

An aerial photograph of a large body of water, likely the Strait of Georgia, with a boat in the lower-left foreground. The water is a deep blue-green color, and the sky is a lighter blue with some clouds. In the background, there are mountains, some with snow. The text is overlaid on the image.

MEOPAR and Oceanography of the Strait of Georgia

Rich Pawlowicz

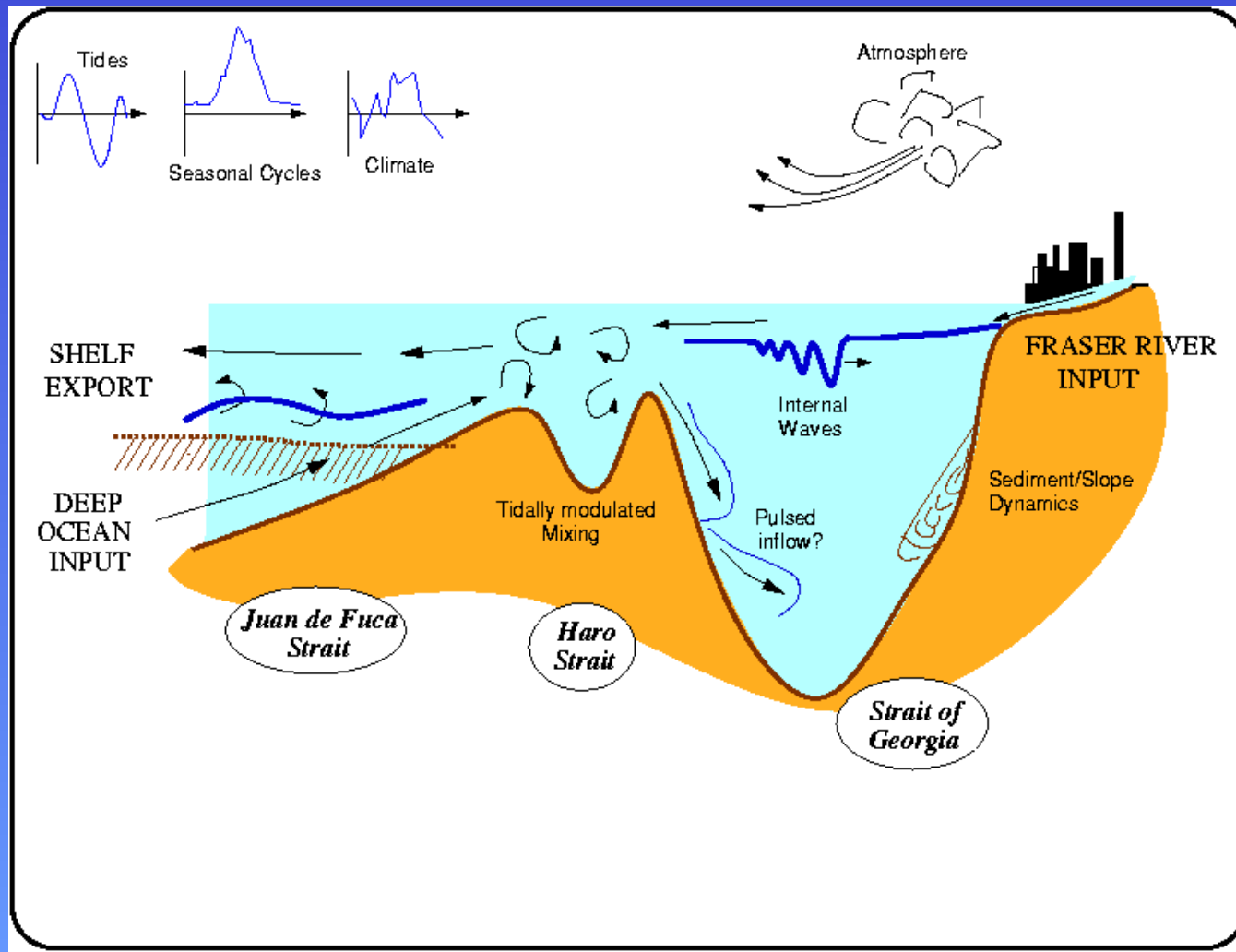
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Validation Issues

- 1) Schematic of Processes
- 2) **Surface**: Plume variability (daily, weekly, seasonal – tied to rivers/local winds)
- 3) **Intermediate water** (seasonal, interannual - ???)
 - 1) Boundary Currents?
- 4) **Deep Water** renewal (monthly in summer – tied to offshore conditions)
- 5) Residence times and time scales
- 6) Bio/physics:
 - 1) Phytoplankton/Zooplankton
 - 2) New and Gross Primary Production
- 7) **Open Questions in SoG oceanography**
- 8) **Observational database for validation**

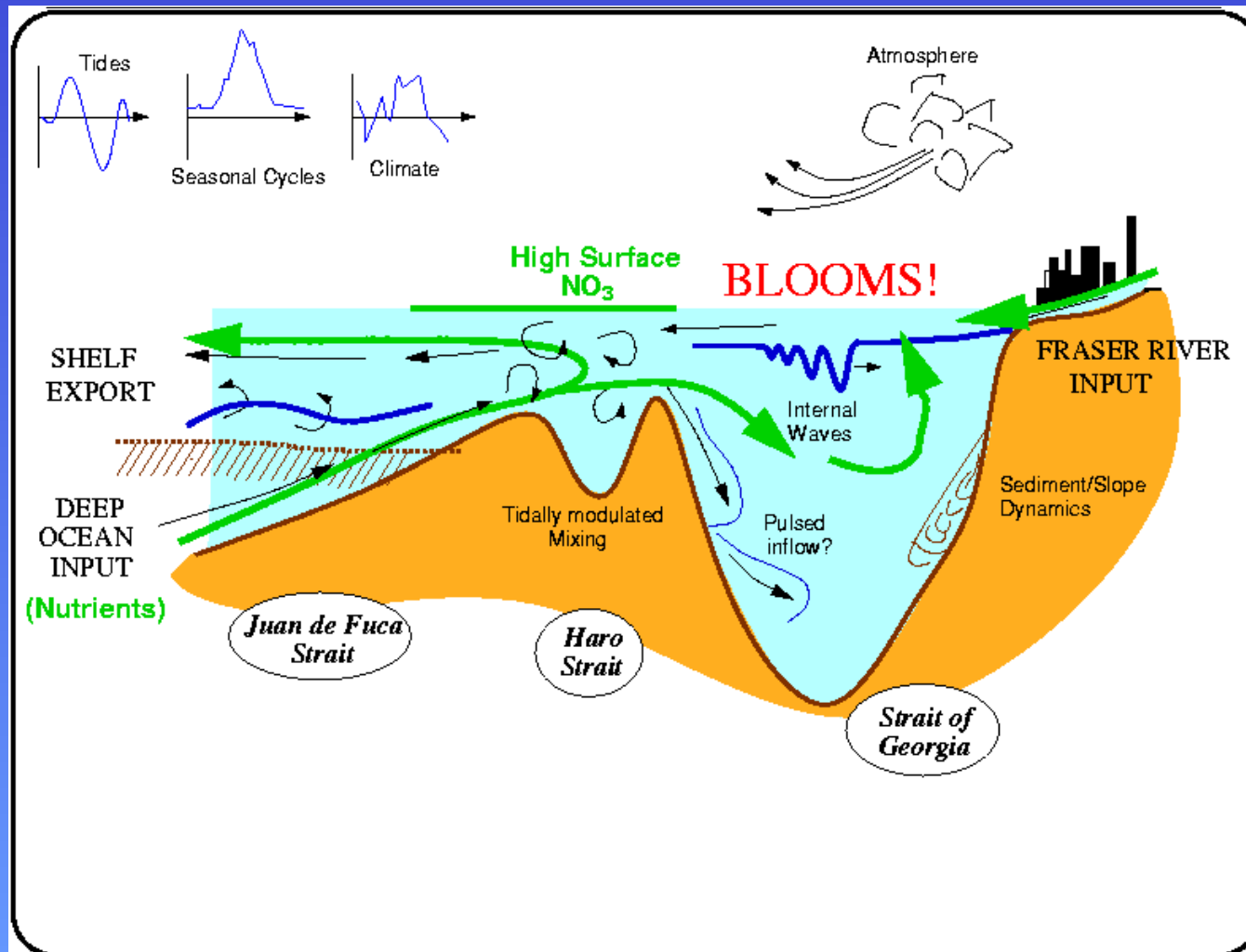
Facts about SoG

- Flow is ESTUARINE, fed (mostly) by the Fraser River ($1,000-10,000 \text{ m}^3/\text{s}$)

