

# Using SalishSeaCast, a coupled bio-chem-physical model of the Salish Sea, to evaluate interannual variability in the Strait of Georgia

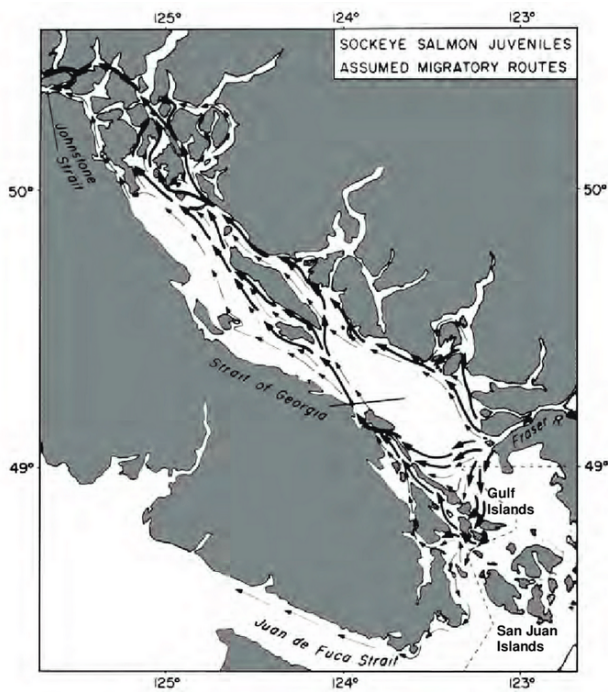
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## Juvenile Sockeye Outmigration

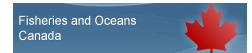


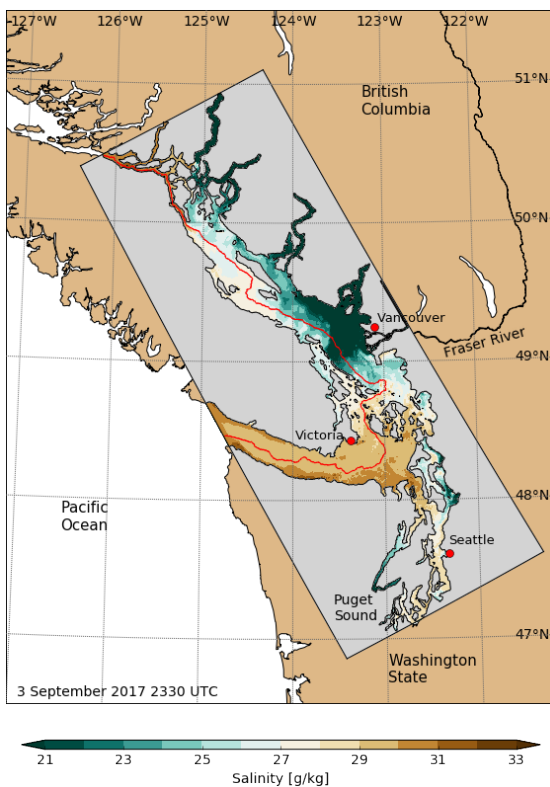
Assumed migration routes of Fraser River sockeye salmon postsmolts based on surveys conducted from [salishsea.eos.ubc.ca](http://salishsea.eos.ubc.ca)

- many different reasons to do a “long” hindcast
- one reason is to look at interannual variation of the Strait of Georgia during out migration of juvenile salmon in late April / early May

