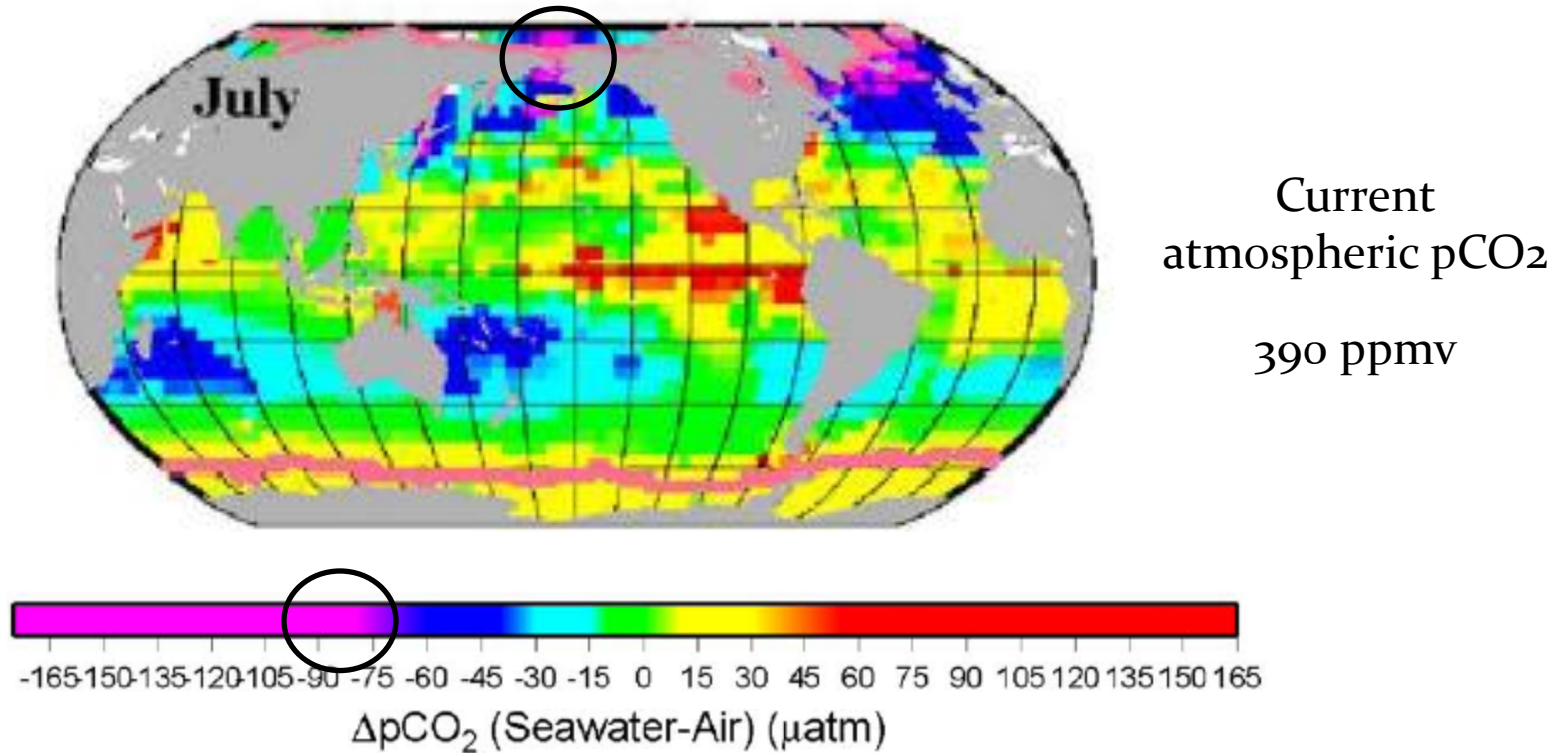Climatological mean and decadal change in surface ocean pCO_2, and net sea–air CO_2 flux over the global oceans   Takahashi et al., DSR II, 56: 554-577, 2009

Current atmospheric pCO_2

390 ppmv

ΔpCO_2 (Seawater-Air) (μatm)

