



## *Supplement of*

# **An indicator of sea ice variability for the Antarctic marginal ice zone**

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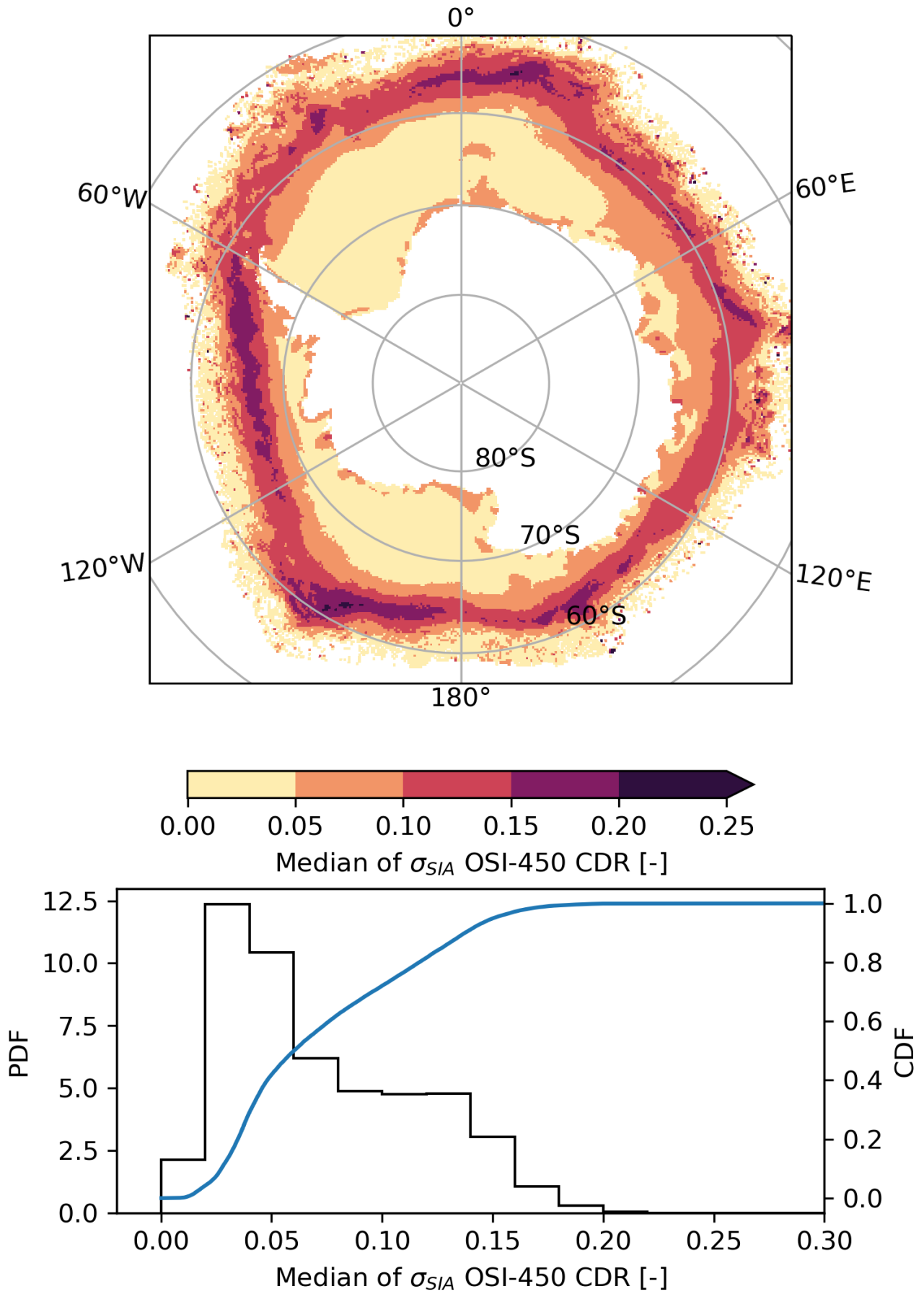


Fig. S1: As in Fig. 2 of the main text but for the OSI-450 CDR (1979-2015). Top panel: median of the monthly standard deviation of sea-ice concentration daily anomaly ( $\sigma_{SIA}$ ), plotted on a stereographic projection. The pixels with SIC=0 have been excluded from the analysis of the distribution. Bottom panel: empirical probability and cumulative density functions of the median values from the map (PDF: black line and CDF: blue line).