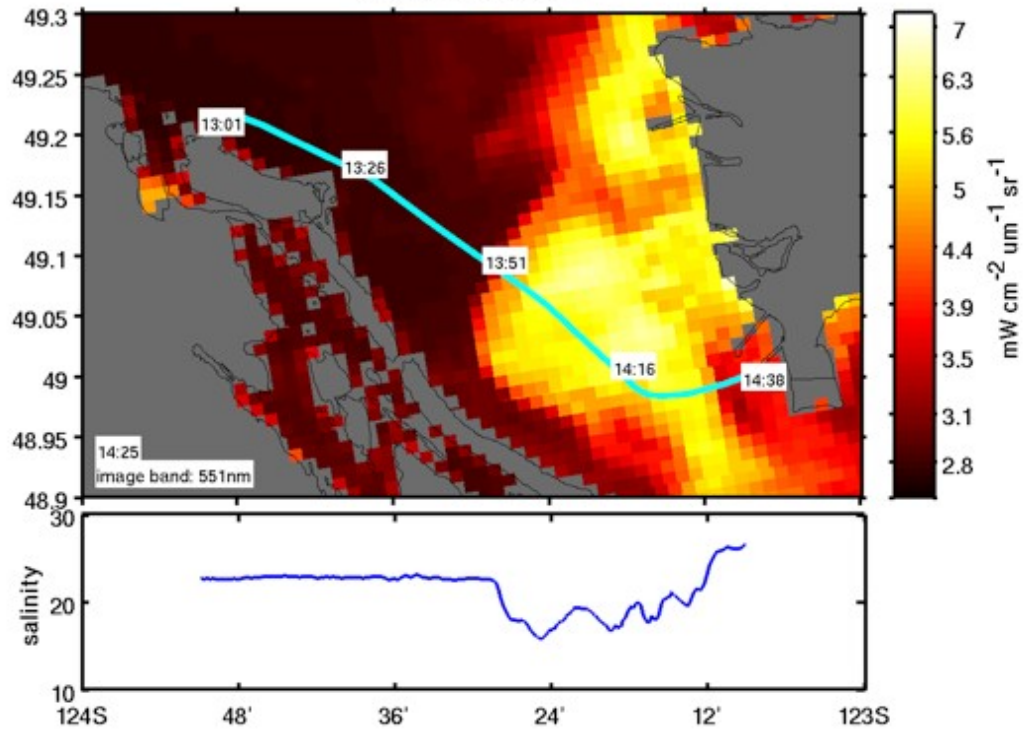


Facts about SoG

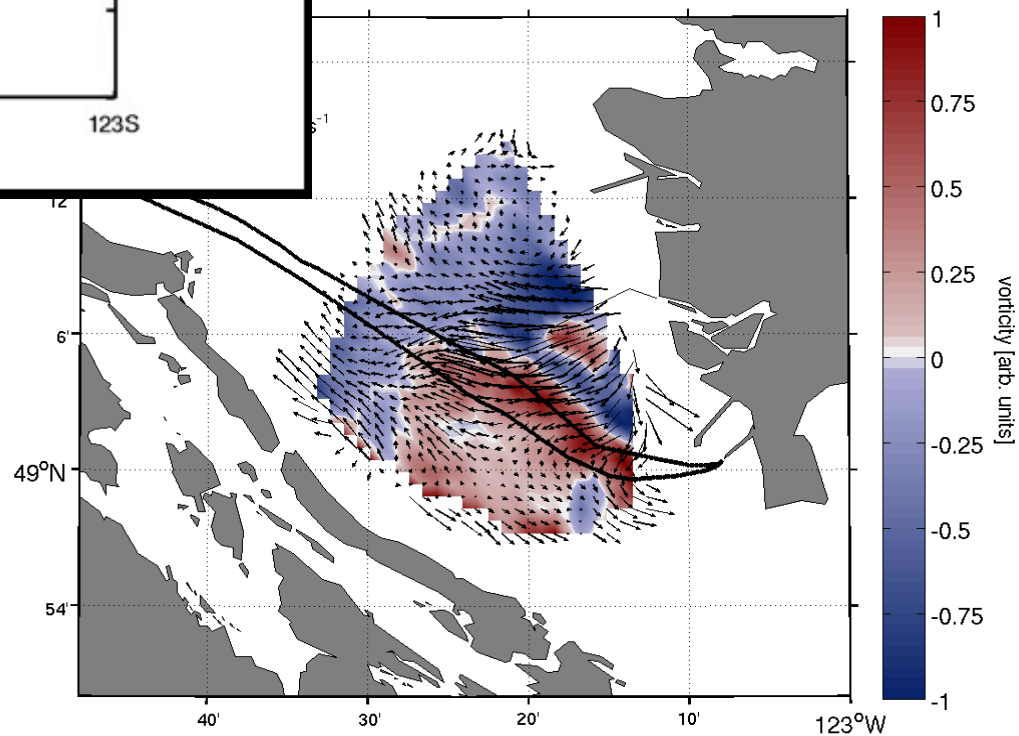
- But inflow is from DEEPER (nutrient-rich) ocean water – SoG can be thought of as a 'mini-ocean'



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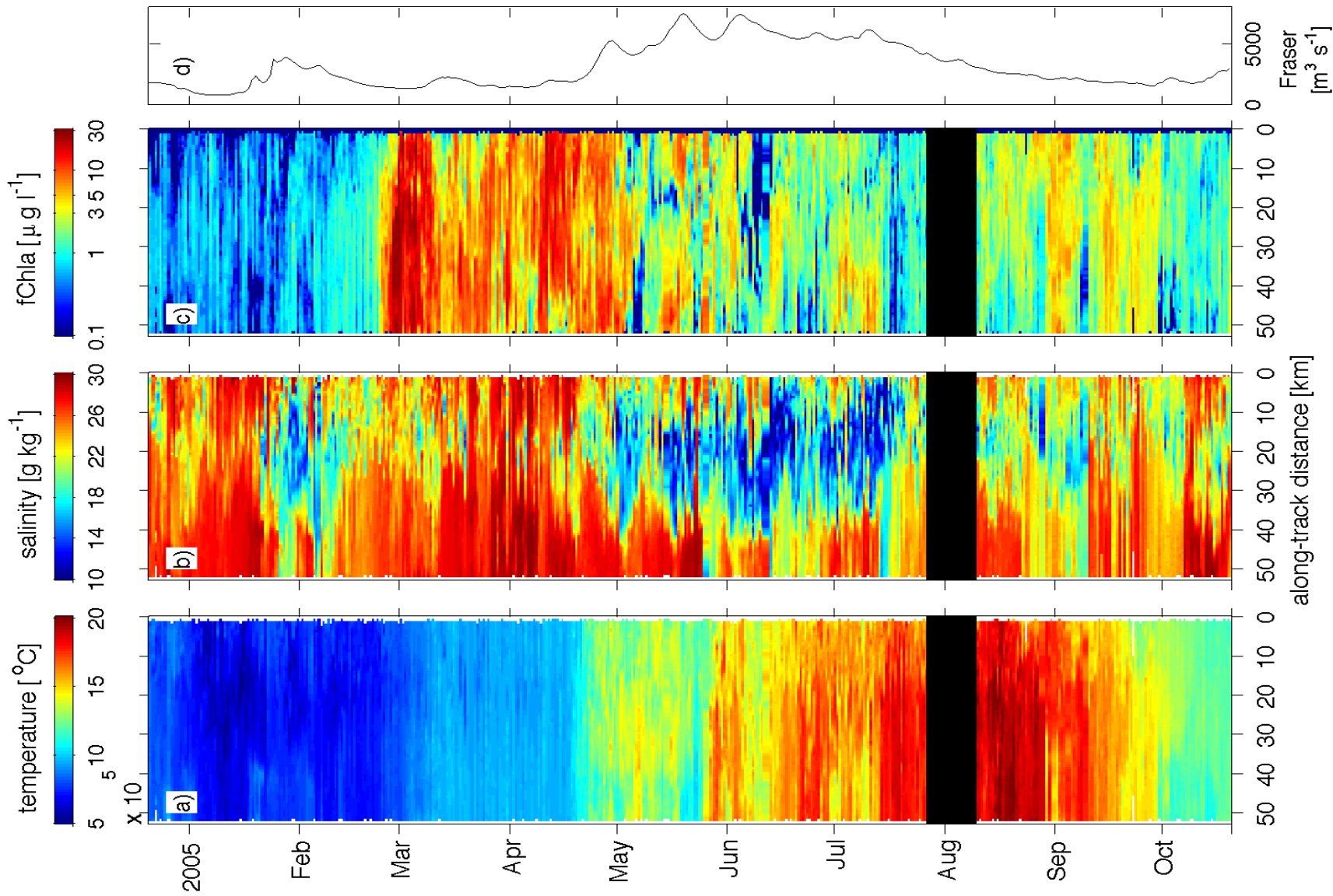