# Outline

- 1 Introduction
- 2 SalishSeaCast
- 3 Preliminary Results
- 4 Summary

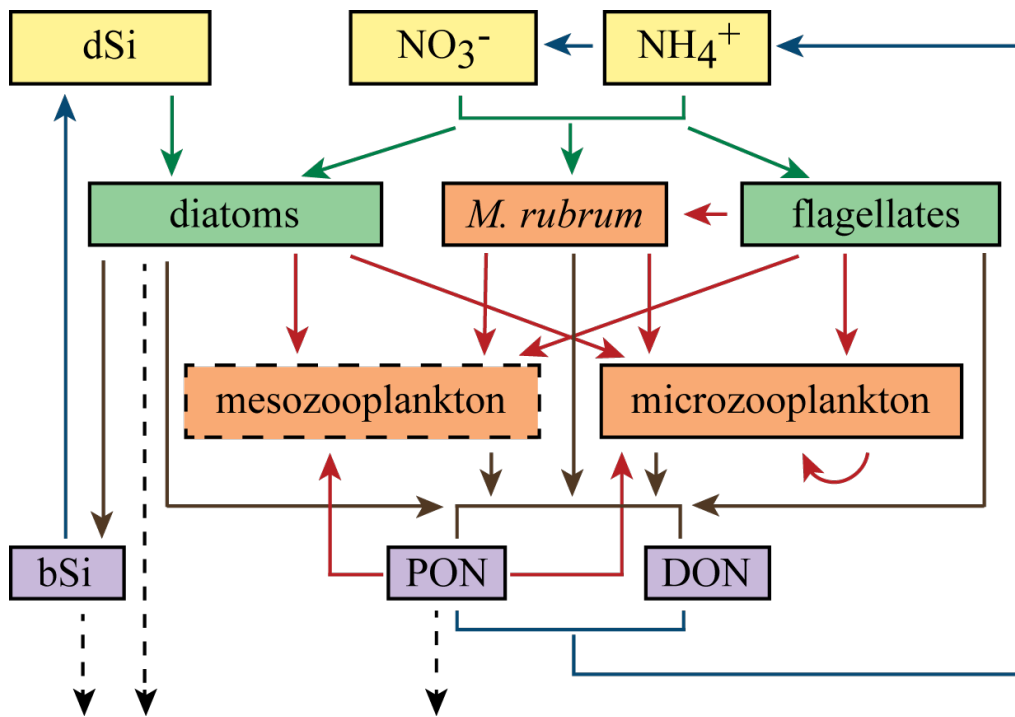




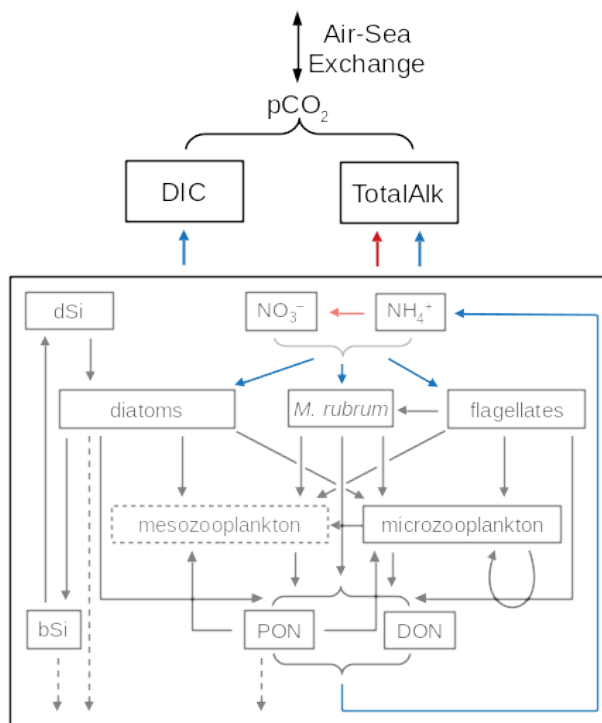
## SalishSeaCast

- based on the community model NEMO 3.6
- domain includes: Strait of Georgia, Juan de Fuca Strait, Puget Sound and part of Johnstone Strait
- open boundaries at the mouth of Juan de Fuca Strait and in Johnstone Strait
- $\approx$  500 m horizontal resolution
- 40 depth levels: 1 m resolution near surface, 24 m at deepest depths

## SMELT: Plankton Biology



## SKOG: Ocean Carbon



Impacts Total Alkalinity Only  
 Impacts Total Alkalinity and  
 Dissolved Inorganic Carbon

## “Long” Hindcast

- We have high spatial winds from 2007 so we start then.
- For operational reasons we have started both in 2007 and in 2013
- Due to computational reasons we are still waiting for 2010-2012.
- All fields kept at 1 hour intervals but here I analyze monthly
- Fields will be available on ERDDAP at some point