Bering Strait appears undersaturated with respect to atmospheric pCO_2

🟡 A3 Mooring

RUSALCA - July 2011

| Site	Lat	Lon	S	T	TAlkalinity	TCO2	pCO2
			psu	°C	umol/kg	umol/kg	matm
BS23	65.5842	-168.1650	28.8	9.4	2441.5	2269.3	394.2
BS21	65.6458	-168.2538	28.8	9.0	2457.6	2314.5	472.2
BS19	65.6730	-168.3863	31.0	5.3	2396.6	2206.2	301.5
BS17	65.7053	-168.5210	31.2	4.4	2397.3	2204.3	286.8
BS13	65.7725	-168.7925	31.6	5.4	2419.0	2165.6	221.8
BS11	65.8060	-168.9323	31.6	5.4	2442.6	2186.4	222.7
A3-11	66.3282	-168.9607	31.7	5.8	2450.1	2196.1	230.7

W ←→ E

≥390 (atm equil)

<< atm equil

Implies: sink for CO_2. Cause? H_o - primary production / export
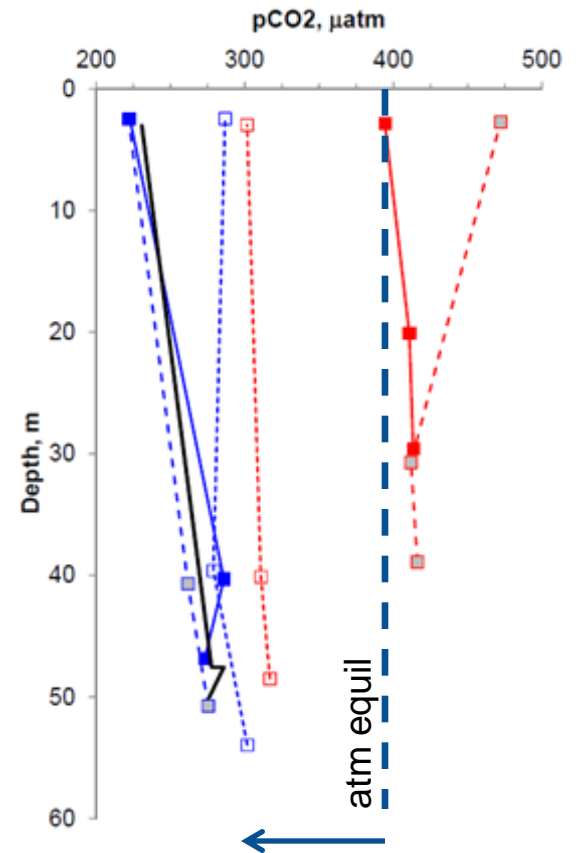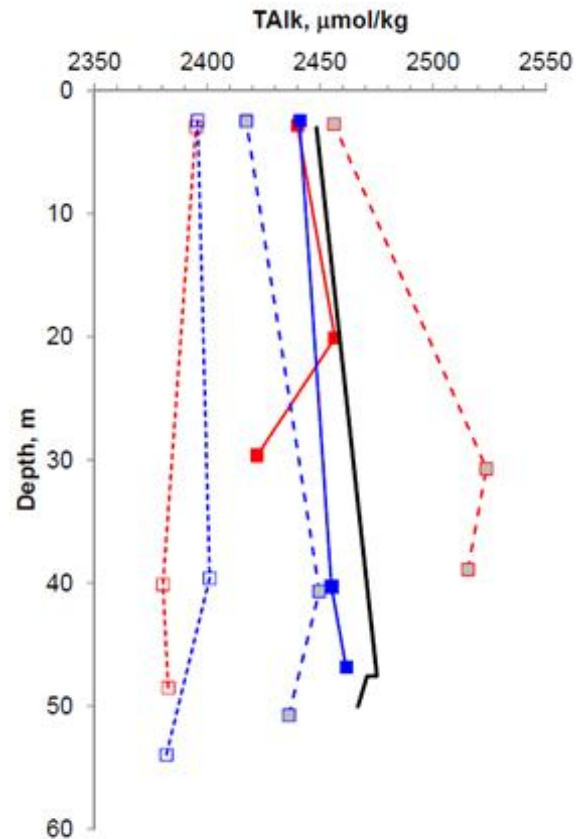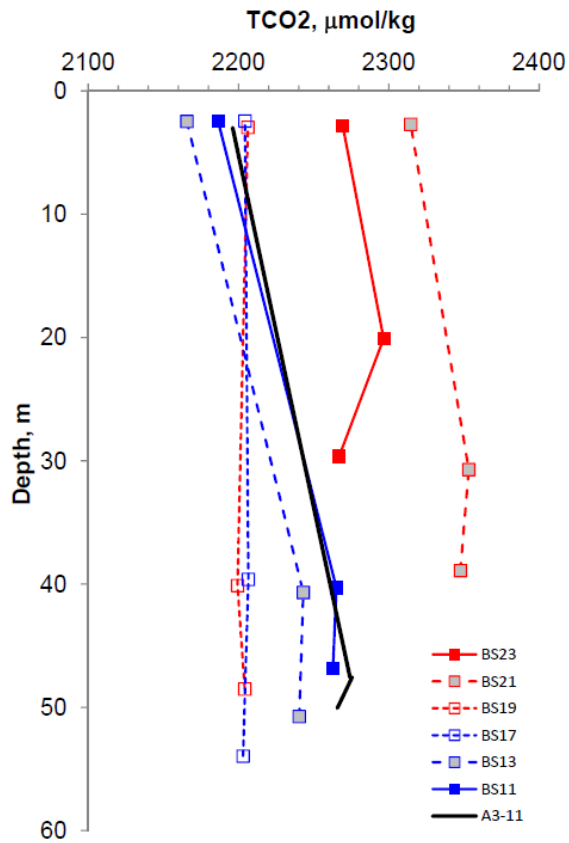
Measured: pCO2 & TCO2
Estimated: TAlk