Fraser plume: Satellite, Ferry, CODAR

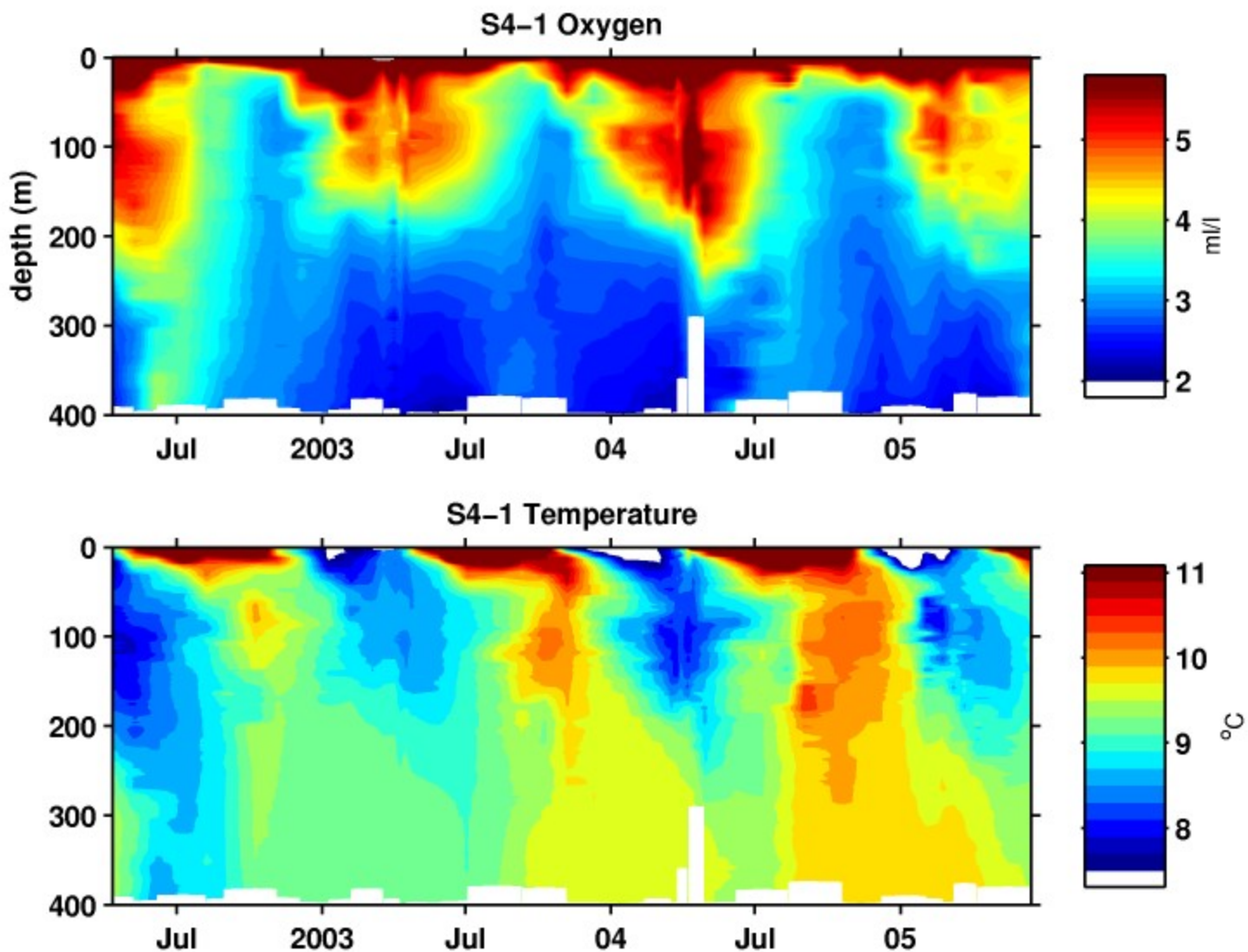


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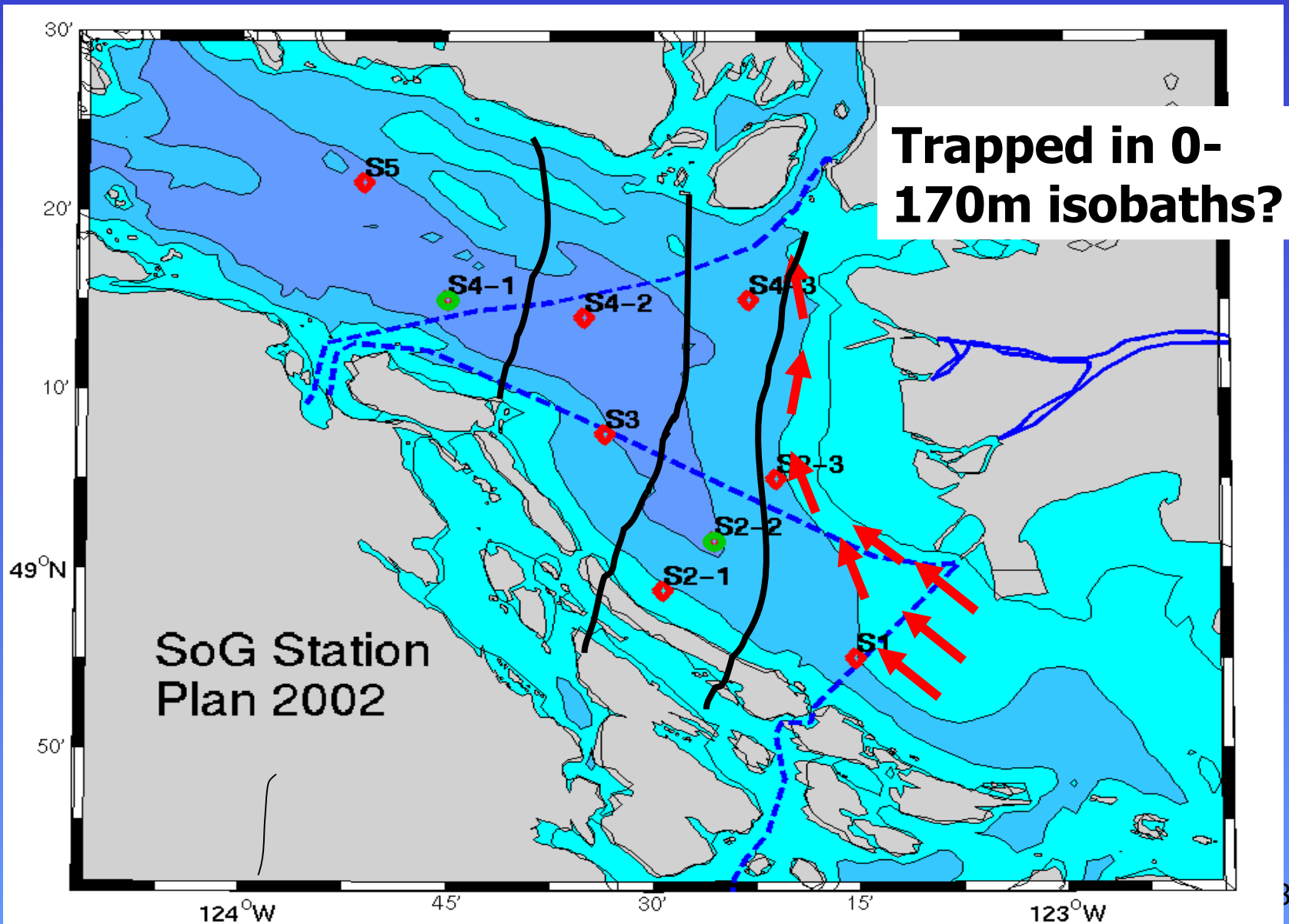
Surface Variability (Daily, weekly, seasonal)