## Forcing

- Environment and Climate Change Canada, HRDPS 2.5 km hourly winds and surface forcing
- River Runoff: Fraser River: gauge,  $\approx$  150 other rivers, watershed climatology
- Open boundaries:
  - Hourly sea surface height : West from NOAA, North = West + some amount
  - 8 Tidal Constituents
  - Barotropic velocities: from SSH with Flather Boundary Conditions
  - Baroclinic velocities: Orlandi radiation with nudging and sponge
- Open Boundary Tracers

### 2007 – 2012

- West: NEP3.6 phys + fit for biol/chem
- North: NEP3.6 phys + fit for chem tracers, Hakai climatology for biol

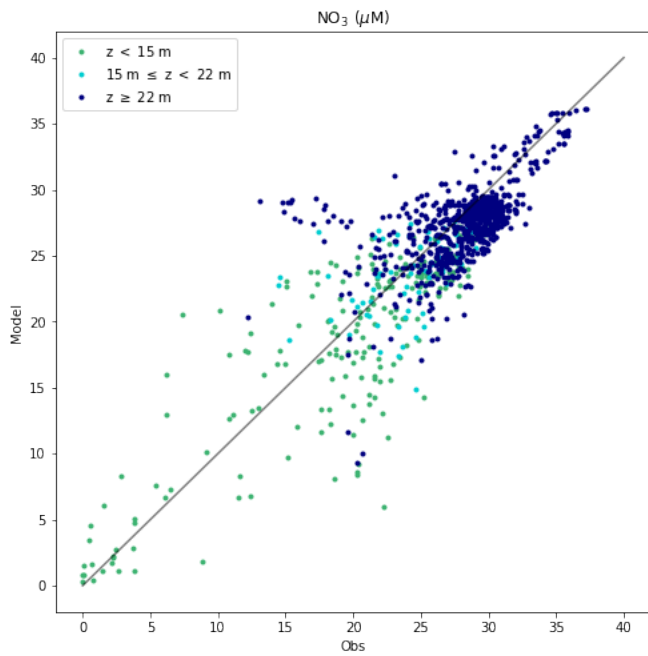
### 2013 – 2019

- West: LiveOcean for all tracers
- North: Hakai Institute Climatology for all tracers