- ≥100 µatm undersaturation of CO2 observed at all but BS23 & BS21 (two easternmost sites)
- need to confirm TAlk – work in progress
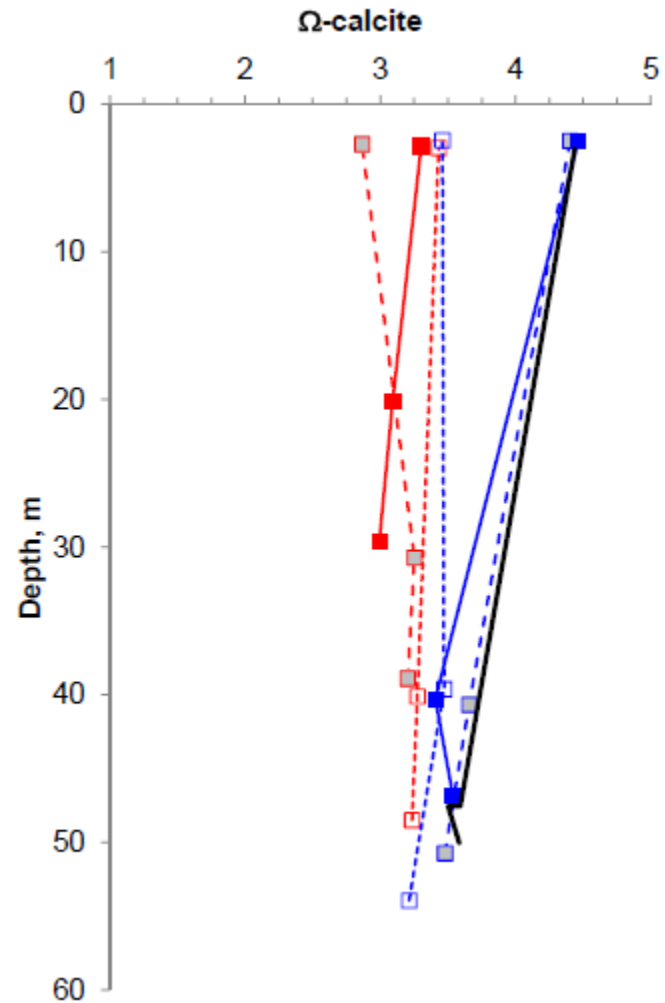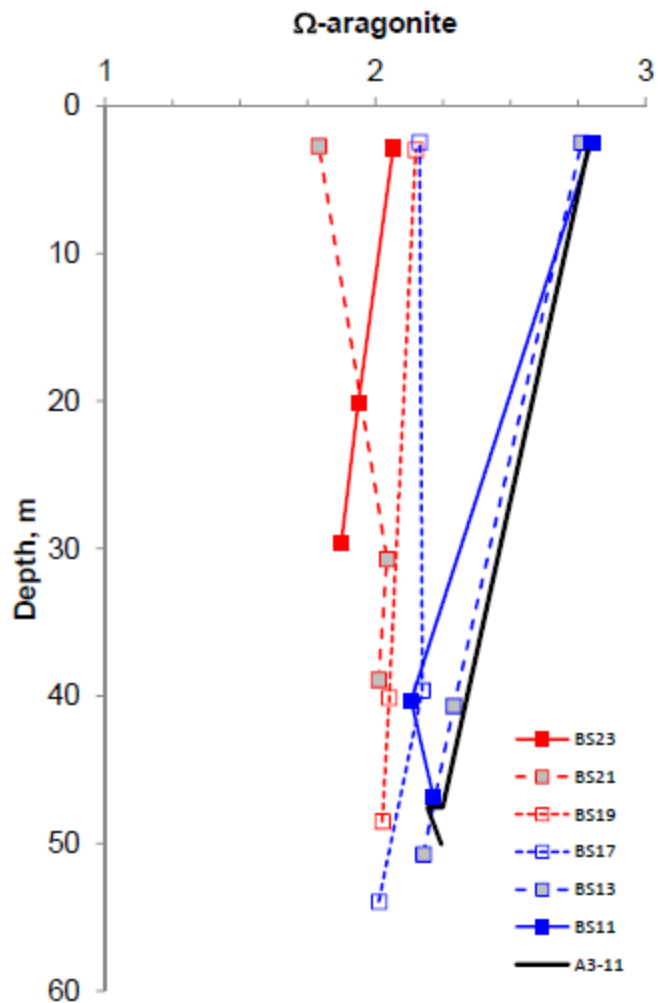
$\Omega > 1$ – supersaturated
- both aragonite and calcite are thermodynamically stable in waters from all sites
- transect sites closest to Alaska are most susceptible to increased ocean acidification

