#9—Lars Kaleschke

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

June 2008 by Lars Kaleschke

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

For this outlook in June a different method is used as in May. In May a prediction based on the actual observed sea ice area was not possible because of the lack of statistical correlation for the May ice area with the Summer minimum. The situation is different in June. As we temporally approach the summer sea ice minimum, a skillful prediction is feasible based on the presently observed sea ice area. Because of the expected increase in predictive skill during July, a computer program was developed to update the September estimate on a daily basis.

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). A hindcast test of the method revealed that the skill of prediction

that is given by the correlation sharply increases after mid of June. The time evolution of the prediction is shown in Figure 2.
NOTE: I'll expect my prediction to further decrease. Today's (0705) estimate is 5.6 +-1.

It is really interesting to see how the errorbar of the estimate is decreasing over the time. I suppose that we can provide a very reasonable estimate in about 2-3 weeks. You can check my website http://www.seaice.de for daily updates.

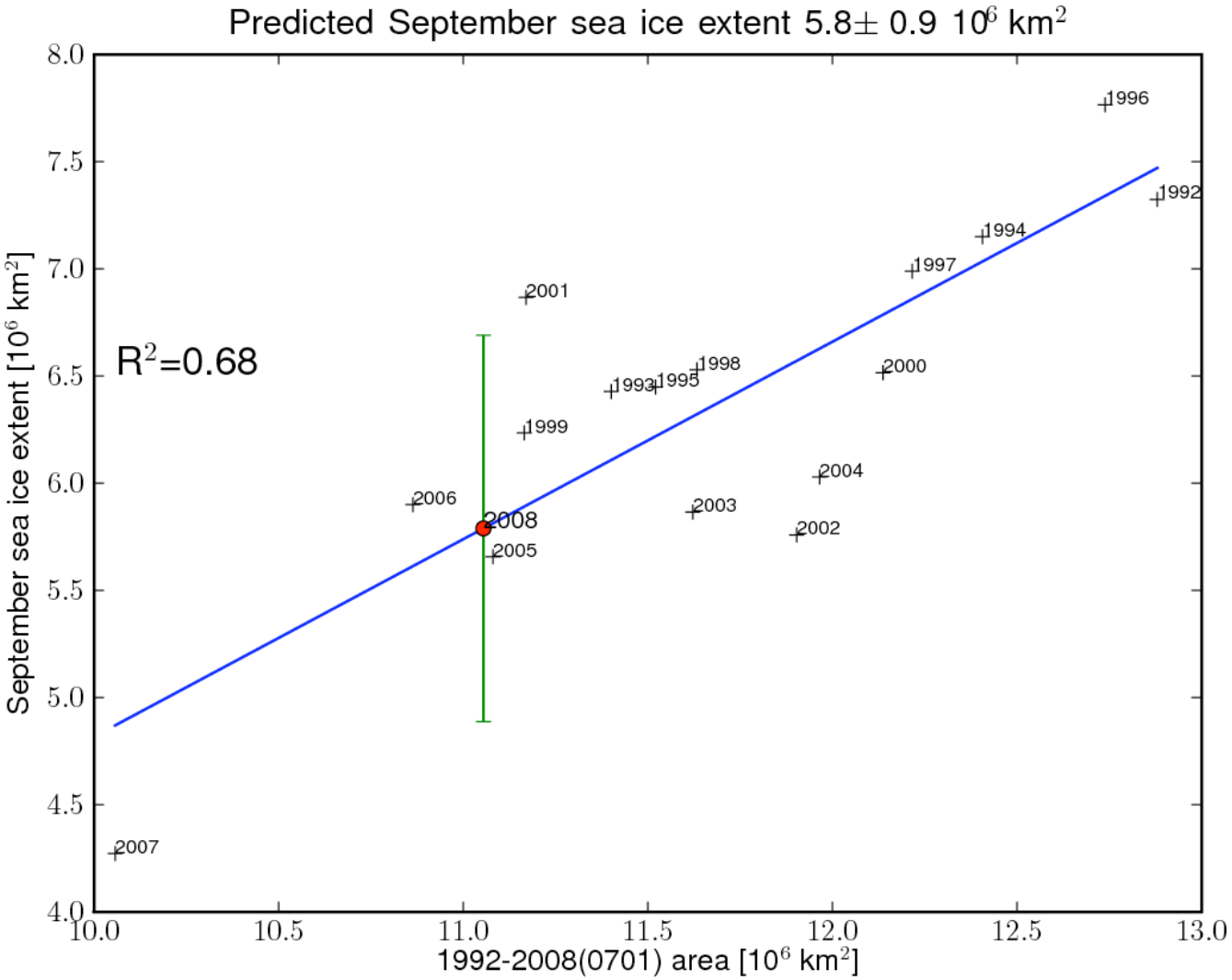

Figure 1: Predicted September sea ice extent. The linear regression line was calculated from the sea ice areas of the 30th June and the September average for the years 1992-2007. The September sea ice extent is estimated from the observation of the 30th June 2008. Daily updates of this figure are available at ftp://ftp-projects.zmaw.de/seaice/prediction/regression.png

