Beaufort Gyre Exploration Project: Dispatch 21: The Beaufort Gyre Circus Spectacular Present

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Last night, the stars aligned and Neptune smiled on the Beaufort Sea. In the morning, a crystal blue sky draped over the horizon. The Arctic sun-
clouds, providing ample light without the blinding radiance often found at high latitudes.

The sunrise occurred in an environment of icicles and frost flowers.

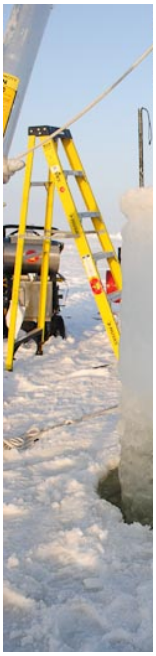
Louis crew position gear for air transport. T
red speck in the sky.

The conditions provided an ideal day for a buoy extravaganza. In total, 19 individuals flew from the *CCGS Louis S. St-Laurent* for a day of sea ic
Observatory, a group of buoys that will give scientists a longitudinal picture of ice, weather, and ocean dynamics. The various projects executed
a five-ring Arctic research circus, missing only a bike-riding polar bear and a fire-breathing narwhal.

In one ring, the WHOI team installed an Ice-Tethered Profiler. Next to them, Mike Dempsey from Fisheries and Oceans Canada (DFO) installed
sawed ice core samples into adorable ten-centimeter segments while Alice Orlich from the University of Alaska-Fairbanks amazed onlookers wit
Tateyama from the Kitami Institute of Technology so gently and deftly measured snow and ice thickness.

And then there was the Obuoy, the scientific lovechild of environmental chemist Dan Carlson and eighteen other collaborators. The Obuoy is a p
it? "Buoy" sounds like "boy." Environmental chemists can't also be comedians.

The Obuoy takes webcam footage of the Beaufort Sea and resembles an enormous bird feeder. More importantly, it monitors three compounds
ozone (O3), and bromine monoxide (BrO).



The first step of installing the Obuoy is creating a massive hole in the ice. WHOI technicians helped with this process by using an innovative cylindrical device that melts ice, heats the melt, and uses that water to melt more ice.

A tripod is erect
the cylindrical ic
chain sawed int
removal.

The helicopter airlifts the Obuoy into place. Filmmakers Kwang-bum Kim and Yong Kim stand in the foreground.

The sun casts long shadows on the Obuoy

Bad boy of the Arctic carbon dioxide has received by far the most press of these compounds. CO_2 is a greenhouse gas. The compound gets its heat on earth, increasing global temperatures, decreasing sea ice cover, and allowing Al Gore to win a Nobel Prize.

It also dissolves in water. It is carbon dioxide's solubility that allows for the delicious and tingly bubbles of seltzer water.

But it's not all fun and bubbles for CO_2. Carbon dioxide also gets absorbed into the world's oceans. When CO_2 concentrations get too high, the animal with an outer shell.

Carlson stands next to the completed Obuoy.

...which looks like an elaborate bird feeder.

However, the ocean has a natural warrior team that battles this chemical intruder: carbonate buffers and algae. The buffers resist the change in alter pH. Algae photosynthesize the ocean's dissolved CO_2 into oxygen. During the summer, when there's abundant sunlight, this happens more periods, or, in the case of the Arctic, not at all.

Though this algae absorption process happens year round in the sunny regions of the world, in Polar Regions the process is a little more compli

First off, the frigid water of the Arctic absorbs more CO_2 than warmer water. Think of a bottle of that seltzer. It stores dissolved fizz better when i

