ScienceNews

Arctic Ocean hosts weird freshwater pond

Odd, persistent winds prevent river inputs from mixing with the sea

By Janet Raloff
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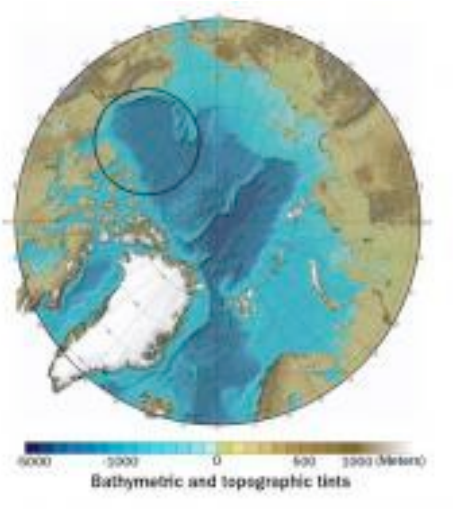

GETTING FRESHFreshwater has been accumulating in the Beaufort Gyre, a clockwise circulation pattern in the Arctic Ocean. The gyre is largely centered over the Canadian Basin (circled region).CLAMER

As rivers empty into seas, freshwater mixes into the vast briny depths to replace water lost to evaporation. Or that's what's supposed to happen. But for the past dozen years, scientists now report, a large share of river inflows and sea-ice melt within a large expanse of the Arctic Ocean has effectively pooled with little mixing.

An unusual and persistent pattern of clockwise winds has corralled at least 7,500 cubic kilometers of freshwater within the Beaufort Gyre off northern Canada, reports Laura de Steur, a physical oceanographer with the Royal Netherlands Institute for Sea Research in Texel. The freshwater pool is roughly twice the volume of Africa's Lake Victoria, one of the largest freshwater bodies in the world.

Ordinarily, wind patterns might foster periods of freshwater accumulation or heavy mixing on scales of no more than five to eight years, de Steur says.

Although her team has quantified the freshwater volume as though it exists as a salt-free pool floating above normal seawater, the pool has mixed somewhat throughout the affected zone, which in places reaches a depth of 27 meters. So the water "would be salty if you tasted it," she acknowledges.

But the persistent and growing magnitude of this not-very-salty accumulation raises several concerns, notes Carlo Heip, who directs the Texel-based institute and coordinates Project CLAMER — short for Climate Change and European Marine Ecosystem Research. CLAMER, a collaboration of 19 research institutes in 11 European nations, reported its data quantifying the Beaufort Gyre's freshening on April 5.

"Freshwater is not really something that marine organisms can tolerate," Heip notes. If drifting plankton — the base of the marine food chain — run into this freshened pool of water, "you could expect that there would be very large mortality," the marine biologist explains.

To date "we've not observed that," he adds. Then again, he cautions, "We haven't been looking for it."

Of potentially greater concern, Heip says, is what this pool of water could do if and when it ultimately disperses into the North Atlantic. A large release of freshwater could tinker with what's known as the North Atlantic heat conveyor belt — vast currents that drive the circulation of water throughout the world's oceans. Heip points to computer simulations that indicate this conveyor belt could slow if too much freshwater dumps into the northern Atlantic at any one time. Slowing these currents could alter their path, he explains — and even, eventually, lead to a cooling of winter temperatures in portions of the Northern Hemisphere.

CLAMER's data on the Arctic's freshening have been submitted for publication. But Benjamin Rabe of the Alfred Wegener Institute for Polar and Marine Research in Bremerhaven, Germany, sees no surprises in CLAMER's data. Rabe headed an international team that reported on the Beaufort Gyre's freshening in the February *Deep Sea Research I.*

Rabe's group estimated the corralling of freshwater to total some 8,400 cubic kilometers — a volume equal to a 20 percent addition to the freshwater that resides in the Arctic's water and sea ice. "So that already tells you this [recent accumulation] is not negligible," Rabe says. Rabe's estimate is also equal to the amount of Arctic freshwater normally spewed into the North Atlantic in any given year.

If the freshened pool of Arctic water were to break up and flush into the Atlantic, no one knows for sure how it would impact the heat conveyor belt, Rabe says. But a large body of research "suggests that it would have some significant influence," the physical oceanographer says. "So that's why it's important we study this."

Too much freshwater entering the North Atlantic "certainly will alter temperature and weather patterns substantially," says James C. McWilliams of UCLA. But that would require "an enormous amount of water," he adds — far more than appears to have accumulated in the Arctic so far. "Until such time as that pool might get much bigger without draining, I think it sounds like a little deal," he says — at least in terms of a climate threat.