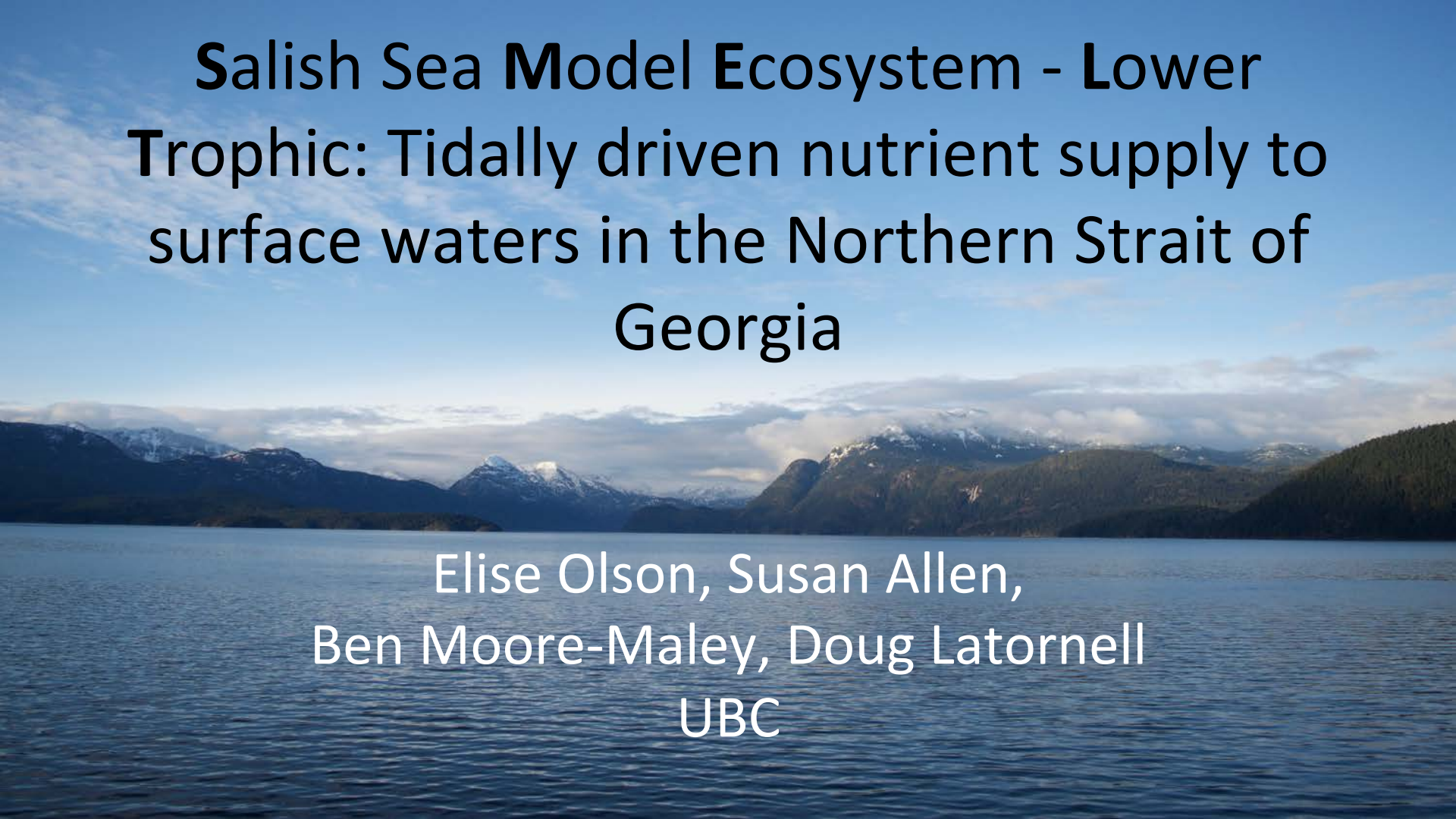
Salish Sea **M**odel **E**cosystem - **L**ower **T**rophic: Tidally driven nutrient supply to surface waters in the Northern Strait of Georgia