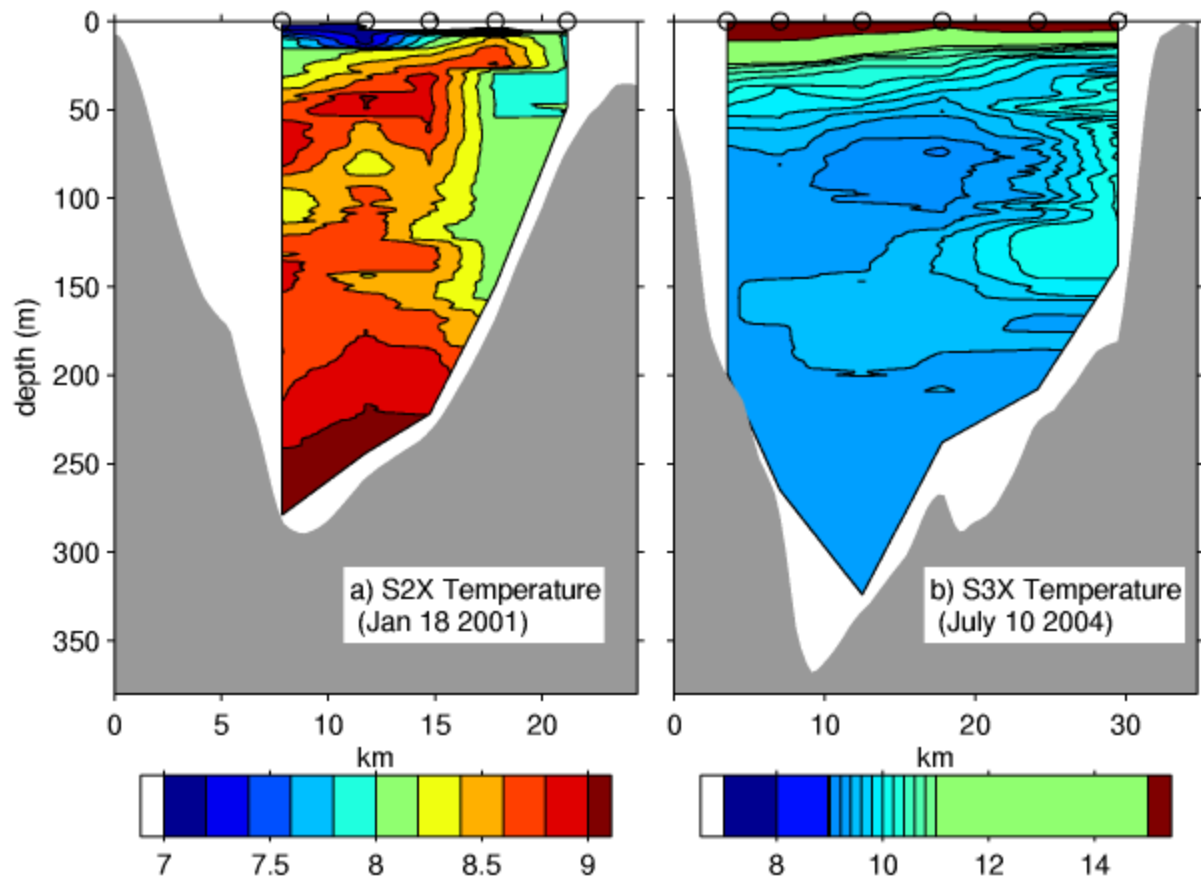
Intermediate Depth Variability (Seasonal)



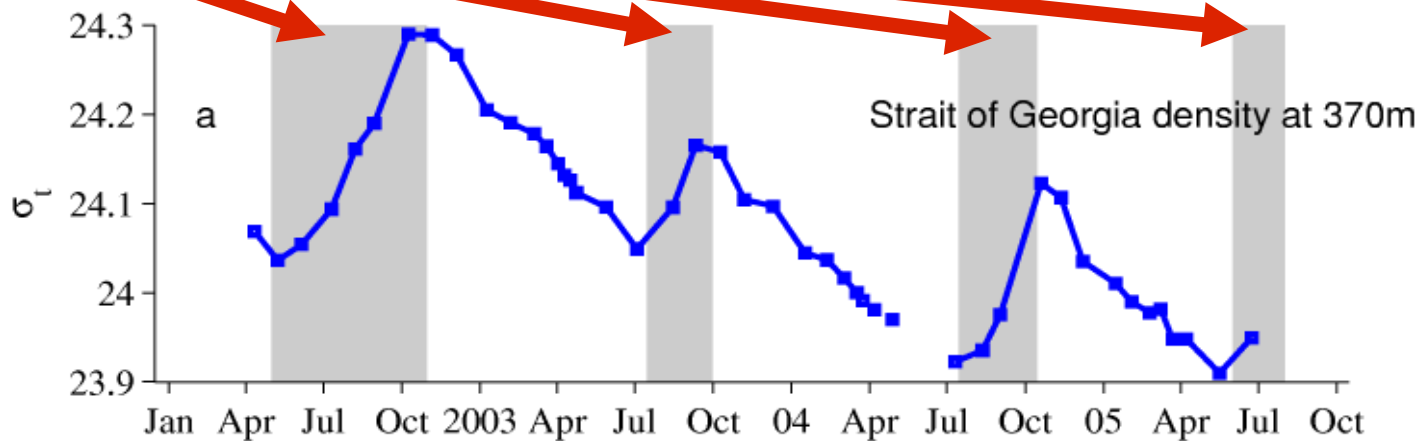
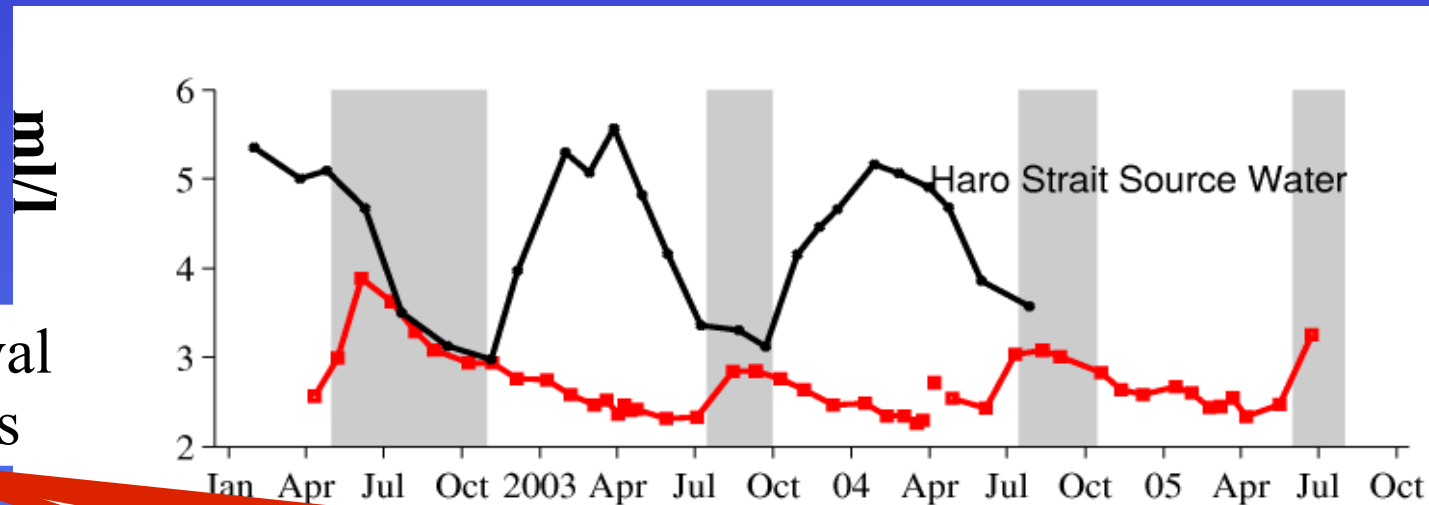
Boundary Current in IW?



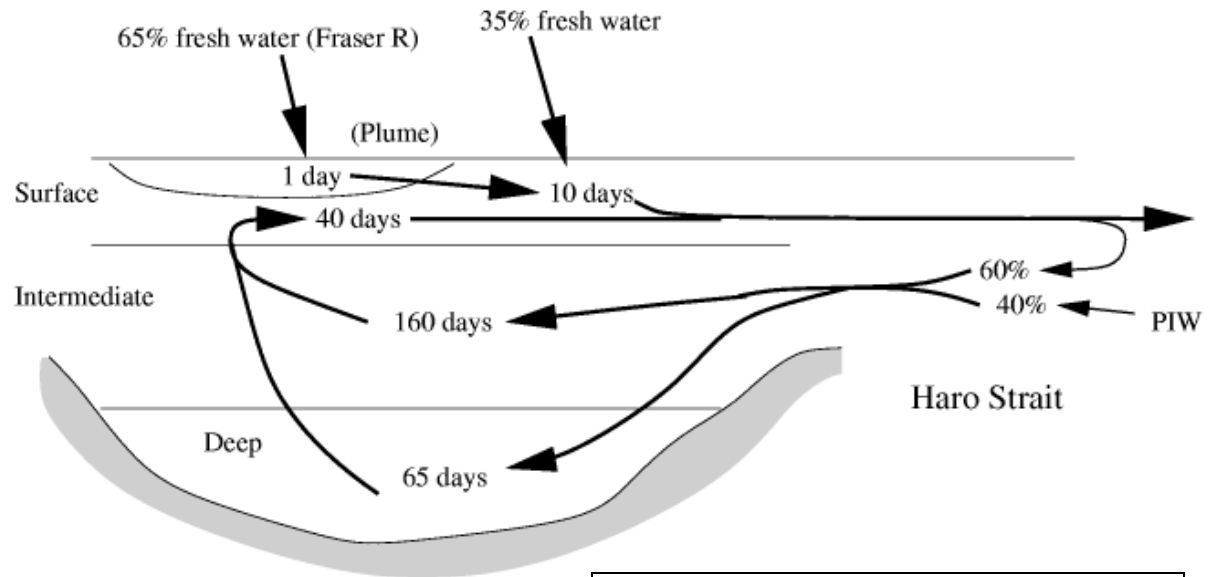
Can we see it in sections? (yes)



