JCOMM Expert Team on Sea Ice

Russian Federation Member Report

March 2010

Introduction

1. Sea-ice services in the Russian Federation are provided by the Arctic and Antarctic Research Institute in St Petersburg (AARI), the Hydrometeorological Centre and the Scientific Research Center of Space Hydrometeorology "Planeta" in Moscow (Hydrometcentre) and local hydrometeorological offices in the Arctic, Far-Eastern Russia, Baltic, Black and Caspian seas; all belonging to the Russian Federal Service for Hydrometeorology and Environmental Monitoring (Roshydromet).

2. AARI provides centralized general and customer-oriented services for shipping and coastal and harbour activities within the Northen Sea Route (NSR), for the Central Arctic Basin and Arctic seas – Greenland, Kara, Laptevs, Eastern-Siberian, Chukha as well as for the seas with the seasonal ice cover – Baltic, White, Bering, Okhotsk, Caspian and also Antarctic seas. AARI is responsible for coordination of the Marine Safety Information (MSI) provision for the GMDSS system for METAREAs XX and XXI. Most of the sea-ice services are provided by the AARI Centre for Ice Hydrometeorological Information while support for numerical operational and climatic modeling is provided by the AARI research department.

Data acquisition

3. Coastal weather polar stations of Roshydromet in the Arctic and Antarctic make daily visual and instrumental ice observations on sea-ice concentration and stages of ice development, ice thickness, forms of ice, ice drift and other phenomena. Icebreakers routinely report the same mentioned main ice parameters plus parameters describing ice navigation. Observational data are relayed to analyzing centers at AARI via the national meteorological network, WMO GTS and are generally available on-line via Cliware system – http://cliware.aari.ru and http://cliware.meteo.ru.

4. Before 1992 aircraft ice reconnaissance flights were conducted in the Arctic usually on a monthly basis from November to April and on a 10-day internal during the summer navigation period. Since 1993 aircraft ice reconnaissance flights have been conducted only occasionally during tailored hydrometeorological support of applied and scientific activities including support for AARI expeditions aboard research vessel “Akademik Fedorov”. The scope of ice information collected during air-ice reconnaissance included visual observations both on main ice parameters (mentioned above excluding thickness and ice drift) as well as discontinuities in sea-ice cover (leads, cracks, etc.) and various surface parameters (hummocks, ridges, snow, contamination, stages of melting, etc.). Collected data were fixed onboard by ice observers in log-books and in mapped form and further were used for sea-ice analysis onboard expeditionary vessels, at AARI and local meteorological offices. Huge collection of these historical log-books and ice charts (since 1930s till 1992) is archived at the AARI archive department, project of its digitization was initiated during last years and is going on at present time.

5. The AARI satellite reception station provides visible and infrared satellite images for major part of the Arctic both from USA (NOAA HRPT, EOS TERRA) and Russian (METEOR, OKEAN) satellites. Customized access to the operational and archived data is provided online (http://eostation.aari.ru/). Information for other regions (e.g. Antarctic) or from other satellites (Envisat, Radarsat etc.) is provided to AARI via Internet from other Roshydromet reception stations (Moscow, Khabarovsk etc) or from commercial satellite data providers (Scanex etc.). All data are further processed within an ice information system, including ArcMap version 9 software and utilized for regional and pan-Arctic sea-ice analysis by AARI. Satellite products are also available via the Planeta web pages (http://planet.iitp.ru/english/index_eng.htm).

6. AARI, Hydrometcentre, Planeta and the local meteorological offices of the Roshydromet exchange described seaice data by facsimile, telex, Inmarsat, Global Star, Iridium and the Internet and disseminate derived products to users. In cases where the AARI operational centre lacks initial data to compile an ice map for a specific area, the necessary information is requested and if available, is obtained within several hours via communicational relays.