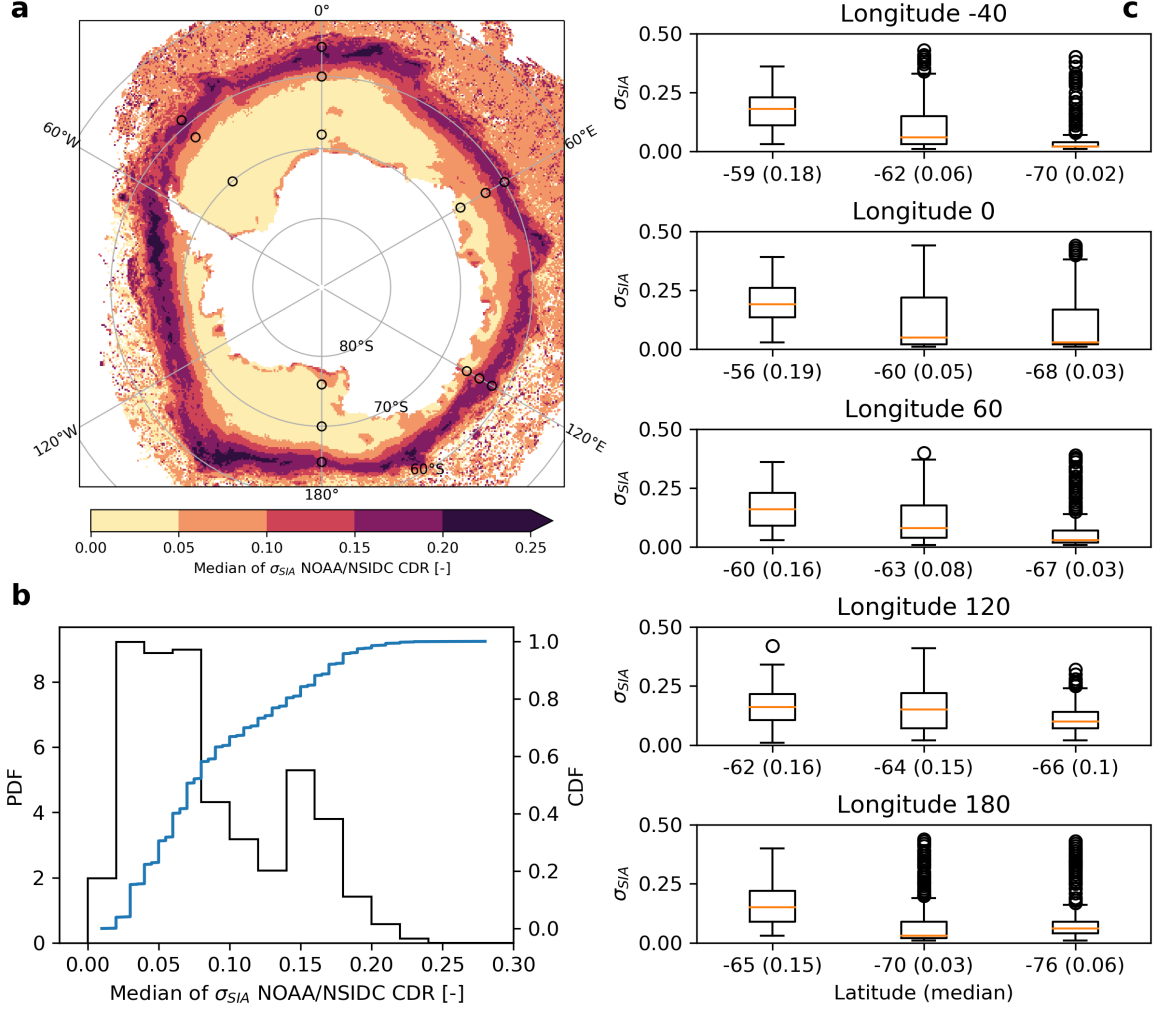


Fig. S2: As in Fig. 2 of the main text but for the NOAA/NSIDC CDR V3 ( <https://doi.org/10.7265/N59P2ZTG>). Overview of the variability indicator highlighting the MIZ extent (NOAA/NSIDC CDR, 1987-2019). (a) Median of the monthly standard deviation of sea-ice concentration daily anomaly ( $\sigma_{SIA}$ ), plotted on a stereographic projection. The pixels with SIC=0 have been excluded from the analysis of the distribution. The circles indicate the locations shown in panel c. (b) Empirical probability and cumulative density functions of the median values from the map shown in panel a (PDF: black line and CDF: blue line). (c) Not shown in Fig. 2, this panel presents box-and-whisker plots of the  $\sigma_{SIA}$  distribution extracted at the locations shown in panel a. The distributions at fixed locations are similar in V4. The three subjective latitudes correspond to different values of the median along each selected longitude (orange line, the value is shown in brackets besides the latitude).

