

# Sea Ice Outlook - June 2009

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## 2009 September Extent

Our forecast remains at  $4.92 \pm 0.43$  Mio. km<sup>2</sup>.

## Methods and Techniques

The estimate is based on a quadratic extrapolation of the measured September sea ice extent time series (Fig. 1)

## Physical Rationale

We have a total of four different statistical forecast methods (see May outlook). Besides extrapolation of the September minimum timeseries, correlation of previous Winter surface air temperature and correlation of the June extent we additionally investigated June sea ice concentration data from CERSAT/IFREMER.

The correlation of June ice concentration with September minimum extent shows a region of significant correlation in Beaufort Sea (red box in Fig. 2). Mean ice concentration of this region and correlation was used for hindcast analysis and it shows to have great potential for prediction of the sea ice minimum, since it has the lowest mean relative error (Fig. 3). Of all parameters the June concentration shows clearly the best statistical relation for the last two years of extreme minima.

Unfortunately, June 2009 concentration data are not yet available from IFREMER due to problems with the SSM/I on the platform DMSP-F13 and the switch to DMSP-F17.

We used a different method for combining forecasts as compared to the May

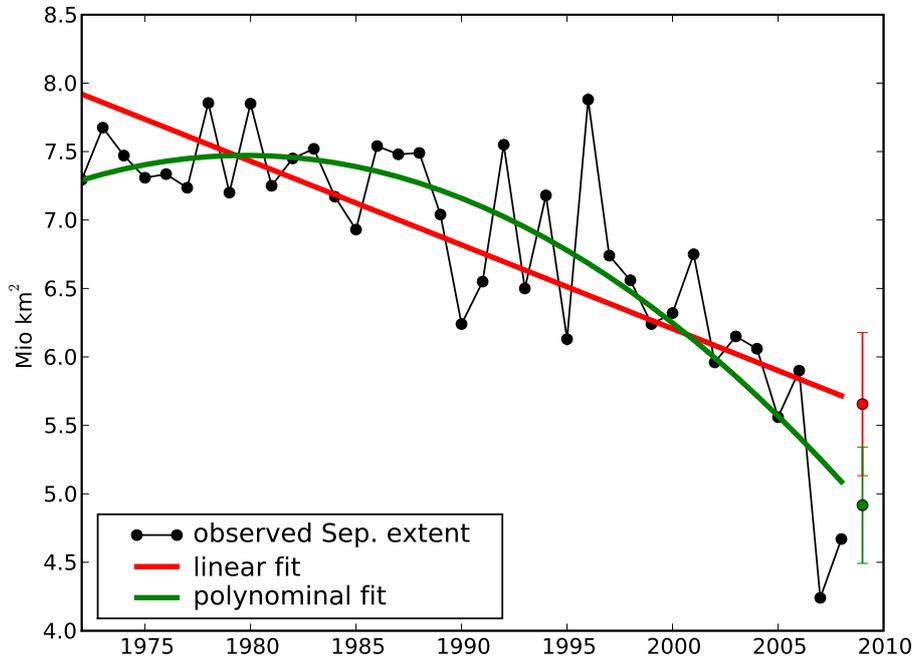


Figure 1: extrapolation of september timeseries, correlation coefficients  $r_{lin} = 0.78$  and  $r_{poly} = 0.86$

outlook. Weights were calculated from the mean relative error from each forecast taken from Figure 3. It shows that for 2008 the combination comes close to being as accurate as extrapolation. Since the prediction with best accuracy is missing this year, using the combination method without the concentration data would probably result in a rather unlikely combined forecast. Therefore our prediction remains at  $4.92 \pm 0.43$  Mio. km<sup>2</sup> only using quadratic extrapolation.