7. For the Baltic Sea region observers of the Northwestern Department of the Hydrometeorological Service (NW Hydromet) at the coastal hydrometeorological stations are providing visual and instrumental daily observations on ice conditions by phone or telegraph.. From 1960s till 1991 daily aircraft ice reconnaissance flights for the Gulf of Finland and the Gulf of Riga were carried out. From 1992 NOAA satellite imagery from up to 15 passes a day is used in operative work. An additional source of the satellite information is TERRA/EQUA imagery received via the Internet. Data from stations and satellite images are by the Baltic Ice Group of the NW Hydromet, and on basis of these data a daily set of information is produced including: SEA telegram, icebreakers report and ice chart. The Baltic Group maintains a vast archive of daily ice chards (since 1927) and the stages of ice development (since 1920).

Operational support

Ice charts and satellite imagery

8. General sea-ice conditions charts of the Arctic Ocean are prepared by AARI on weekly scale (every Wednesday) and available via the AARI web page for public use. Charts depict drifting and fast ice boundaries and five classes of sea-ice concentration in the summer period or stages of development in the winter period and are available in GIF and WMO SIGRID-3 format (http://www.aari.ru/projects/ecimo/ModuleLoad.php?mod=d0015&in=1).

9. Detailed sea-ice conditions charts for the 3 Antarctic sectors (Atlantic-Weddell Sea, Indian - Cosmonavtov-Sodruzhestva Seas and Pacific -Ross Sea) are prepared by AARI twice a month (every 10-15 and 25-31 days of month) to provide tailored support for operational activities of the Russian Antarctic Expedition (RAE – http://www.aari.aq) and general ice monitoring in the South Ocean. Generally these products are not available on-line at present moment.

10. Detailed regional sea-ice conditions charts and annotated imagery for the seas Greenland, Barents, Kara, Laptev, East-Siberian, Chukchi, Bering, Okhotsk and Baltic are prepared by AARI on weekly (every Wednesday) or shorter scales and on request and are disseminated via appropriate telecommunication means to the customers (masters, shipping companies, federal agencies, etc) requesting tailored support. Informational products are relayed to the users in graphic GIF/JPEG formats, in WMO SIGRID-3, ARC/INFO e00 and since 2009 in S-57 formats. Archive of detailed regional sea-ice charts in national coding is available via http://www.aari.ru/projects/ecimo/ModuleLoad.php?mod=d0004&in=1.

11. In the recent years there is a growing request from the customers for operational properly documented satellite imagery for tactical and strategic analysis on the bridge inside the ENC software (NaviSailor, IceNavigator). After processing (in GIS or special package environment like ENVI) the imagery is relayed by the AARI to the customers in georeferenced graphic formats (JPEG, JGW, PRJ). Mercator projection is preferred but used till 80Nº, polar stereographic projection is commonly used northward of 80Nº. In many cases an accompanying ice chart is provided along with the imagery and is superimposed over it to facilitate decision.

Plain language information

12. Coastal and open sea sea-ice and weather GMDSS and other plain language reports are prepared routinely on weekly, daily or shorter scales and on request by AARI and the local meteorological offices of Rosgydromet for METAREAs XX, XXI and XIII and are disseminated via various telecommunication means to the customers. Synoptic bulletins on weather conditions in the Eurasian Arctic are prepared routinely on daily scale by AARI and are disseminated via various telecommunication means to the customers and published on AARI web-site (http://www.aari.ru/projects/ecimo/ModuleLoad.php?mod=d0011&in=1).

Gulf of Finland sea-ice products

13. Regular daily and longer term analysis and prognostic products for the Gulf of Finland are provided by the NW Hydromet Baltic Ice Group and include:

