Daily updated Sea Ice Outlook based on statistics of the sea ice area from 85 GHz SSM/I data 1992-2008

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KlimaCampus Hamburg, Cluster of Excellence in Climate Change
Center for Marine and Atmospheric Research
Institute of Oceanography, University of Hamburg
Bundesstrasse 53, D-20146 Hamburg, Germany
+49 40 42838 6518 fax 7471
lars.kaleschke@zmaw.de

Estimate of sea ice extent for the month of September 2008:

5.4 ± 0.6 Mio km²

ftp://ftp-projects.zmaw.de/seaice/prediction/regression.png
ftp://ftp-projects.zmaw.de/seaice/prediction/prediction_timeseries.png

Principal method
Daily updated statistical regression based on sea ice concentration derived from 85 GHz SSM/I data

Primary physical reasoning
The auto-correlation of the sea ice area anomaly time series is in the order of three months. Therefore, a skillful prediction of the September ice extent is possible based on the satellite derived sea ice area at the end of June.

Expanded information
As we temporally approach the summer sea ice minimum, a skillful prediction is feasible based on the presently observed sea ice area. Several algorithms exist to calculate the sea ice concentration from passive microwave data. Here the ARTIST Sea Ice (ASI) algorithm is used to derive the sea ice concentration from SSM/I data (Kaleschke et al. 2001). A validation with ship based observations in the summer season showed the good performance of the ASI algorithm in terms of standard deviation and correlation to the ground truth (Andersen et al. 2007).
Average values of the September sea ice area were calculated for the years 1992-2007. A linear scaling is used to convert the sea ice area to the extent which is justified by the high correlation of the September sea ice area with the extent. The sea ice area of the present day is used together with the same days of the 16 previous years and the September averages to estimate this year's September extent (Figure 1). The time evolution of the prediction and the correlation coefficient is shown in Figure 2. The uncertainty of the prediction is expressed by three standard deviations because the 2007 ice extent anomaly just exceeded this boundary. The drops in the correlation time series reflect the technical issue that near real time data are used and satellite data gaps have not been corrected for.

Regional sea ice conditions

The AMSR-E 89 Ghz channels have been used to calculate the sea ice concentration with a resolution of about 5 km in order to show the regional differences between the years 2007 and 2008 (Figure 3). On August 5 2008 there is considerable less ice in the East Greenland Current and the Beaufort Sea as compared to August 5 of 2007 whereas there is more ice in the Laptev and Chukchi Sea and around north of Svalbard.