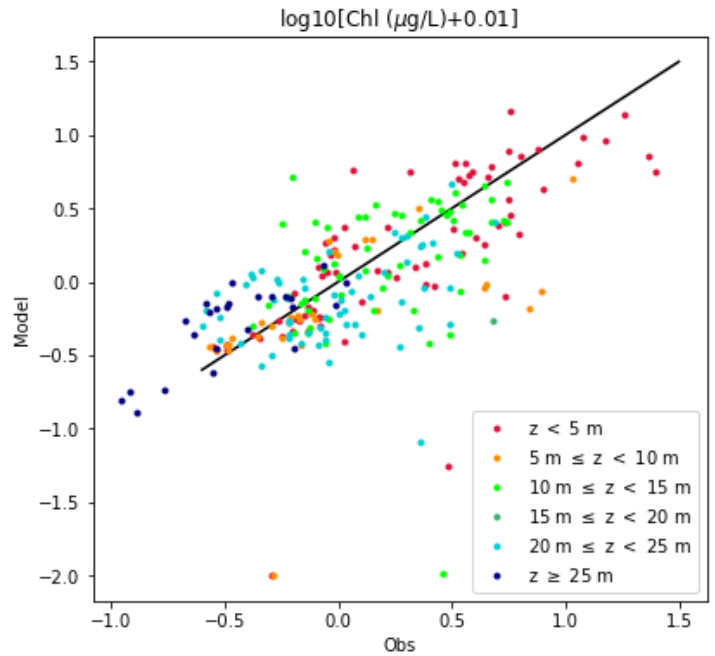


## Some Preliminary Evaluation: 2007 evaluation against IOS Data

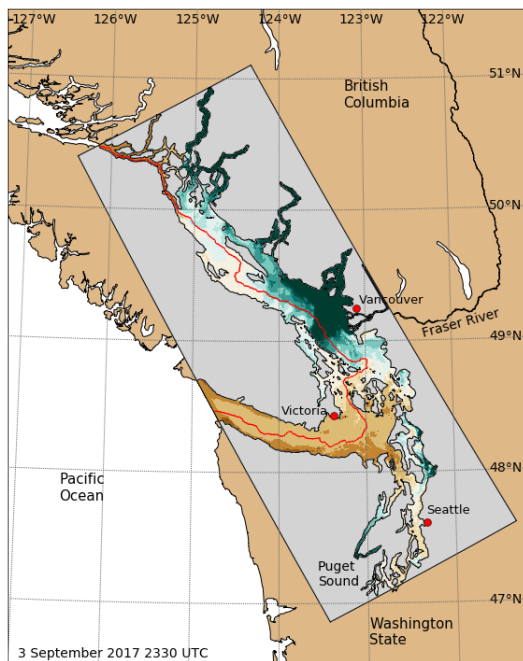
Nitrate: Willmott Score = 0.91



Chlorophyll: Willmott Score = 0.77