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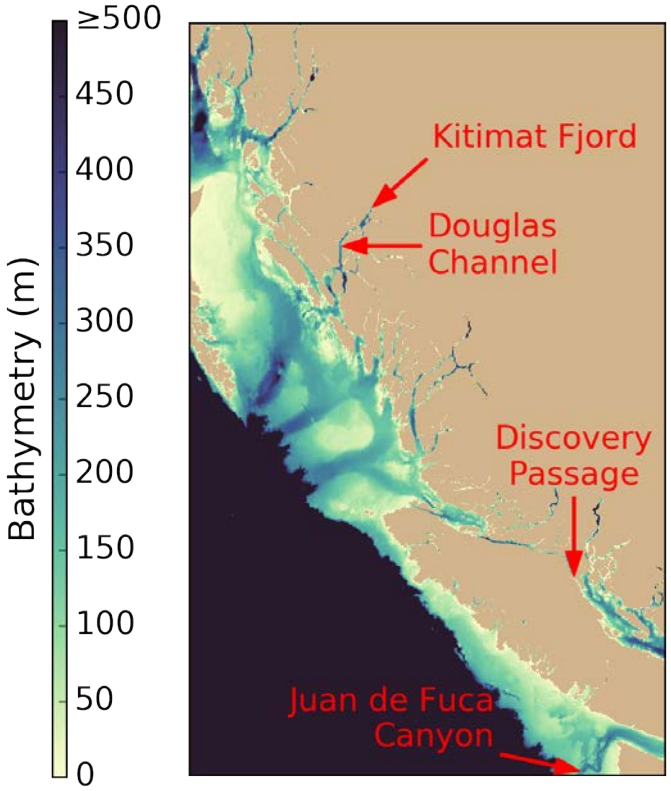
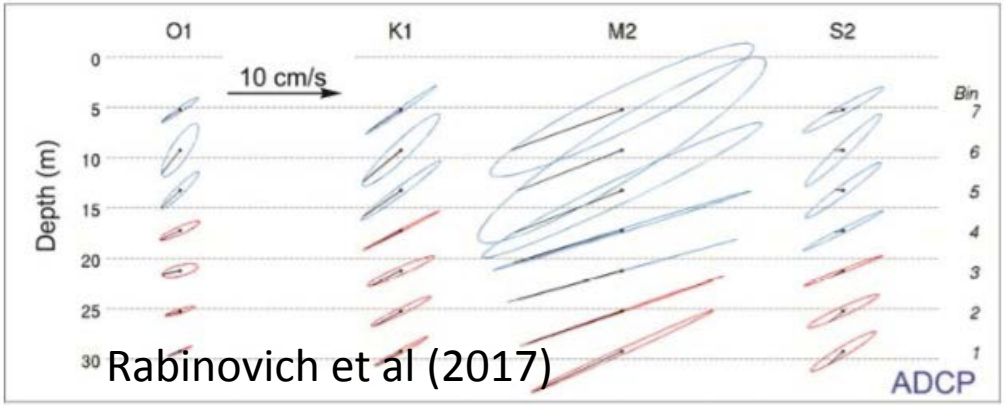
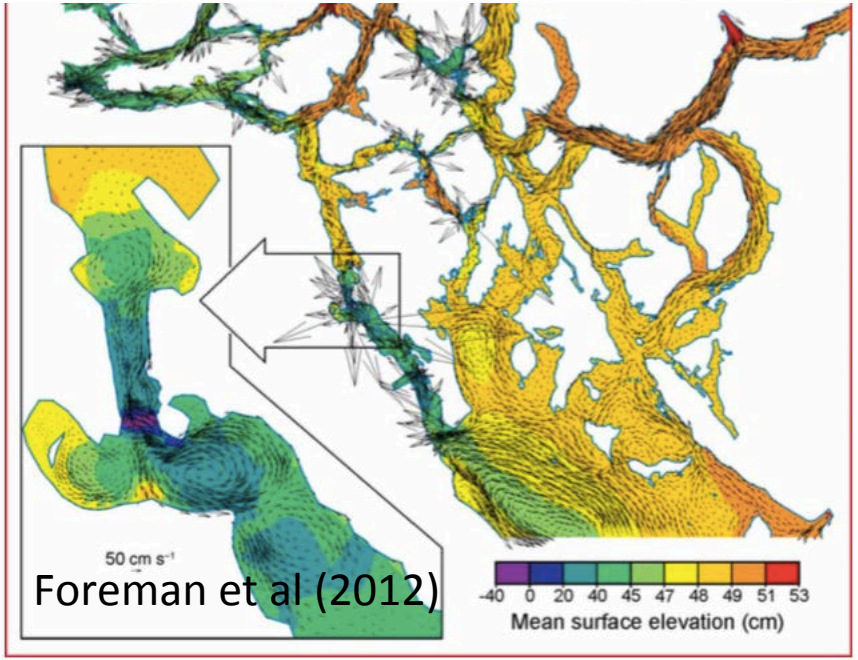