In July 2011, deployed a set of sensors at ~48m water depth on the A3 mooring for a one-year period. The set included: 1) **SAMI-pCO2; 2) SAMI-pH**; 3) **seapHox**; and 4) **SBE-37**.

In situ measurements of seawater pCO_2

M. D. DeGrandpre, T. R. Hammar, S. P. Smith, and F. L. Sayles

A Submersible Autonomous Sensor for Spectrophotometric pH Measurements of Natural Waters

Todd R. Martz, Jeffrey J. Carr, Craig R. French, and Michael D. DeGrandpre*

SeaFET Ocean pH Sensor (Todd Martz and Ken Johnson)
The SeaFET Ocean pH sensor is an ion selective field effect transitor type sensor for accurate long-term pH measurements in both fresh and salt water.
Request a Quote - SAtlantic

Sensors were deployment within a cylindrical metal cage (~30" x 34" dia.). seapHox included on package as an independent check on pH measurements by the SAMI-pH sensor. SAMI-pCO2 was included as a measure of dissolved carbon dioxide (pCO2). The pH and pCO2 measurements, combined with temperature (T) and salinity (S) measurements obtained by the SBE-37, will allow unique definition of time variability in the speciation of the inorganic carbon chemistry system in the Bering Strait water at the A3 site.
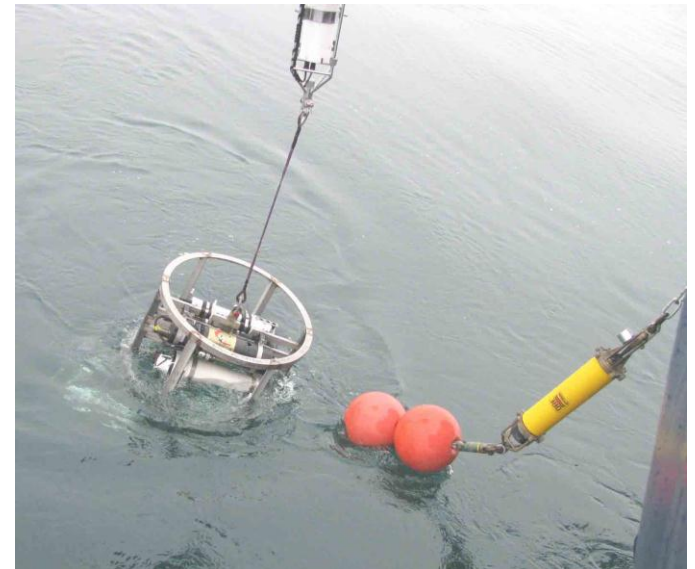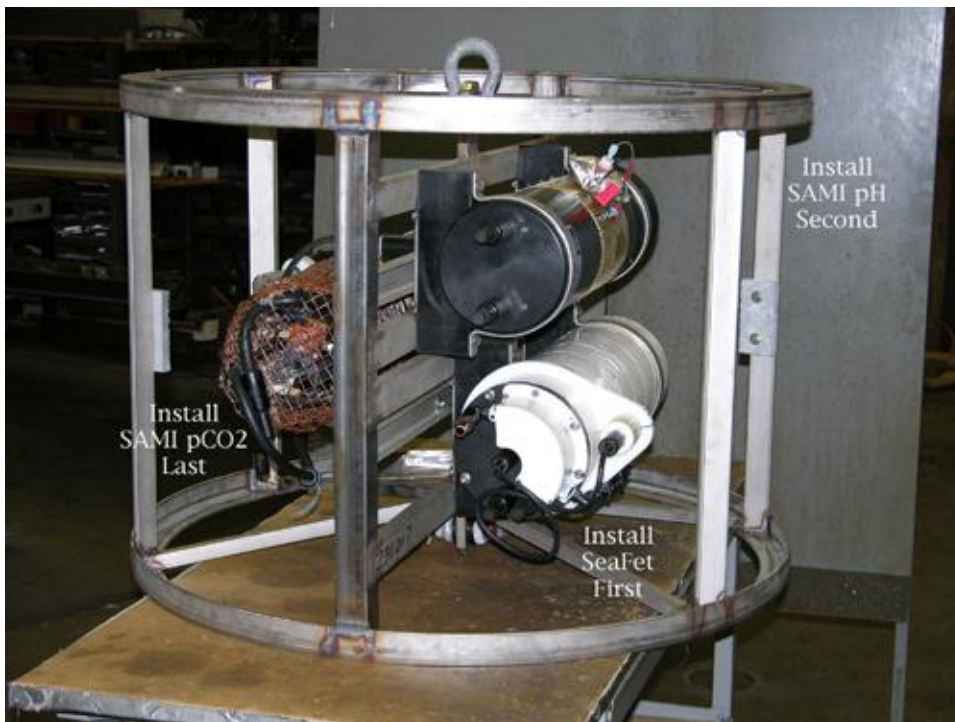
Improving estimations of phytoplankton class abundances using CHEMTAX

