



The Rate of Change of the Arctic Sea Ice Cover: 1979-2003 Model Results

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Evidence from in situ data and satellite remote sensing suggests that Arctic sea ice cover has been decreasing in the last decades. Based on passive microwave satellite data, the record minimum in the Arctic sea ice extent was set in summer 2002 and closely followed in summer 2003. This suggests an accelerating downward trend and it is further supported by records from submarine sonar, drilling, and electromagnetic sounding as well as some model results. The decreasing sea ice cover through freshwater flux into the North Atlantic may affect the global ocean thermohaline circulation, the long-term ocean heat and salt transports and climate.

To investigate the variability of sea ice cover and associated freshwater fluxes into the North Atlantic we use a high resolution coupled ice-ocean model of the Pan-Arctic region forced with realistic atmospheric data for 1979-2003. Model results, validated against various observations, suggest that the rate of decrease of sea ice thickness and volume is larger than that of ice extent/concentration as determined from satellite data. The recent decrease of sea ice cover might be in part a result of a delayed oceanic effect at the ice-ocean interface, and in particular the upward heat fluxes, affected by the increased advection of summer Pacific and warm Atlantic waters into the Arctic Ocean during the 1990s. The decrease of the total sea ice volume affects the total freshwater content in the Arctic Ocean, which under certain regional climate regimes is advected via Fram Strait and the Canadian Arctic Archipelago out into the active convection regions of the northern North Atlantic.