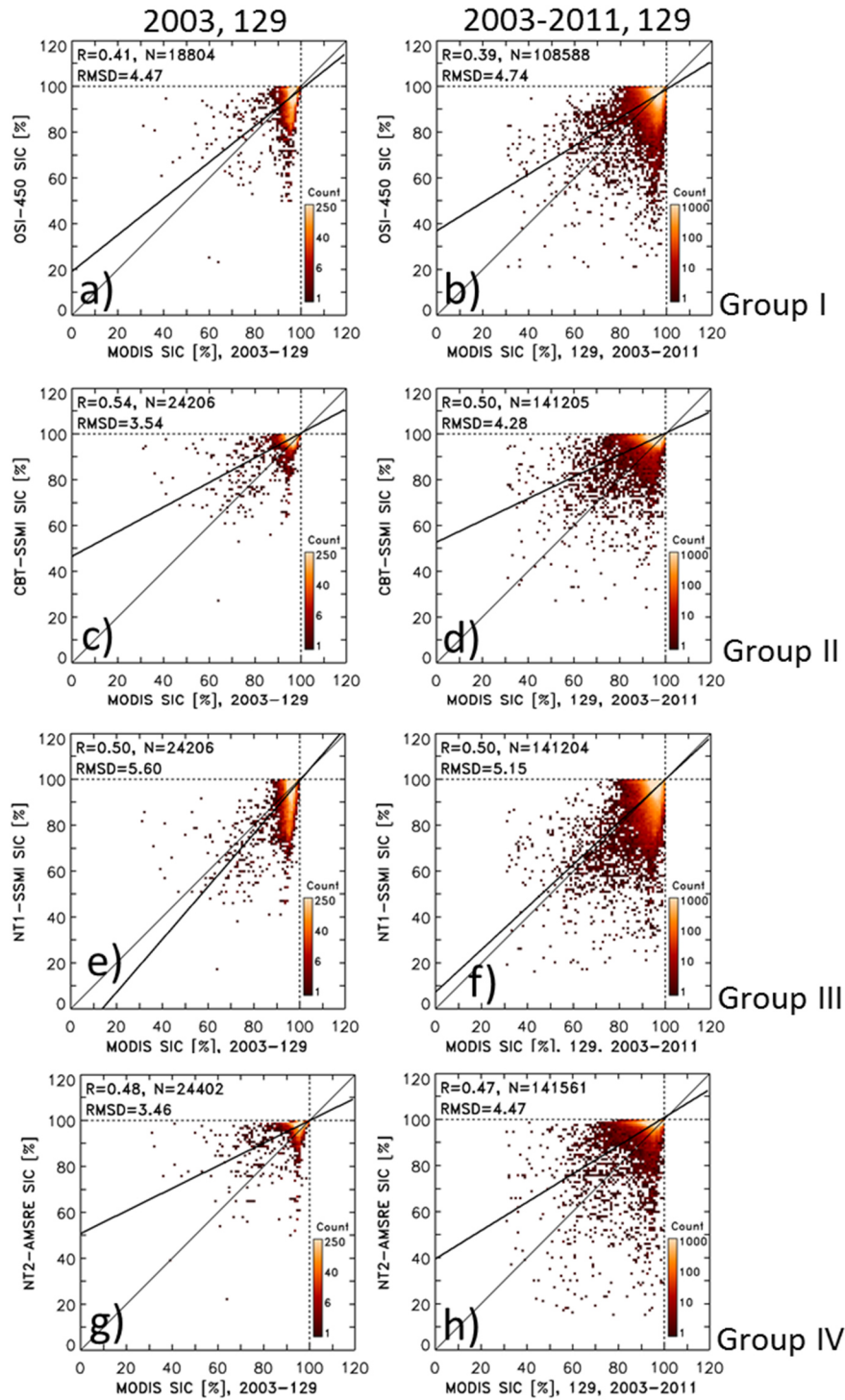
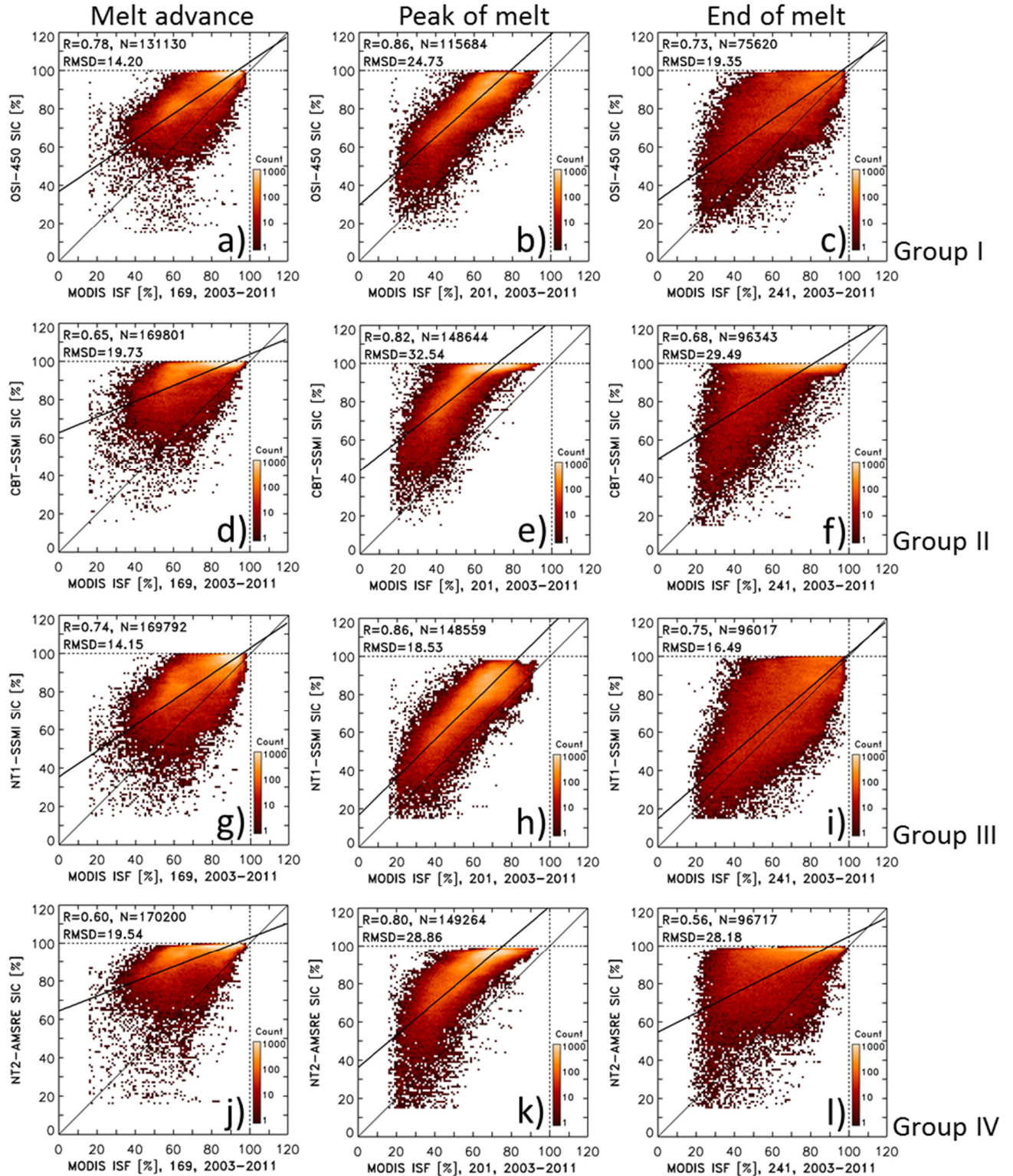


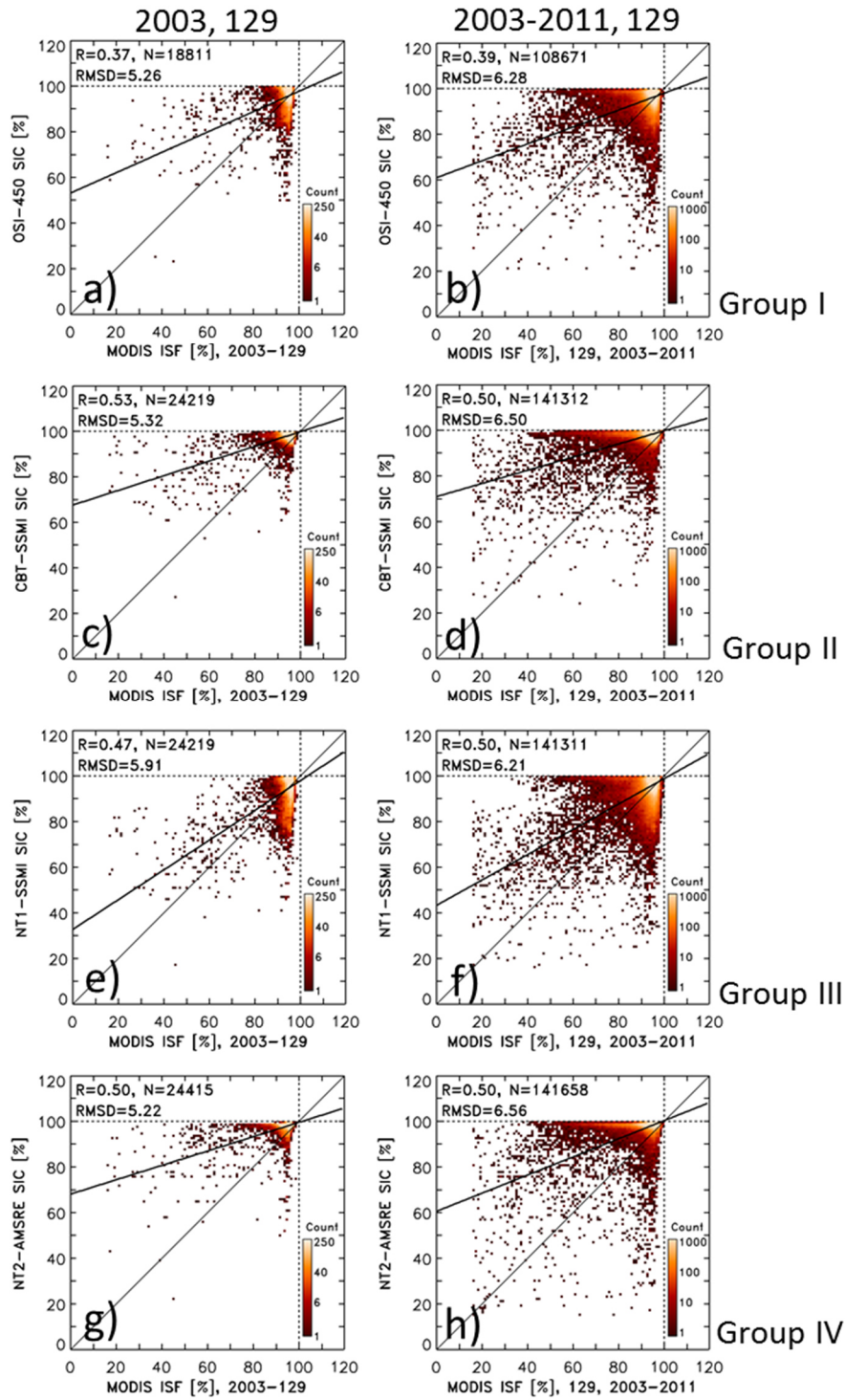
**Figure S1.** Two-dimensional histograms of the distribution of PMW (y-axis) versus MODIS (x-axis) SIC data pairs using a bin size of 1 % for the same products and 8-day periods as shown in Fig. 6 but for years 2003-2011. The thin black line is the identity line. The thick black line denotes the linear regression through the data pairs. In the top left of every image we display the linear correlation coefficient  $R$ , the number of data pairs  $N$  and the root mean squared difference RMSD; the latter is given in percent. The leftmost, middle and rightmost columns are representing melt advance, peak of melt, and end of the melt, respectively. Respective scatterplots for pre-melt are shown in Figure S2.