Mikel Latasa*

ABSTRACT: CHEMTAX is a computer program that allows researchers to allocate chl a, a proxy for phytoplankton biomass, into different algal groups defined by a suite of pigment markers. The pro-
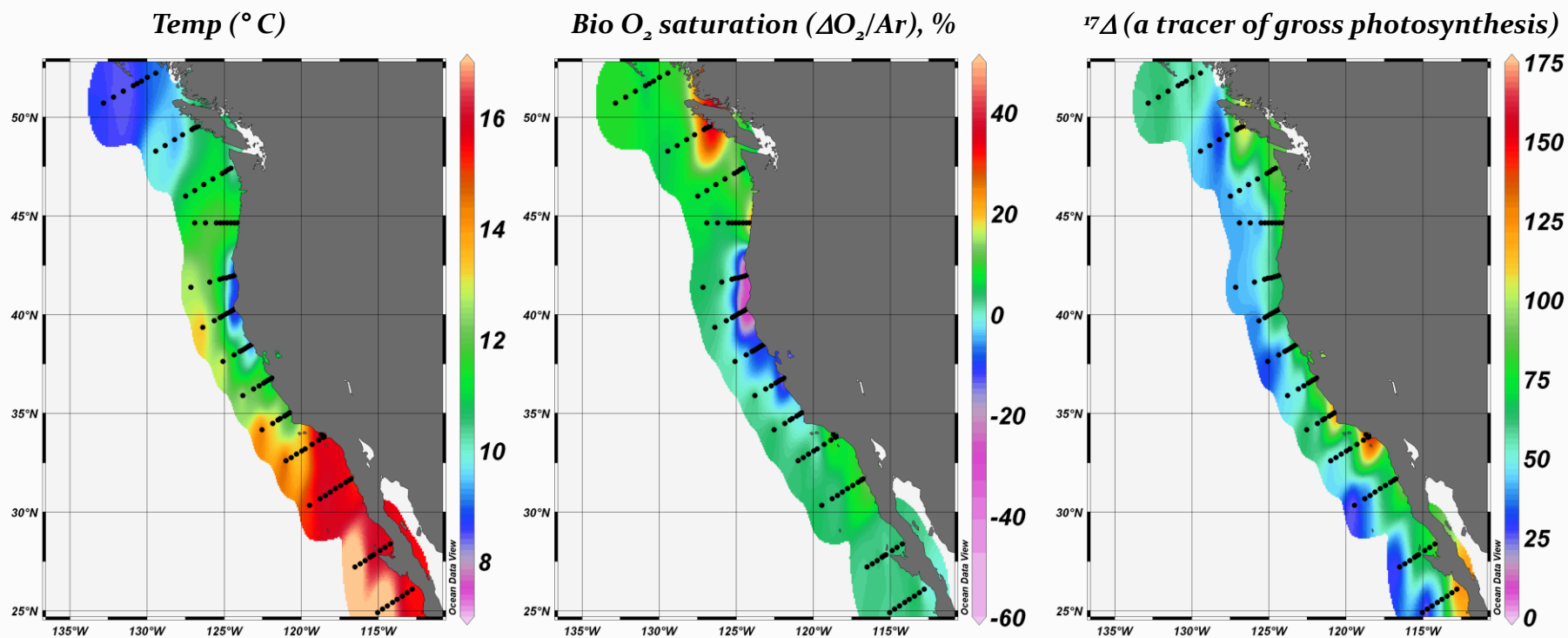
chlorophyll a - most phytoplankton
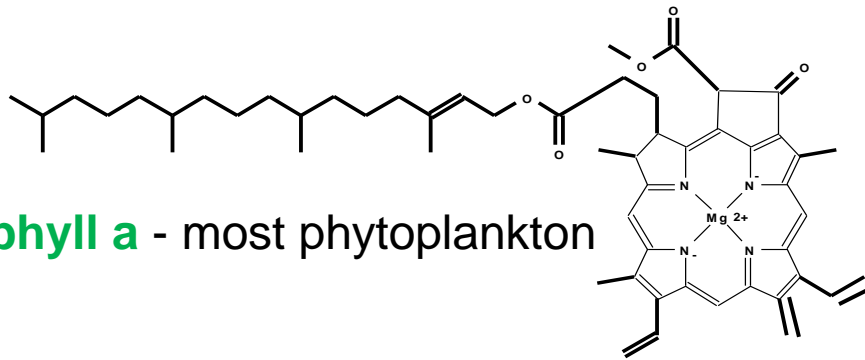
Summer 2012 RUSALCA plan:
- collect samples for HPLC analysis
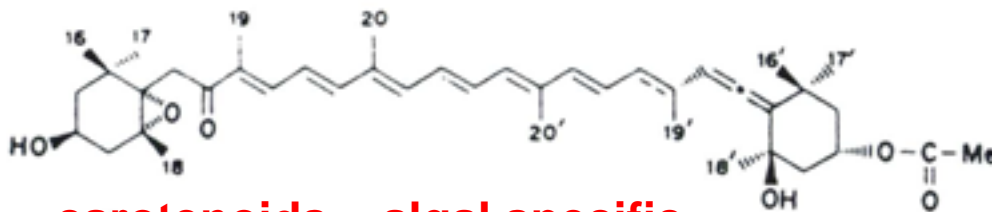
carotenoids – algal specific

Accommodate sampling needs of Laurie Juranek – Assistant Professor, CEOAS - OSU

Use of dissolved gas tracers to study biological production/export: US. West Coast