Dewey (1987)
Davis et al (2014)



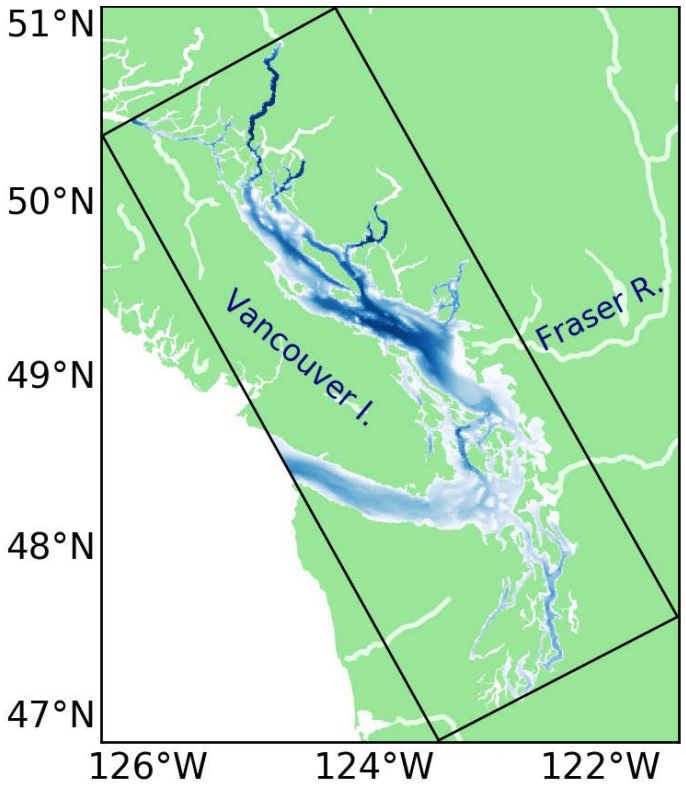
Rabinovich et al (2017)



Foreman et al (2012)