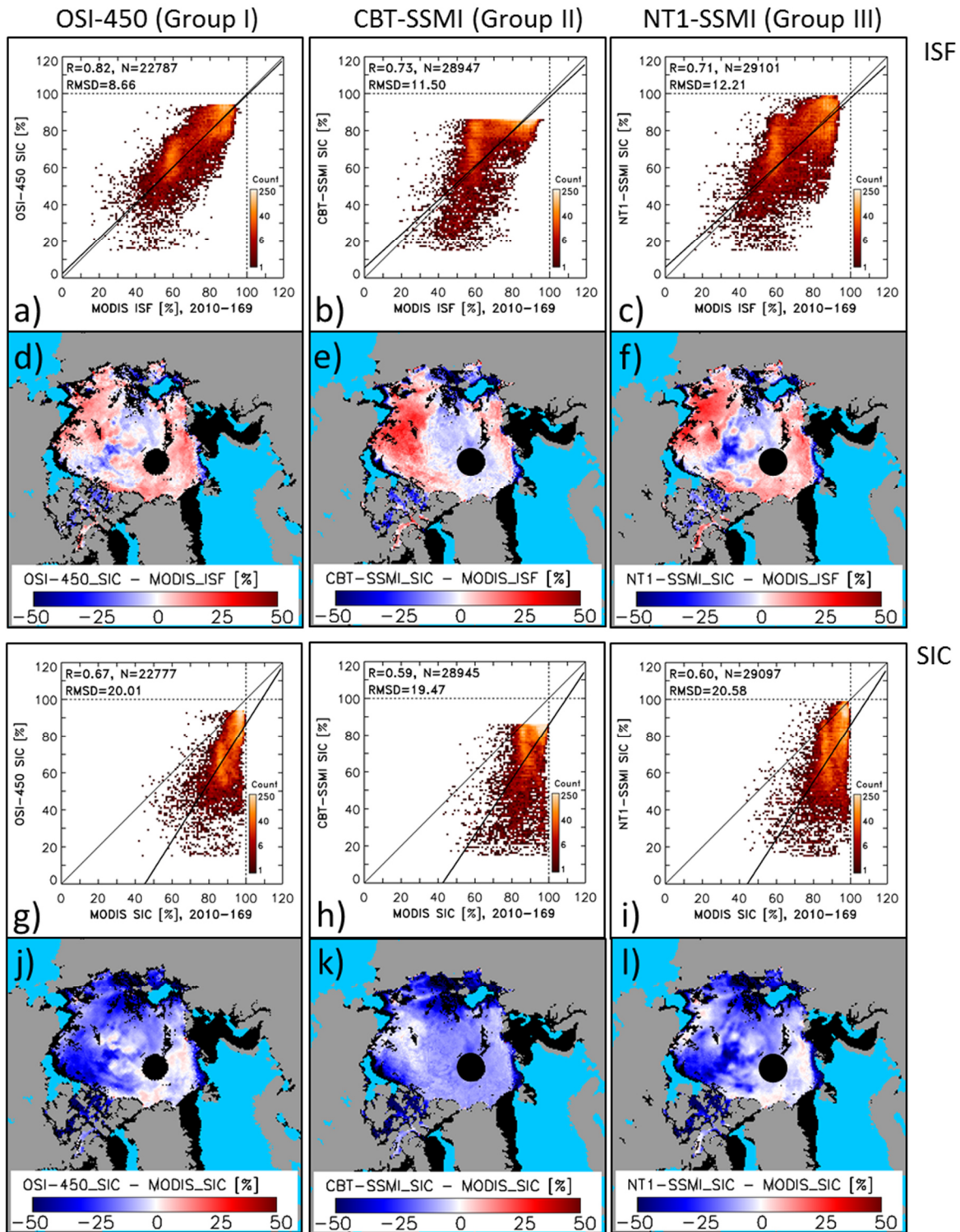
**Figure S2.** Two-dimensional histograms of the distribution of PMW SIC (y-axis) versus MODIS SIC (x-axis) data pairs using a bin size of 1 % for the same products as shown in Fig. 5 for a pre-melt example, i.e. period DOY 129 (May 9-16) 2003. The left column shows data of a single year (2003), the right column data of years 2003-2011. The topmost row shows OSI-450 (for group I), the second row CBT-SSMI (for group II), the third row NT1-SSMI (for group III), and the bottommost row NT2-AMSRE (group IV). The thin black line is the identity line. The thick black line denotes the linear regression through the data pairs. In the top left of every image we display the linear correlation coefficient  $R$ , the number of data pairs  $N$  and the root mean squared difference  $RMSD$ ; the latter is given in percent.



**Figure S3.** Two-dimensional histograms of the distribution of PMW SIC (y-axis) versus MODIS ISF (x-axis) data pairs using a bin size of 1 % for the same products and 8-day periods as shown in Fig. 9 but for years 2003-2011. The thin black line is the identity line. The thick black line denotes the linear regression through the data pairs. In the top left of every image we display the linear correlation coefficient  $R$ , the number of data pairs  $N$  and the root mean squared difference RMSD; the latter is given in percent. The leftmost, middle and rightmost columns are representing melt advance, peak of melt, and end of the melt, respectively. Respective scatterplots for pre-melt are shown in Figure S4.



**Figure S4.