Study reveals causes for freshwater increase in oceans

August 25 2006

A new analysis of 50 years of changes in freshwater inputs to the Arctic and North Atlantic oceans may shed light on what's behind the recently observed increase in freshwater in the North Atlantic. University of Texas at Austin marine scientist Dr. Jim McClelland and his colleagues report their findings in the Aug. 25 issue of the journal *Science*.

The first-of-its-kind, big-picture effort reveals that freshwater increases from Arctic Ocean sources—rivers, ice melt and precipitation—appear to be highly linked to a fresher North Atlantic.

"Our synthesis shows that the amount of excess freshwater coming into the oceans matches up with the amount of excess freshwater that's being

stored there," says McClelland, assistant professor at the Marine Science Institute in Port Aransas, Texas. "Normally, oceanographers would think these changes in freshwater storage are associated with changes in ocean circulation and mixing patterns, but this shows that rivers, ice melt and precipitation have a large influence."

Scientists contend that a significant increase of freshwater flow to the Arctic Ocean could alter global ocean circulation and influence the planet's climate. One of the potential effects could be a cooling of Northern Europe within this century.

"The high-latitude freshwater cycle is one of the most sensitive barometers of the impact of changes in climate and broad-scale atmospheric dynamics because of the polar amplification of the global warming signal," says Dr. Bruce Peterson, senior scientist at Marine Biological Laboratory (MBL). "It's easiest to measure these changes in the Arctic and the better we understand this system, the sooner we will know what is happening to the global hydrologic cycle."

The multidisciplinary team of scientists led by Peterson calculated annual and cumulative freshwater input for the latter half of the 20th century. The scientists compared the fluxes to measured rates of freshwater accumulation in the North Atlantic during the same time period.

They found that increasing river discharge and excess net precipitation on the ocean contributed the most freshwater (about 20,000 cubic kilometers) to the Arctic and high-latitude North Atlantic. Sea ice reduction provided about 15,000 cubic kilometers of freshwater, followed by about 2,000 cubic kilometers from melting glaciers.

The sum of inputs from all of the freshwater sources analyzed matched the amount and rate at which freshwater accumulated in the North

Atlantic during much of the period from 1965 through 1995.

“This synthesis allows us to judge which freshwater sources are the largest, but more important shows how the significance of different sources have changed over the past decades and what has caused the changes,” says Peterson.

In recent years, much attention has been given to the observed freshening of the Arctic Ocean and North Atlantic and the potential impacts it may have on the Earth’s climate. Models predict that a significant increase of freshwater flow to the Arctic Ocean could slow or halt the Atlantic Deep Water formation, a driving factor behind the great “conveyor belt” current that is responsible for redistributing salt and thermal energy around the globe, influencing the planet’s climate.

“We’re observing changes that climate change scientists have been modeling for a while,” adds McClelland, “particularly those scientists that have been modeling increased net precipitation in response to global warming.”

“Theory is meeting reality and that’s a major, exciting aspect to this work.”

Source: University of Texas at Austin