



THE ARCTIC INSTITUTE OF NORTH AMERICA

media release



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Climate modeling systems would benefit from increased scientific input

SEPTEMBER 2009 – There is an old saying that too many cooks spoil a stew, but nothing could be further from the truth in the world of climate modeling. In fact, two climate researchers are calling for increased input from scientists in order to build even better climate modeling systems.

Climate models suggest that before the end of this century, the Earth will be warmer and the Arctic Ocean will have less ice if greenhouse gas concentrations continue to rise. True to the models, average global temperatures are increasing and the extent of Arctic sea ice is diminishing. However, these changes are unfolding much faster than models predict.

John Turner, a research scientist with the British Antarctic Survey, and James Overland, with the National Oceanic and Atmospheric Administration in Seattle, write in a recent online issue of *Polar Research* that incorporating improved ocean, atmosphere and ice processes into models is a challenging but necessary step to obtaining more accurate simulations.

“Climate models are the only tool we have to understand such complex systems. We need better observations and better models,” said Turner. “A few decades ago we thought that if we had faster computers we could model more accurately. But we use the most powerful computers on the planet and even simulating past changes is still a challenge.”

The issue is not just the size and speed of the computers – it’s that the climate system is complex and chaotic. Modeling programs must be able to reproduce the vast range of interactions between the atmosphere, ocean and sea and glacial ice. To verify models, researchers require huge amounts of environmental data and unfortunately that information has not always been available. Satellites have only been collecting images of sea ice since 1979 and observations about the ocean have only been available for a few decades.

The Antarctic provides a good example of how more information can change a projection.

Just a few years ago, scientists were predicting that the southern continent would be warmer because of climate change. But the Antarctic is slightly colder than it was a few decades ago and the sea ice extent is increasing. This has largely been a result of the ‘ozone hole’ which is temporarily masking the impact of rising greenhouse gas concentrations in the Antarctic.

“When the ozone hole was discovered, we thought we’d get more radiation coming through and it would be more dangerous for people and animals. We knew all about that,” says Turner.

But researchers didn't know that the increased radiation would bolster the strength of the winds that circle the Antarctic by 10 to 15%, effectively blocking the region from incoming tropical heat. Models that do not accurately simulate ozone loss cannot reproduce the cooling trend.

There's also natural variability in climate patterns that is hard to predict. Overland notes that in June and July, warm winds and clear skies in the Arctic were melting sea ice at record-breaking speed. In August, however, the winds unexpectedly shifted and the melt rate slowed.

"There's an interaction between natural variability and the emerging global warming trend that's difficult to account for," says Overland.

Still, modeling systems have been improving. Original models only simulated the atmosphere. In the late 70s, the oceans were added, followed by volcanic dust, carbon and, now, biological systems (such as forest and grassland cover).

As well, the nature of the data continues to be refined. Altimeters can now measure the height of the Greenland and Antarctic ice sheets to within a few centimeters.

"Now we have a lot of information on the atmosphere –better ocean information. It's getting better continuously," says Turner.

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British Antarctic Survey is a world leader in research into global issues in an Antarctic context. It is the UK's national operator and is a component of the Natural Environment Research Council. It has an annual budget of around £40 million, runs nine research programmes and operates five research stations, two Royal Research Ships and five aircraft in and around Antarctica. More information about the work of the Survey can be found at www.antarctica.ac.uk

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