Temp (°C) · *Bio O_2 saturation ($\Delta O_2/Ar$), %* · *$^{17}\Delta$ (a tracer of gross photosynthesis)*

Observations from a NOAA coastal cruise in 2007

$\Delta O_2/Ar$ reflects production/respiration balance (normalization to Ar removes sensitivity to warming/cooling/bubbles, leaves only biologically—induced changes in O_2 saturation)
Net metabolism rate can be determined if effects of mixing, air-sea exchange constrained
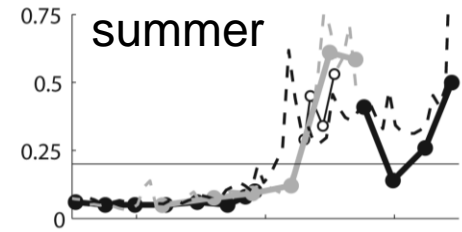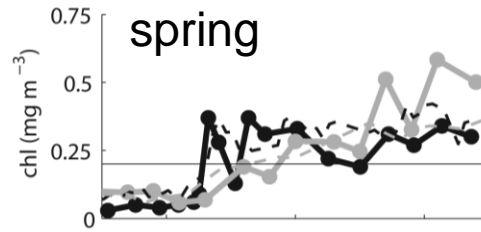
$^{17}\Delta$ reflects balance of gross photosynthesis and air-sea O_2 exchange (higher values: more photosyn. relative to atm. O_2 input); **gross productivity** rate can be determined if mixing biases are constrained

