Atmospheric Circulation Response to Arctic Sea Ice Loss

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The decline of Arctic sea ice is an integral part of anthropogenic climate change. Sea ice loss is already having a significant impact on Arctic communities and ecosystems. Its role as a cause of climate changes outside the Arctic has also attracted much scientific interest. Evidence is mounting that Arctic sea ice loss can affect weather and climate throughout the Northern Hemisphere. This presentation will focus on the atmospheric circulation response to projected Arctic sea ice loss, and has two parts.

In the first part, we will review progress in modelling the response to Arctic sea ice loss, identifying both consistencies and discrepancies across climate models. The remote impacts of Arctic sea ice loss can only be properly represented using models that simulate interactions among the ocean, sea ice, land and atmosphere. A synthesis of six such experiments with different models shows consistent hemispheric-wide atmospheric warming, strongest in the mid-to-high latitude lower troposphere; an intensification of the wintertime Aleutian Low and, in most cases, the Siberian High; a weakening of the Icelandic Low; and a reduction in strength and southward shift of the midlatitude westerly winds in winter. The atmospheric circulation response seems to be sensitive to the magnitude and geographic pattern of sea ice loss and, in some cases, to the background climate state.

In the second part, results will be presented from new coupled ocean-atmosphere-land-ice model simulations using HadGEM2, in which Arctic sea ice loss was induced by reducing the sea ice albedo. These experiments have been designed to highlight the atmospheric response to Arctic sea ice loss commensurate with the United Nations target of limiting global warming to 2 °C above pre-industrial levels.

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