

Submission for ERS Symposium in March in Florence:

Testing Sea Ice Motions from Sequential Passive Microwave Observations with ERS SAR and Buoy Ice Motions.

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Observing the motion of sea ice from space is rather analogous to observing wind

stress over the wet oceans: both provide surface forcing for modeling ocean dynamics. Ice motion is also directly provides the advective component of the equations governing the mass balance of the sea ice cover. Thus its routine observation from space is of great value to understanding ice and ocean behavior. We have estimated ice motion from sequential passive microwave imagery: both the 85 GHz channel of SSM/I and the 37 GHz channel of SMMR. The method, which has been well used previously, involves finding the spatial offset

that maximizes the cross-correlation of the brightness temperature fields over 100 kilometer patches in two images separated in time. The problems with using passive microwave imagery arise from its rather coarse spatial resolution of 12 km for the 85 GHz and 25 km for the 37 GHz data. The ice moves only about 10 km

per day. The time interval between tracking images must be chosen to allow the ice to move as far as possible without having the ice cover deform so strongly or the appearance of the surface change so drastically that the tracker cannot recognize the same patch of ice in its new location. We assess the quality of motions tracked over one day intervals and motions tracked over three days. We take as the "truth" motions observed by drifting buoys and by tracking high resolution ERS SAR imagery. We find rms errors of from 5 to 15 km in the displacements. Errors seem to be largest in the most dynamic regions, in particular near the ice edge in the Barents and Greenland seas, and in zones with high shear. We believe a useful record of ice motion can be established for the duration of the SMMR and SSMI sensors: that is, from 1978 into the next millenium.