Background: **S**alish **M**odel **E**cosystem - **L**ower **T**rophic

Model Domain



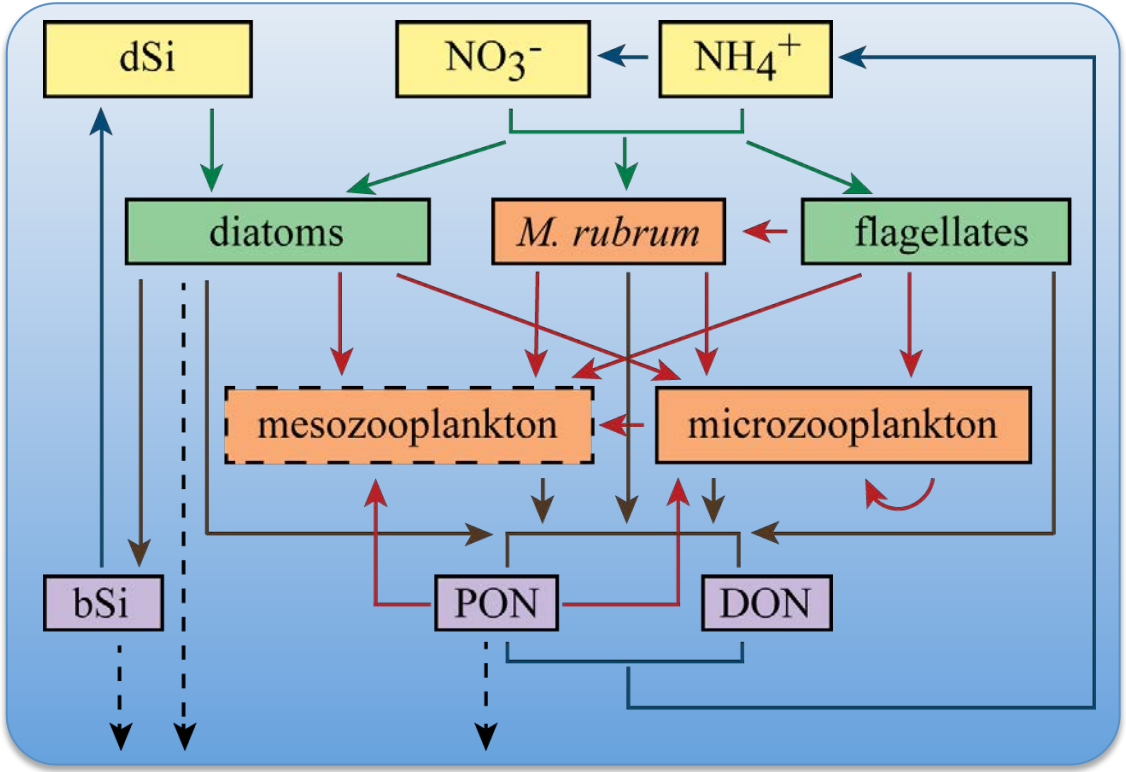
SalishSeaCast Physical Model (Soontiens et al, 2015)

- NEMO (Madec et al 2012) v3.6 primitive equation, baroclinic model
- GLS vertical turbulence in k-ε regime
- 398 x 898 x 40 grid
  - ~500 m horizontal, 1-27 m vertical
- forcing:
  - tides: 8 constituents
  - atmospheric: hourly 2.5 km resolution from Environment Canada
  - open boundary SSH (west)
  - rivers (150+): climatology except for Fraser measured at Hope

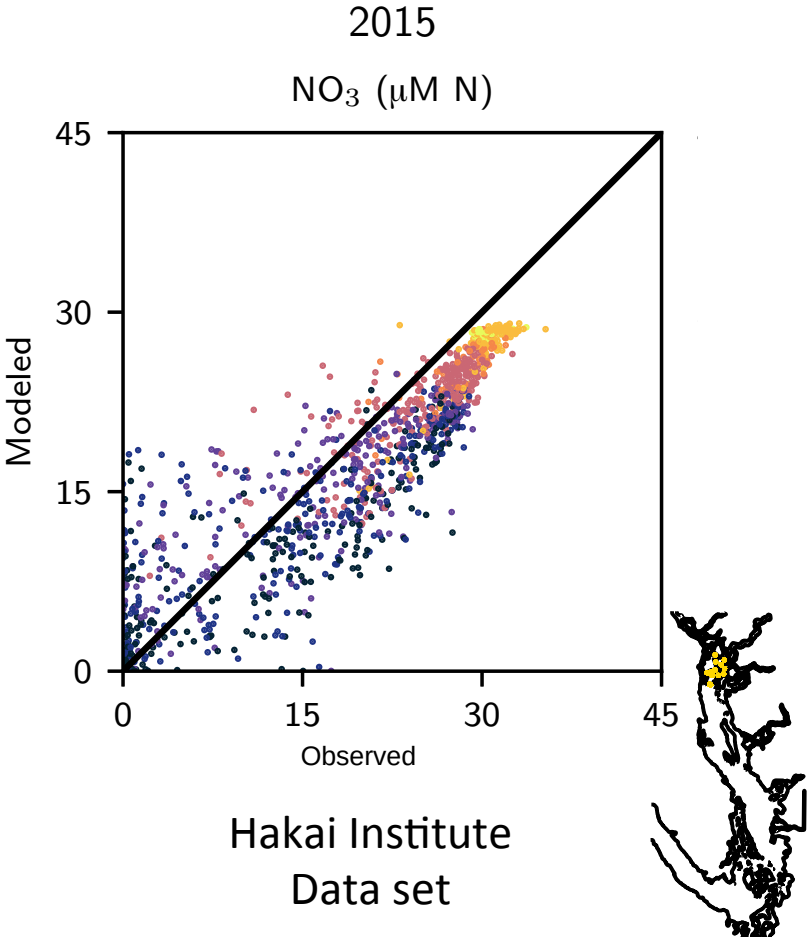
Background: **S**alish **M**odel **E**cosystem - **L**ower **T**rophic

