



Earth Observatory

[Home](#) [Image of the Day](#) [Feature Articles](#) [News](#) [Natural Hazards](#) [Global Maps](#) [Blogs](#)

 Search

Browse by Topic

[NASA News](#)

[Headlines](#)

[Research](#)

[Media Alerts](#)

Arctic Oscillation's Impact On Northern Climate Studied

FROM: Vince Stricherz

(206) 543-2580

vinces@u.washington.edu

DATE: Dec. 16, 1999

Evidence mounts for Arctic Oscillation's impact on northern climate

SAN FRANCISCO - A growing body of evidence indicates that a climate phenomenon called the Arctic Oscillation has wide-ranging effects in the Northern Hemisphere and operates differently from other known climate cycles.

The evidence indicates the acceleration of a counterclockwise spinning ring of air around the polar region could be responsible for warmer winters in Scandinavia and Siberia, thinning of the stratospheric ozone layer, and significant changes in surface winds that might have contributed to Arctic ice thinning.

"These changes at high latitudes could be part of human-induced climate change," said John M. Wallace, a University of Washington atmospheric sciences professor.

Wallace, David Thompson, a doctoral student conducting research at the UW-based Joint Institute for the Study of the Atmosphere and Oceans, and Mark Baldwin, a research scientist with Northwest Research Associates Inc. of Bellevue, Wash., discussed the implications of the Arctic Oscillation during a news conference today at the American Geophysical Union's fall meeting in San Francisco.

The Arctic Oscillation is a seesaw pattern in which atmospheric pressure at polar and middle latitudes fluctuates between positive and negative phases. The negative phase brings higher-than-normal pressure over the polar region and lower-than-normal pressure at about 45 degrees north latitude. The positive phase brings the opposite conditions, steering ocean storms farther north and bringing wetter weather to Alaska, Scotland and Scandinavia and drier conditions to areas such as California, Spain and the Middle East.

In recent years the Arctic Oscillation has been mostly in its positive phase, research has shown. "In its positive phase," Thompson said, "frigid winter air doesn't plunge as far south into North America," meaning warmer winters for much of the United States east of the Rocky Mountains, while areas such as Greenland and Newfoundland tend to be colder than normal.

The existence of a virtually identical phenomenon in the Southern Hemisphere, the Antarctic Oscillation, has helped scientists understand the Arctic Oscillation. The Antarctic Oscillation affects the even faster spinning ring of air that encircles the South Pole. It is believed the presence of large land masses in the north prevents the ring of air flowing around the Arctic from becoming as strong as that in the Antarctic.

During the winter, the Arctic Oscillation extends up through the stratosphere, 6 to 30 miles above the Earth's surface. "The stratosphere's effect on the Arctic Oscillation's behavior appears particularly intriguing because it is opposite of what happens in other major climate systems," Baldwin said. When the oscillation changes phases, the strengthening or weakening of the circulation around the pole tends to begin in the stratosphere and work its way down through lower levels of the atmosphere. In phenomena such as El Nino in the equatorial Pacific Ocean, the changes begin in the ocean and work their way up through the atmosphere.

Stratosphere cooling in the last few decades has caused the counterclockwise circulation around the North Pole to strengthen in winter. In turn, the belt of westerly winds at the surface along 45 degrees north latitude has shifted farther north, the scientists said, sweeping larger quantities of mild ocean air across Scandinavia and Russia and bringing balmy winters over most of the United States as well.

The Arctic Oscillation is an alternate view of what many scientists call the North Atlantic Oscillation, the researchers said. Year-to-year fluctuations in the North Atlantic Oscillation are thought to be prompted primarily by changes in the ocean, as with El Nino. However, Wallace, Thompson and Baldwin argue that the North Atlantic Oscillation is in fact part of the Arctic Oscillation, which involves atmospheric circulation in the entire hemisphere. They say the trend toward a stronger, tighter circulation around the North Pole could be triggered just as well by processes in the stratosphere as by those in the ocean. The trend in the Arctic Oscillation, they said, has been reproduced in climate models with increasing concentrations of greenhouse gases.

[subscribe to the Earth Observatory](#) [feeds](#) · [contact us](#)

[about the Earth Observatory](#) · [image use policy](#) · [privacy policy & important notices](#)

the Earth Observatory is part of the EOS Project Science Office located at NASA Goddard Space Flight Center

webmaster: Paul Przyborski · NASA official: Lorraine Remer

last updated: January 3, 2010