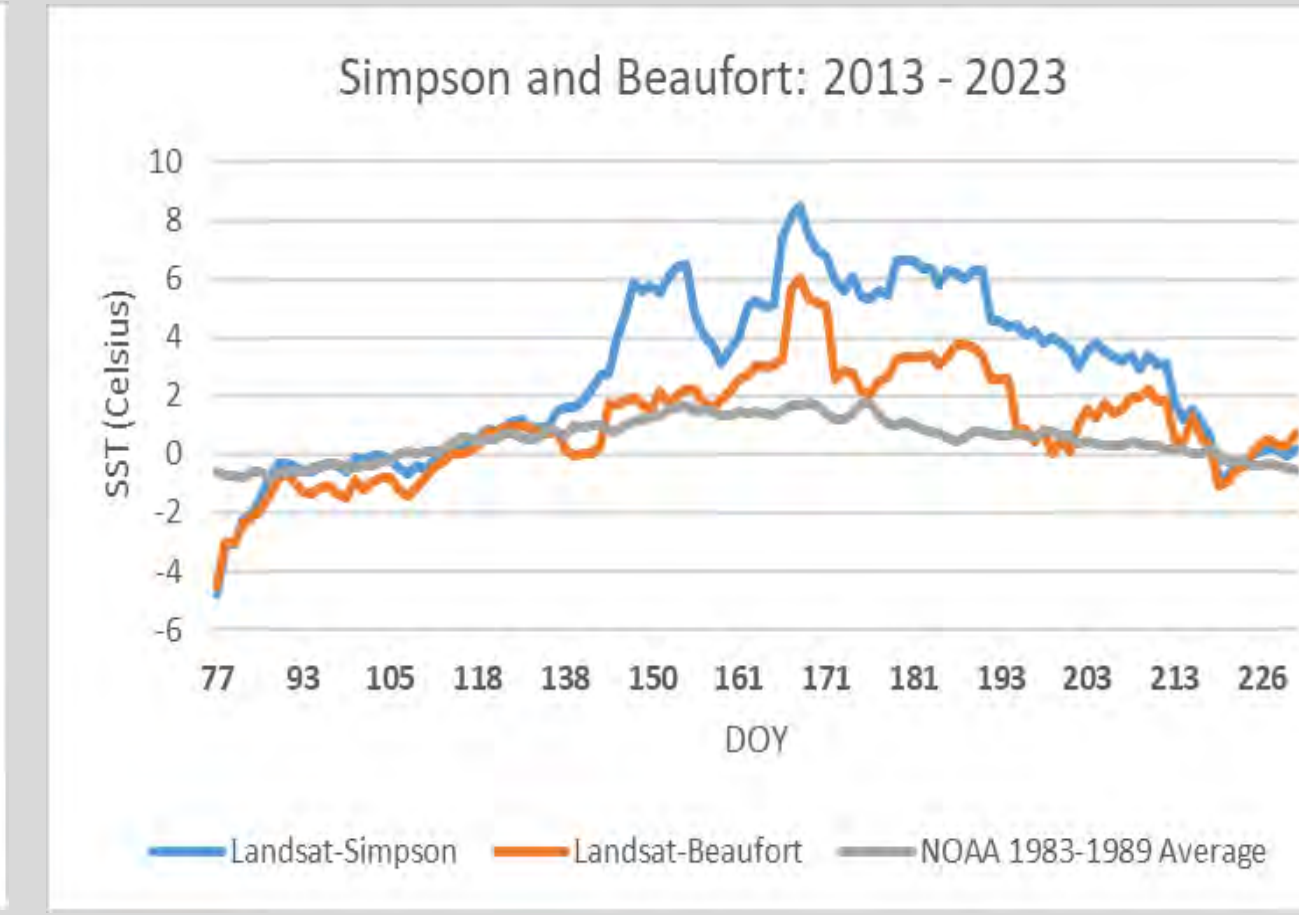
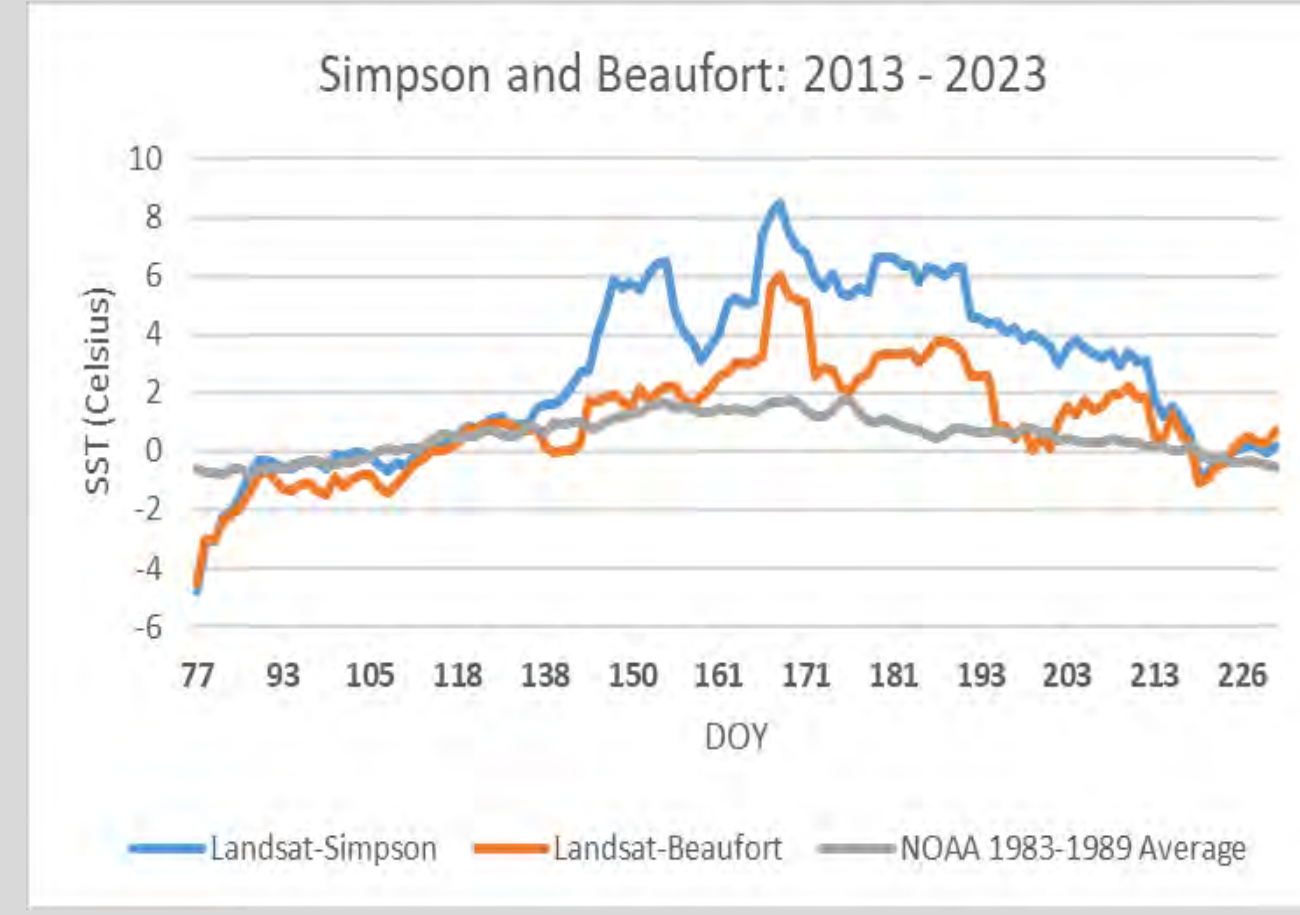
