



## **Arctic sea ice decline and its influence on shipping activity**

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Climate models simulations showing the decline in Arctic sea ice during the 21st century have led to widespread suggestions of corresponding increases in Arctic shipping activity. While logical, these suggestions are primarily based on simulations that only consider physical changes in sea ice cover and are not directly coupled to actual observed shipping activity. Here, we present the results of the first observational study that investigates the direct spatial linkage between sea ice and shipping activity over a long term 26-year period from 1990 to 2015 in the Canadian Arctic. Statistically significant sea ice concentration decline was apparent throughout the Canadian Arctic but corresponding statistically significant increases in shipping activity were only observed in the Hudson Strait (150-500 km traveled per year), the Beaufort Sea (40-450 km traveled per year), Baffin Bay (50-350 km traveled per year) and the Northwest Passage southern route (50-250 km traveled per year). Shipping activity was found to increase independently of sea ice changes in seasonal first-year ice regions (e.g. the Hudson Strait and the Northwest Passage southern route) but in the multi-year ice regions of the Beaufort Sea and the Northwest Passage northern route there was a statistically significant correlation (up to -0.6) between sea ice concentration and shipping activity although, very little shipping activity has actually occurred despite the persistence of low ice concentration since 2007. Overall, results of this study provide a benchmark for establishing more realistic future shipping scenarios based on the continued decline of Arctic sea ice.