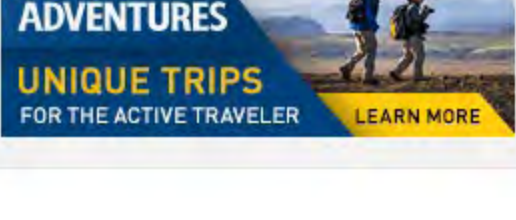




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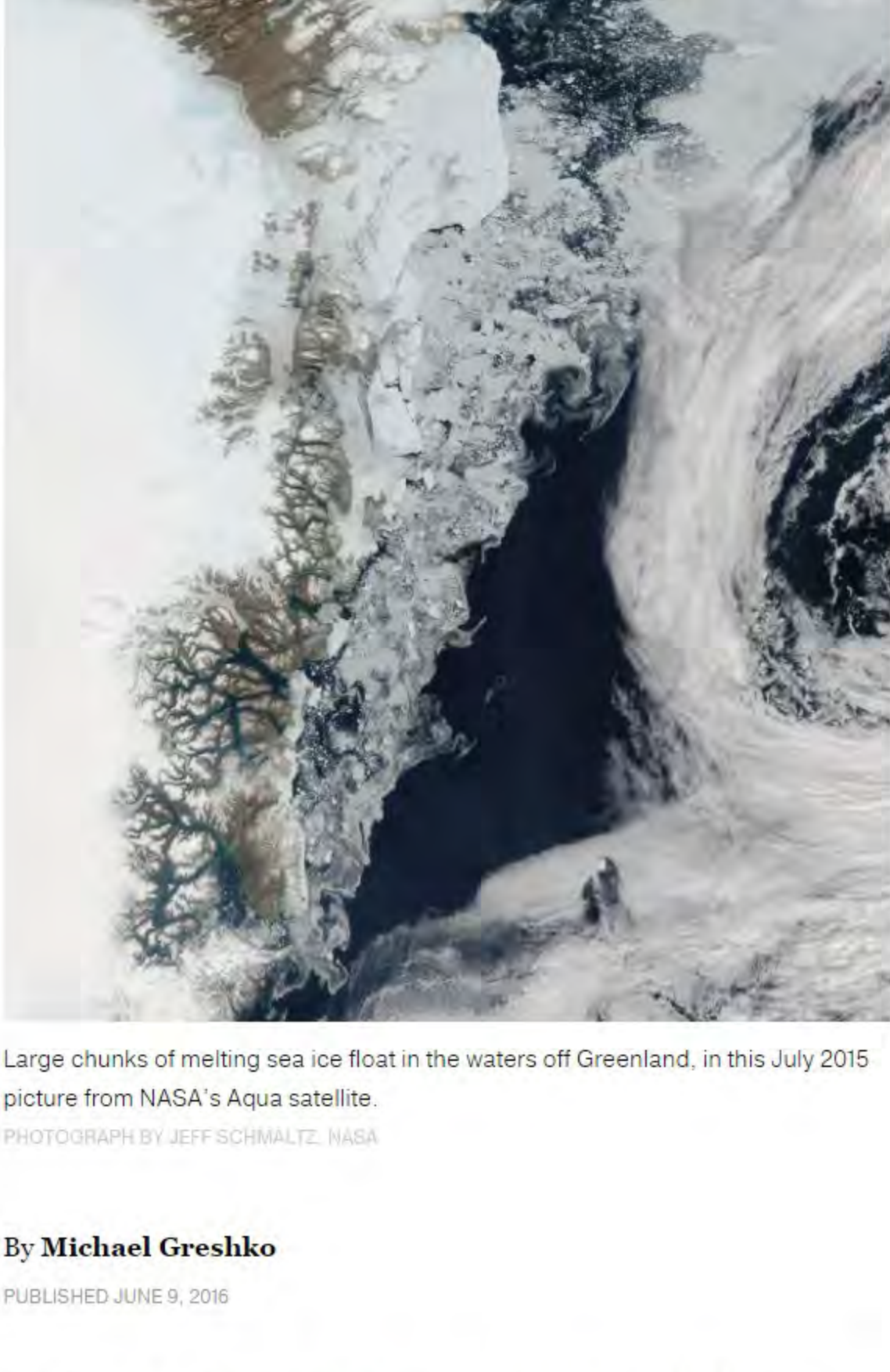
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Record Greenland Melting Caused by Surprising Feedback Loop

As Arctic sea ice extent hits a record May low, a new study shows how melting changes Greenland's weather, with far-reaching consequences.