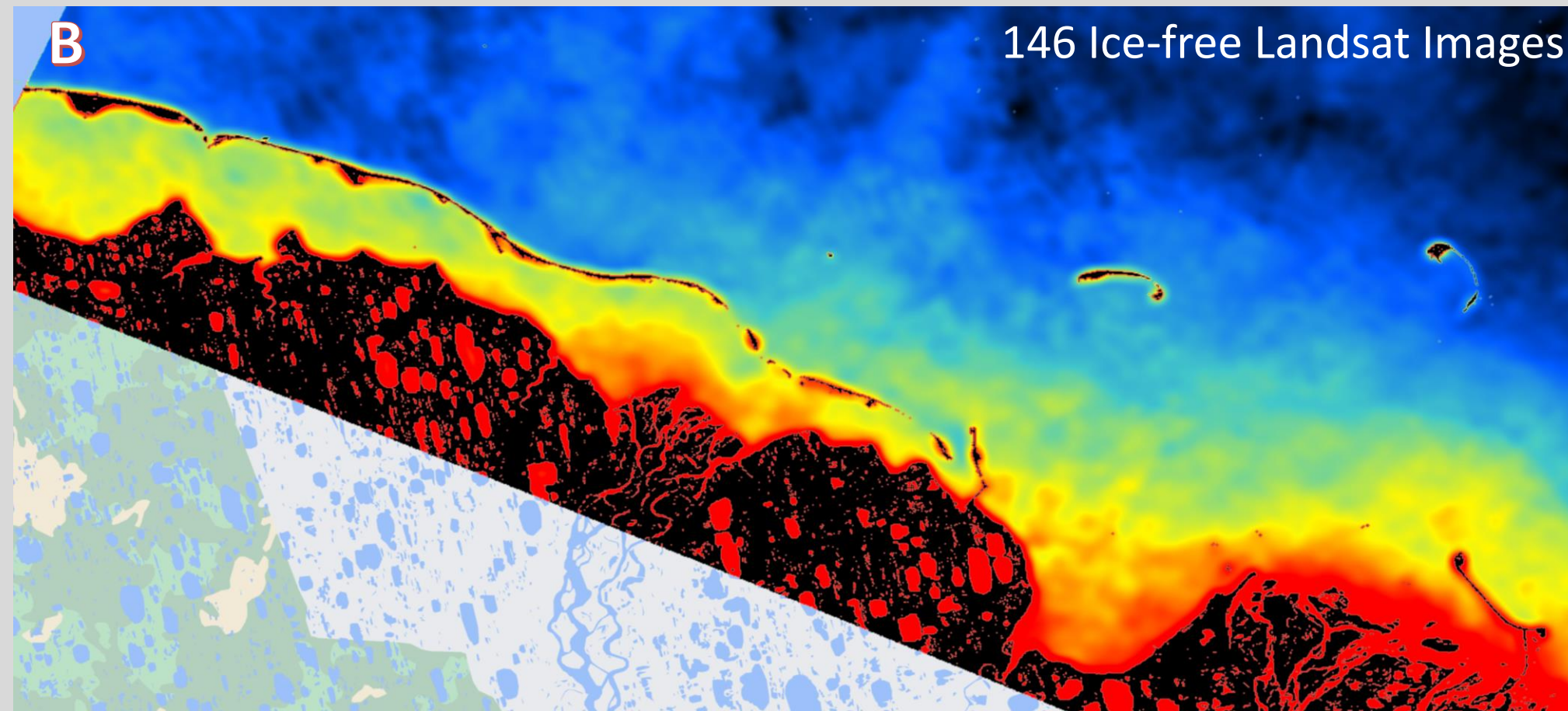
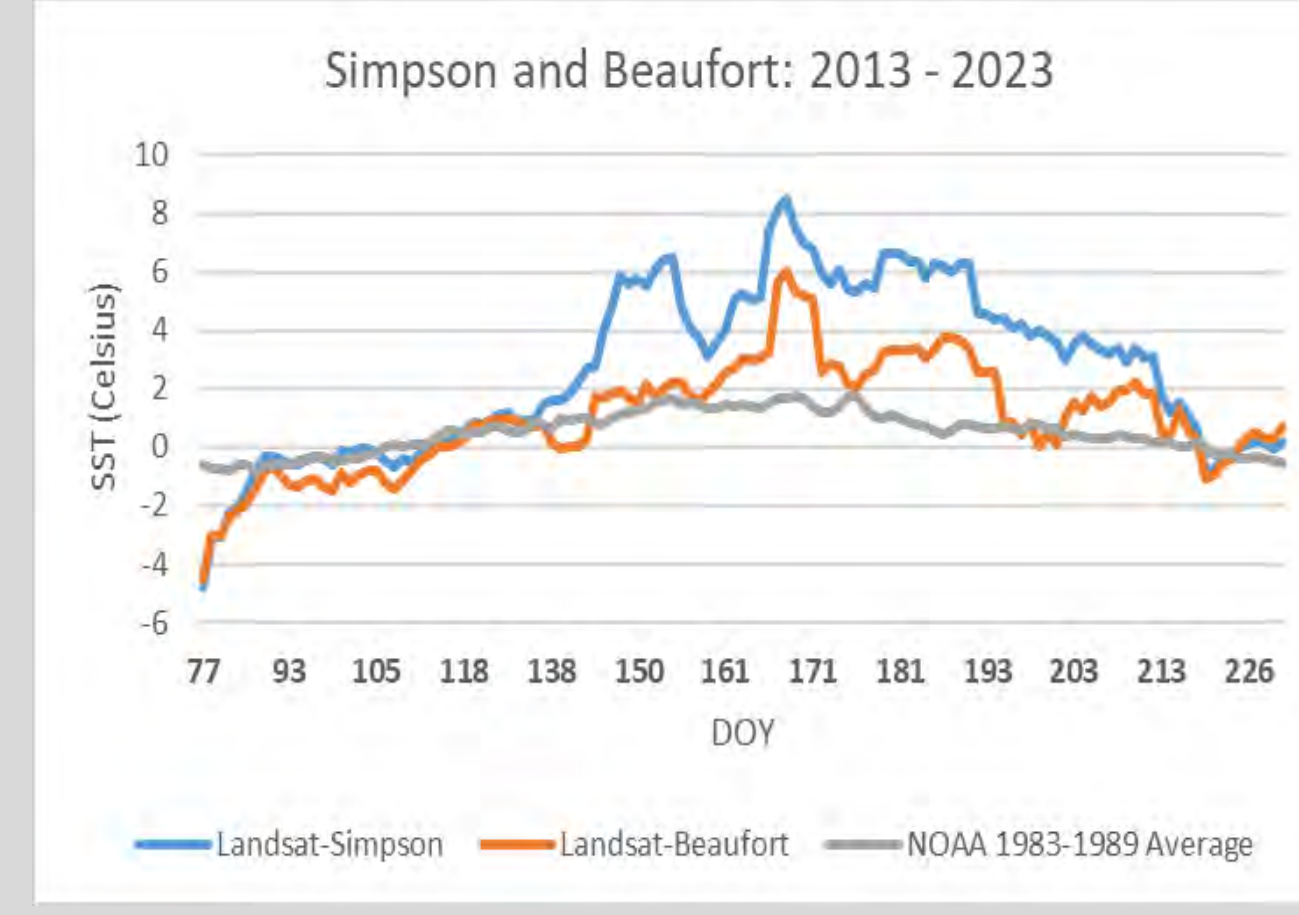