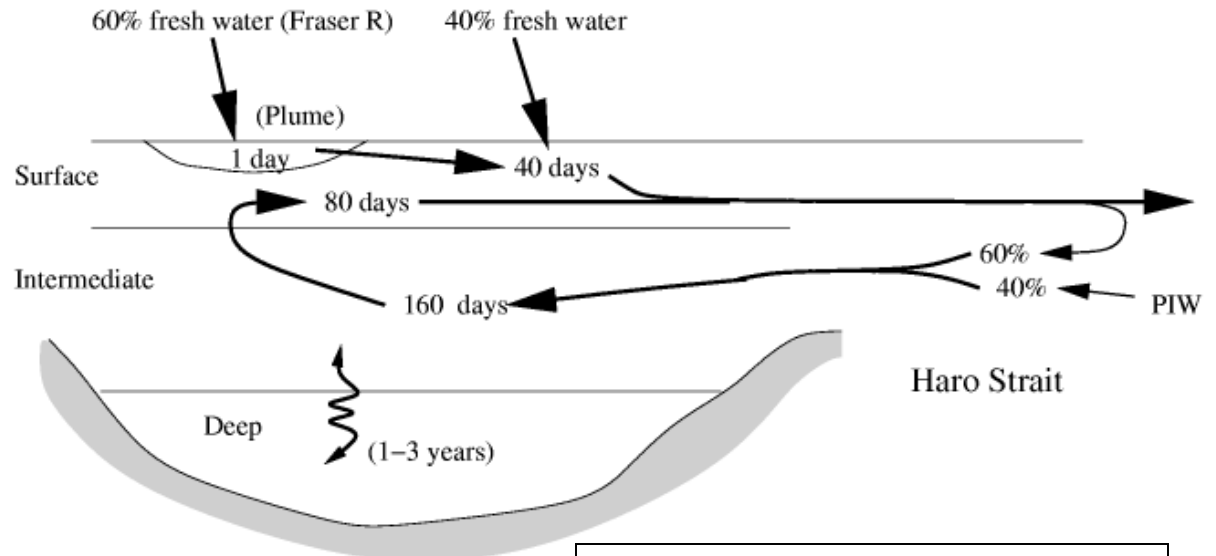
Deep water Variability (annual renewal)



Residence Times



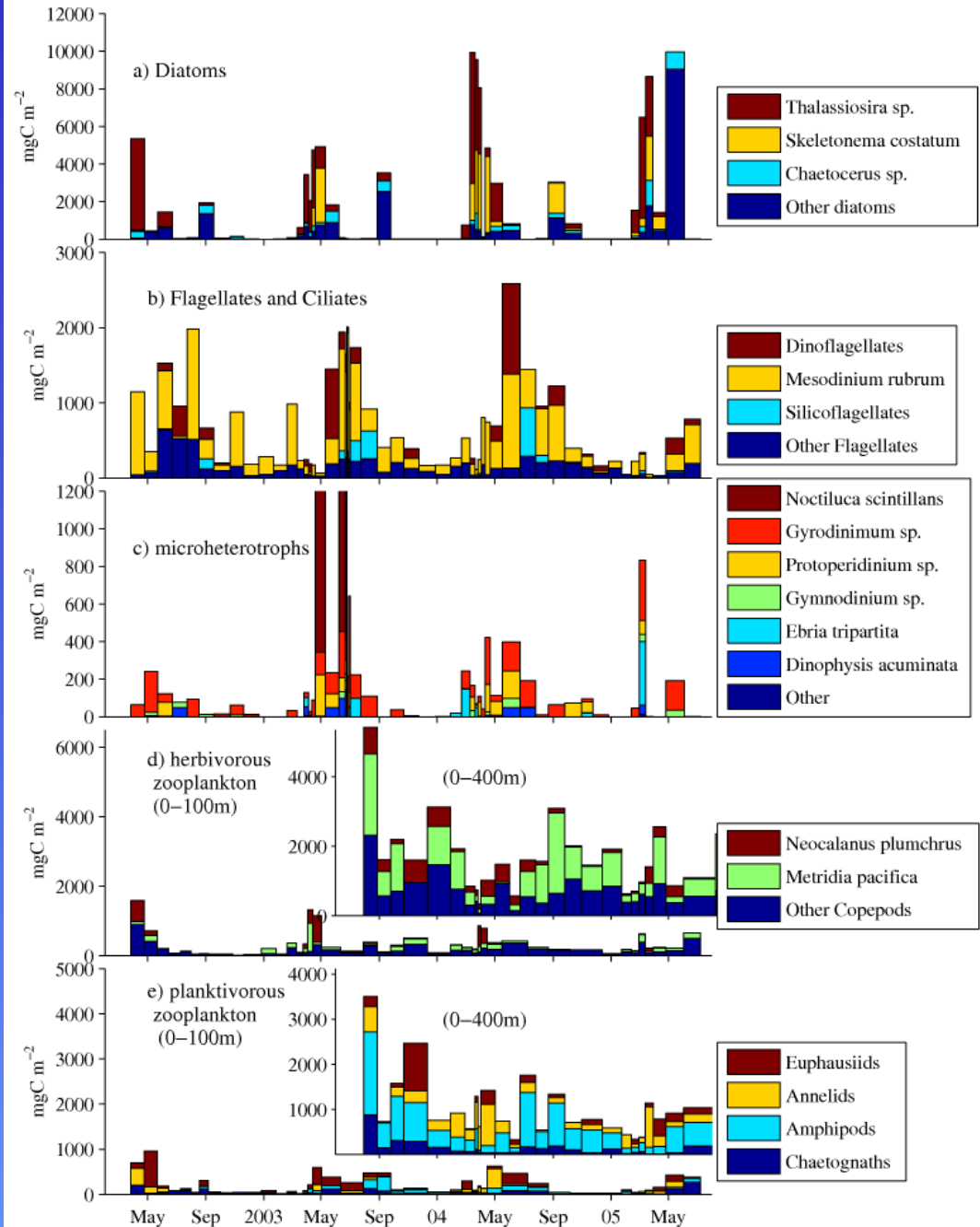
Strait of Georgia – **Summer renewal**



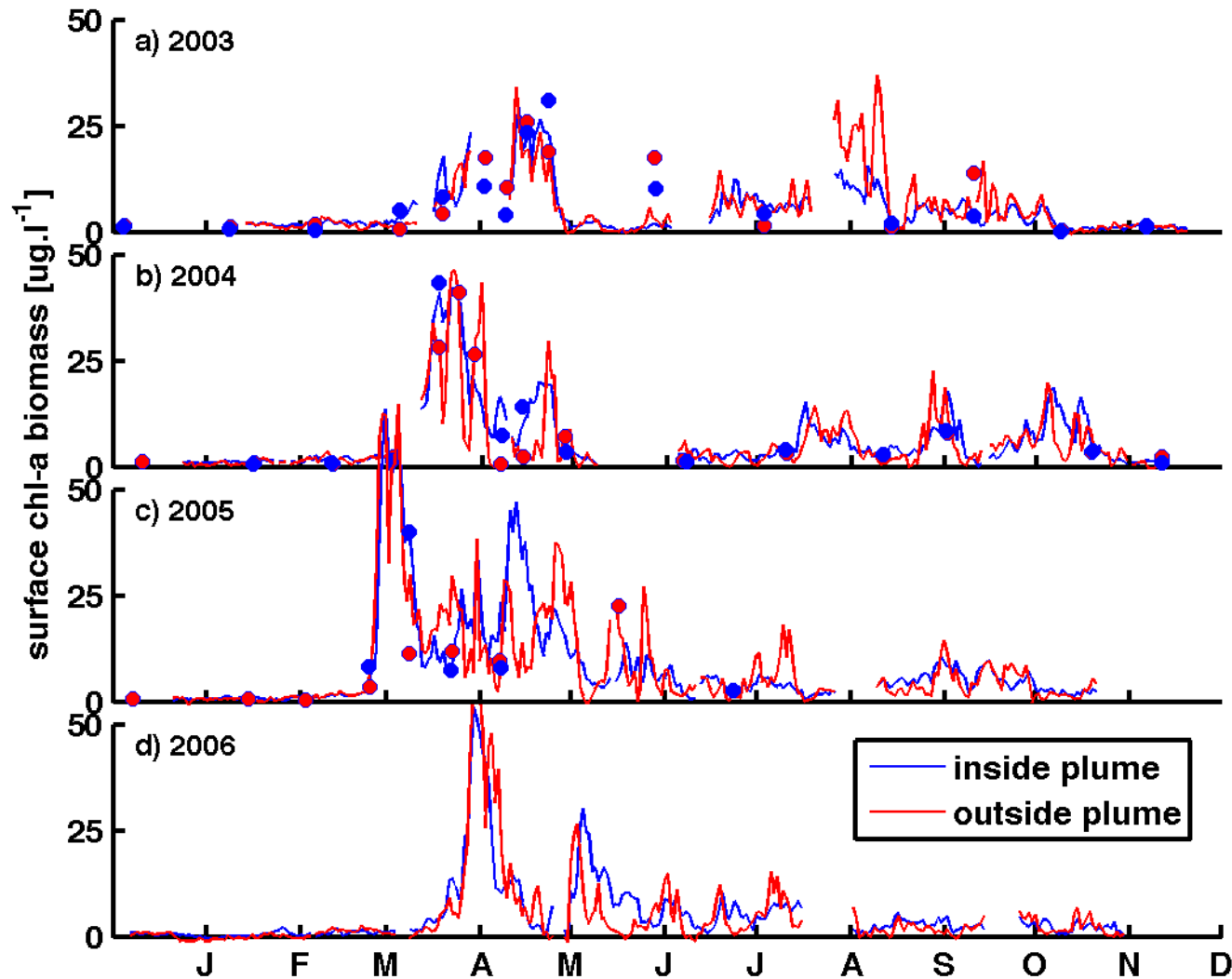
Strait of Georgia – **Rest of year**

Taxonomy!

