North Atlantic warming tied to natural variability; but global warming may be at play elsewhere

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A Duke University-led analysis of available records shows that while the North Atlantic Ocean's surface waters warmed in the 50 years between 1950 and 2000, the change was not uniform. In fact, the subpolar regions cooled at the same time that subtropical and tropical waters warmed.

This striking pattern can be explained largely by the influence of a natural and cyclical wind circulation pattern called the North Atlantic Oscillation (NAO), wrote authors of a study published Thursday, Jan. 3, in *Science Express*, the online edition of the journal Science.

Winds that power the NAO are driven by atmospheric pressure differences between areas around Iceland and the Azores. "The winds have a tremendous impact on the underlying ocean," said Susan Lozier, a professor of physical oceanography at Duke's Nicholas School of the Environment and Earth Sciences who is the study's first author.

Other studies cited in the Science Express report suggest human-caused global warming may be affecting recent ocean heating trends. But Lozier and her coauthors found their data can't support that view for the North Atlantic. "It is premature to conclusively attribute these regional patterns of heat gain to greenhouse warming," they wrote.

"The take-home message is that the NAO produces strong natural variability," said Lozier in an interview. "The simplistic view of global

warming is that everything forward in time will warm uniformly. But this very strong natural variability is superimposed on human-caused warming. So researchers will need to unravel that natural variability to get at the part humans are responsible for."

In research supported by the National Science Foundation in the United States and the Natural Environment Research Council in the United Kingdom, her international team analyzed 50 years of North Atlantic temperature records collected at the National Oceanic Data Center in Washington, D.C.

To piece together the mechanisms involved in the observed changes, their analysis employed an ocean circulation model that predicts how winds, evaporation, precipitation and the exchange of heat with the atmosphere influences the North Atlantic's heat content over time. They also compared those computer predictions to real observations "to test the model's skill," the authors wrote.

Her group's analysis showed that water in the sub-polar ocean –- roughly between 45 degrees North latitude and the Arctic Circle –- became cooler as the water directly exchanged heat with the air above it.

By contrast, NOA-driven winds served to "pile up" sun-warmed waters in parts of the subtropical and tropical North Atlantic south of 45 degrees, Lozier said. That retained and distributed heat at the surface while pushing underlying cooler water further down.

The group's computer model predicted warmer sea surfaces in the tropics and subtropics and colder readings within the sub-polar zone whenever the NAO is in an elevated state of activity. Such a high NAO has been the case during the years 1980 to 2000, the scientists reported.

"We suggest that the large-scale, decadal changes...associated with the

NAO are primarily responsible for the ocean heat content changes in the North Atlantic over the past 50 years," the authors concluded.

However, the researchers also noted that this study should not be viewed in isolation. Given reported heat content gains in other oceans basins, and rising air temperatures, the authors surmised that other parts of the world's ocean systems may have taken up the excess heat produced by global warming.

"But in the North Atlantic, any anthropogenic (human-caused) warming would presently be masked by such strong natural variability," they wrote.

Source: Duke University