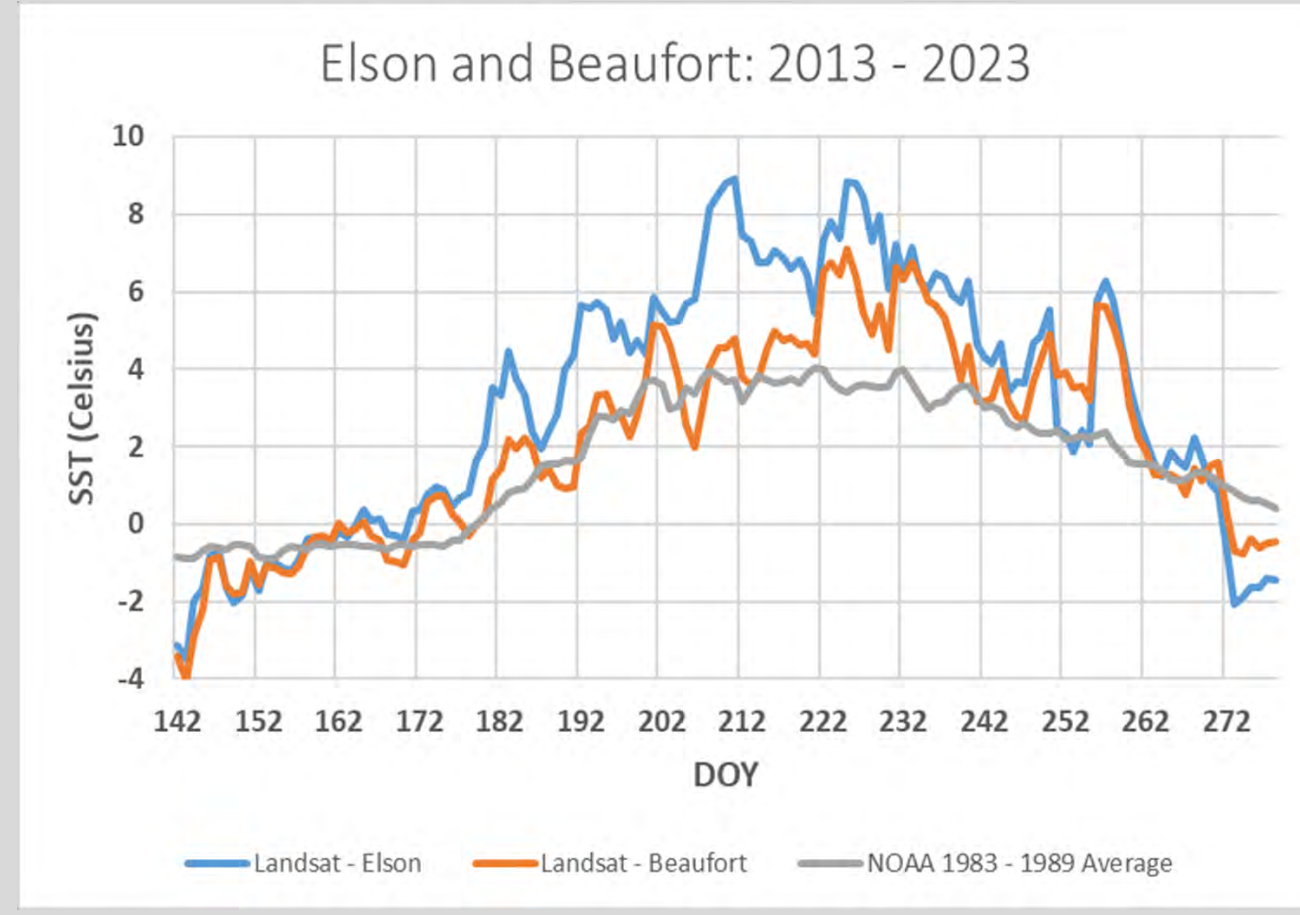
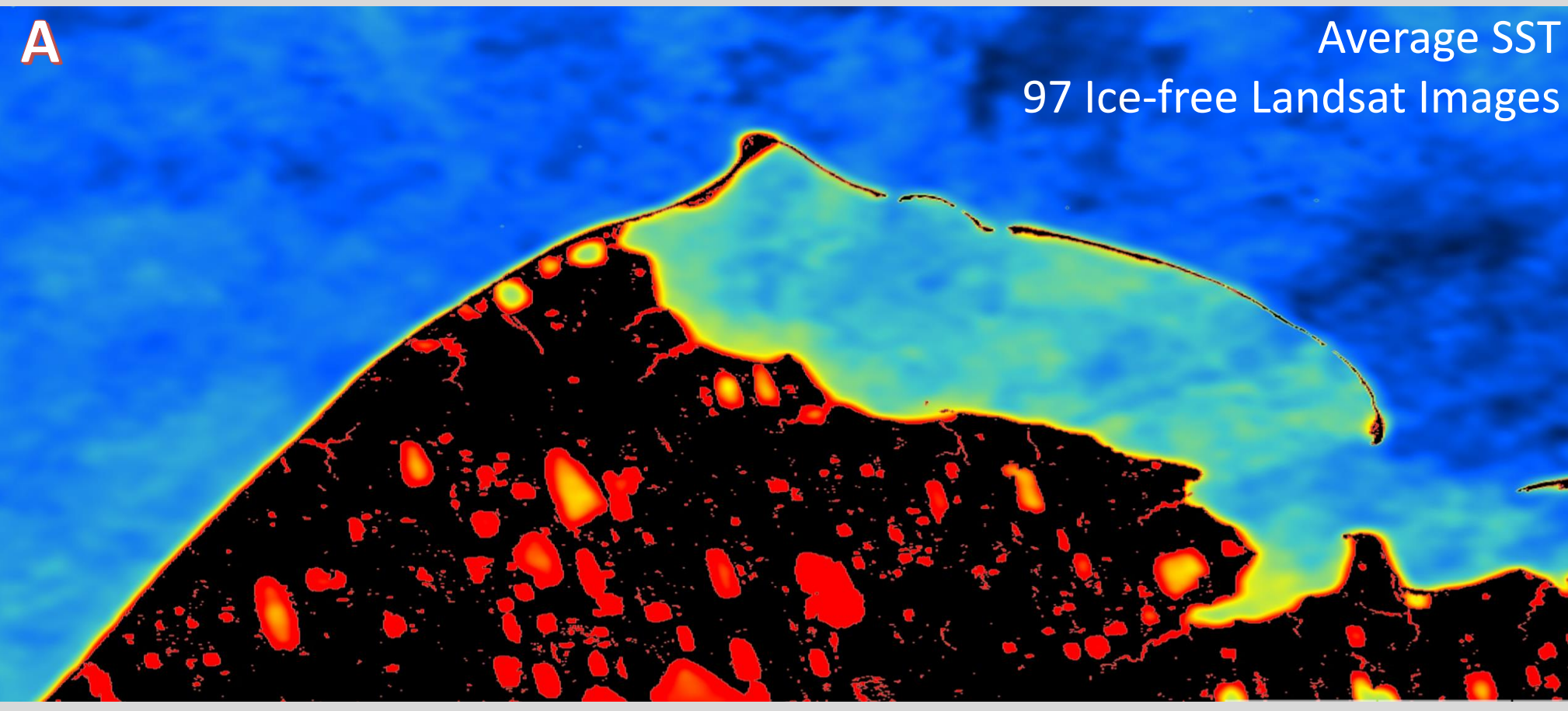
