

## **Regional sea ice outlook for Greenland Sea and Barents Sea - based on data until the end of June 2011**

Sebastian Gerland<sup>1</sup>, Harvey Goodwin<sup>1</sup>, Angelika H.H. Renner<sup>1</sup>, and Nick Hughes<sup>2</sup>

1: Norwegian Polar Institute, 9296 Tromsø, Norway (E-mail: gerland@npolar.no;  
goodwin@npolar.no)

2: Norwegian Ice Service, Norwegian Meteorological Institute, 9293 Tromsø (E-mail:  
nick.hughes@met.no)

The monthly mean sea ice extents for May and June 2011 based on Norwegian ice charts produced primarily from passive microwave satellite data, supplemented with high resolution SAR imagery since 2007, are compared with the corresponding monthly means for May and June, respectively, for the years 2008-10 (Figs. 1 and 3), and with 30, 20, and 10 year averages for monthly means for the periods 79-08, 80-99 and 99-08 (Figs. 2 and 4).

### **May 2011 ice extent**

In the Greenland Sea and Fram Strait, the May 2011 mean ice extent appears similar to the situation in May in the past 3 years. In the southern Greenland Sea, ice extent is average or on minimum level compared with past years. Further north, in the Fram Strait, ice extent varies locally between maximum and minimum levels (Fig. 1). In the western Barents Sea, the ice extent reaches further south than during the last years, almost reaching Bjørnøya (Bear Island). In the central Barents Sea, ice extent is relatively high as well. However, further east, close to Novaja Semlja, the ice edge is located further north than in the past years, leaving almost the entire western coast of Novaja Semlja ice free. In summary, in the Greenland Sea no substantial variation between recent years is obvious. In contrary, in the Barents Sea, the ice extent varies strongly between individual years for May. May 2011 does not resemble one specific year of the past three years for the Barents Sea. Comparison with long-term means over decades (Fig. 2) reveals that the May 2011 ice extent is not far from long-term means, except for the eastern Barents Sea. In the southern Greenland Sea, the current year continues to follow the negative trend in ice extent, whereas in the Fram Strait, long-term means and May 2011 appear very stable. In the western and central Barents Sea, May 2011 ice extent is slightly larger or similar to long-term means, whereas in the eastern Barents Sea ice extent is considerably lower than in the long-term means.

### **June 2011 ice extent**

Compared with May, in the Greenland Sea, including Fram Strait, the ice extent has only changed little (Fig. 3). In the southwest, the ice edge moved slightly closer towards Greenland. In the central Greenland Sea, the 2011 extent for June is similar to 2010 (and less than 2008 and 2009). In the northeast, the bay north of Svalbard is very similar to the May situation, leaving the northern and eastern coasts of Nordaustlandet (Svalbard) ice covered. For the Greenland Sea, the ice extent is within the boundaries of decadal means (Fig. 4), except in the southwestern region, where the June 2011 ice extent is less than the selection of decadal means shown in Fig. 4.

In the Barents Sea, the ice retreated slightly in the western part. However, here the ice edge is still relatively far south (further south than June 2010, but similar to June 2008 and 2009, see Fig. 3), but within the area of decadal means (Fig. 4). In the central and eastern Barents Sea, the situation has changed drastically, compared with the May extent (Fig. 1): The data show an ice free area all the way to western Franz Josef Land, and Novaya Semlja appears (almost) ice-free on both coasts, western and eastern. In this region, the different decadal means plotted in Fig. 4 show a larger ice extent for June than observed in 2011. However, the data from the past years (Fig. 3) indicate a high

interannual variability in ice extent especially in this region.

It is interesting to see that the ice extent for June 2011 in the Barents Sea is unique in its shape, compared with the past years. June 2009 was similar in the western and central part, but then areas north and east of Novaja Semlja were ice covered.

### Forecast

The Norwegian Ice Service ice charts provide a record for the Svalbard area that extends back to 1967 (45 years). The ice charts use six categories for ice concentration: open water (0-10%), very open drift ice (10-40%), open drift ice (40-70%), close drift ice (70-90%), very close drift ice (90-100%), and fast ice (100%). Monthly average area values for each of these classes were calculated within a box extending from 72 to 85°N and 0 to 40°E. The sum of these values was then used as the average monthly ice area for our analysis.