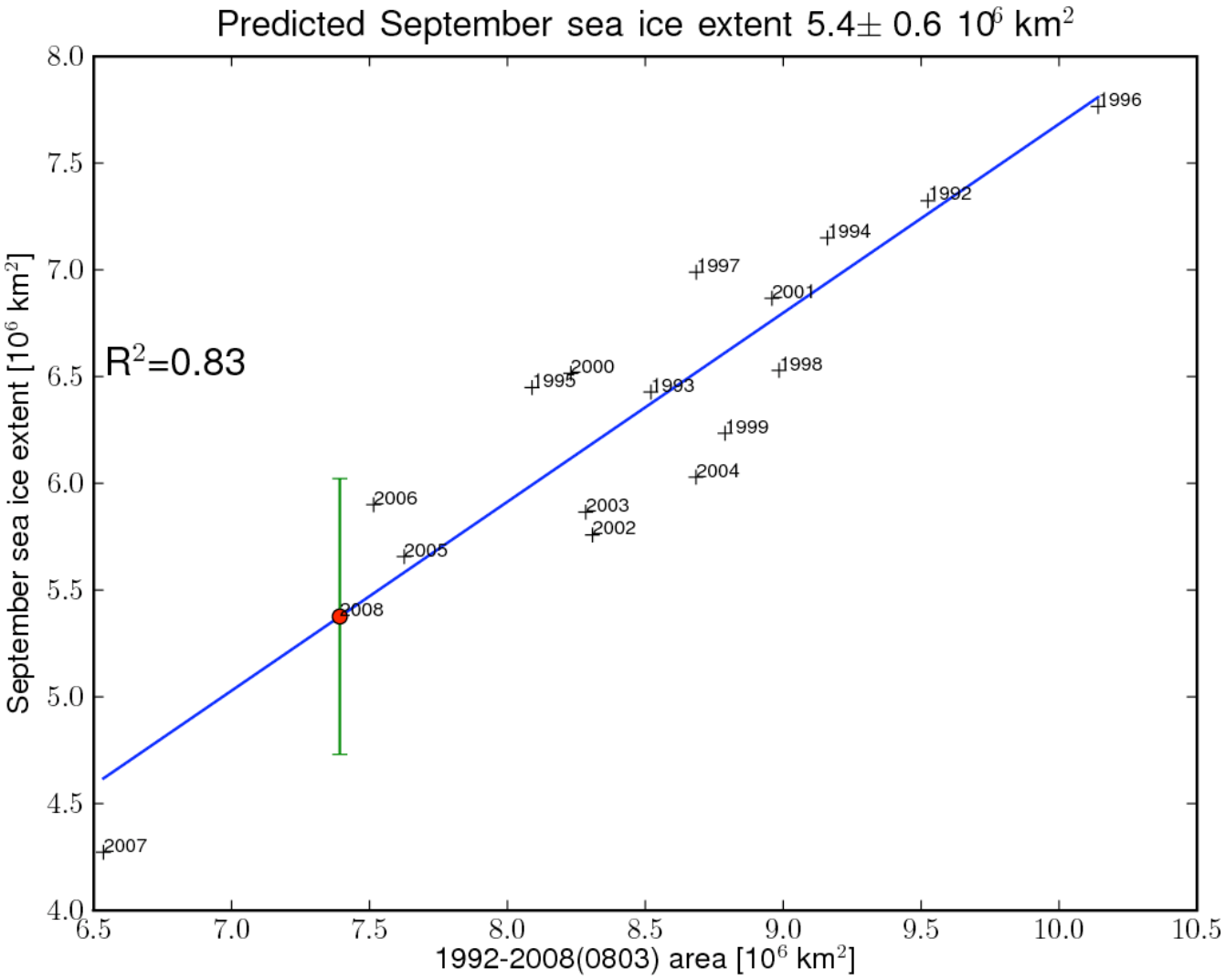

Figure 1: Predicted September sea ice extent. The linear regression line was calculated from the sea ice areas of the 3rd August and the September average for the years 1992-2007. The September sea ice extent is estimated from the observation of the 3rd August 2008. Daily updates of this figure are available at ftp://ftp-projects.zmaw.de/seaice/prediction/regression.png

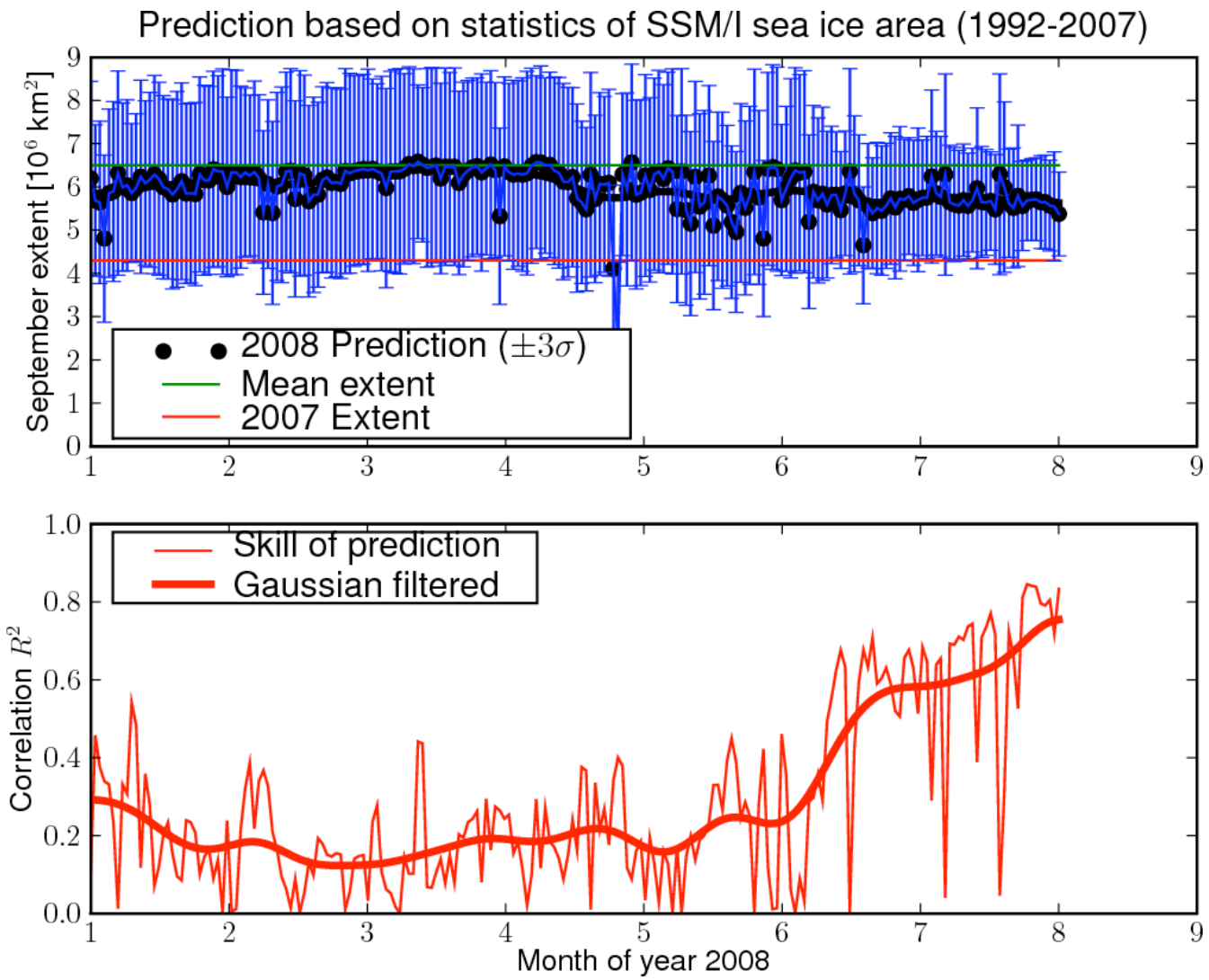

Figure 2: Estimated September sea ice extent and skill of the estimate (correlation). This graph is the result of the method shown in Figure 1 applied for every day of the year 2008. The drops of correlation indicated satellite data gaps which have not been accounted for. Daily updates of this figure are available at: ftp://ftp-projects.zmaw.de/seaice/prediction/prediction_timeseries.png

