



## **Long-term variability of sea ice drift in the Arctic Ocean**

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Sea ice drift data ranging in time from the famous Nansen “Fram expedition” in the 1890s and followed by the collections of information from the Russian North Pole Stations, International Geophysical Year ice camps, International Arctic Buoy Program buoys and satellite-based products are analyzed focusing on the long-term changes present in the sea ice drift speeds and trajectories. The major focus of this study is to identify causes of variability and trends based on the observational data and model results. It is shown that the sea ice drift speed has a robust positive trend for both summer and winter seasons for at least the last 60 years. Three major factors are analyzed with greater details, namely, changes in: (i) wind stress, (ii) oceanic circulation, and (iii) characteristics of sea ice (ice thickness, surface and bottom roughness and internal ice stresses dependent on ice convergence under external forcing). It is found that wind stress (from NCEP/NCAR Reanalysis) has a significant positive trend with a maximum along the Transpolar Drift system. On the hand, the ocean currents associated with the Arctic Ocean thermohaline structure have accelerated as well and there is a substantial contribution to the increased ice drift speed from the changes in sea ice properties and mechanics (reduction in thickness, concentration and internal ice stresses).