

Identification of Polynya Areas in the Kara Sea from AMSR-E Data

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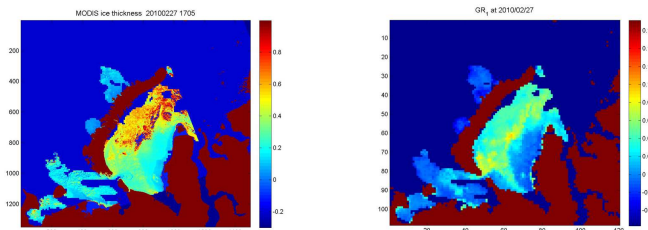
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Polynyas are large regions of open water or thin ice, which prevail though climatologically thick ice should be expected. Because of the large heat and salt fluxes present, polynyas are effecting substantially to the atmospheric heat balance and the oceanic salt balance [1]. Physically they are important as ice and brine factories and they contribute to sediment transportation, biologically they are vital for marine mammals and arctic bird colonies for offering breathing holes and nourishment [2]. For marine industry the identification of thin ice areas is essential for the operational planning and navigation. Hence this topic is important also for the operational sea ice products developed by Finnish Meteorological Institute and Aalto University in TEKES funded KaraX project.

Polynyas release cloud and water vapor, thus visible/infrared instruments are limited in their identification, but the radiometer data e.g. from SSM/I and AMSR-E has proven its applicability in observing the well-known polynya areas Arctic Ocean [3,4]. The identification is gained utilizing observables like ratio $R = \frac{T_{B,V}}{T_{B,H}}$ or polarization ratio $PR = \frac{T_{B,V} - T_{B,H}}{T_{B,V} + T_{B,H}}$ both at 37/36 GHz (SSM/AMSR-E) for lower sensitivity to water vapor or at 85/89 GHz (SSM/AMSR-E) for higher spatial resolution. We observed that also the gradient parameter $GR = \frac{T_{B,89V} - T_{B,36V}}{T_{B,89V} + T_{B,36V}}$ seem to locate the thin ice layers well. We have compared the ice thicknesses gained from the optical MODIS data to AMSR-E observables from winters 2008-2010 and estimated locations of polynya areas in the Kara Sea area (Figure).



References

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