Large chunks of melting sea ice float in the waters off Greenland, in this July 2015 picture from NASA's Aqua satellite.
PHOTOGRAPH BY JEFF SCHMALTZ, NASA

By **Michael Greshko**
PUBLISHED JUNE 9, 2016

Two days after Arctic sea ice hit a new record low extent for May, a new study hints at how this accelerating trend could make melting in Greenland even worse, with serious consequences for global climate and sea level rise.

Satellite observations published by the [U.S. National Snow and Ice Data Center](#) on Tuesday reveal that Arctic sea ice covered an area of just 4.63 million square miles (12 million square kilometers). That's about 5 percent lower than the previous record low, set in May 2004, and more than 10 percent lower than the average sea ice extent from 1981 to 2010.

"It's pretty worrisome," says climate scientist [Jennifer Francis](#) of Rutgers University. "We're in uncharted territory, in terms of the human experience."

May 2016, the fourth month this year to set a monthly record low, also saw ice melting far faster than historical averages. This past month, the Arctic lost some 23,600 square miles (61,000 square kilometers) of ice per day, about 30 percent faster than the long-term average of 18,000 square miles (46,600 square kilometers) per day.

The melting of Arctic sea ice poses dangerous long-term threats to climate because sea ice plays a huge role in reflecting solar radiation away from Earth. As climate change warms the oceans and melts the sea ice, the Arctic becomes darker on average, increasing its ability to absorb more heat and causing further warming of the oceans—a runaway feedback loop called Arctic amplification.

And as the new study—published on Thursday in *Nature Communications*—shows, Arctic amplification may play a role in Greenland's melting ice, as well, potentially contributing to future sea level rise.

The study, authored by a team led by [Marco Tedesco](#) of Columbia University's Earth Institute, analyzed weather data to show that Greenland's record melting in the summer of 2015 was caused by unusual wobbles in the jet stream, the undulating, riverlike current of air that circles the Northern Hemisphere.

It's thought that by lessening the temperature difference between polar latitudes and more temperate regions, climate change can slow down the jet stream, and this slowdown could give the jet stream enough wiggle room to let it bend far more northward than it usually does. In fact, the study reveals the northernmost record of the jet stream ever observed.

The jet stream's wacky northern upswing formed a blocking event—a stable, clockwise-circulating weather pattern—that hovered over Greenland, drawing in warm, moist air from lower latitudes, which led to last summer's warm temperatures and shockingly high melting.

In and of itself, the study doesn't link back to Arctic amplification directly, but a recent flurry of climate science papers connects the rest of the dots. A study published on May 2, for instance, shows that blocking events have become significantly more common over Greenland since the 1850s because of climate change. Another—also published in May—definitively connects these weather patterns back to Arctic sea ice loss, via Arctic amplification.

"[Tedesco's] paper adds a piece to the puzzle," says Francis, who co-authored the paper connecting blocking events to sea ice loss. "It's a complicated puzzle—but it's really starting to come together."

And if Greenland's ice continues to melt, not only would it contribute to sea level rise, but also to changes in global ocean currents: As cool meltwater accumulates directly south of Greenland, it dilutes the cold, salty seawater of the north Atlantic, making it sink less rapidly—slowing down the Atlantic meridional overturning circulation (AMOC), a global circulation system that's key to transferring heat through the world's oceans.

In fact, a March 2015 study in *Nature Climate Change* illustrated that climate change already slowed down the AMOC throughout the 20th century—setting the stage for future climatic woes, if exceptional sea ice melting like May's continues in the future.

Follow [Michael Greshko](#) on [Twitter](#).

Correction: A sentence in an earlier version of this story incorrectly referred to the Northern Hemisphere's jet stream as the Gulf Stream. Jet streams are narrow, river-like air currents in the upper levels of the atmosphere. The Gulf Stream is a powerful current in the Atlantic Ocean.

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Don Inodessa 2 days ago

A paragraph from the same story on the Washington Post website, explains the physics of the warming: "John Cappelen, a senior climatologist at the DMI, told The Washington Post that the warm weather was brought on by winds from the east that set up between high pressure over northeast Greenland and low pressure south of Greenland. When winds come from the east over Nuuk, they blow downhill, which leads to an increase in temperature. This is the result of adiabatic warming, where air is compressed from low pressure (at the top of a mountain) to high pressure (at sea level). It's the same kind of dry warmth that occurs as a result of Santa Ana winds in Southern California." Looks to me like the National Geographic folks have a little more of an agenda.

