

Arctic Sea Ice Motion from Wavelet Analysis of SSM/I Data

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Abstract

Wavelet analysis of DMSP (Defense Meteorological Satellite Program) SSM/I (Special Sensor Microwave/Imager) 85GHz data from October of 1992 to March of 1993 is used to obtain daily sea ice drift information for the Arctic region. The derived maps of sea ice drift provide both improved spatial coverage over the existing array of Arctic Ocean buoys and better temporal resolution over techniques utilizing satellite data from SAR (Synthetic Aperture Radar). Comparisons of the derived ice velocities from SSM/I with ice velocities derived from buoys show good quantitative agreement. Therefore, the ice velocities derived from the wavelet analysis of SSM/I are suitable for validation of the ice velocities derived from an ice-ocean interaction model and for data assimilation input to a model. For demonstration purposes, the ice velocities from SSM/I are compared with the ice velocities derived from a coupled Arctic ice-ocean system with the comparison revealing the similarities of the general circulation patterns and significant ice velocity differences between the two. These results indicate where the model results need to be improved; with the expectation that the data assimilation of the model with ice velocities derived from SSM/I data would improve the model results. This wavelet analysis procedure is robust and can make a major contribution to the understanding of ice motion over-large areas at relatively high temporal resolutions and would help to improve our current knowledge of sea ice drift and related processes through the data assimilation of ice-ocean numerical modeling.