# Regional sea ice outlook for Greenland Sea and Barents Sea - update based on data until the end of July 2012

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The monthly mean sea ice extent for July 2012 based on Norwegian ice charts produced primarily from passive microwave satellite data and supplemented with high resolution SAR imagery since 2007, is compared with the corresponding monthly means for June for the years 2008-11 (Fig. 1), and with 30, 20, and 10 year averages for monthly means for the periods 79-08, 80-99 and 99-08 (Fig. 2). The sea ice regimes in the Greenland Sea and in the Barents Sea are substantially different. Sea ice in the Greenland Sea is dominated by ice drifting with the Transpolar Drift and the East Greenland current out of the Arctic Basin southwards (see e.g. Spreen et al. 2009; Vinje et al. 1998), whereas sea ice in the Barents Sea consists to a high degree of seasonal ice formed in the same area during the past winter (see e.g. Vinje and Kvambekk 1991).

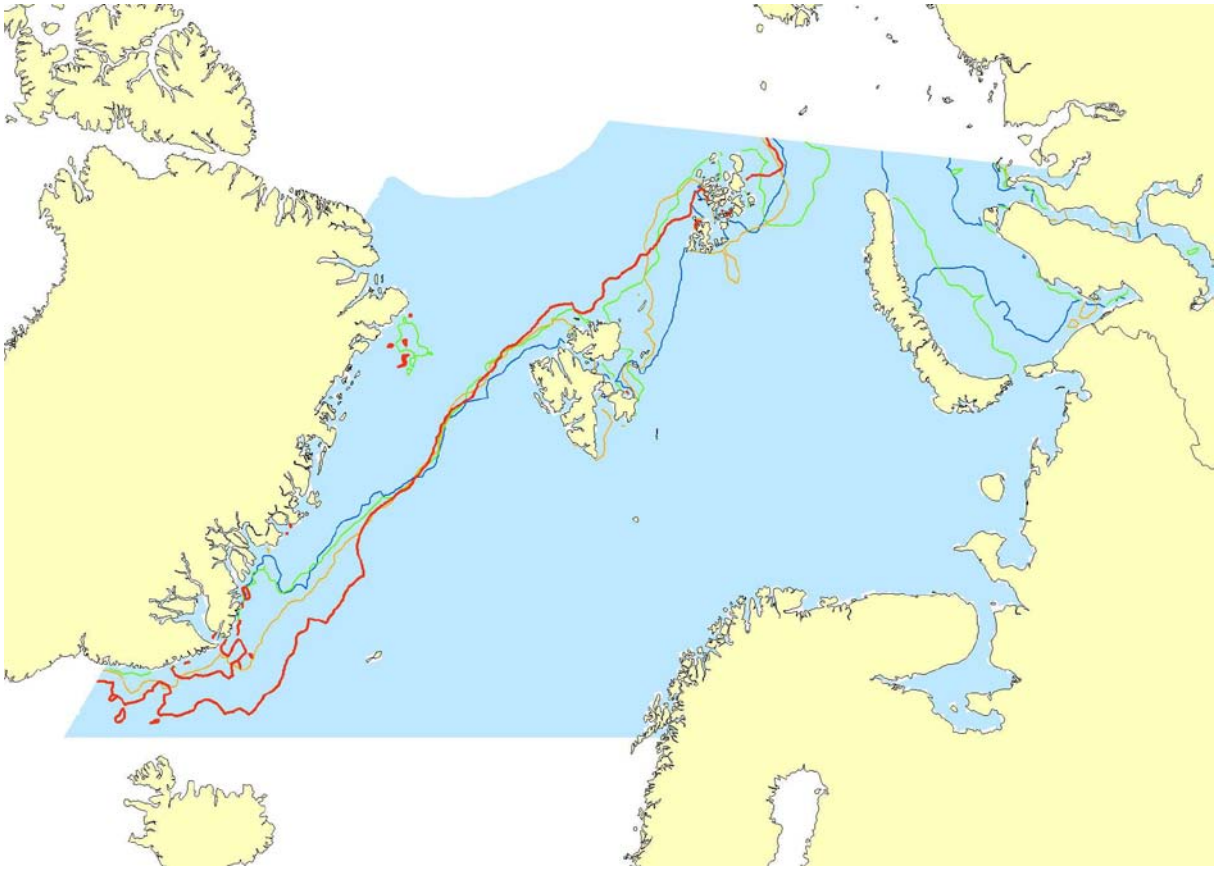

**Fig. 1:** Ice extent (monthly means, June) southern border of 30% ice concentration, in the Greenland Sea / Fram Strait and Barents Sea, based on passive microwave satellite data (red = July 2012, orange = July 2011, green = July 2010, blue = July 2009).