SMELT Biological Model – Based on 1-d SOG Model (Olson et al., submitted, 2019; Allen and Wolfe, 2013; Moore-Maley et al., 2016))

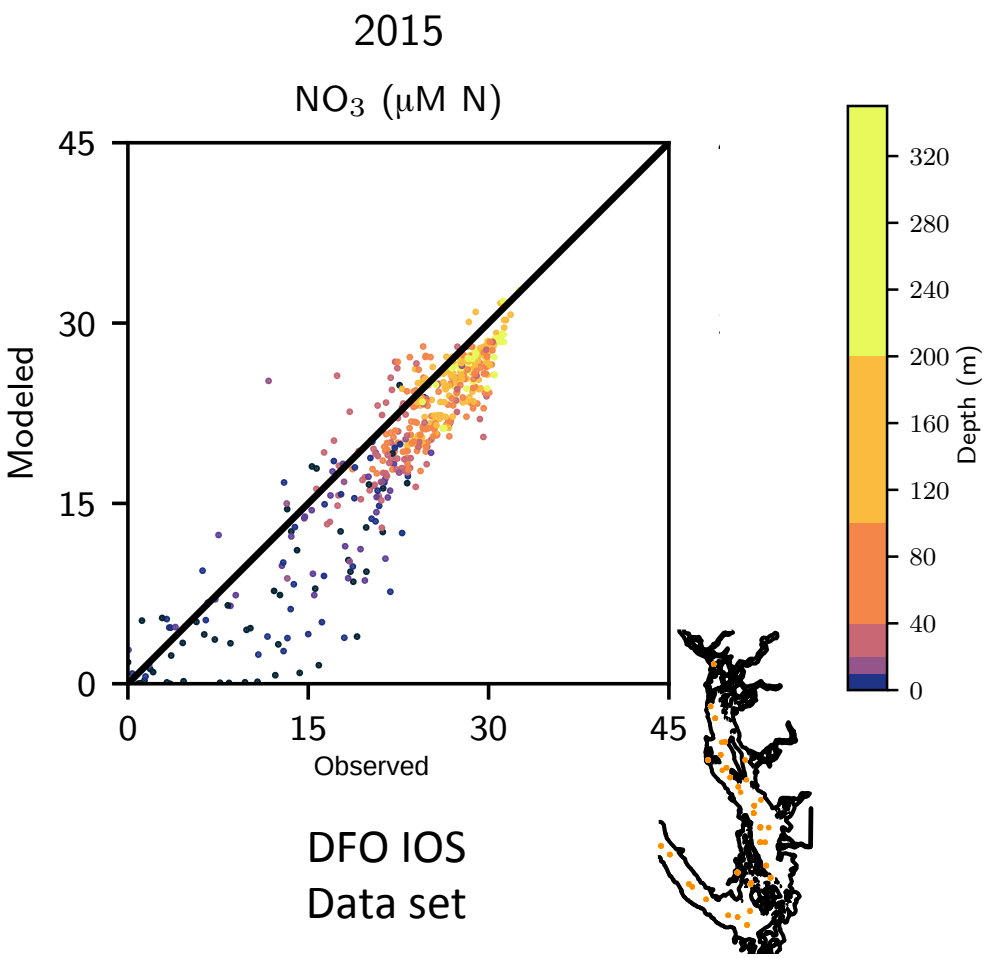
- nutrients, phytoplankton, zooplankton, detritus
  - *M. rubrum* is a mixotroph
- mesozooplankton closure based on climatology
- forcing: nutrient input through rivers (climatology) and at open boundaries (climatology + LiveOcean model), light