** Two-dimensional histograms of the distribution of PMW SIC (y-axis) versus MODIS ISF (x-axis) data pairs using a bin size of 1 % for the same products as shown in Fig. 9 for a pre-melt example, i.e. period DOY 129 (May 9-16) 2003. The left column shows data of a single year (2003), the right column data of years 2003-2011. The topmost row shows OSI-450 (for group I), the second row CBT-SSMI (for group II), the third row NT1-SSMI (for group III), and the bottommost row NT2-AMSRE (group IV). The thin black line is the identity line. The thick black line denotes the linear regression through the data pairs. In the top left of every image we display the linear correlation coefficient R, the number of data pairs N and the root mean squared difference RMSD; the latter is given in percent.



**Figure S5.** Illustration of the effect of a simple linear bias correction for an 8-day period during melt advance (DOY 169, June 18-25, 2010). Topmost row, panels a) to c): Two-dimensional histograms of the distribution of bias-corrected PMW SIC (y-axis) versus MODIS ISF (x-axis) data pairs. Second row, panels d) to f): Respective maps of the difference of bias-corrected PMW SIC minus MODIS ISF. Third row, panels g) to i) Two-dimensional histograms of the distribution of bias-corrected PMW SIC (y-axis) versus MODIS SIC (x-axis) data pairs. Bottommost row, panels j) to l): Respective maps of the difference bias-corrected PMW SIC minus MODIS SIC. Leftmost, middle and rightmost columns show OSI-450 (for group I), CBT-SSMI (for group II), and NT1-SSMI (for group III). Bin size in the histograms is 1 %. The quantities given in the top left corner are R: linear correlation coefficient, N: number of valid data pairs, and RMSD: root mean squared difference. The thin black line is the identity line; the thick black line denotes the linear regression through the data pairs.