



Increasing sea ice drift velocities in the Arctic Ocean, 1979-2005

V.K. Pavlov, O. A. Pavlova

Norwegian Polar Institute, Tromsø, Norway (pavlov@npolar.no / Phone: +47 77-750516 / Fax: +47 77-750501)

Monthly mean ice drift velocities, computed from Advanced Very High Resolution Radiometer (AVHRR), Scanning Multichannel Microwave Radiometer (SMMR), Special Sensor Microwave/Imager (SSM/I), and International Arctic Buoy Programme (IABP) buoy data (Polar Pathfinder Daily 25 km EASE-Grid Sea Ice Motion Vectors data set), are used to investigate the spatial and temporal variability and trends of the ice motion in the Arctic Ocean and Nordic seas during 27 years, from 1979 through 2005. The ice drift in the Arctic Ocean is characterized by strong seasonal and inter-annual variability. Following seasonal changes in the wind in the Arctic, sea ice drift velocities reach maxima in December and minima in June. The average value of the annual cycle amplitude of the ice drift velocities in the Arctic Ocean is on the order of 2-3 cm/s. The maximal values of the annual cycle amplitude we find in the Fram Strait (9-10 cm/s), the Beaufort Gyre (6-7 cm/s) and the northern part of the Barents Sea (5-6 cm/s). The results of combined statistical analysis of sea ice velocities and wind fields over the Arctic Ocean suggest that the seasonal changes of local wind are a predominant factor in the formation of the sea ice velocities annual cycle.

By analysing the inter-annual variability of the sea ice velocities, averaged for the entire Arctic Ocean, we can document a clear positive linear trend. Spatial distribution of the linear trend coefficients shows that, except in the central part of the Arctic Basin, where trends are slightly negative, other regions of the Arctic Ocean and Nordic seas have positive trends of the sea ice velocities. Maximum values of the positive trend, more than 1.5 cm/s per decade, were obtained in the Fram Strait and the northern part of the Barents Sea. Analysis of the trends of the inter-annual sea ice velocities variability in the different seasons shows that maximal values of the linear trend appear in winter (December-February) and minima in June-October. For summer months the

trend of the inter-annual sea ice velocities variability has negative values in the Beaufort Gyre and the northern part of the Chukchi Sea. Another very interesting feature of the inter-annual sea ice velocities variability is a well pronounced cycle with a period of 5.3 years. We show that this cycle is related to changes of the regime of the atmospheric circulation.

Based on the results of the analysis of sea ice conditions and atmospheric and oceanic driving forcings we suggest that the increase of the sea ice drift velocities in the Arctic Ocean is mostly related to the decrease of the ice concentration and ice thickness.