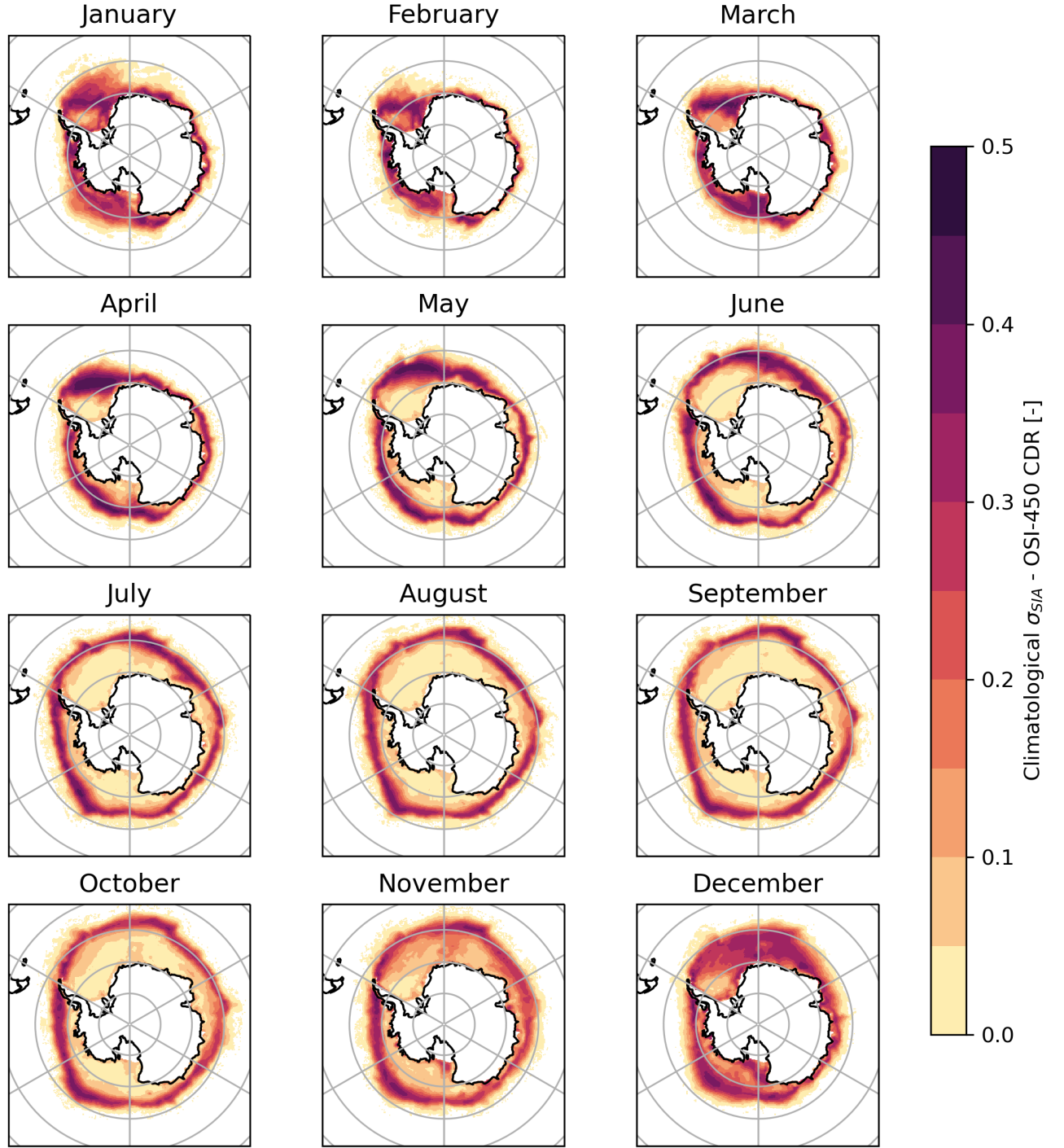


Fig. S3: As in Fig. 4 of the main text but for the OSI-450 dataset. Climatological values of the indicator ( $\bar{\sigma}_{SIA}^n$ ), computed as the standard deviation of the daily anomalies for each month in the whole time series.