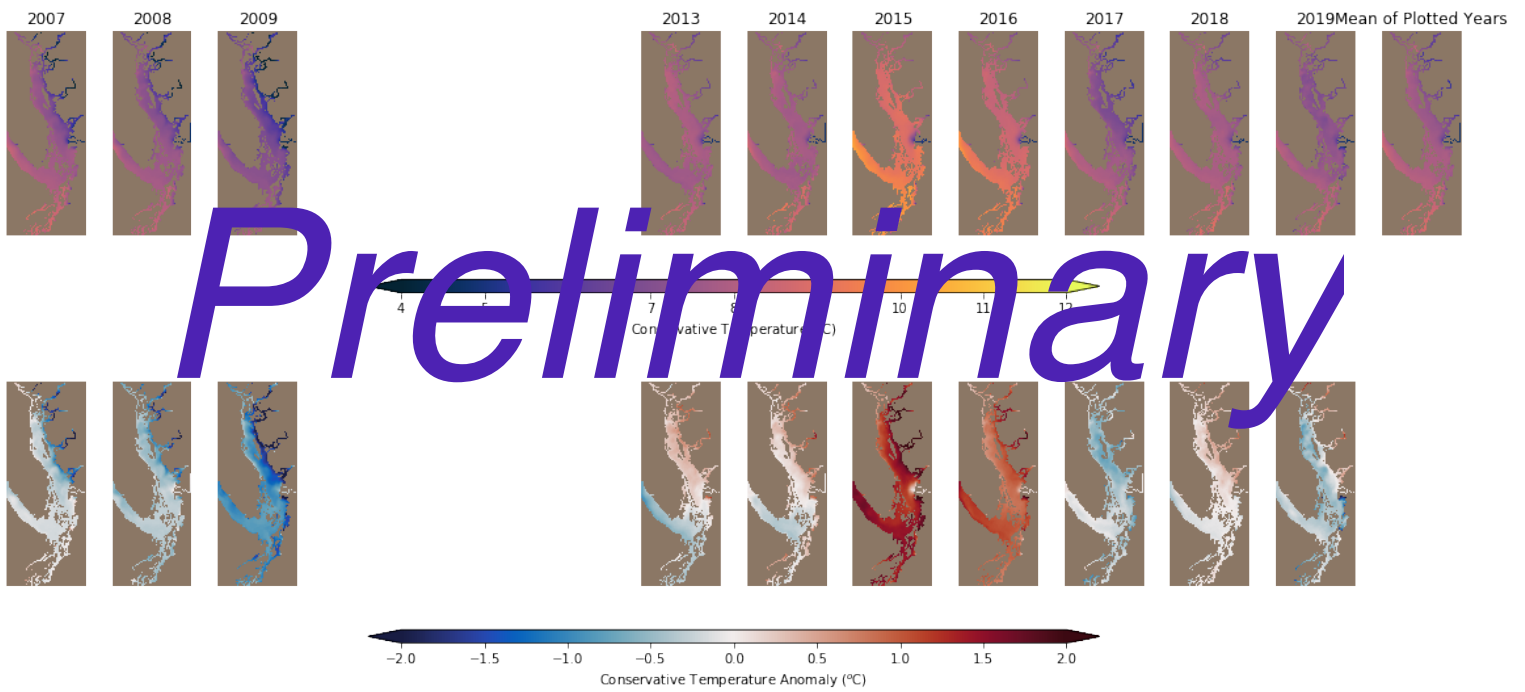


## Orientation

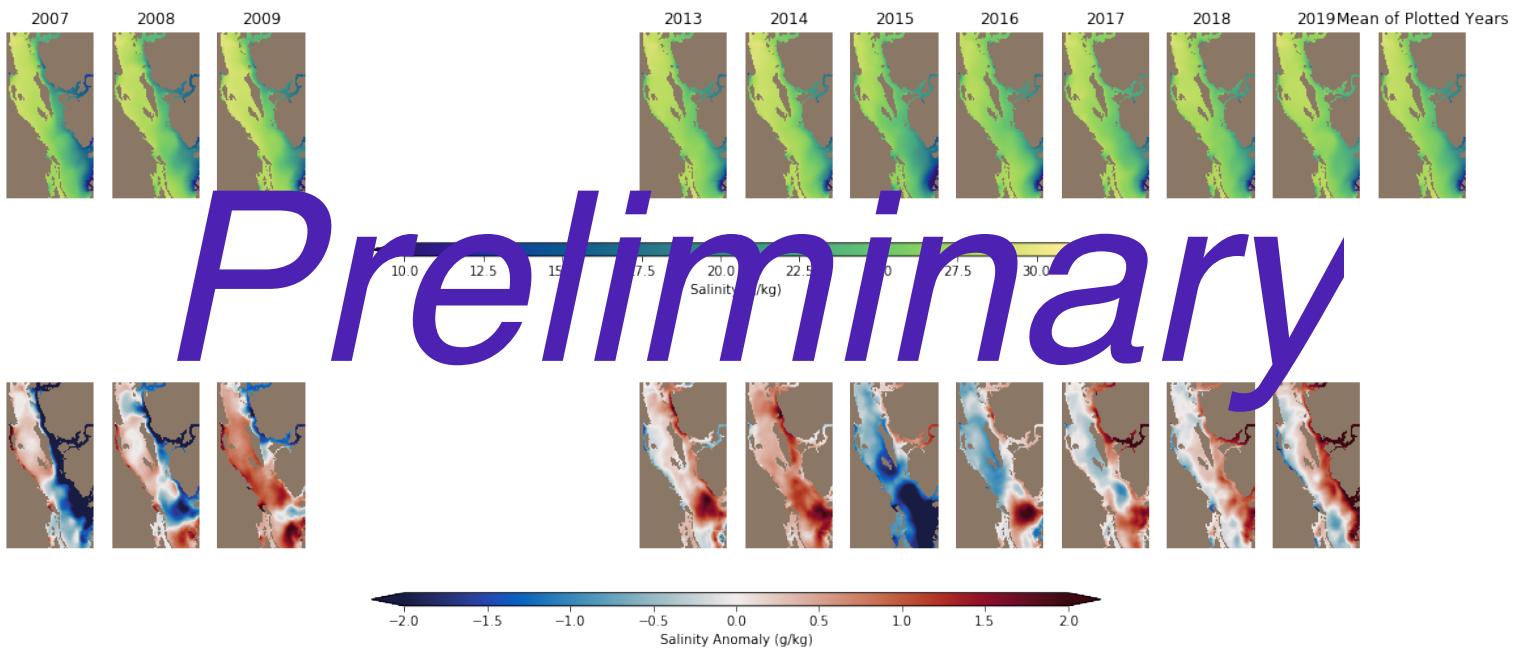


Results plots will show inside the grey box and then a subset just of Strait of Georgia.