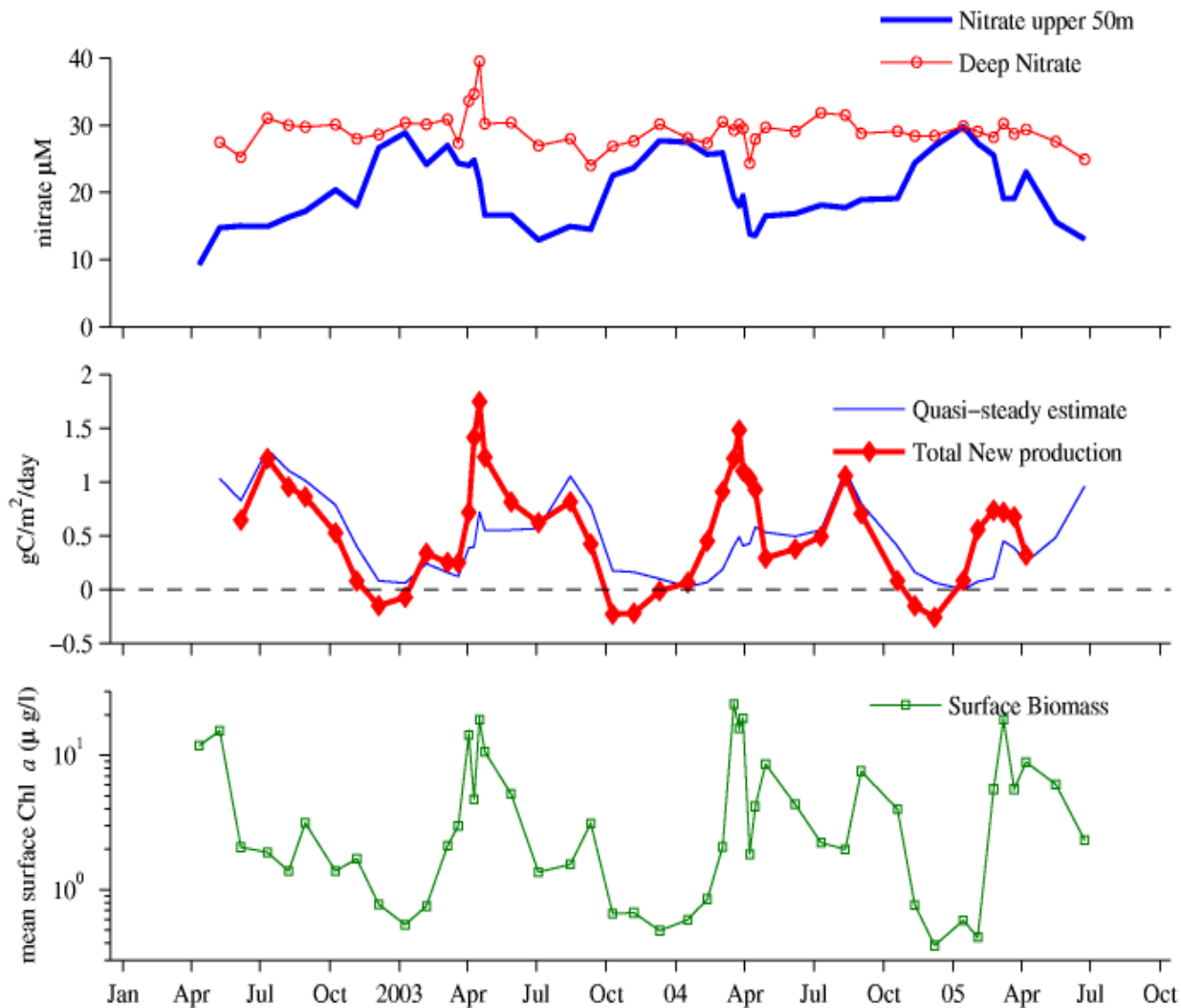
- 63 categories of microplankton from water samples
- >250 categories of macrozooplankton from net tows



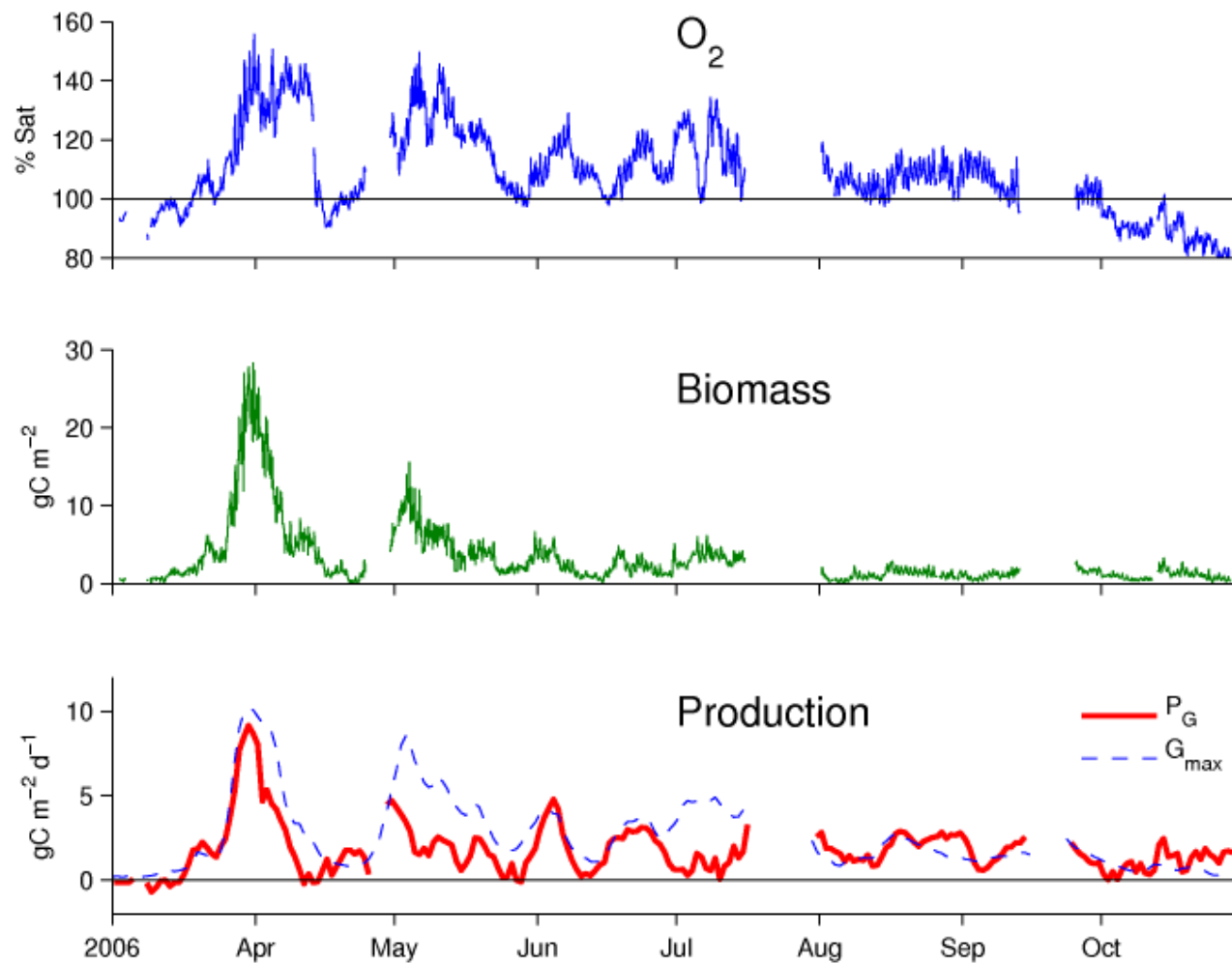
Phytoplankton Variability (ferry)



New Nitrate Primary Production – estimates using our circulation



Daily Average Gross Production!