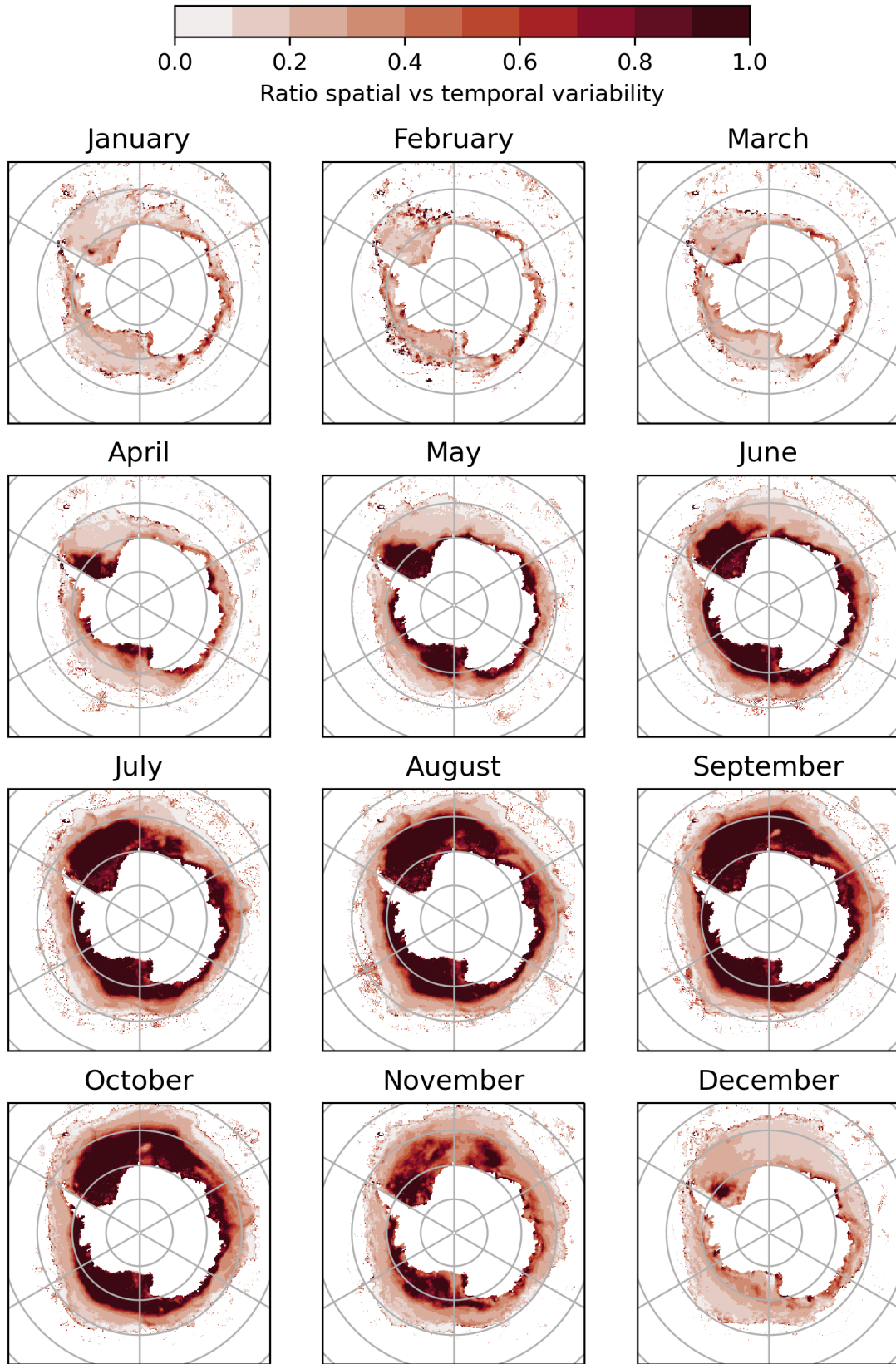


Fig. S4: Ratio between the spatial standard deviation and the temporal variability indicator  $\bar{\sigma}_{SIA}^n$ .