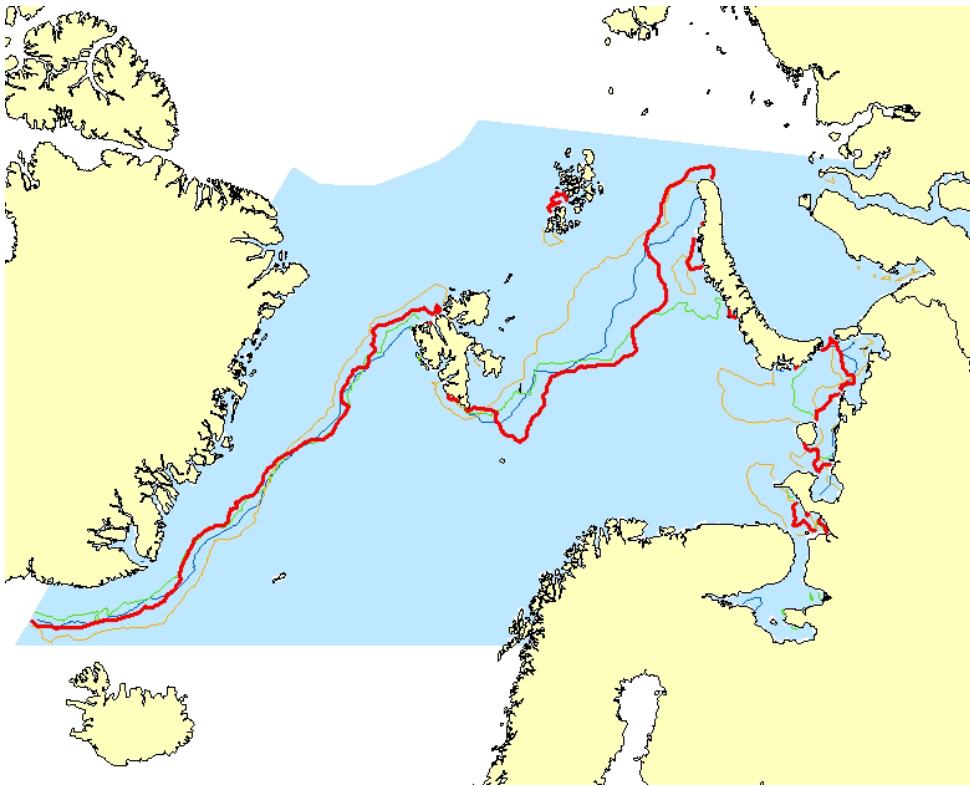
The forecast uses a simple statistical regression, using:

- ice extent from the ice charts,
- NOAA Extended Reconstructed Sea Surface Temperature (SST) V3b (<http://www.esrl.noaa.gov/psd/data/gridded/data.noaa.ersst.html>), and
- NWS Climate Prediction Centre (CPC) Arctic Oscillation Index ([http://www.cpc.ncep.noaa.gov/products/precip/CWlink/daily\\_ao\\_index/ao.shtml](http://www.cpc.ncep.noaa.gov/products/precip/CWlink/daily_ao_index/ao.shtml)).

