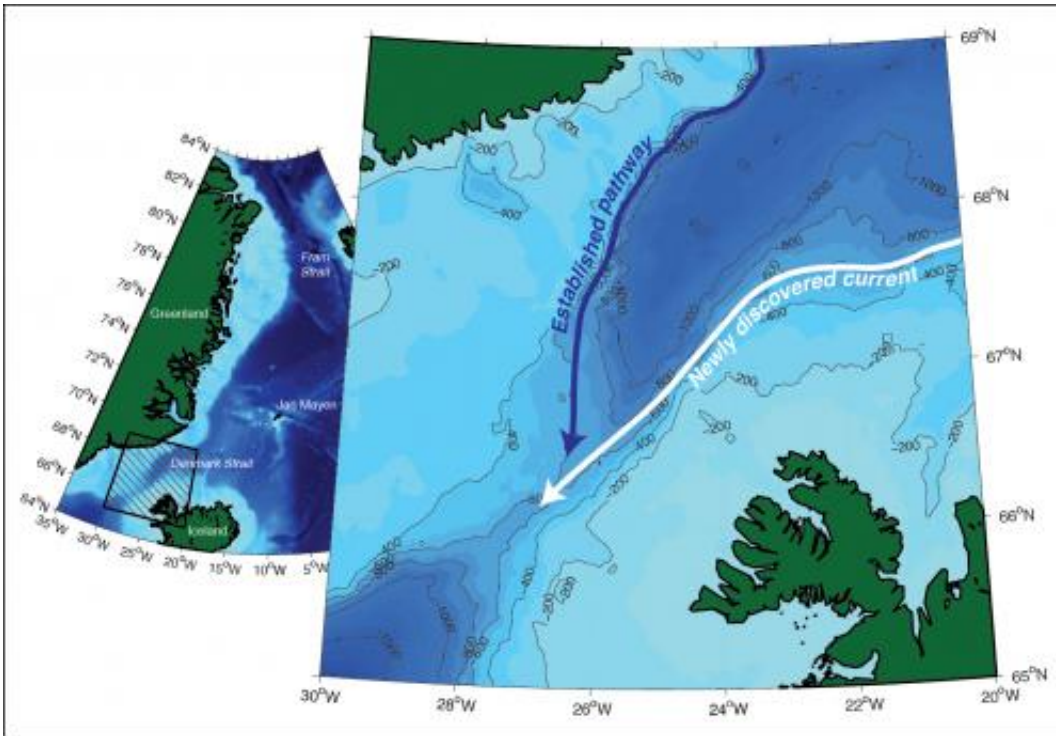


Researchers discover Icelandic current, change North Atlantic climate picture

August 21 2011



Northern Denmark Strait showing newly discovered deep current, in relation to known pathway. Credit: WHOI

An international team of researchers, including physical oceanographers from the Woods Hole Oceanographic Institution (WHOI), has confirmed the presence of a deep-reaching ocean circulation system off Iceland that could significantly influence the ocean's response to climate change in previously unforeseen ways.

The current, called the North Icelandic Jet (NIJ), contributes to a key component of the Atlantic Meridional Overturning Circulation (AMOC), also known as the "great ocean conveyor belt," which is critically important for regulating Earth's climate. As part of the planet's reciprocal relationship between [ocean circulation](#) and climate, this conveyor belt transports warm surface water to [high latitudes](#) where the water warms the air, then cools, sinks, and returns towards the equator as a deep flow.

Crucial to this warm-to-cold oceanographic choreography is the Denmark Strait Overflow Water (DSOW), the largest of the deep, overflow plumes that feed the lower limb of the conveyor belt and return the dense water south through gaps in the Greenland-Scotland Ridge.