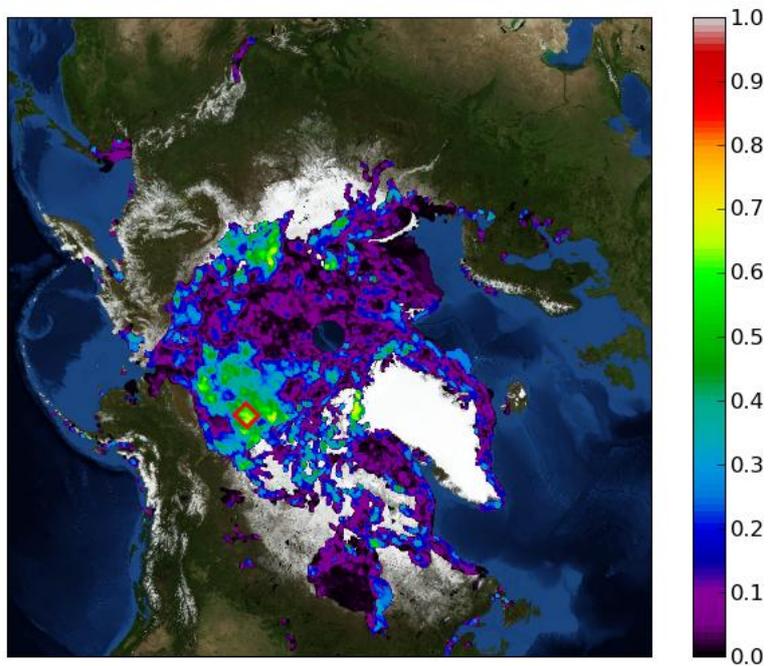


Figure 2: Correlation ( $r^2$ ) of June sea ice concentration and September extent; significance levels are  $p_{95} = 0.24, p_{99} = 0.54$

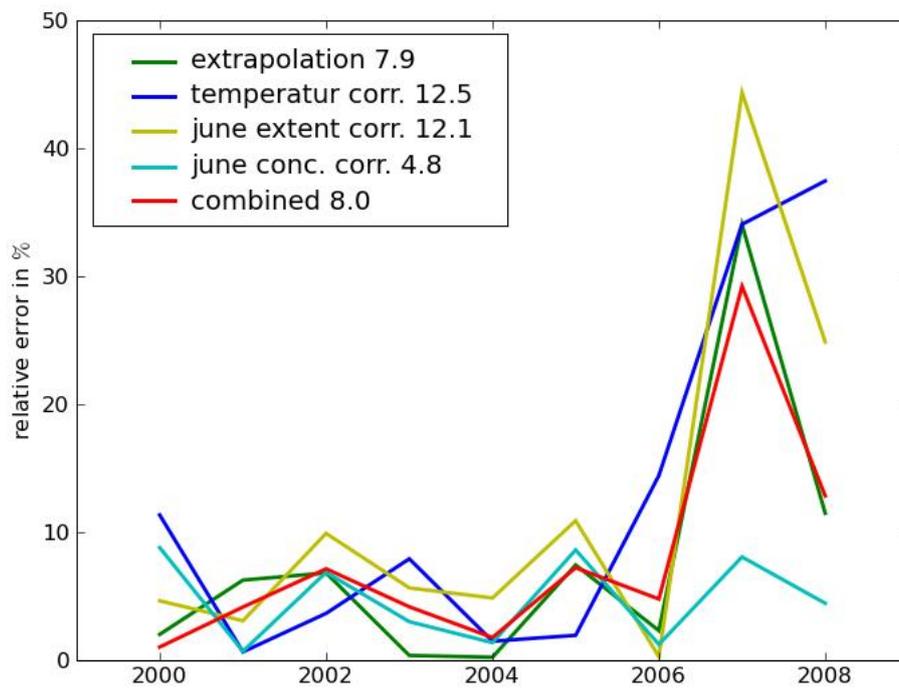


Figure 3: Prediction error hindcast experiment. The methods described in the text are used to predict the September minimum for the years 2000 to 2008. The relative deviation of the prediction to the actual sea ice extent are shown. The averaged errors in % are given within the legend.