Sea and Lake Ice Thickness and Age with GOES-R ABI and NPP/JPSS VIIRS

NOAA Satellite Science Week
Kansas City, MO
April 30 – May 4, 2012

Xuanji Wang,[1], Jeff Key[2], and Yinghui Liu[1]

[1]Cooperative Institute for Meteorological Satellite Studies, University of Wisconsin-Madison, Madison, WI
[2]NOAA/NESDIS, Madison, WI

The cryosphere exists at all latitudes and in about one hundred countries. It has profound socio-economic value due to its role in water resources and its impact on transportation, fisheries, hunting, herding, and agriculture. Current spaceborne sensors have been used primarily for mapping ice extent and ice concentration, but more accurate, consistent, and detailed ice thickness and age data are also critical for a wide range of applications from climate modeling to operational uses such as shipping and hazard mitigation.

Here we describe the application of a thermodynamic model, called the One-dimensional Thermodynamic Ice Model (OTIM), to estimate sea and lake ice thickness and age with optical satellite imagery. The model was developed for use with the Geostationary Operational Environmental Satellite (GOES-R) Advanced Baseline Imager (ABI). A similar method is being used with the Visible/Infrared Imager Radiometer Suite (VIIRS) on the Suomi National Polar-orbiting Partnership (NPP) satellite.

Validation with in-situ ice thickness measurements from submarine sonar, mooring sites, and surface stations, shows that the OTIM is capable of retrieving ice thickness up to three meters with an overall accuracy greater than 80%. OTIM ice age meets the required ABI accuracy of 80% and product precision of less than one ice age category.