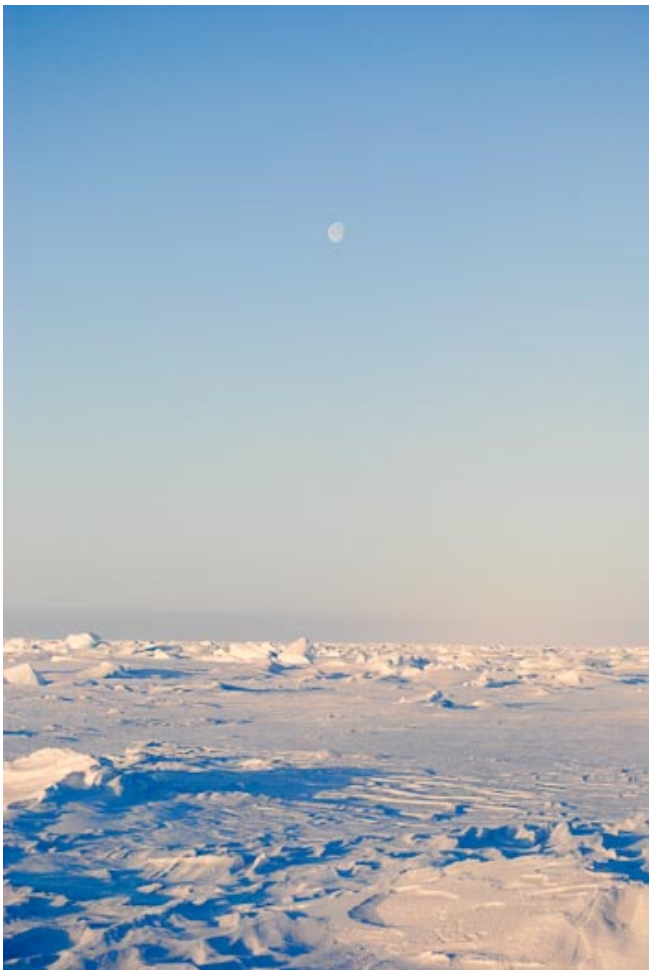
Second, the Arctic Ocean can't absorb CO_2 when it's completely covered in ice. Ice cover means the ocean isn't in touch with the atmosphere. S all-you-can-eat-dissolved-gas buffet for algae and phytoplankton, it stays in the atmosphere and heats things up.

Carbon dioxide has a natural enemy in the form of ozone, earth's most abundant oxidizer. Ozone is ambient in earth's surface atmosphere. It als which got a lot of press in the mid-90's but was then eclipsed by the popularity of whale conversation. Ozone and whales are no longer on speak

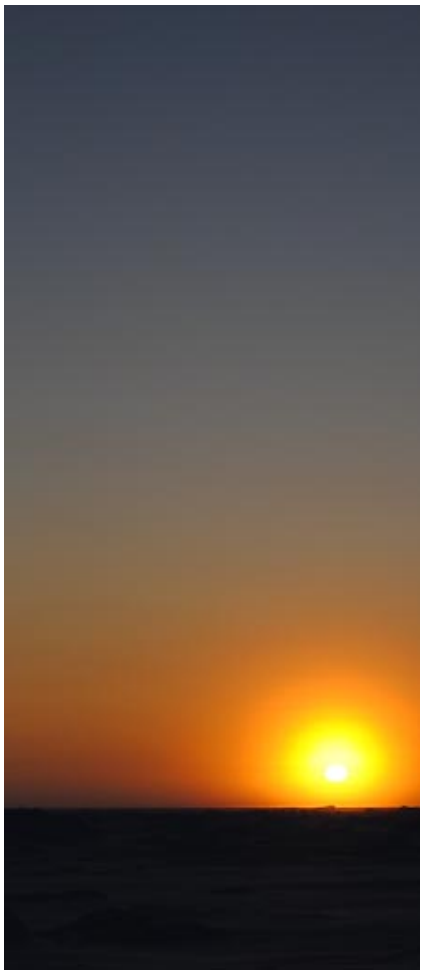
Ozone protects earth from the harmful UV rays of the sun. Below its eponymous layer, ozone is also responsible for cleaning pollutants from the from harmful pollutants and renders them into less harmful chemicals. Think of ozone as an Arctic superhero.

Every superhero has his or her weakness. Achilles has his heel. Superman has his Kryptonite. Ozone has its bromine monoxide.

Every spring in the Arctic, bromine monoxide in sea ice causes O_3 levels deplete to zero through a catalytic cycle. BrO combines with elemental then reacts with ozone to produce BrO and elemental oxygen. The cycle repeats until ozone levels completely deplete.



During the day, the Arctic icescape resembles the monochromatic surface of the moon.



At night, color fills the sky.

While ozone depletes, mercury enters the polar ecosystem from volcanic activity and human production. It also drifts into polar seas from contan It's what causes that little pang of concern in the back of your mind every time you eat a piece of tuna.

With reduced sea ice cover and no ozone to ward it off, the mercury enters ocean water and invades the earth's food chain, risking biological ha teasers like "Think that sashimi is delectable? Well, it will probably kill you. More in five minutes."

Carlson's Obuoy will monitor CO_2, O_3, and BrO to improve the understanding of how sea ice cover affects these interrelated processes.

The Beaufort Gyre Circus Spectacular comes with real results, not just sticky sno-cone hands and a $15 commemorative mug that you didn't wa

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