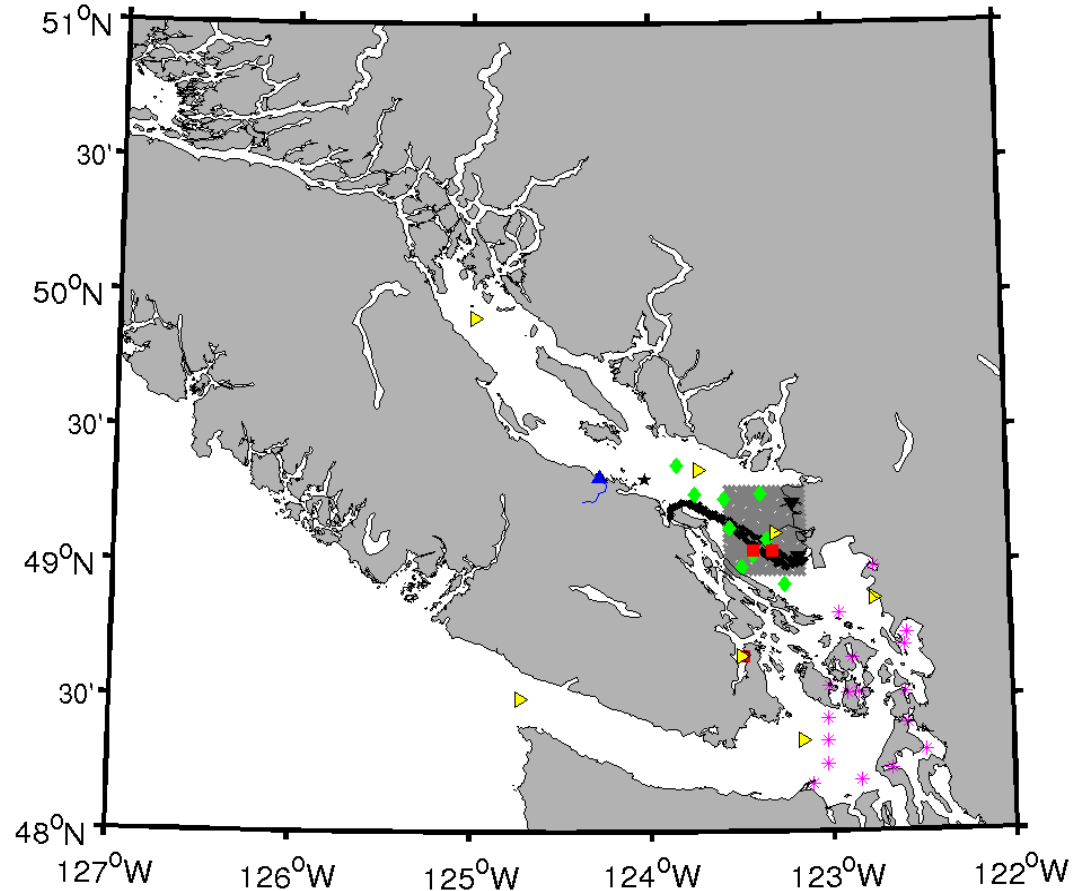
Observations Available for Validation

- Surface:

- Weather buoys (EC)
- Hi-res ATMOS models (UBC, EC)
- River flows (EC)
- Tide gauges (CHS)
- Lighthouse Time series (DFO)
- Ferries (VENUS)
- CODAR (VENUS)
- Satellite (various)