Many so called "scientist" will tell you that the ice age that began about 1.8 million years ago and flash froze animals in their tracks some with still fresh greens and flowers in their mouths, ended about 11 thousand years ago. Tell me something ... if these animals are still in ice covered areas how is the ice age over yet. Idiots! ... the ice age is still ending. Of course the planet is warming!

1 Like Reply

L Skeptic 4 days ago

The description of the jet stream's behavior and how it changes with global warming is repeatedly weak. If you look down from the north pole, the jet stream is 'normally' a wobbly, wiggly off-center ellipse that wanders around like a hat on a bald man's head. The jet stream is driven by the difference in temperature between the air above it and the air below it. When the wind of the jet stream is strongest it evens out and look less wiggly. When the temperature difference decreases, it more easily wiggles. This last fall and winter, the wiggles were so bad that the jet stream looked more like a starfish from the north pole. It was not only going higher than normal and thereby affecting Greenland, it was also dipping lower than normal, right down to the Gulf of Mexico down by Alabama. This is when the north eastern U.S. was blasted with snow. It was from moisture being sucked up from the Gulf that then immediately encountered the cold air on the other side of the jet stream. This same starfish am continued right on up past Greenland bringing it warmer than normal air from the south. Can't you afford to have someone make a little video that shows this? Or an animated GIF? The jet stream really isn't that mysterious and it has a huge impact on our weather (and flight times). It is relatively easy to create a computer model that generates an effect like the jet stream. It so far has been impossible to accurately predict more than a couple of days out what the jet stream is going to do next. Check out the mathematics of strange attractors for more details on why you can simulate something that looks like a jet stream without being able to predict exactly what is going to happen next.

Like Reply

Deb Werner 5 days ago

@L Skeptic When the earthquake/tsunami happened in Indonesia, the island of Japan moved: not much but enough. At that time, I told friends and family, anyone that would listen to expect changes in the weather patterns in the next few years. That was 2003. When Japan had their huge earthquake, the island moved feet. You don't think that could have affected the jet stream and how it went over the mountains of Japan? Mere inches changed the pattern. What did feet do? The planet is doing what she always has done. 2003 was a burp. JMO

Like Reply

Rose S. 4 days ago

The massive dilution of fresh water into polluted ocean waters will be a beneficial affect of this ice melt era.

Like Reply

Sharon Richards Weiser 4 days ago

What follows is a quote from your article above:

Greenland's record melting in the summer of 2015 was caused by unusual wobbles in the Gulf Stream, the undulating, riverlike current of air that circles the Northern Hemisphere.

End quote.

It does need to be gently pointed out the Gulf Stream is not an undulating riverlike current of air that circles the Northern Hemisphere.

The Gulf Stream is a critical key oceanic circulation warm water current originating in the Gulf of Mexico. It travels clockwise northward into the western Atlantic Ocean along the eastern coast of North America. At a little more than 40 degrees North it forks into two branches the northernmost current referred to as the Northern Drift continues north and east to Europe. Without the action of the Gulf Stream in place the climate of the British Isles and neighboring Europe would be noticeably colder. The southern branch of this warm water circulation is called the Canary Current. It travels easterly to begin recirculating off the coast of West Africa.

The undulating air current you mentioned must just be the high altitude air current often called the Northern Hemisphere Polar Jet Stream.

Since this is fairly common knowledge I'm not going to cite references to support this adjustment to your article except the following web links.

Encyclopedia Britannica

<http://www.britannica.com/place/Gulf-Stream>

https://en.wikipedia.org/wiki/Jet_stream

and

Wikipedia

https://en.wikipedia.org/wiki/Gulf_Stream

https://en.wikipedia.org/wiki/Jet_stream

Hope this helps clear up the confusion about the difference between the Gulf Stream and the Jet Stream.

The other important point to remember is that the melting of freshwater ice into the North Atlantic is effectively lowering the North Atlantic's salinity.

Eventually a new tipping point is created. We learned in elementary school fresh water freezes at a higher temperature than salt water. So after the tipping point is reached then most likely the heating feedback loop will be replaced with a cooling feedback loop and sooner than we might expect.

So please allow me to respectfully suggest the following two URLs:

Salinity = NASA Science

science1.nasa.gov/earth-science/oceanography/physical-ocean/salinity/

and

Thermohaline Circulation - Fact Sheet by Stefan Rahmstorf

http://www.pik-potsdam.de/~stefan/thc_fact_sheet.html

Sincerely hope this helps a little bit...

Like Reply

Michael Greshko 4 days ago

@Sharon Richards Weiser Thank you very much for catching that! As you can see by the rest of the article, we clearly meant the jet stream. We regret the error.

Like Reply



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