



Sea ice monitoring and modeling: Arctic hazards information support

S. Sandven

Nansen Environmental and Remote Sensing Center,

Thormøhlensgate 47, N-5006 Bergen, Norway,

Tel. + 47 55205800, Fax: + 47 55205801,

e-mail: stein.sandven@nersc.no

The ongoing warming in the Arctic with reduction of the sea ice cover as one of the consequences will have profound impact on the whole Arctic environment. Increased human activities are expected due to offshore operations, ship transport, tourism, and the vulnerable environment will be more exposed to natural as well as man-made hazards. The Arctic has over the last 2-3 decades warmed more than other regions of the world, and the ice cover has decreased in the order of 10% in the same period, based on satellite observations. Climate models furthermore indicate that anthropogenic global warming will be enhanced in the northern high latitudes due to complex feedback mechanisms in the atmosphere–ocean–ice system. The predicted warming in the Arctic over the next 50 years is in the order of 3-4°C or more than twice the global average, while the ice cover is predicted to be reduced ~40% during summer and ~10% during winter time over the same period. At the end of this century, the Arctic Ocean is predicted to be “a blue ocean” during summer time.

In addition to long-term observations of sea ice for climate monitoring, there is an increasing need for daily operational monitoring and forecasting to support the sea transport, offshore operations and other marine activities. Monitoring of sea ice by high-resolution Synthetic Aperture Radar (SAR) satellite images and forecasting by regional scale ice-ocean models can improve the safety of Arctic marine operations. Ships navigating in sea ice need information about ice concentration, ice types, ice drift, leads, polynyas and ridges, and SAR images have a unique capability to provide detailed information about these ice parameters. These monitoring and modeling ac-

tivities are presently under implementation as services in the context of GMES (Global Monitoring for Environment and Security).

One GMES project with focused on sea ice monitoring is ICEMON which presently offers several sea ice information products using SAR as the main input data (<http://www.icemon.org>), such as ice area fluxes in the Fram Strait, high-resolution ice charts in the Svalbard area, and geolocated SAR ice images delivered to ships operating in ice areas.

Ice forecasting is provided by the TOPAZ model system, which is an operational real time ocean modelling and forecasting system for the North Atlantic and the Arctic Ocean. This system provides 10 days sea ice forecasts for the Arctic and adjacent seas in addition to 3-D oceanographical fields. The main ice forecast products include maps of ice concentration, ice thickness and ice drift. The system is presently operated under the EU MERSEA Integrated Project (<http://topaz.nersc.no>).

Monitoring and forecasting of sea ice will continue to be developed in the period 2005 – 2008 with support from PolarView under ESA and MERSEA under EU as key projects.