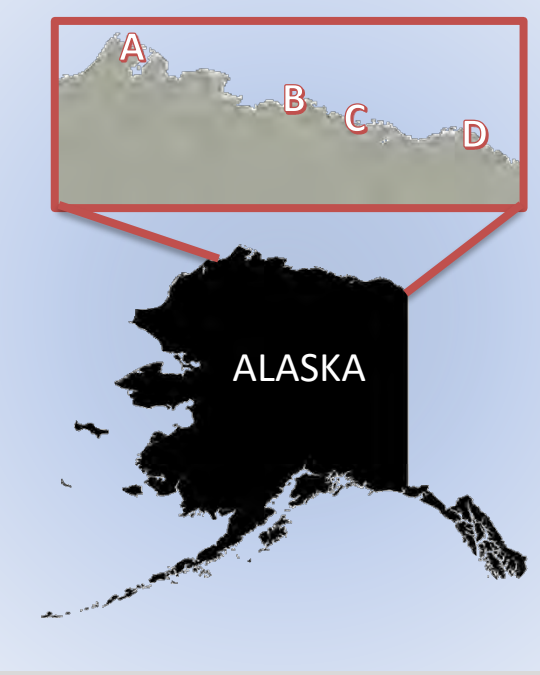
## Day of Year SST: 1982 - 2023



This DOY chart averages SST across the entire ROI and then plots the 10-year average for every day of the year.