Temperature: March average Sea Surface Temperature. Note 2015, 2016, the Blob Years

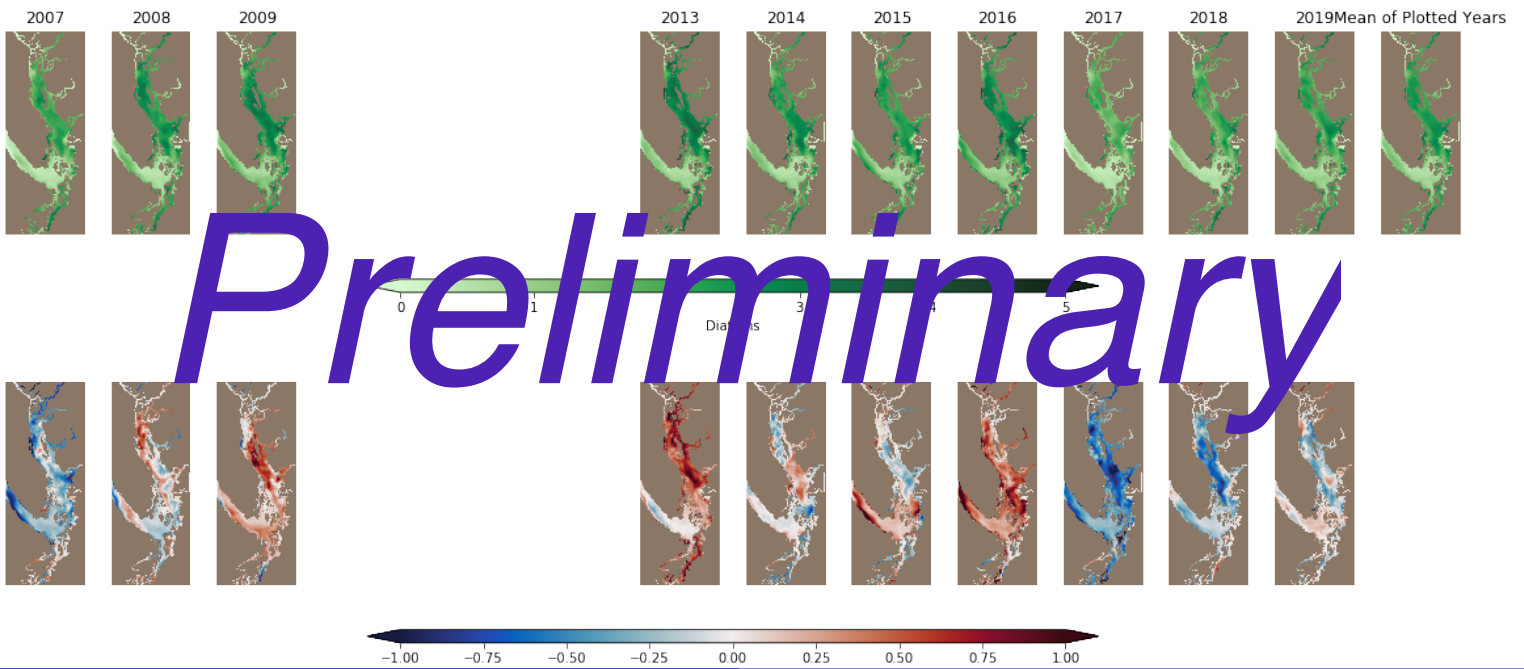


Salinity: March average Sea Surface Salinity, Strait of Georgia Only. Note 2007 strong south wind