Model Evaluation

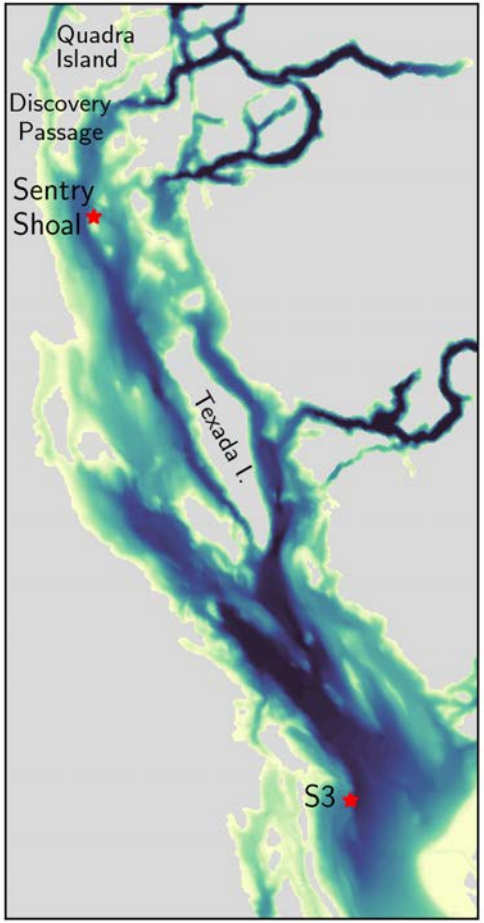


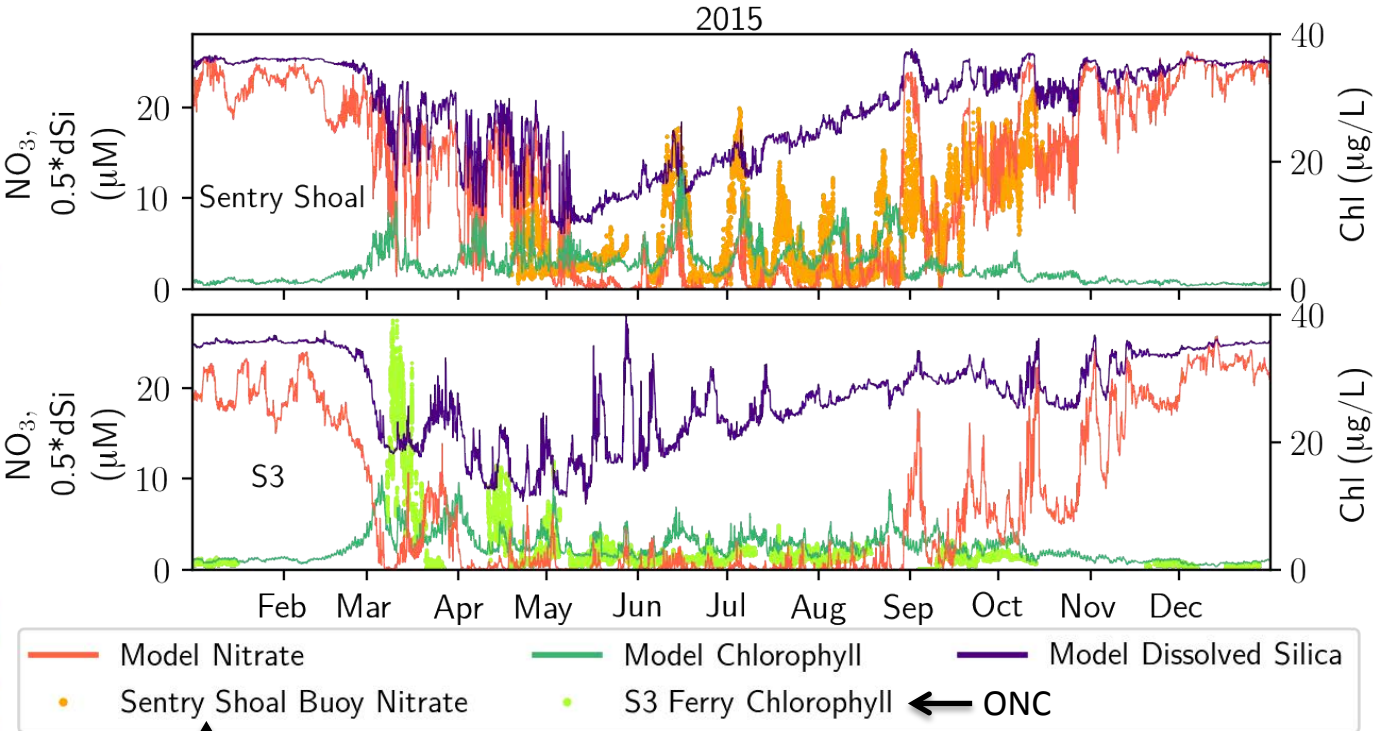
Hakai Institute
Data set



DFO IOS
Data set

Model Evaluation: Seasonal Cycles