As for June 2012, sea ice extent in the Greenland Sea was larger in July 2012 in the south, but otherwise similar to recent years (Fig. 1). On a regional scale, there is relatively little variability in Fram Strait (which represents the northern part of the Greenland Sea) sea ice extent for July during the last four years, except close to Svalbard. Near Svalbard, the July 2012 data in the map (Fig. 1) shows open water north of Svalbard, also north of Nordaustlandet, meaning the ice area is disconnected from Svalbard. None of the previous three years had this situation in the July mean data. In the Barents Sea, the ice edge for July 2012 exhibits a relatively straight line from west (north of Svalbard) to east (northern part of Franz Josef Land, see Fig. 1). In the northwestern Barents Sea, this implicates a ice extent less far south than thre previous years, in the northeastern Barents Sea, ice extent is about average relative to recent years. Near Svalbard, July 2012 is lower than all longterm July means.

When comparing the ice extent from July this year with decadal and multi-decadal means (Fig. 2), the Fram Strait exhibits only very little variation. The southern Greenland Sea extent for July 2012 is larger than longterm means. Especially the lowest extent in this region, the mean for July 1999-2008, is in clear contrast with this year's July extent. Near Svalbard, July 2012 extent is lower than the decadal means. However, both here and further east in the Barents Sea, the interannual variability of the ice edge position is known to be high, and a direct comparison of a single year and decadal and multidecadal means can be misleading. As for June 2012, in the Barents Sea, also July 2012 extent is substantially less than the decadal means for July (Fig. 2). The intercomparison of July data of individual years (Fig. 1) shows that in the recent years July extent already was relatively low in this region, compared to the longterm means.