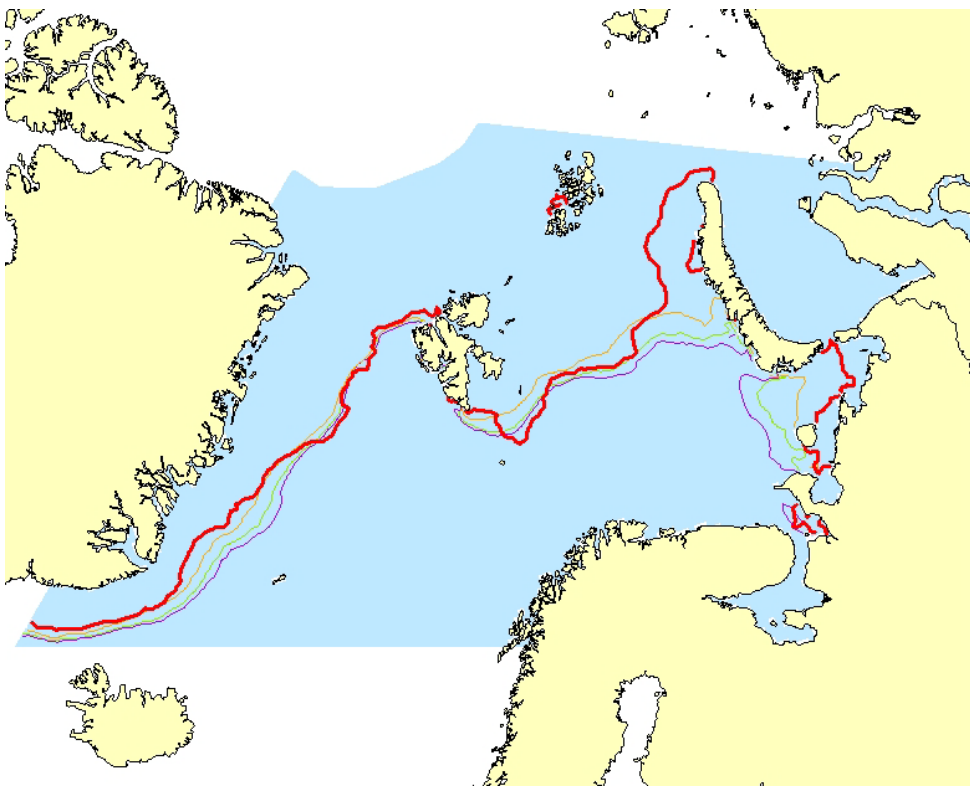
Monthly data to the end of June was used. For September ice extent, we find:

$$\begin{aligned} Ice_{September} = & 514763 + (-99136.11 * AO_{March}) \\ & + (0.15809 * Ice_{June}) \\ & + (9925.64 * SST_{June}) \end{aligned}$$

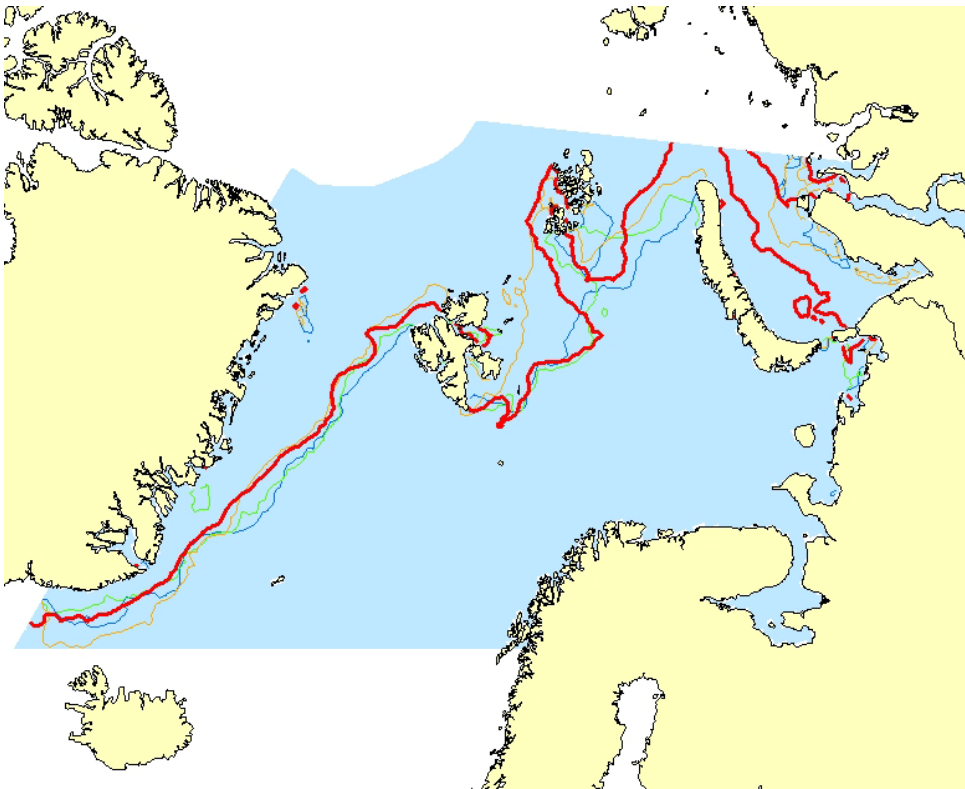
Taking the values of 1.424, 318,396, and 3.69 for  $AO_{March}$ ,  $Ice_{June}$ , and  $SST_{June}$  respectively, we obtain a predicted ice extent of 213,421 km<sup>2</sup>. This latest result is now less than the September average, and if correct would be lower than the previous four Septembers.