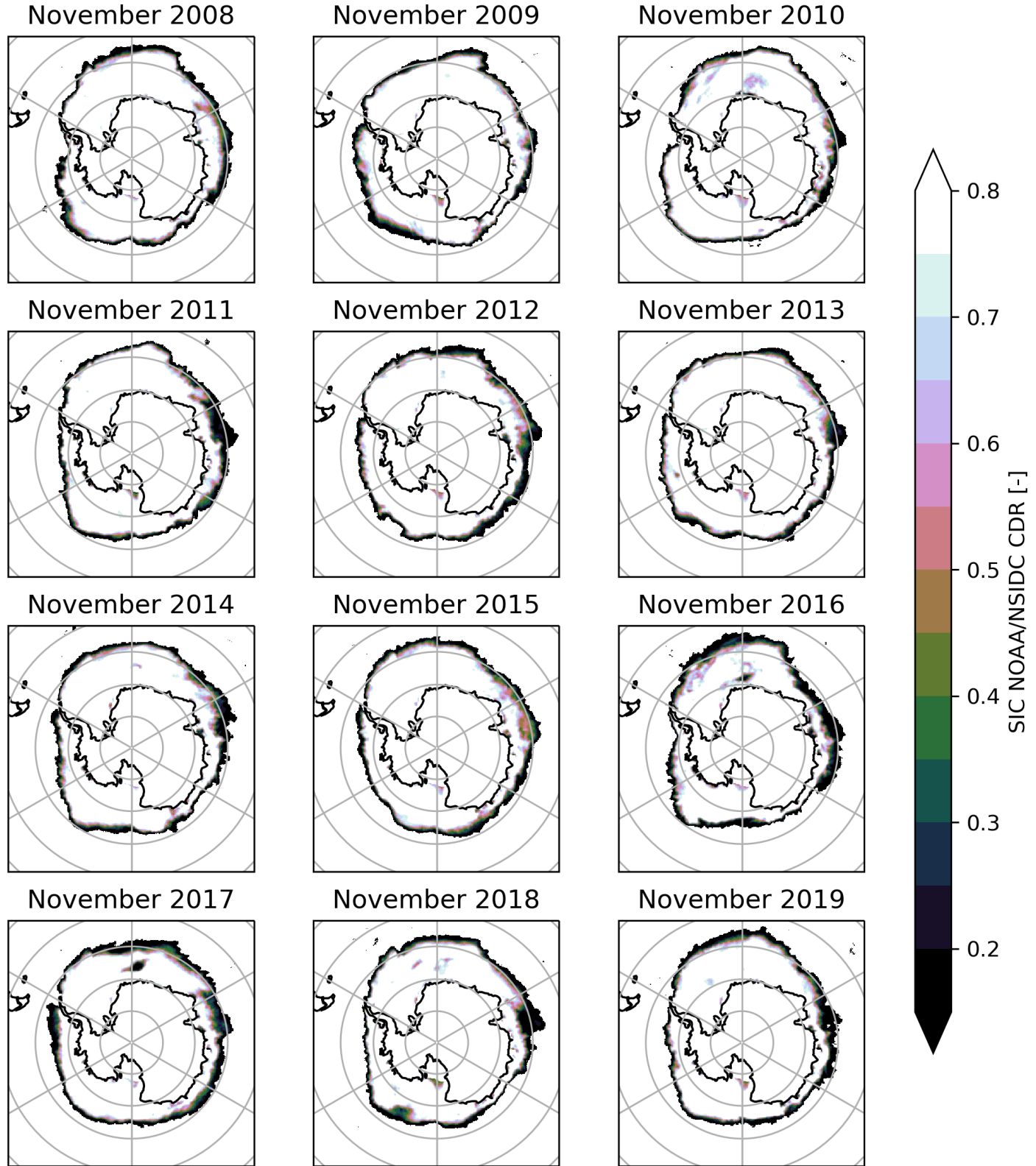


Fig. S5: Average monthly SIC for all Novembers during the period 2008-2019. Only the SIC interval between 0.15 and 0.80 is shown  $\bar{\sigma}_{SIA}^n$ .