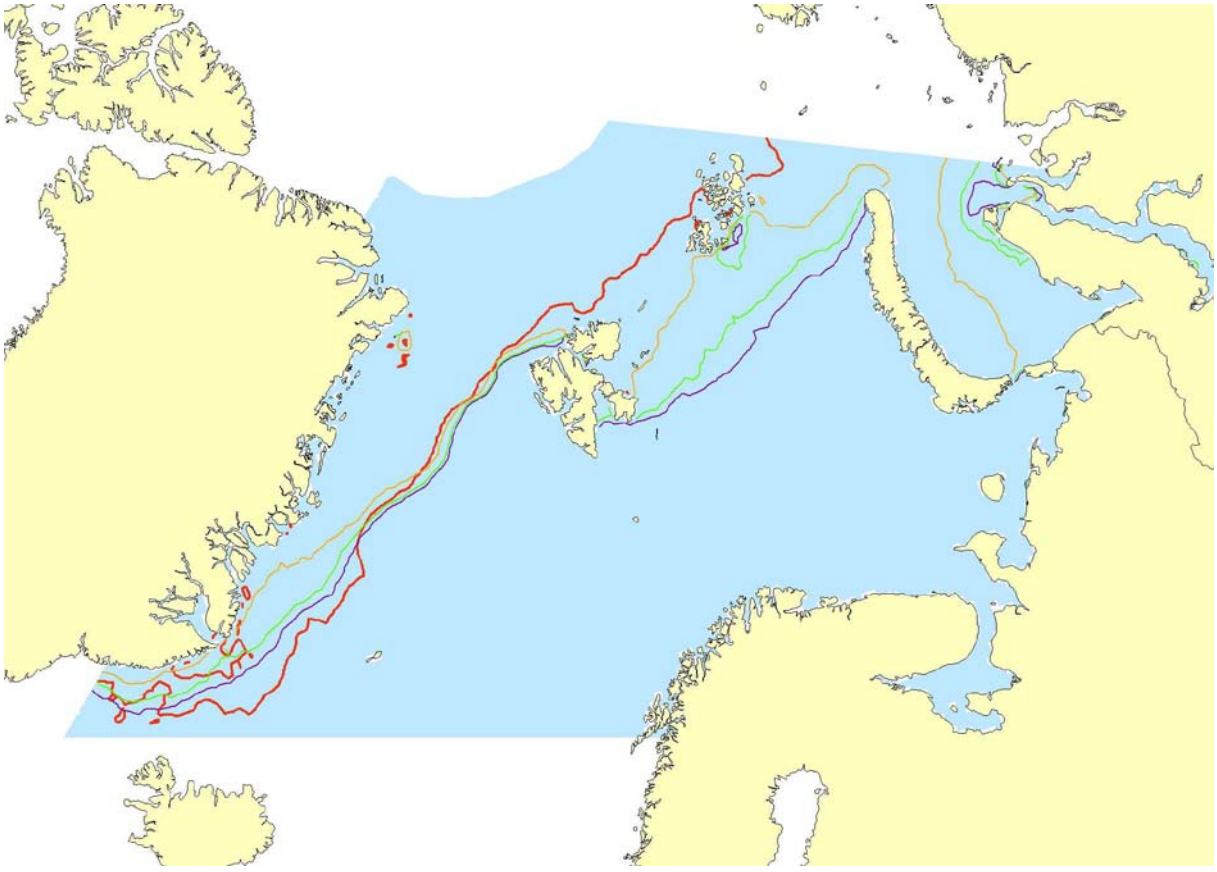

**Fig. 2:** Ice extent (monthly means, June) southern border of 30% ice concentration, in the Greenland Sea / Fram Strait and Barents Sea, based on passive microwave satellite data (red = July 2012, orange = mean July 1999-2008, purple = mean July 1980-1999, green = mean July 1979-2008).

During a recent science cruise of the Norwegian Polar Institute with RV Lance to the pack ice north of Svalbard in late July to early August 2012, the ice edge was encountered at approximately 81.5 °N. The ice melt was advanced with extensive melt pond coverage and large areas with melt holes. Ice thickness was surveyed between 81.5 to 82.75 °N at around 22 °E using a helicopter-born EM-bird. Preliminary results show a regional ice thickness distribution with modal ice thickness at 0.6 – 0.7 m within the pack ice and closer to 0.4 m near the ice edge.

Ice concentration data from the Norwegian Ice Service ice charts were analysed to produce monthly ice area values for the Svalbard region, 0° to 40° East longitude, 72° to 82° North latitude. These were compared against climatic variables, including sea surface temperature (SST) for the West Spitsbergen Current, and Arctic Oscillation (AO) index values, to develop a linear regression model for future ice area from which the prediction for September ice area for the area is derived.
Monthly SST data was acquired from the NOAA Extended Reconstructed SST V3b (http://www.esrl.noaa.gov/psd/data/gridded/data.noaa.ersst.html) dataset, and AO index values from the NOAA National Weather Service (NWS) Climate Prediction Center (CPC) (http://www.cpc.ncep.noaa.gov/products/precip/CWlink/daily_ao_index/ao.shtml).
Data was input into the Weka data mining software (http://www.cs.waikato.ac.nz/ml/weka/) to experiment with different methods for predicting future ice area values. The time series extension to this software provides a linear regression model to determine the best fit to the data by predictor variables at large number of time lags.
Following the prediction from early July of a value of 164,313 $km^2$, the dataset was updated with the July values and the software run again to yield the following:

ist_svalbard =

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 0.182  * Month=oct,jul,nov,jun,dec,jan,may,feb,apr,mar +
-0.1196 * Month=jul,nov,jun,dec,jan,may,feb,apr,mar +
 0.2614 * Month=nov,jun,dec,jan,may,feb,apr,mar +
-0.1154 * Month=jun,dec,jan,may,feb,apr,mar +
 0.1132 * Month=dec,jan,may,feb,apr,mar +
-0.0737 * Month=may,feb,apr,mar +
 0.0522 * Month=feb,apr,mar +
 0.7751 * Lag_ist_svalbard-1 +
-0.1101 * Lag_ist_svalbard-2 +
 0.0733 * Lag_ist_svalbard-4 +
 0.0687 * Lag_ist_svalbard-10 +
 0.0849 * Lag_ist_svalbard-11 +
-0.1044 * Lag_ist_svalbard-12 +
 2.5015
```

Where 'Month=feb,apr,mar' and similar, are averages of all the values in the dataset for those months.
For September 2012 this produces a nearly the same value (as for early July), 164,900 $km^2$. This would be the seventh lowest ice area for the Svalbard area in the 46 year record.

**References**


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