## Initial Analysis

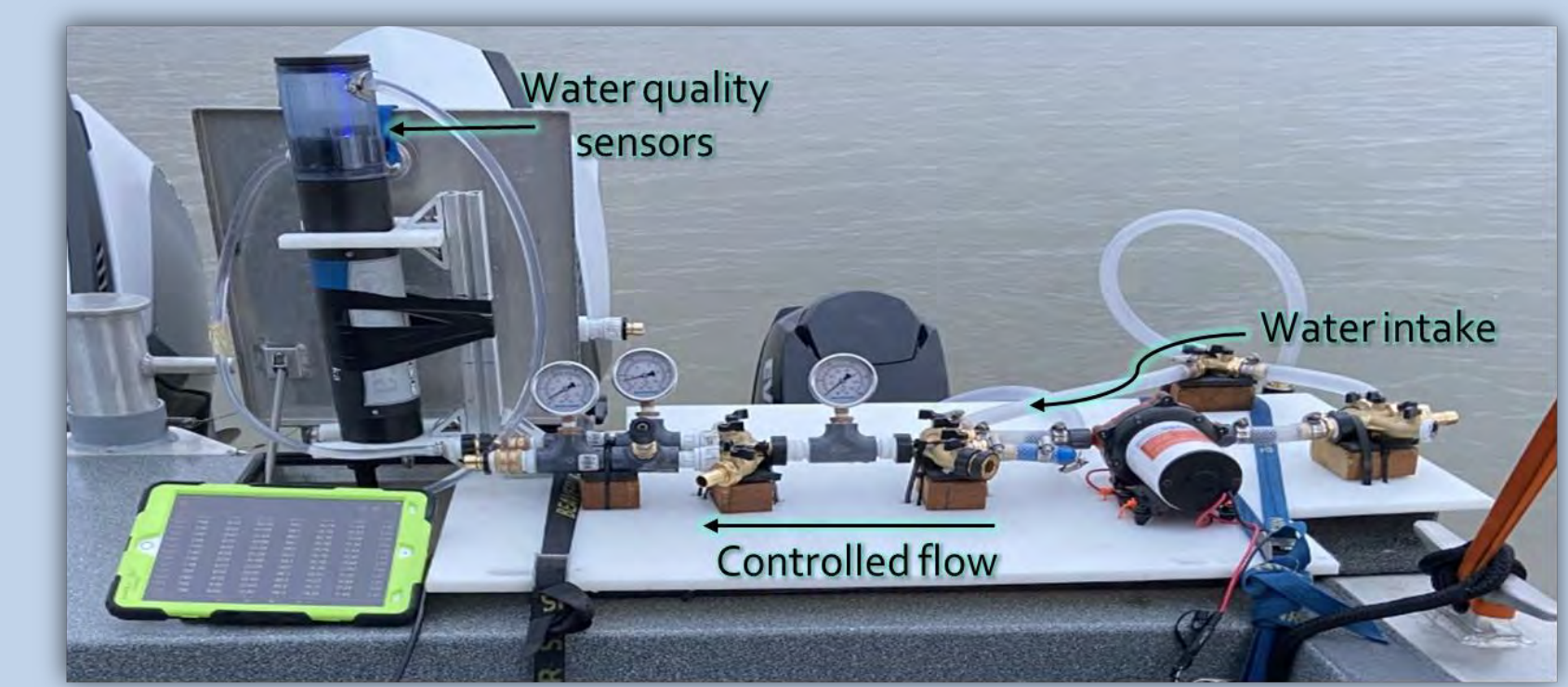
In order to obtain SST insight into near-shore lagoon ecosystems, the need for a higher spatial resolution dataset was required. Landsat 4, 5, 7, 8, and 9 imagery were merged to obtain a 100-meter resolution SST dataset composed of 1,469 images. This data allowed for a comparison between near-shore ecosystems and the open ocean. Four lagoon ecosystems along Alaska's Beaufort coastline were chosen across the state



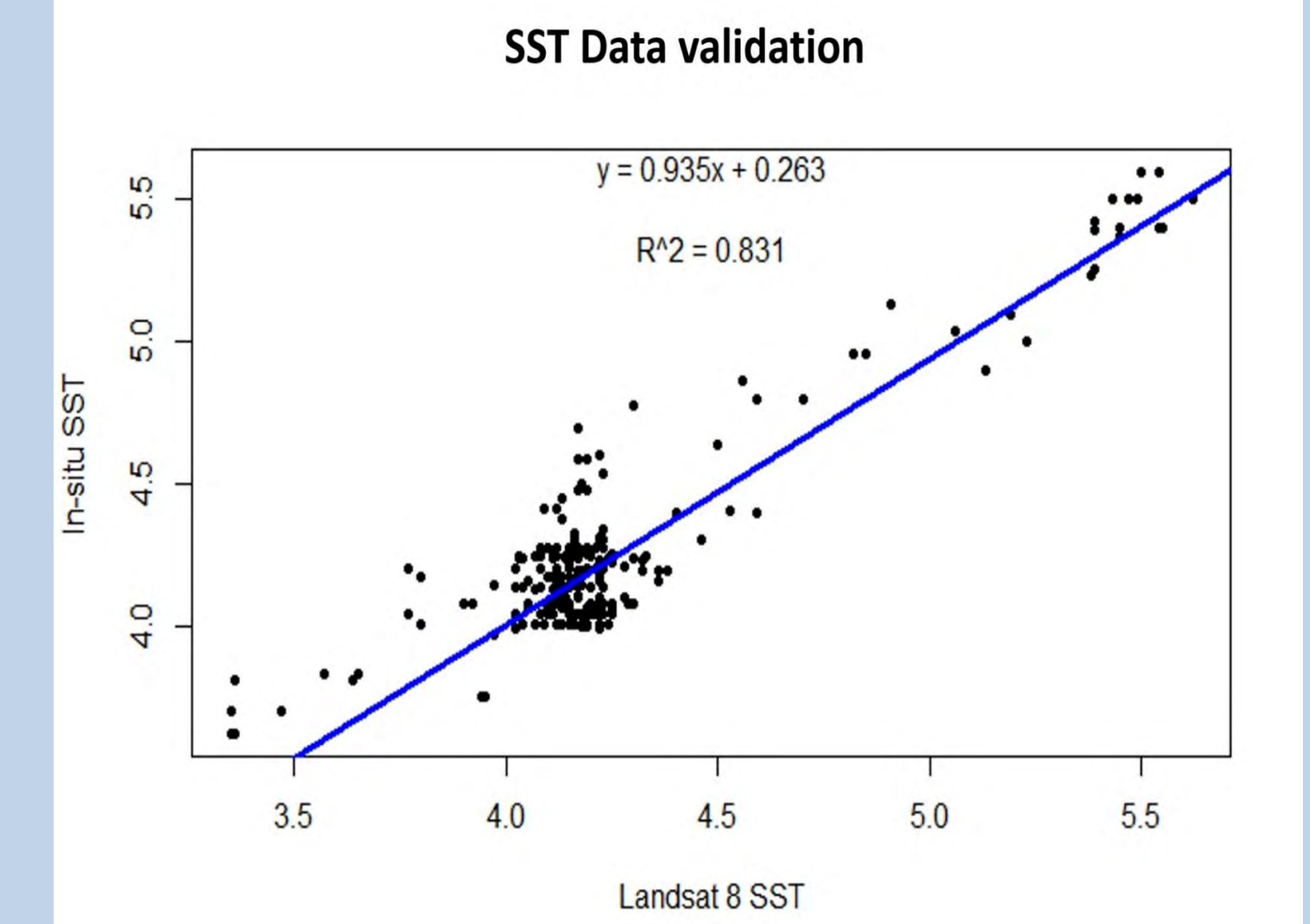
## Results

The lag in freeze-up day of the year suggests that there will be an extended ice-free season, leading to increased absorption of solar radiation and heat flux from the ocean to the atmosphere. The warming trend observed in both open ocean areas and near-shore environments will also lead to increased heat flux, altering biogeophysical cycling and changes in momentum flux. The heterogeneity in SST patterns observed in lagoons with river deltas suggests that river flow may play a critical role in modulating air-sea fluxes in the region. Overall, our results highlight the need for continued monitoring of SST trends and river flow dynamics in the Arctic to fully understand the impact of warming on air-sea interactions, particularly at a larger scale.