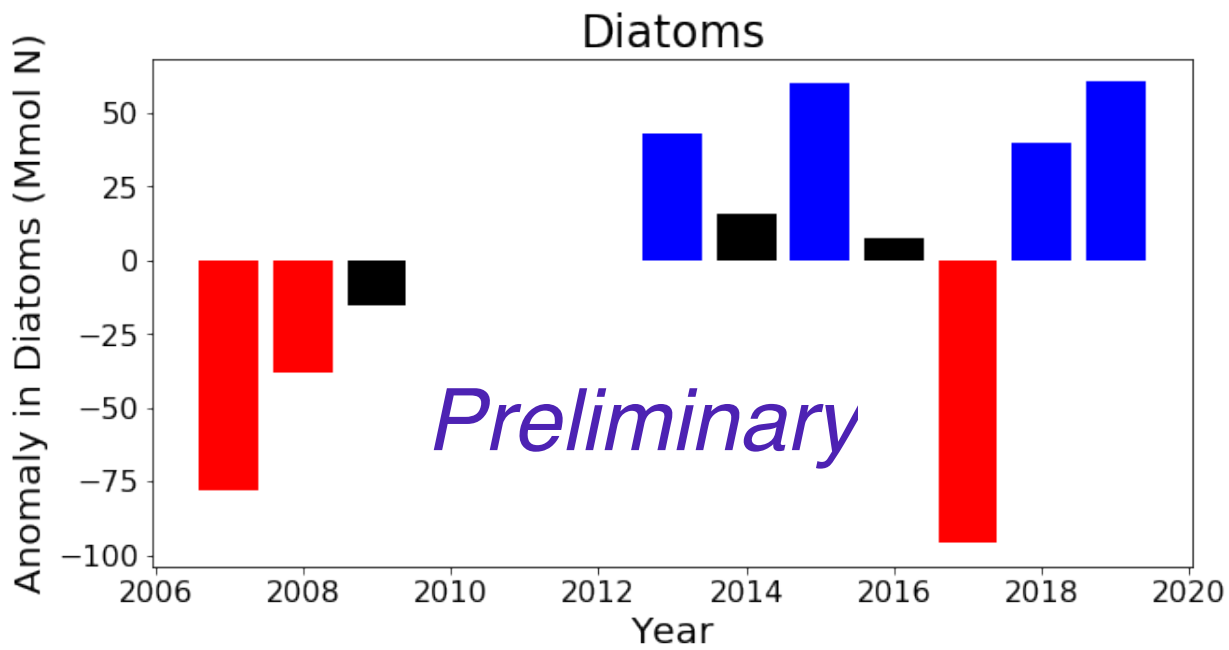
## Diatoms:

April depth-integrated Diatoms, Strait of Georgia Only. Note 2007 and 2017 strong negative anomalies