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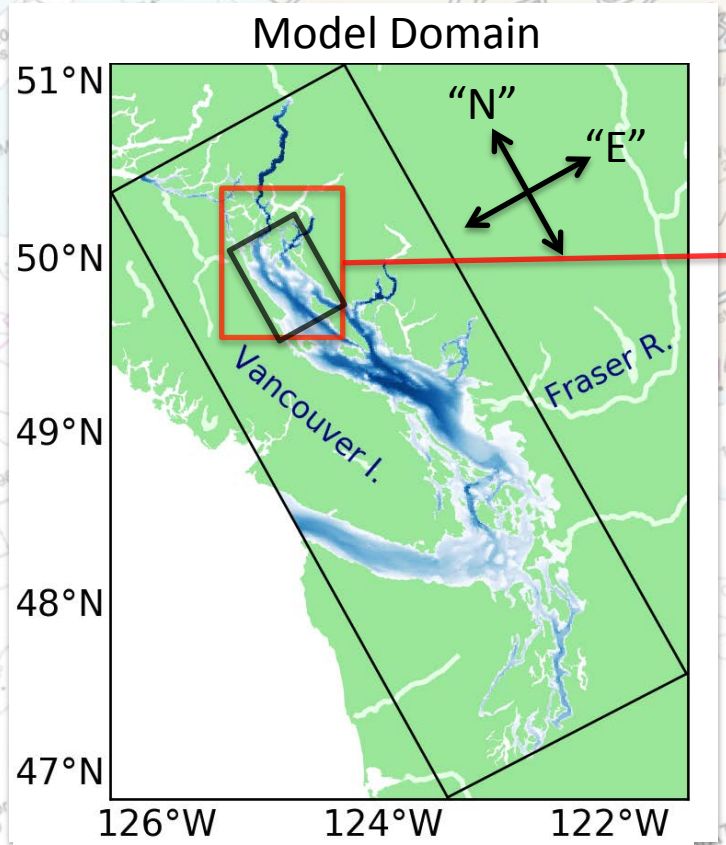
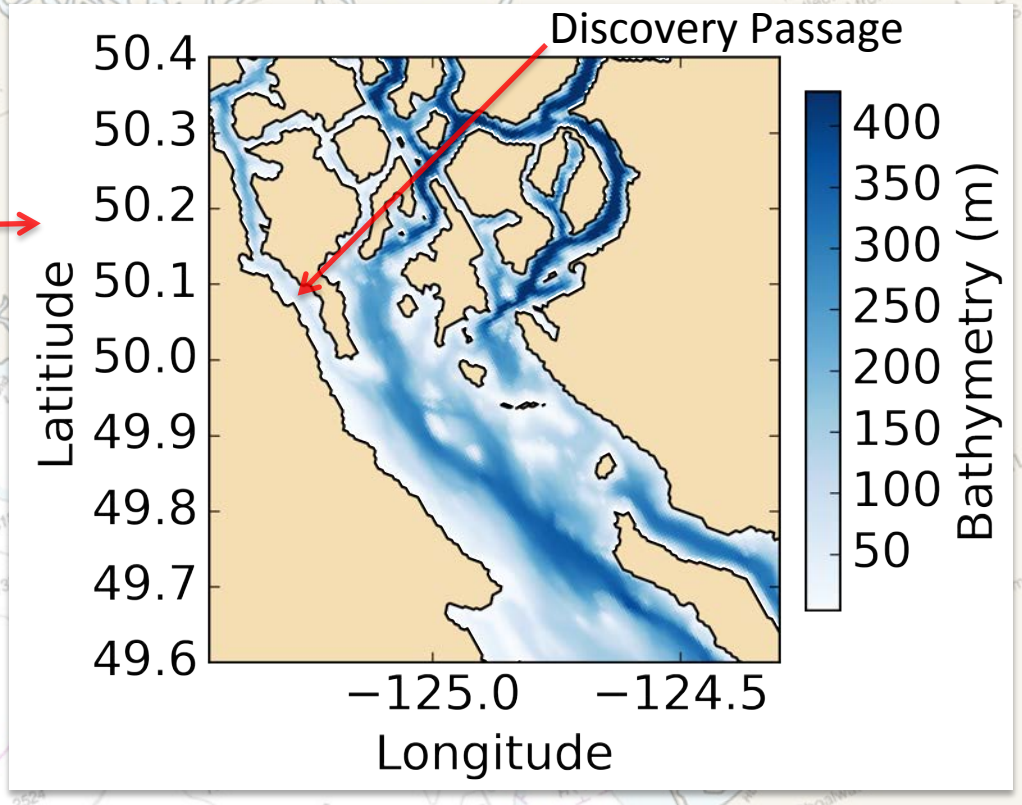
Discovery Passage Tidal Jet and Nitrate Plume