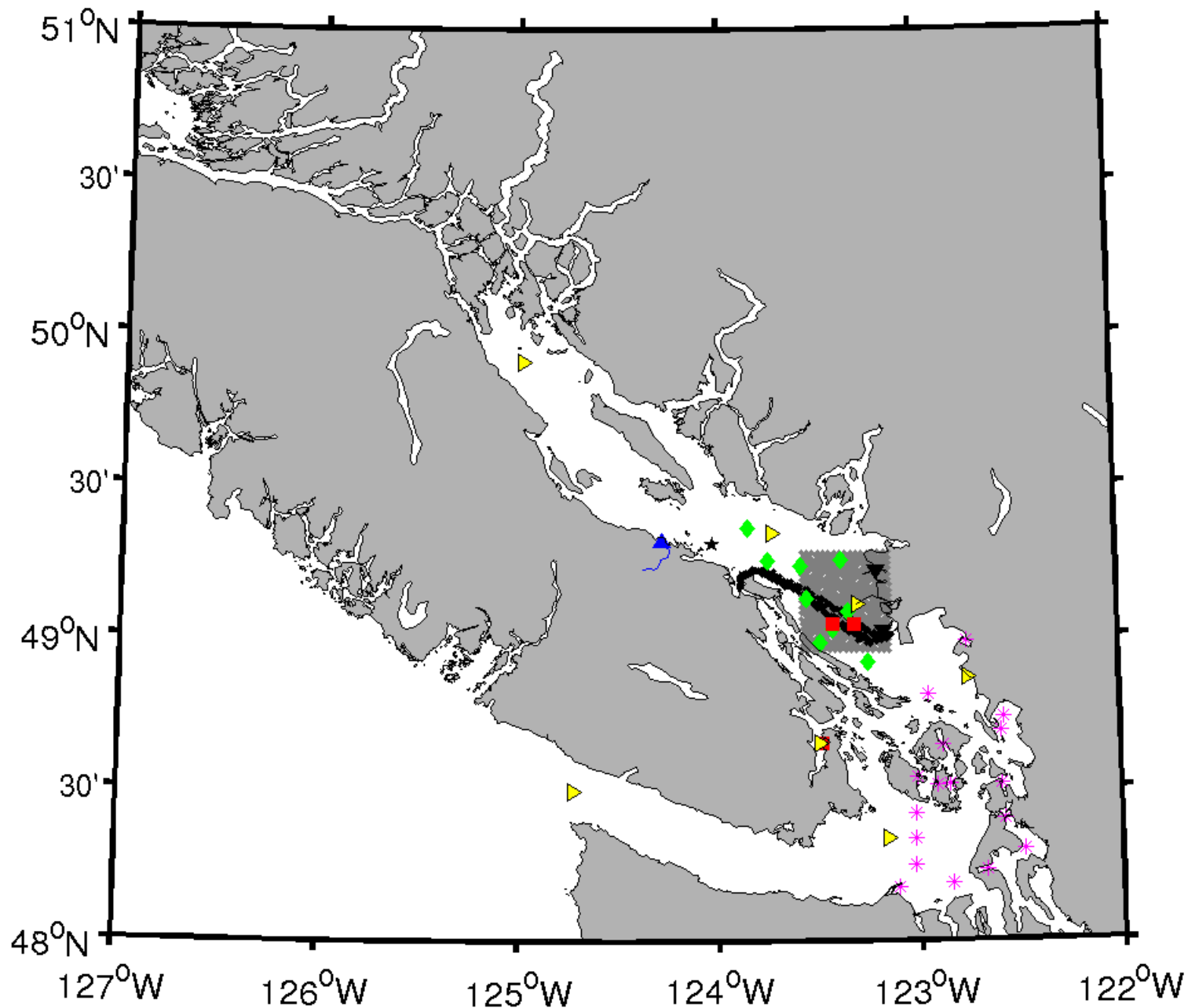
- Intermediate/Deep

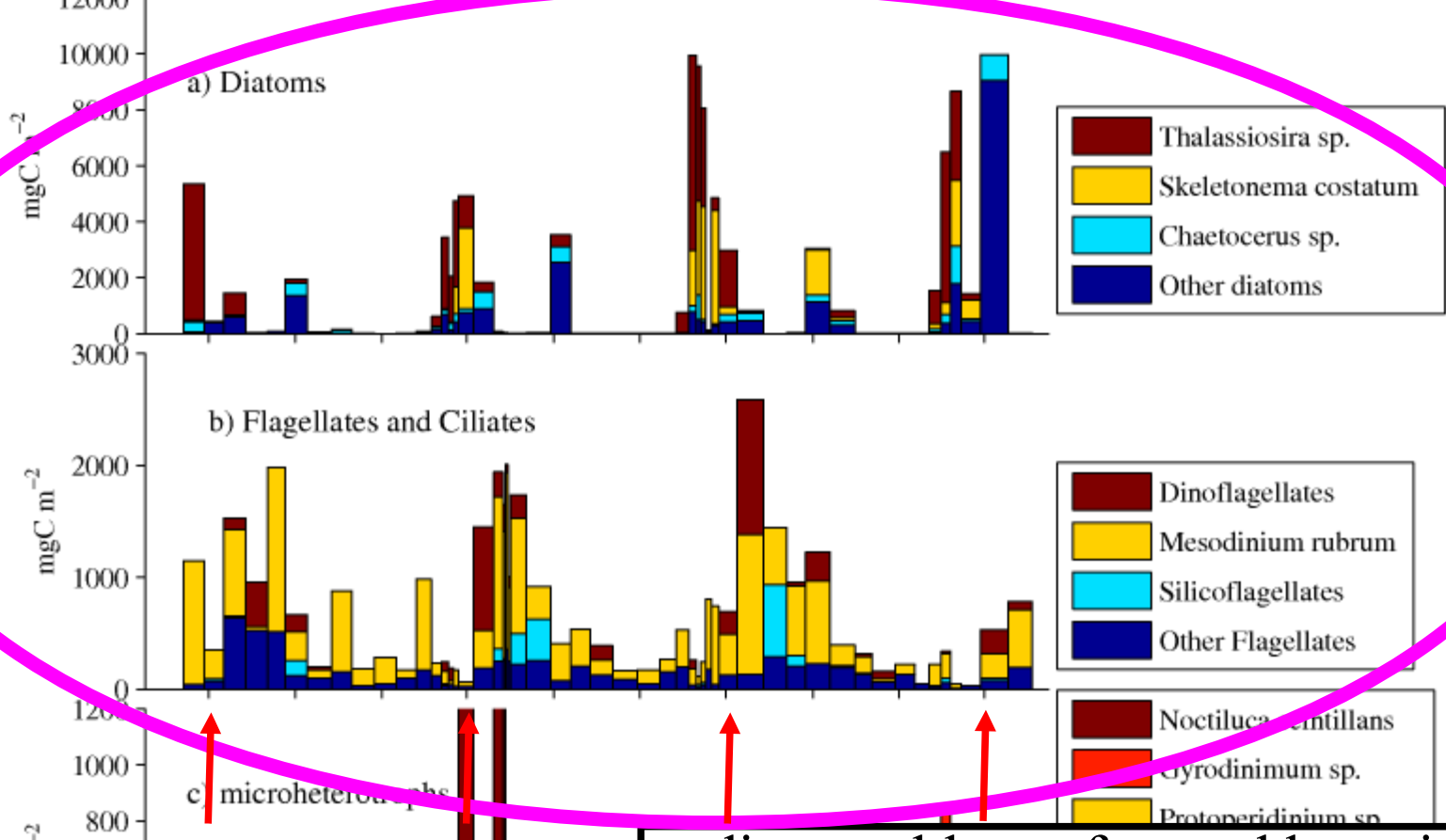
- ADCP (VENUS)
- CTD (Nanoose, GEMS)
- Historical CTD (STRATOGEM monthly, IOS quarterly)



Open questions

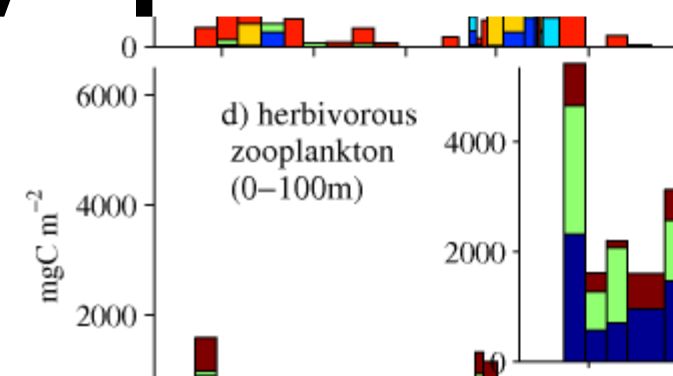
- Surface: Plume variability
 - wind/plume interactions on short time scales
 - Dispersal and eddy structure at high discharge
 - Salinity and flow structure at low discharge
 - Locations and mechanisms related to mixing
 - Plume fronts and primary productivity
 - Fate of river turbidity
 - Ocean colour
- Near-Surface:
 - Internal Wave generation and propagation
 - New and Net Primary production, Oxygen and Carbon fluxes
 - Larval dispersal
 - Fisheries acoustics
- Intermediate water
 - Horizontal circulation (incl Northern Strait transports)
 - Seasonality
 - Boundary Currents (existence and structure)
- Deep Water renewal
 - Tidal mixing, gravity currents



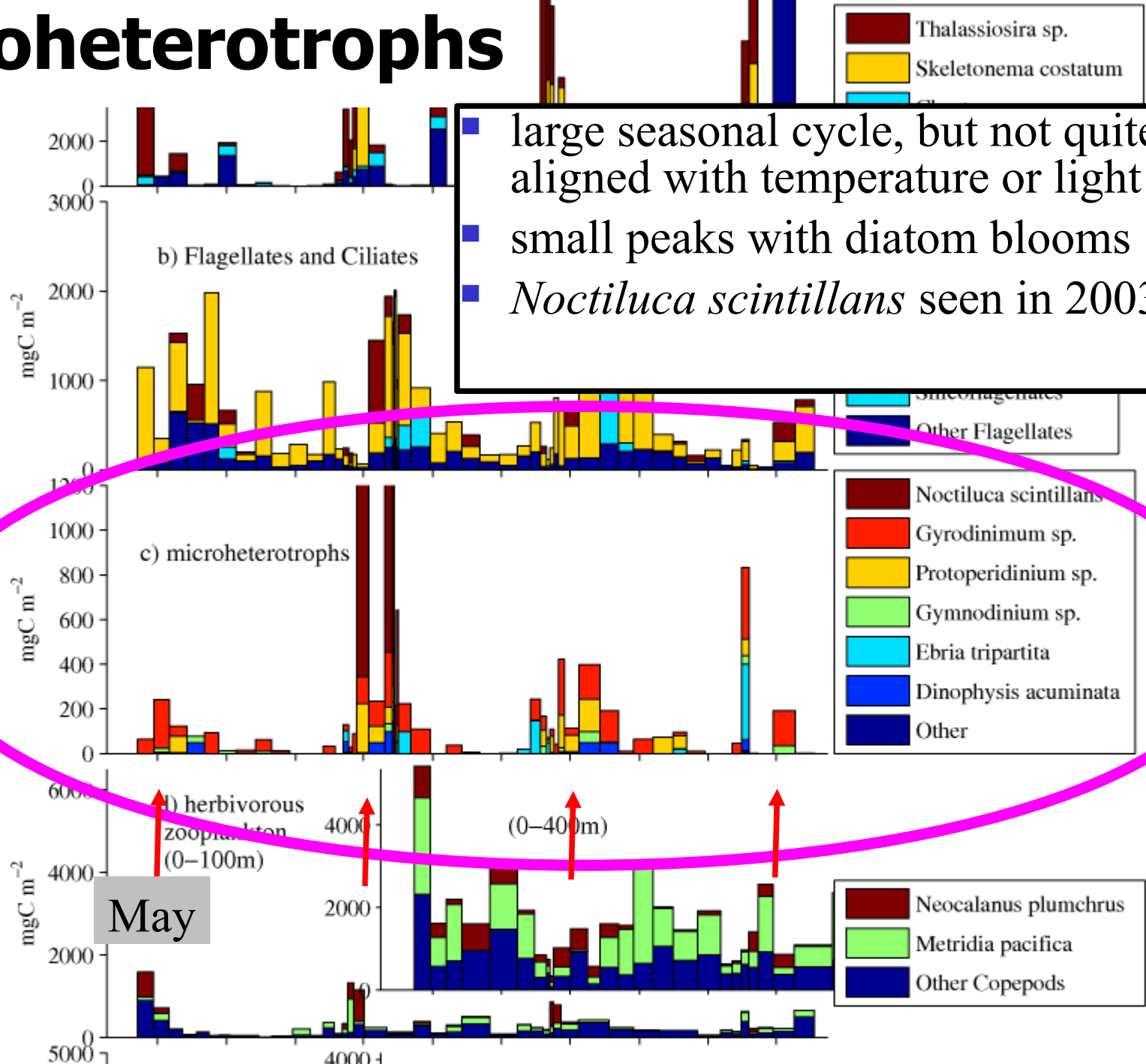


Large phytoplankton

- diatoms bloom fast and huge in spring (*Thalassiosira*, *skeletonema*, dinoflagellates?)
- and also in summer (grab bag of species)
- Stable *Mesodinium rubrum* (= *Myrionecta rubra*) biomass dominates in summer



Microheterotrophs



■ large seasonal cycle, but not quite aligned with temperature or light
■ small peaks with diatom blooms
■ *Noctiluca scintillans* seen in 2003!

May

herbivorous zooplankton (0-100m)

(0-400m)

c)

Zooplankton

- *Neocalanus plumchrus* comes up in spring (annual VM)
- but there is way more *Metridia pacifica* (daily VM)!
- Decay in numbers over 2002-2005?