Using dissolved gas tracers to study a chemical/biological front in the N. Pacific
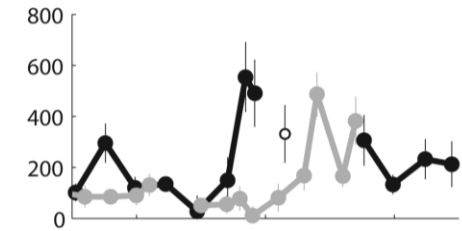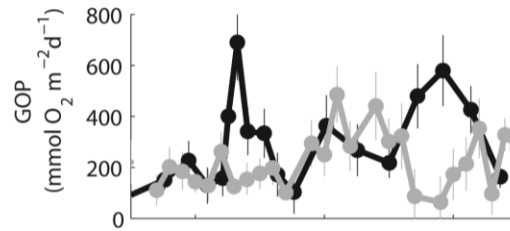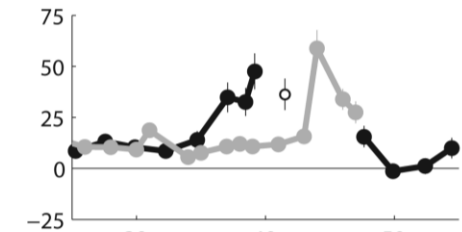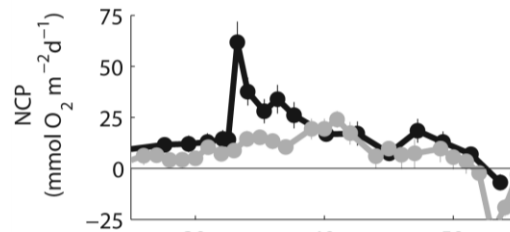
4 cruises of opportunity between Hawaii and Alaska
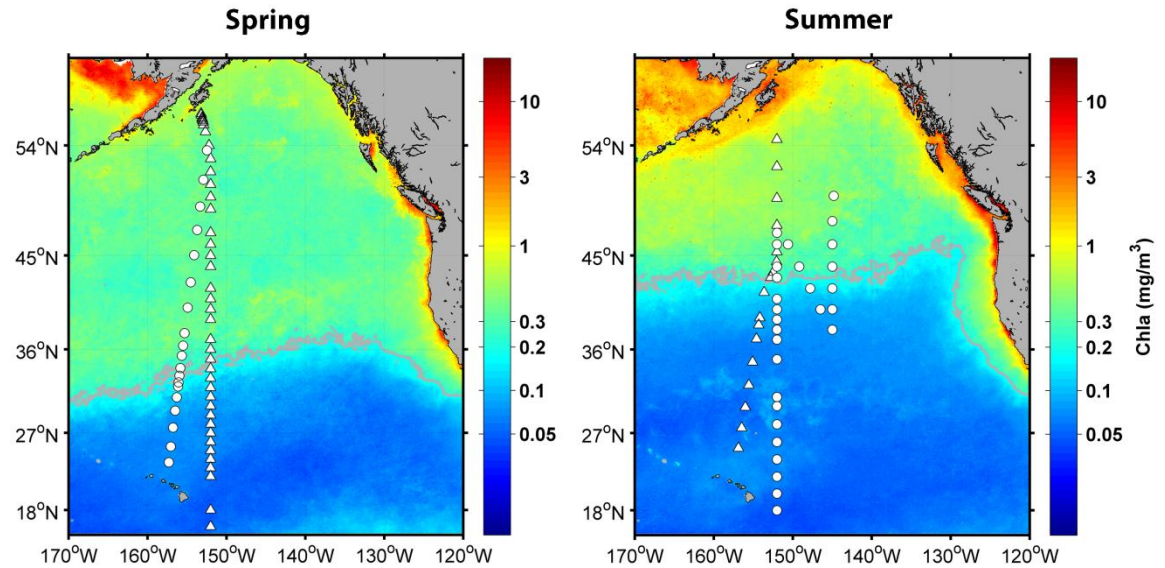
Upper ocean $^{17}\Delta$ and $\Delta O_2/Ar$ tracer distributions