- Daily report for coastal points “SEA” / MORE” in KN-2 code.
- Daily ice report for fairway containing review of Gulf of Finland ice conditions, the Baltic sea ice code telegram, information about icebreakers, navigation restrictions, point of convoy formation for the ships steering. Ice report for fairway is produced in English and Russian by 8:00 GMT.
- Daily detailed ice chart produced by 10:00 GMT in international black-and-white and color coding.
- Ice bulletin produced twice a weak (Monday and Thursday). The bulletin consist s of ice chart, detailed review of ice condition of the Gulf of Finland and short ice review of Baltic sea, short-term forecast (next 3-4 days) of ice condition’s development for the Gulf of Finland.
- Forecast of the ice condition along the fairway to the next month in English and Russian. It is made on last day of month for the 10-th, 20-th and 30(31)-th day of the next month. That forecast contains the probable ice thickness, concentration, hummocking, rafting for each part of fairway, probable position of fast ice boundary and ice edge location.
- Long-term forecasts of the ice appearance, total freezing, fracturing of fast ice, total disappearance of ice at the points of Gulf of Finland in advance of 20- 45 days.
- Preliminary forecast of maximum ice conditions for the Gulf of Finland for the coming ice season on July 31st with amendment on November 30th.

4. Forecasts and forecasts methods

Numeric short-term forecasts

14. Daily diagnosis and forecast tabular and mapped patterns of mean daily and instantaneous ice drift, surface currents and sea level elevation in the Arctic Ocean and at selected coastal points of Eurasian Arctic for period 0d…+6d are provided on the basis of an output from the AARI hydrodynamic model with viscous ice rheology, available at http://www.aari.ru/projects/ecimo/index.php?im=102&sub=4.

15. Weekly or shorter period diagnosis and forecast tabular and mapped patterns of the evolution of ice cover in Barents and Kara Seas including sea ice total concentration, thickness (stages of ice development), hummocks concentration and level of compacting for period 0d…+6d on the basis of the thermo hydrodynamic with elastic viscous-plastic ice rheology AARI model; available at http://www.aari.ru/projects/ecimo/index.php?im=102&sub=1.

16. Daily diagnosis and forecast charts for winds, wave significant height and direction and ice accretion for open water areas in the Western and Eastern Eurasian Arctic Seas for period 00…+72h with 6-h interval on the basis of the AARI spectral parametric wave model; available at http://www.aari.ru/projects/ecimo/index.php?im=102&sub=2.

Empirical and statistical long-term forecasts

17. Seasonal forecasts of ice conditions in the Eurasian Arctic seas and big Siberian rivers estuaries are produced in AARI in March, June and in August using empirical-statistical techniques in a form of textual bulletins. As a background to those forecasts a long-term AARI meteorological annual forecast with seasonal and monthly corrections is used.

18. Weekly-monthly forecasts of ice phenomena in the big Siberian rivers estuaries based on AARI empirical-statistical techniques are produced in spring (May-June) in a form of textual bulletins.

5. International cooperation and IPY

19. AARI and other institutions of Roshydromet participate in most of the projects aimed to support IPY 2007/2008 observing system legacy, including Sustaining Arctic Observing Networks (SAON), Southern Ocean Observing System (SOOS), Global Cryosphere Watch (GCW).

6. Training and capacity building

20. Hydrometerological University of Roshydromet in St.Petersburg and AARI are supporting a number of educational facilities and CB in the field of Polar and marine meteorology including the sailing *UNESCO/IOC* Universities (training of the undergraduates is conducted during the ship-borne marine research) in the Baltic and Caspian Seas and North Atlantic, joint Norwegian – Russian Fram Laboratory (http://www.fram.nw.ru) and the joint German – Russian Otto Schmidt Laboratory (http://www.otto.nw.ru). During the last years the AARI provided several bi-weekly training courses for the ice observers

7. Publications

21. The following publications are issued by AARI at different periods:

- The quarterly and yearly bulletin *Review of the hydrometeorological processes in the Arctic Ocean* (in Russian);
- The quarterly bulletin *State of the Antarctic Environment* (in Russian and English);
- Bulletin “Long-term forecast of the ice conditions in the Arctic seas”: 3 bulletins are published per year in the end March, June and August (in Russian);
- *Trudi AANII* (AARI Transactions): irregular two to three volumes are published per year (in Russian);
- *Problemi Arktiki i Antarktiki* (Problems of the Arctic and Antarctic): two volumes are published per year (in Russian);
- Irregular express information, informational bulletins of the Russian Antarctic expedition, monographs etc.