Climatological mean and decadal change in surface ocean pCO₂, and net sea–air CO₂ flux over the global oceans  
Takahashi et al., DSR II, 56: 554-577, 2009

Current atmospheric pCO₂
390 ppmv

Bering Strait appears undersaturated with respect to atmospheric pCO₂
Implies: sink for CO₂. Cause? \( H_0 \) - primary production / export

\[
\geq 390 \, \text{(atm equil)} \quad < \quad \text{atm equil}
\]
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.
Sensors were deployed within a cylindrical metal cage (~30” x 34” dia.). See pHox 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.
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

carotenoids – algal specific

Summer 2012 RUSALCA plan:
• collect samples for HPLC analysis
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

Gross Productivity

Net community metabolism
Upper ocean $^{17}\Delta$ and $\Delta O_2/Ar$ tracer distributions

Spring: well-ventilated, thermocline similar to surface, signal of respiration at depth
Summer: stratified, seasonal thermocline shows productivity ingrowth

*Juranek et al (submitted)*
Dissolved gas sampling

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

Although pre-flushing with CO₂ is a good idea, it is not absolutely necessary

Each sample takes ~3 minutes to collect

1. pre-flush neck with CO₂ (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.

Youtube sampling demonstration: http://www.youtube.com/watch?v=aweHBlc2Olq&feature=related