Journal 21
Monday

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1.  312200Z January 05
2.  Position: Lat: 52-27.4S, LONG: 150-00.0W
3.  Course: 180T
4.  Speed: 10.0 kts
5.  Distance: 112.2 NM
6.  Steaming Time: 11H 12M
7.  Station Time: 12H 48M
8.  Fuel: 3,322 gals
9.  Sky: St, Ns 8
10. Wind: 270-T, 25-30 Kts
11. Sea:  270-T, 5-7 Ft
12. Swell: 270-T, 10-15 Ft
13. Barometer: 1005.0 mb
14. Temperature: Air: 11.0 C, Sea: 10.0 C
15. Equipment Status: Normal
16. Comments: none
MASTER, R/V ROGER REVELLE
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Down in the Furious Fifties now and hoping the weather will calm down a bit. It has been rough going in the sample bay. Here are some pictures of what it looks like out there.

A view of the team bringing in the CTD looking back at the stern of the ship

Once on deck the CTD Rosette is pulled into the Staging Bay at the right and the samplers go to work taking their various water samples. Freon, O_2, CO_2, Nutrients, Salts and several others depending on the cast.

Sample cop view by Jim Swift.

So this is what I see when I am keeping track of who is on which bottle. As they go around they call out their bottle number and sample number and I record it on a data sheet, for O_2 I also record the temp. The temperature is always a little warmer than it was in the water column as it has warmed on its way to the surface. That does not mean it feels warm on your hands though! Note everyone is now wearing foul weather gear as it gets colder in the hangar.

The first 4 people sampling are looking for dissolved gasses, Freon, Helium and O_2 and CO_2. So here is some information on dissolved gasses in seawater for backround.

Dissolved Gases

You have experienced at home how well solids such as salt and sugar dissolve in water. What may be less obvious is how well gases dissolve in water. For example, Carbon dioxide (CO_2) dissolves under pressure in soda. If you open a can of cola tiny CO_2 bubbles escape, giving the drink its fizz. Dissolved gases are also present in ocean water; these include CO_2, Nitrogen (N_2)and Oxygen (O_2). (Note that dissolved O_2 is not the O_2 in H_2O).

Gases are exchanged between the atmosphere and ocean at the ocean surface. You have seen this in an aquarium with the water filters; the water flows back into the tank with just enough force to break the surface tension, this is enough to add oxygen to the water for the fish to breathe. In the ocean the surface tension is broken and gas exchange occurs due to wave action. However in the colder latitudes sea-ice is a barrier to gas transfer at the ocean surface. When water is saturated with a gas (has as much as it will hold) the rate at which the gas dissolves in water is equals the rate at which the gas escapes into the atmosphere. Remember that soda? Well the soda is supersaturated with CO2 and as soon as it is not held into the liquid by the pressure in the bottle, it escapes. Warm soda goes "flat" faster than cold soda, so cold water holds more saturated gas than warmer water.

Below the ocean/atmosphere interface biochemical processes play important roles in controlling proportions of certain dissolved gases. Within the Photic Zone, the sunlit upper layer of the ocean, the photosynthesis of phytoplankton enhance the amount of dissolved O2 in comparison to CO2 . In surface waters the principal dissolved gasses are Nitrogen (48%), Oxygen (36%) and Carbon dioxide (15%). For the ocean as a whole, CO2 is the most abundant dissolved gas, accounting for 83% of the total. CO2 is much more abundant in the ocean than in the atmosphere. CO2 is only 0.37% by volume of the gases composing the atmosphere below an altitude of 80km (50miles). About seven times as much CO2 is sequestered in the ocean. CO2 is highly soluble in water because it reacts with water to produce carbonate and bicarbonate ions that readily dissolve in water. At a temperature of 0'centigrade (32' F) and sea level air pressure, one liter of water that is saturated with carbon dioxide has dissolved about 1.7 liters of CO2. The oceans ability to take up atmospheric carbon has important climatic implications in the rising levels of atmospheric CO2

If a dissolved gas does not participate in any biochemical process such as photosynthesis or cellular respiration, its concentration in a parcel of seawater remains unchanged except for the relatively slow movements of gas molecules (diffusion) through the water or by mixing with other water masses containing different amounts of dissolved gas. Amounts of dissolved gases in water masses are constant enough that this is one of the characteristics used to track water mass movements.

(Insert diagram of global pattern average of annual sea-surface salinity from NOAA national oceanographic data center)

Journal questions:

1 - Looking at what you know about global warming, why might we want to know how much atmospheric CO2 is being absorbed by the oceans?

#2 – Why might scientists want to know how much CO2 the ocean can hold? How might that effect the climate?

#3 Looking at your notes from Dr. Measures, what part might iron and plankton play in the amount of CO2 that can be absorbed by the ocean?