Juranek et al (submitted)
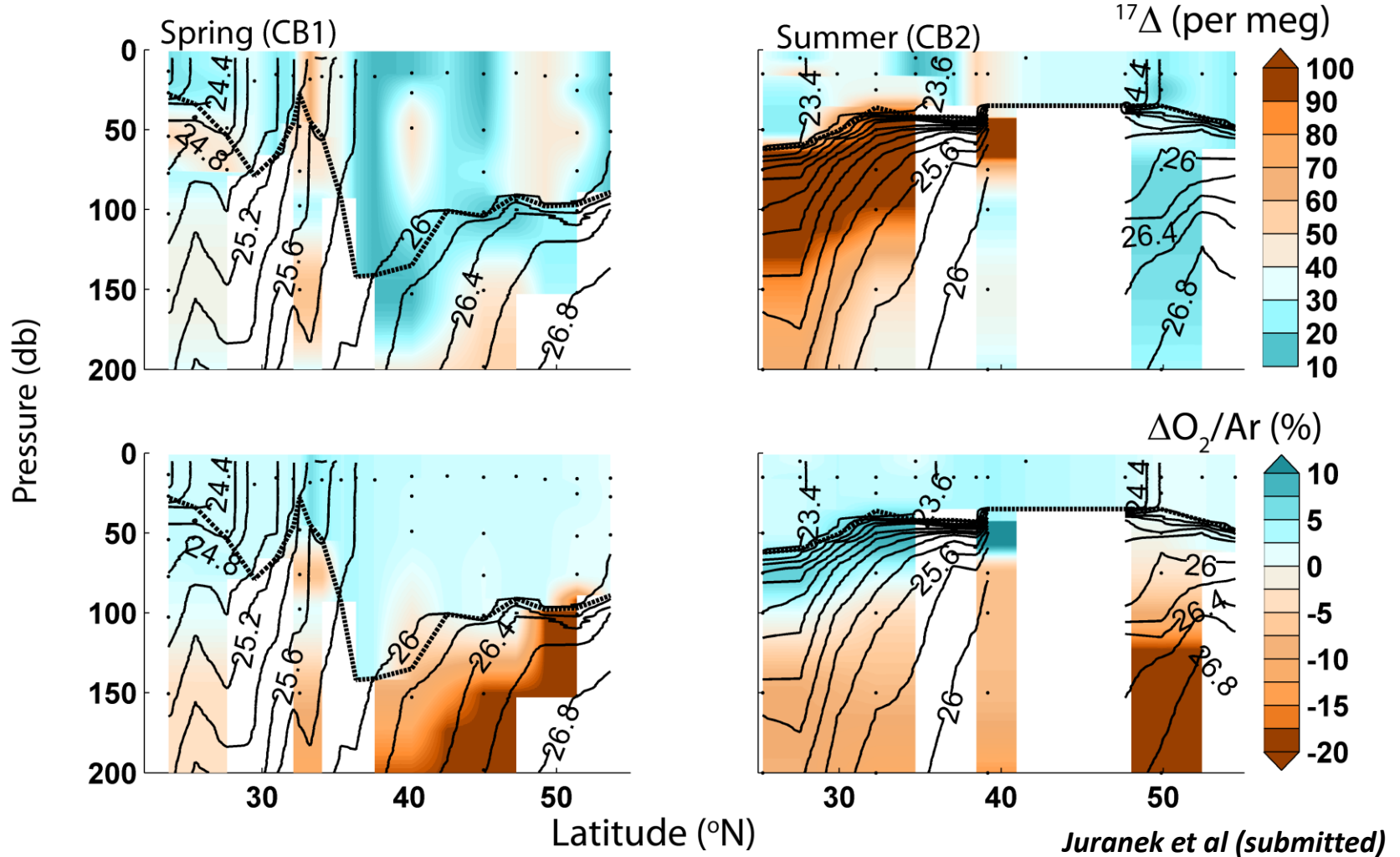
Spring: well-ventilated , thermocline similar to surface, signal of respiration at depth
Summer: stratified, seasonal thermocline shows productivity ingrowth

Dissolved gas sampling

Sample is ~100 ml, requires ~0.5L for flushing and "water lock"

Although pre-flushing with CO_2 is a good idea, it is not absolutely necessary

Each sample takes ~3 minutes to collect

Youtube sampling demonstration:
http://www.youtube.com/watch?v=aweHBIc2Olg&feature=related

1. pre-flush neck with CO_2 (if using)
2. Insert water flow from niskin, tap to remove bubbles
3. Create water lock in sidearm and attached tygon tube; expel all bubbles!
4. Slowly open vacuum valve, allow flask to fill half-way while maintaining water-lock.