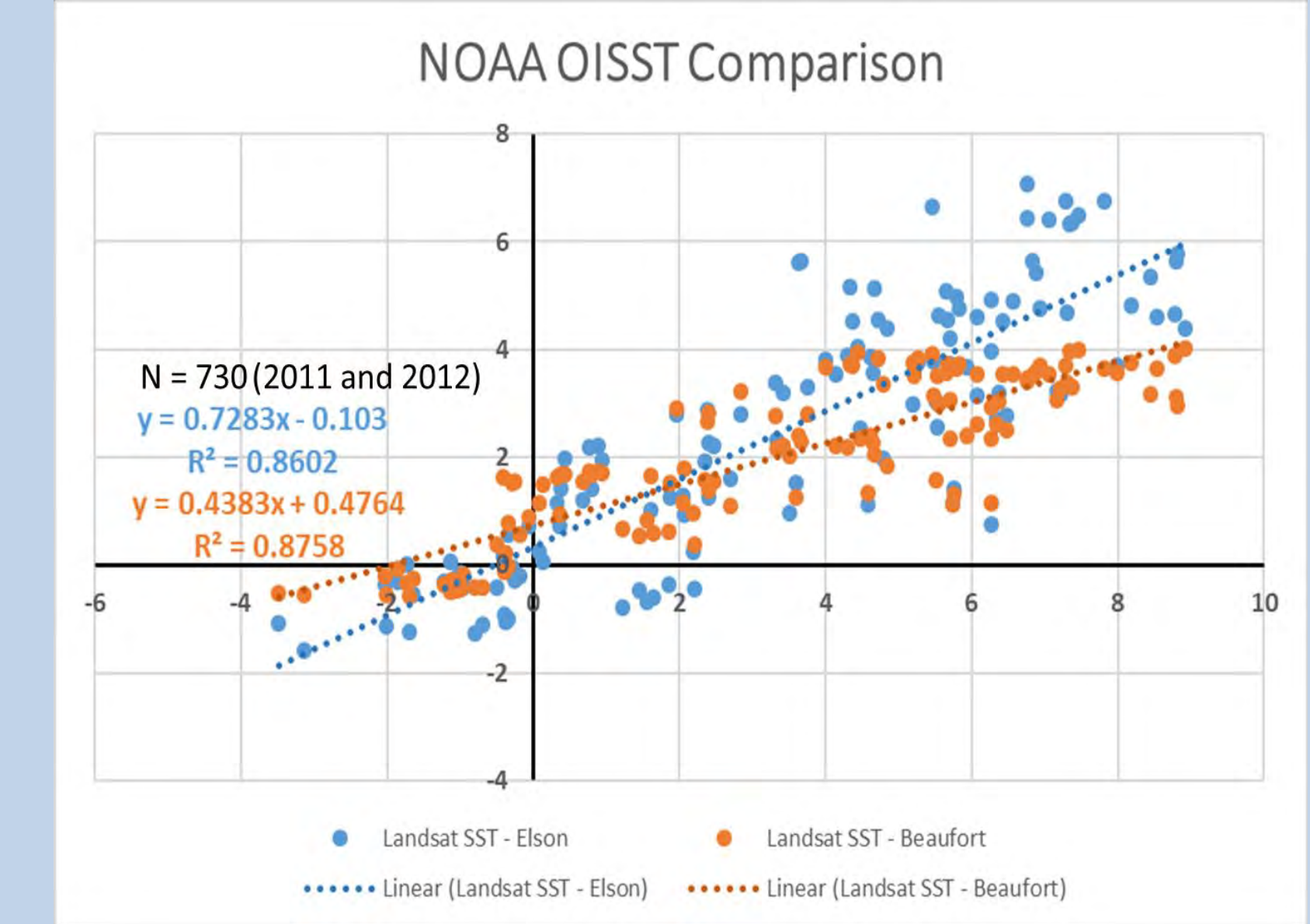
## Validation



Water intake system for UTEP field deployments in near-shore aquatic environments, developed summer 2022. This system as used while the research vessel was moving.



SST validation scatter plot between in-situ sampling done at Elson Lagoon on July 14, 2022 with a single Landsat 8 image from July 15, 2022.



This scatter plot correlates the NOAA OISST SST observations to the compiled Landsat dataset.

## Future Steps

Future focus of this research will include understanding the relationship between environmental variables and patterns of SST.

