

Getting Fresh: Will a Warming Climate Disrupt the Gulf Stream and Other Essential Ocean Currents?

If the melting of the polar ice caps injects great amounts of freshwater into the world's oceans, climate scientists fear that the influx could affect currents enough to drastically change the weather on land

Dear EarthTalk: If the ice caps are melting, what is happening to the salt content of the oceans? And might this contribute to weather patterns or cause other environmental problems?

—George Boyer, via e-mail

It's true that the melting of the polar ice caps as a result of global warming is sending large amounts of freshwater into the world's oceans. Environmentalists and many climate scientists fear that if the climate heats up fast enough and melts off the remaining polar ice rapidly, the influx of freshwater could disturb ocean currents enough to drastically change the weather on the land as well.

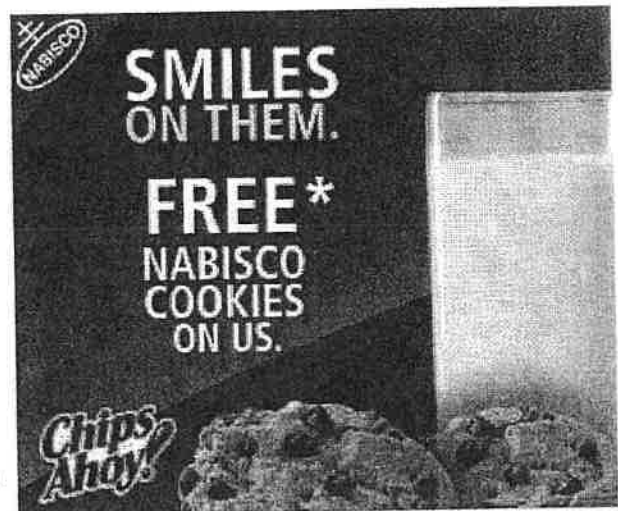
The Gulf Stream, a ribbon of ocean water that delivers heat from the tropics up to the North Atlantic, keeps northeastern U.S. and northwestern Europe weather much milder than other areas at the same latitude around the globe. In theory, less salt in the ocean could stall out the Gulf Stream and rob some of the world's greatest civilization centers of their natural heating source, plunging the two continents into a cold snap that could last decades or longer—even as the rest of the globe warms around them.

The Gulf Stream keeps running because the warmer water travelling north is lighter than cold water, so it floats on top and keeps moving. As the current approaches the northern Atlantic and discharges its heat, it grows denser and sinks, at which point it flows back to the south, crossing under the northbound Gulf Stream, until it reaches the tropics to start the cycle all over again. This cycle has allowed humans and other life forms to thrive across wide swaths of formerly frozen continents over thousands of years. But if too much dilution occurs, the water will get lighter, idling on top and stalling out the system.

Some scientists worry that this grim future is fast approaching. Researchers from Britain's National Oceanography Center have noticed a marked slowing in the Gulf Stream since the late 1950s. They suspect that the increased release of Arctic and Greenland meltwater is to blame for overwhelming the cycle, and fear that more warming could plunge temperatures significantly lower across land masses known as some of the most hospitable places for humans to live.

Of course—not surprisingly—others have noted a contradictory trend: Some parts of the world's oceans are getting saltier. Researchers from the UK's Met Office and Reading University reported in a recent issue of the peer-reviewed journal *Geophysical Research Letters* that warmer temperatures over southerly sections of the Atlantic Ocean have significantly increased evaporation and reduced rainfall from Africa to the Caribbean in recent years, concentrating salt in the water that's left behind. In fact, the Atlantic in this region is about 0.5 percent saltier than it was four decades ago.

But given how little we really know about the future effects of our carbon loading of the atmosphere, calling these two trends contradictory might be premature—as the two regions of ocean interact with one another and are part of a larger whole. Looking instead at the big picture, it's clear that climate change is already having a relatively large effect on the world's oceans by fundamentally altering evaporation and precipitation cycles. Only time will tell how dramatic the results of these changes will be.



Name/Period/Date

Getting Fresh:

Will a Warming Climate Disrupt the Gulf Stream and Other Essential Ocean Currents?

1. What is a potential outcome of melting polar ice caps?
2. How does the Gulf Stream influence climate?
3. How has the Gulf Stream changed in the last 50 years?
4. Where has salinity been increasing in the oceans?
5. What do you conclude from the article?