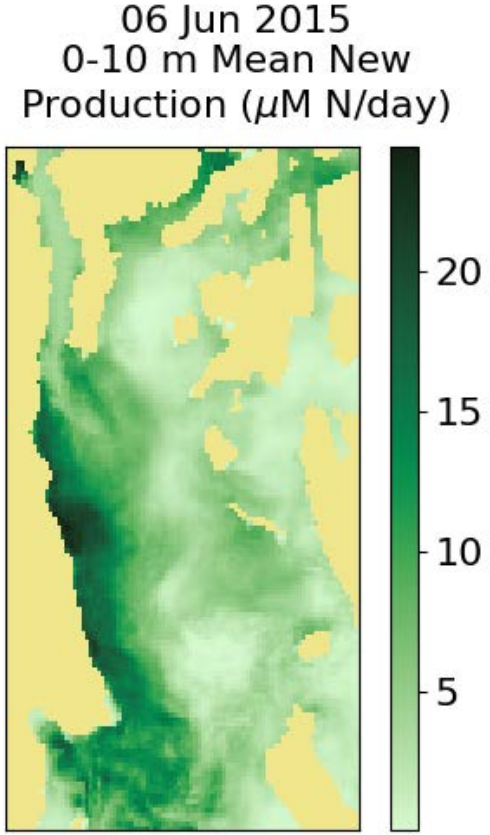


results in:

Elise M. Olson, Susan E. Allen, Vy Do, Michael Dunphy, and Debby Ianson, 2019. Nutrient Supply by a Tidal Jet in the Salish Sea Based on a Highly Resolved Biogeochemical Model. Submitted to *JGR:Oceans.*

Conclusions: Northern Nitrate

- Strong tidal flow in Discovery Passage leads to a southward pulse of nitrate in surface waters
- Downstream, increased stability and reduced velocities (greater residence times) lead to greater phytoplankton biomass and new production
- Regions of tidally enhanced mixing may increase local ecosystem resilience to anthropogenic forcing



Acknowledgements

Salish Sea NEMO Model group: Tereza Jarnikova, Michael Dunphy, Nancy Soontiens, Jie Liu, Rachael Mueller, Vicky Do

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Data: Stephanie King, Katie Pocock, Hayley Dosser Hakai Institute, DFO

Thank you!