Arctic summer wind shift could affect sea ice loss and U.S./European weather, study says

October 11 2012

mage from the North Pole webcam shows (July 27, 2010) ponds created by the summer sea ice melt. Credit: NOAA

(Phys.org)—Changes in summer Arctic wind patterns contribute not only to an unprecedented loss of Arctic sea ice, but could also bring about shifts in North American and European weather, according to a new NOAA-led study published today in *Geophysical Research Letters*.

A research team led by James Overland, Ph.D., of NOAA's Pacific Marine Environmental Laboratory in Seattle, Wash., examined the wind patterns in the subarctic in the early summer between 2007 and 2012 as compared to the average for 1981 to 2010. They discovered that the previously normal west-to-east flowing upper-level winds have been

replaced by a more north-south undulating, or wave-like pattern. This new wind pattern transports warmer air into the Arctic and pushes Arctic air farther south, and may influence the likelihood of persistent weather conditions in the mid-latitudes.

"Our research reveals a change in the summer Arctic wind pattern over the past six years. This shift demonstrates a physical connection between reduced Arctic sea ice in the summer, loss of Greenland ice, and potentially, weather in North American and Europe," said Overland, an oceanographer who leads the laboratory's Coastal and Arctic Research Division.

The shift provides additional evidence that changes in the Arctic are not only directly because of global warming, as shown by warmer air and sea temperatures, but are also part of an "Arctic amplification" through which multiple Arctic-specific physical processes interact to accelerate temperature change, ice variability, and ecological impacts.

The study, entitled "The Recent Shift in Early Summer Arctic Atmospheric Circulation," was co-authored by scientists from Rutgers University in New Jersey, the University of Sheffield in the United Kingdom, and the Joint Institute for the Study of the Atmosphere and Ocean, a partnership of NOAA and the University of Washington. It can be found online.

Before 2007, typical summer winds at the Arctic surface were more variable but tended to flow from the west. Since then, the summer winds were found to blow more consistently from the south, through the Bering Strait, across the North Pole, and out toward the Atlantic Ocean relative to the mean pattern in previous decades. These winds transfer additional heat from the south toward the North Pole and push sea ice across the Arctic and out into the Atlantic Ocean, contributing to record losses of summer sea ice. The 2012 Arctic summer sea ice minimum far

surpassed 2007 as the lowest on record.

"Higher pressure over the North American continent and Greenland is driving these changes in the early summer wind patterns," said Edward Hanna, Ph.D, of the University of Sheffield.

These shifts in winds not only affect weather patterns throughout the Arctic but are also thought to influence weather in Greenland, the United States, and western Europe. Understanding such links is an ongoing area of research, the scientists said. The effects of Arctic amplification will increase as more summer ice retreats over coming decades. Enhanced warming of the Arctic affects the jet stream by slowing its west-to-east winds and by promoting larger north-south meanders in the flow. Predicting those meanders and where the weather associated with them will be located in any given year, however, remains a challenge.

The researchers say that with more solar energy going into the Arctic Ocean because of lost ice, there is reason to expect more extreme weather events, such as heavy snowfall, heat waves, and flooding in North America and Europe but these will vary in location, intensity, and timescales.

"What we're seeing is stark evidence that the gradual temperature increase is not the important story related to climate change; it's the rapid regional changes and increased frequency of extreme weather that global warming is causing. As the Arctic warms at twice the global rate, we expect an increased probability of extreme weather events across the temperate latitudes of the northern hemisphere, where billions of people live," said Jennifer Francis, Ph.D, of Rutgers.

More information: www.agu.org/journals/gl/gl1219 … 268/2012GL053268.pdf

Provided by NOAA Headquarters