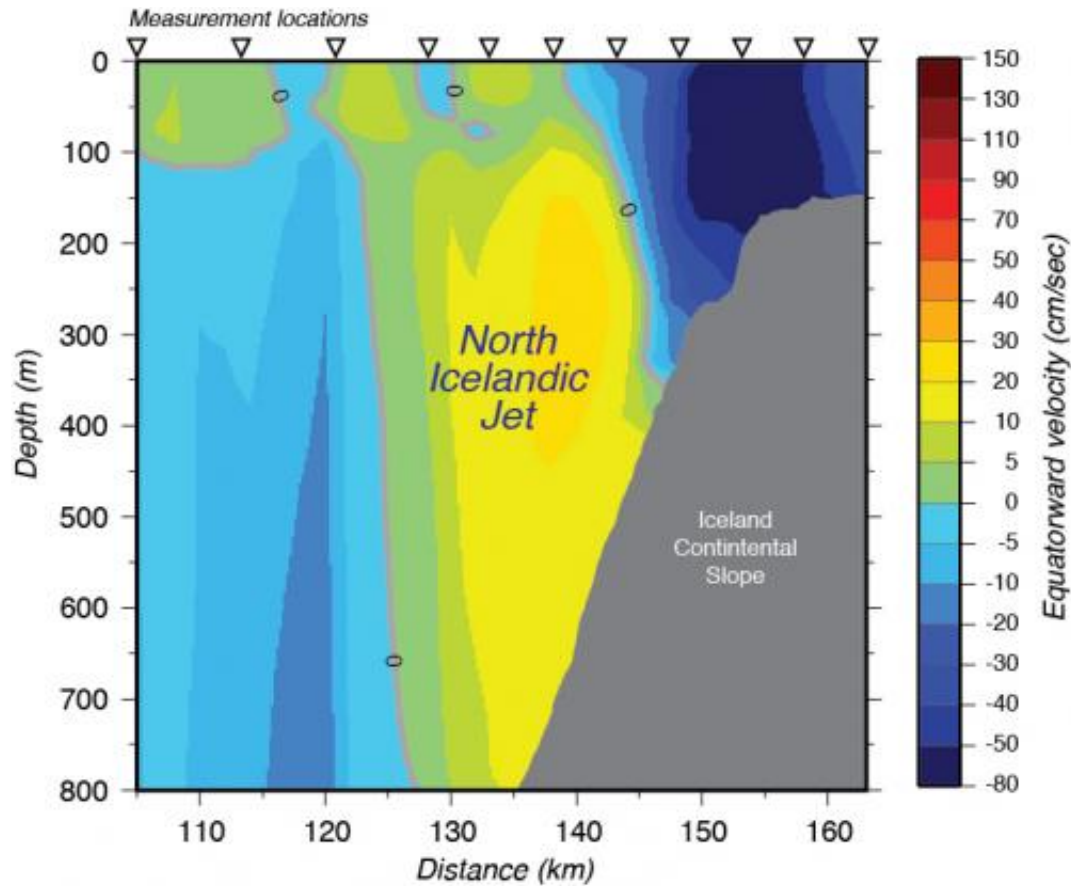
For years it has been thought that the primary source of the Denmark Overflow is a current adjacent to Greenland known as the East Greenland Current. However, this view was recently called into question by two oceanographers from Iceland who discovered a deep current flowing southward along the continental slope of Iceland. They named the current the North Icelandic Jet and hypothesized that it formed a significant part of the overflow water.

Now, in a paper published in the Aug. 21 online issue of the journal *Nature Geoscience*, the team of researchers—including the two Icelanders who discovered it—has confirmed that the Icelandic Jet is not only a major contributor to the DSOW but "is the primary source of the densest overflow water."

"In our paper we present the first comprehensive measurements of the NIJ," said Robert S. Pickart of WHOI, one of the authors of the study. "Our data demonstrate that the NIJ indeed carries overflow water into Denmark Strait and is distinct from the East Greenland Current. We show that the NIJ constitutes approximately half of the total overflow

transport and nearly all of the densest component.

The researchers used a numerical model to hypothesize where and how the NIJ is formed. "We've identified a new paradigm," he said. "We're hypothesizing a new, overturning loop" of warm water to cold.



The North Icelandic Jet in cross-section, adjacent to the continental slope of Iceland. Credit: WHOI

The results, Pickart says, have "important ramifications" for ocean circulation's impact on climate. Climate specialists have been concerned that the [conveyor belt](#) is slowing down due to a rise in global

temperatures. They suggest that increasing amounts of fresh water from melting ice and other warming-related phenomena are making their way into the northern North Atlantic, where it could freeze, which would prevent the water from sinking and decrease the need for the loop to deliver as much warm water as it does now. Eventually, this could lead to a colder climate in the northern hemisphere.

While this scenario is far from certain, it is critical that researchers understand the overturning process, he said, to be able to make accurate predictions about the future of climate and circulation interaction. "If a large fraction of the overflow water comes from the NIJ, then we need to re-think how quickly the warm-to-cold conversion of the AMOC occurs, as well as how this process might be altered under a warming [climate](#)," Pickart said.

"These results implicate local water mass transformation and exchange near Iceland as central contributors to the deep limb of the Atlantic Meridional Overturning Circulation, and raise new questions about how global ocean circulation will respond to future [climate change](#)," said Eric Itsweire, program director in the U.S. National Science Foundation (NSF)'s Division of Ocean Sciences, which funded the research.

The Research Council of Norway also funded the analysis of the data.

Pickart and a team of scientists from the U.S., Iceland, Norway, and the Netherlands are scheduled to embark on Aug. 22 on a cruise aboard the WHOI-operated R/V Knorr to collect new information on the overturning in the Iceland Sea.

"During our upcoming cruise on the Knorr we will, for the first time, deploy an array of year-long moorings across the entire Denmark Strait to quantify the NIJ and distinguish it from the East Greenland Current," Pickart said. "Then we will collect shipboard measurements in the

Iceland Sea to the north of the mooring line to determine more precisely where and how the NIJ originates."

Provided by Woods Hole Oceanographic Institution

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