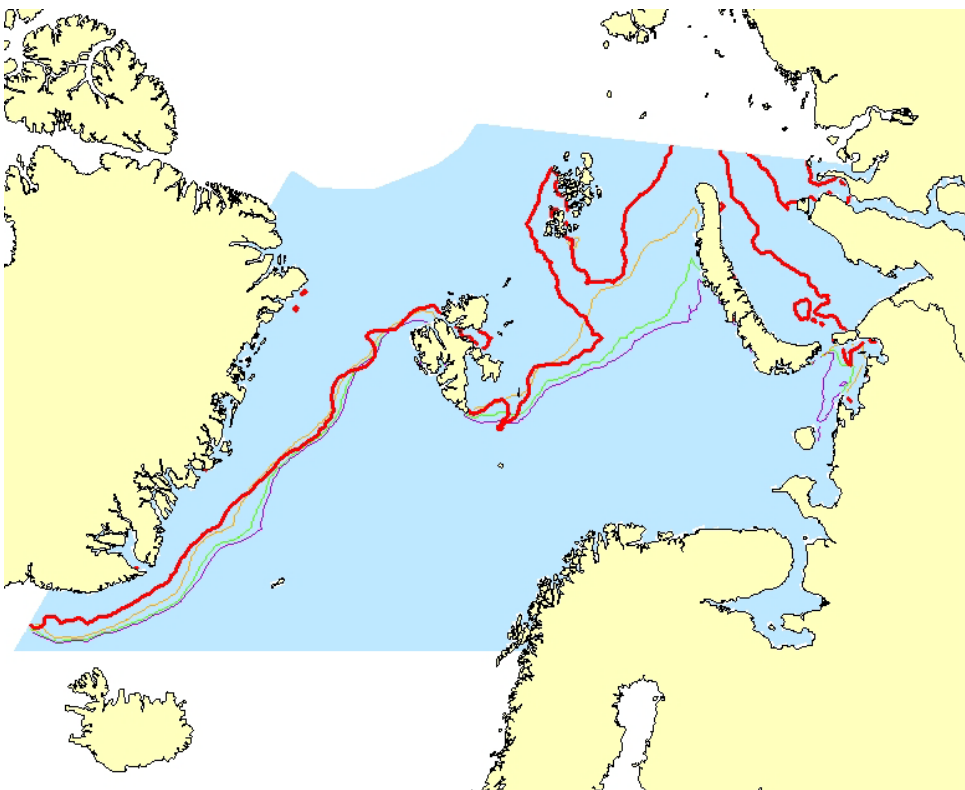
**Fig. 1:** Ice extent (monthly means, May) southern border of 30% ice concentration, in the Greenland Sea / Fram Strait and Barents Sea, based on passive microwave satellite data (red = May 2011, orange = May 2010, green = May 2009, blue = May 2008).



**Fig. 2:** Ice extent (monthly means, May) southern border of 30% ice concentration, in the Greenland Sea / Fram Strait and Barents Sea, based on passive microwave satellite data (red = May 2011, orange = mean May 1999-2008, purple = mean May 1980-1999, green = mean May 1979-2008).



**Fig. 3:** Ice extent (monthly means, June) southern border of 30% ice concentration, in the Greenland Sea / Fram Strait and Barents Sea, based on passive microwave satellite data (red = June 2011, orange = June 2010, green = June 2009, blue = June 2008).



**Fig. 4:** Ice extent (monthly means, June) southern border of 30% ice concentration, in the Greenland Sea / Fram Strait and Barents Sea, based on passive microwave satellite data (red = June 2011, orange = mean June 1999-2008, purple = mean June 1980-1999, green = mean June 1979-2008).