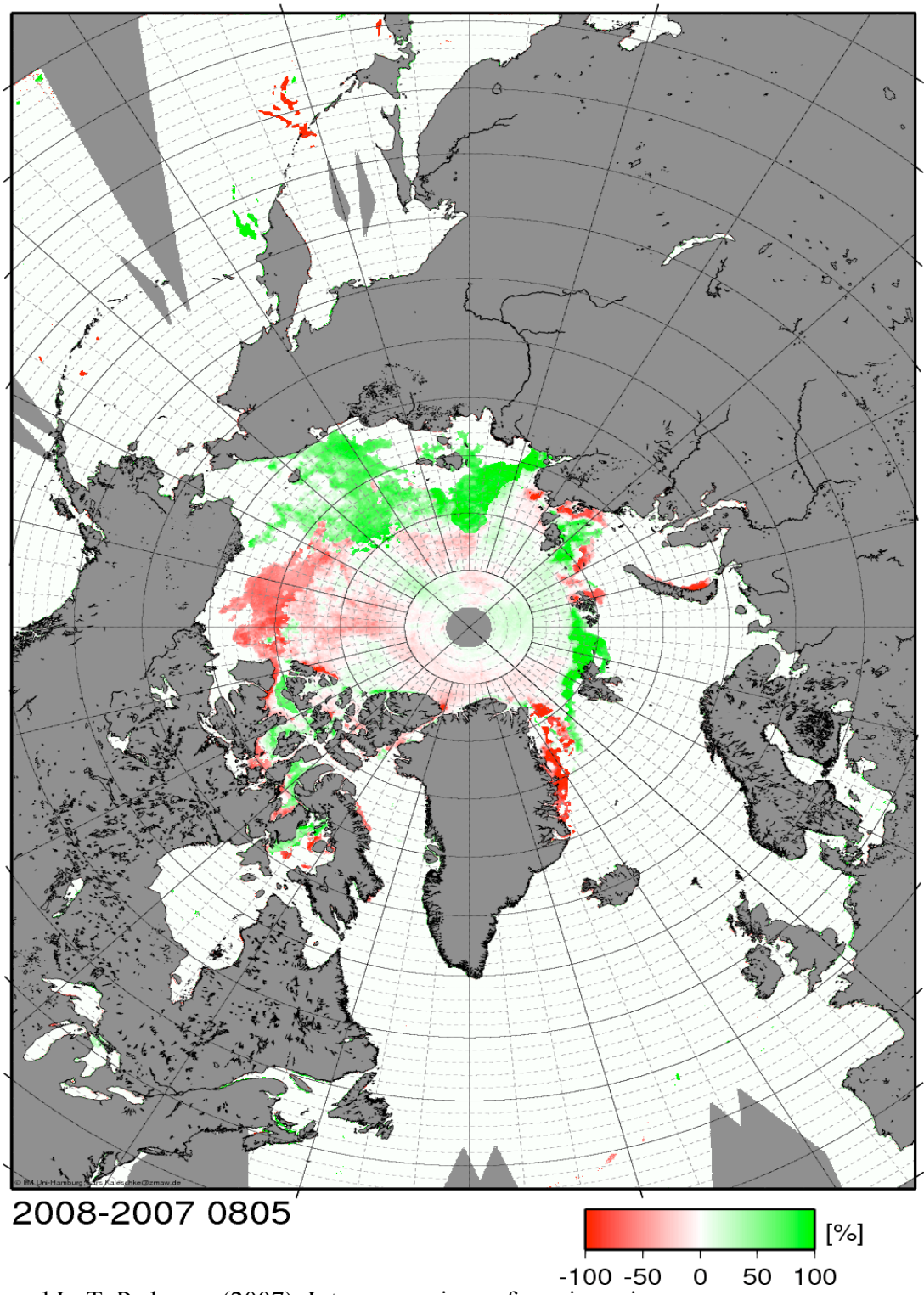

Figure 3: Difference of sea ice concentration derived from AMSR-E 89 GHz channels of 5th August 2008 minus 5th August 2007. The red areas indicate less ice in 2008 as compared to 2007.

References:

Andersen, S., R. Tonboe, L. Kaleschke, G. Heygster, and L. T. Pedersen (2007), Intercomparison of passive microwave sea ice concentration retrievals over the high-concentration Arctic sea ice, J. Geophys. Res., 112, C08004, doi:10.1029/2006JC003543.

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Daily gridded sea ice concentrations from http://cersat.ifremer.fr/data/discovery/by_parameter/sea_ice