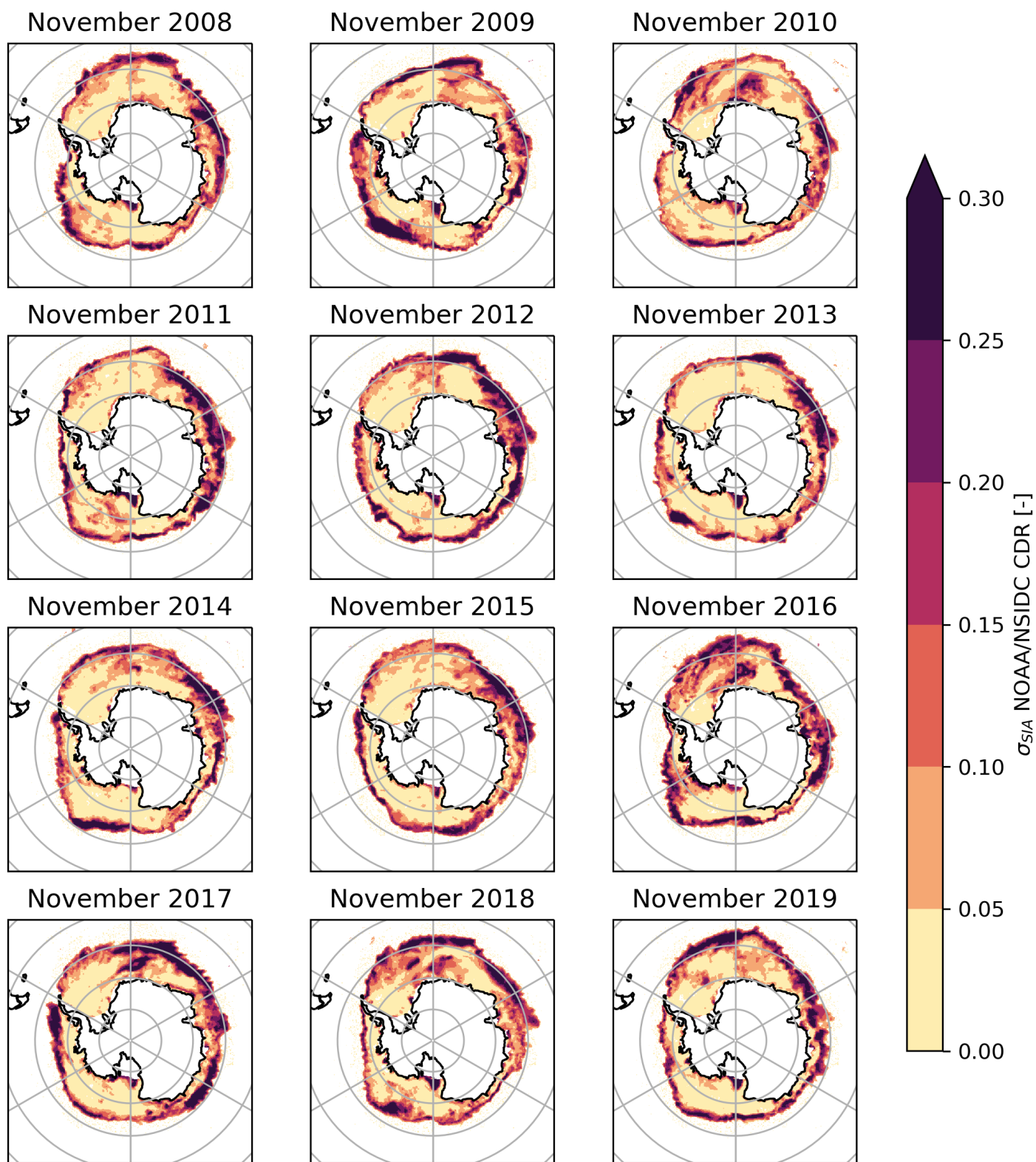


Fig. S6: November maps of the  $\sigma_{SIA}$  indicator from the NOAA/NSIDC CDR for the years 2008-2019.

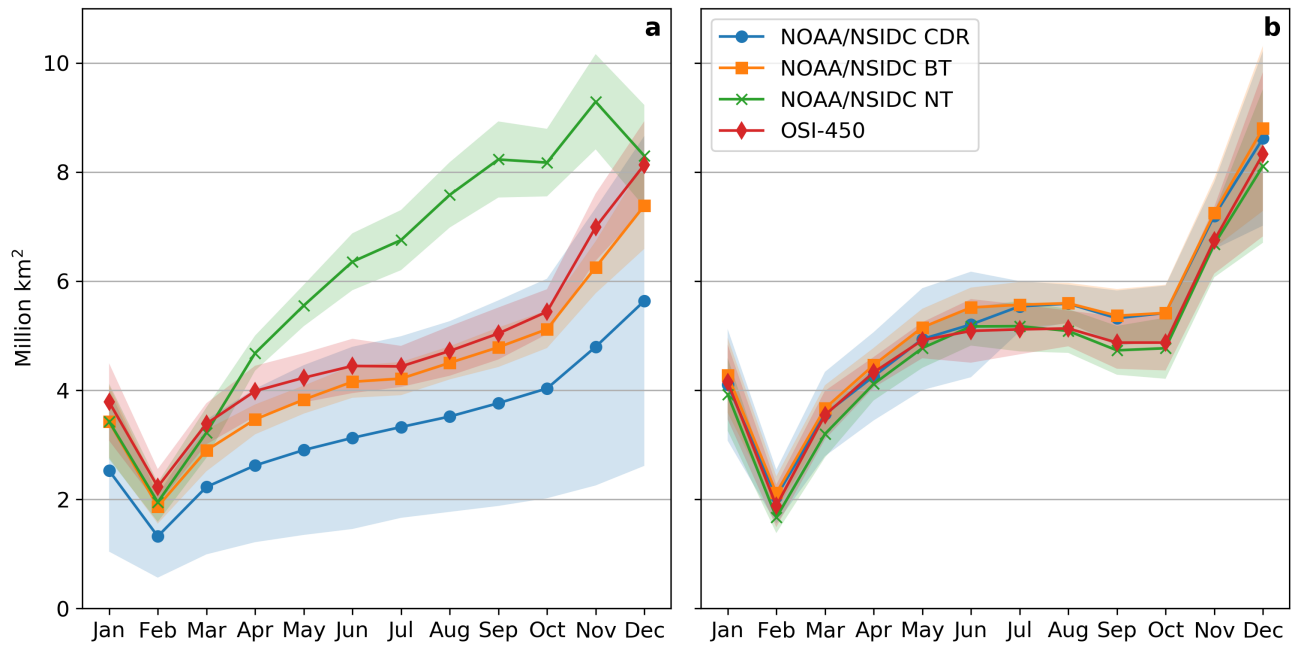


Fig. S7: As Fig. 9 the main text but for the NOAA/NSIDC CDR V3 (<https://doi.org/10.7265/N59P2ZTG>). The only difference is in the blue line for CDR V3. The analysis with the  $\sigma_{SIA}$  indicator still indicates agreement in the seasonality even if the threshold-based MIZ extent is much lower.