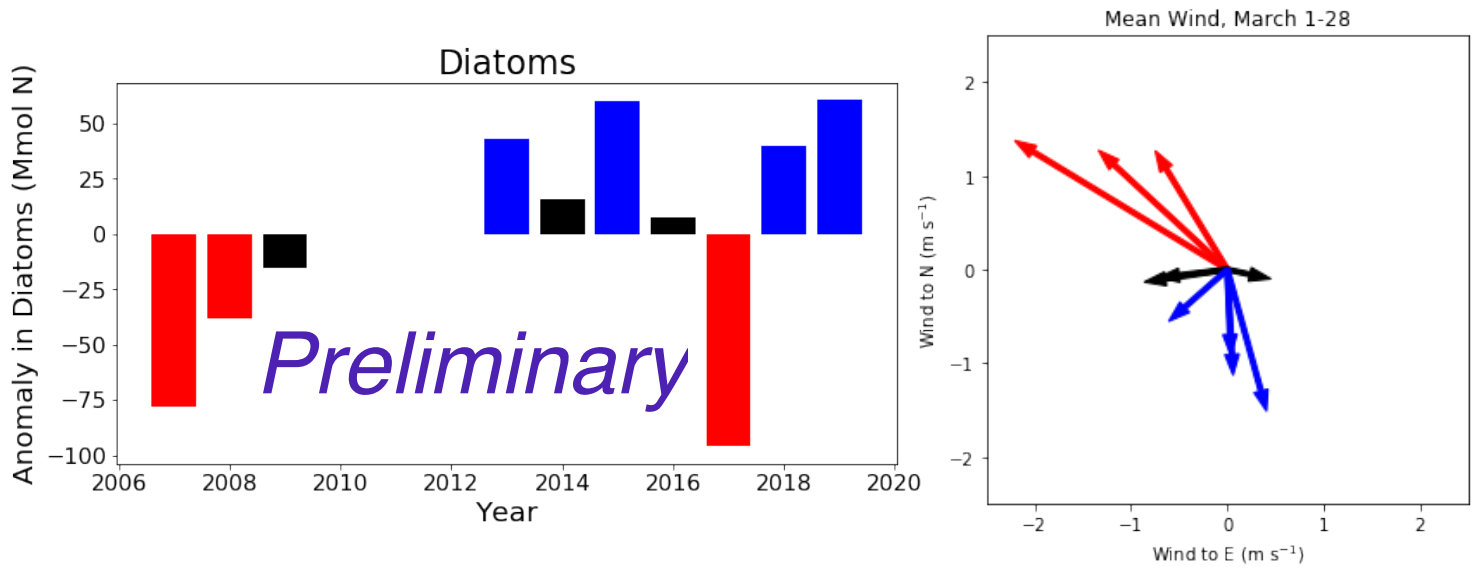


## March and April Cumulative Diatoms

Strait of Georgia Integrated. Note 2007, 2017 very low values

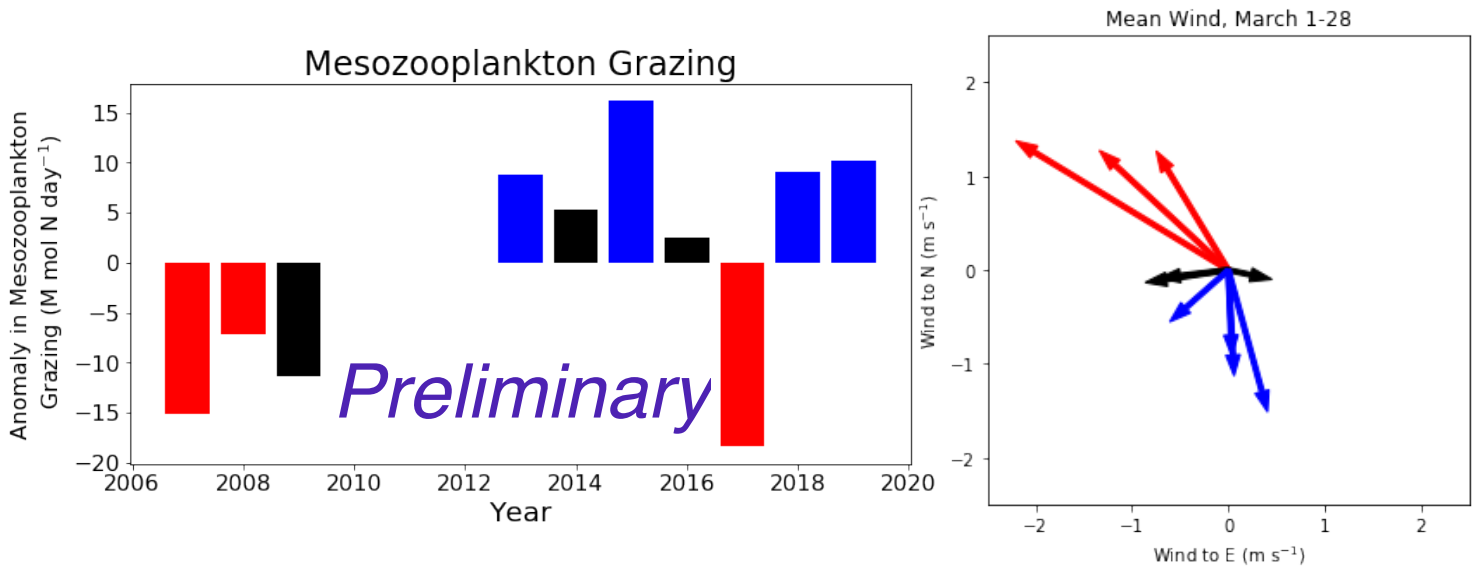


## March and April Cumulative Diatoms vs Mean Wind Mar 1-28



**Correlated. Causation may not be direct.**

## March and April Cumulative Mesozooplankton Grazing





## Summary

- We will soon have a 13 year hindcast of the Salish Sea including physics, carbon chemistry and lower trophic biology
- Model has strong skill making it useful – *there are known issues*
- 2007 model fields reflect the observed strong northward advection previously described and link it to low diatom biomass and low mesozooplankton grazing in the model
- This talk is a small taste of the wealth of results to be explored.  
**Many more analyses of various phenomena to come!**