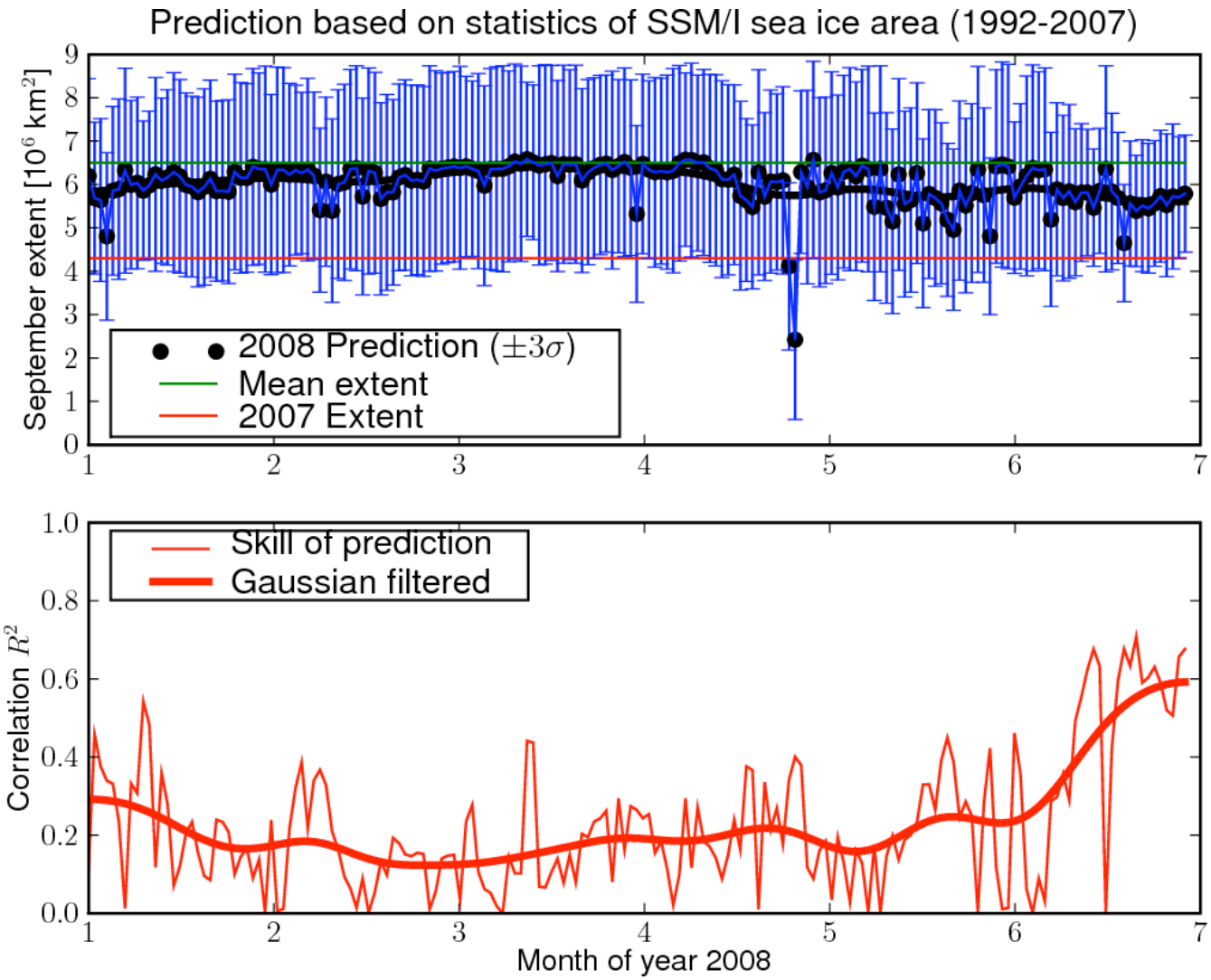

Figure 2: Estimated September sea ice extent and skill of the estimate (correlation). This graph is the result of the method shown in Figure 1 applied for every day of the year 2008. Daily updates of this figure are available at: ftp://ftp-projects.zmaw.de/seaice/prediction/prediction_timeseries.png

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.

Kaleschke, L., C. Lüpkes, T. Vihma, J. Haarpaintner, A. Bochert,, J. Hartmann, and G. Heygster (2001), SSM/I sea ice remote sensing for mesoscale ocean-atmosphere interaction analysis, Can. J. Remote Sens., 27(5), 526– 537.

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