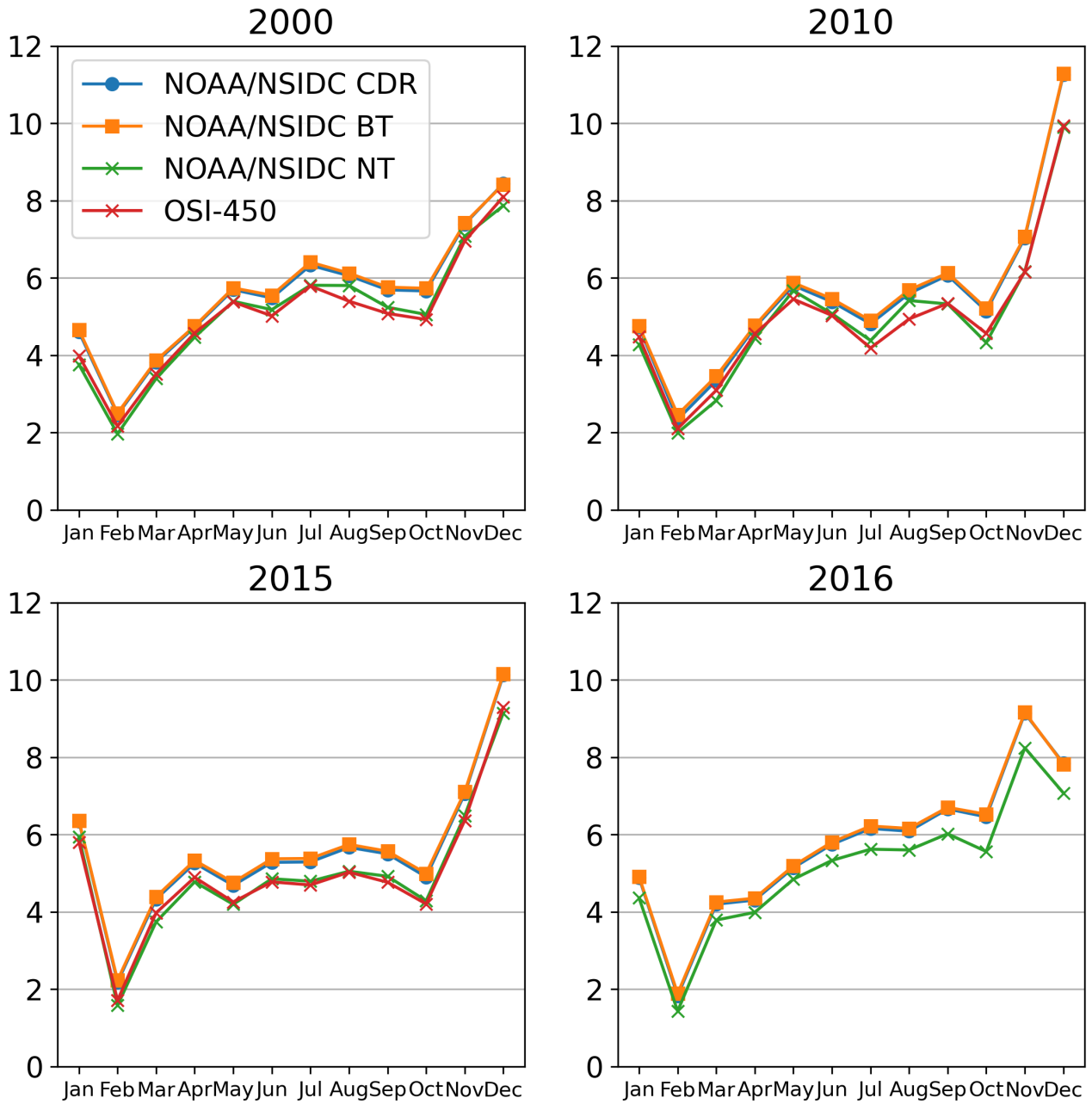


Fig. S8: As in Fig. 9b of the main text but for selected years. The OSI-450 product (red line) is not shown for 2016 since it terminates in 2015.

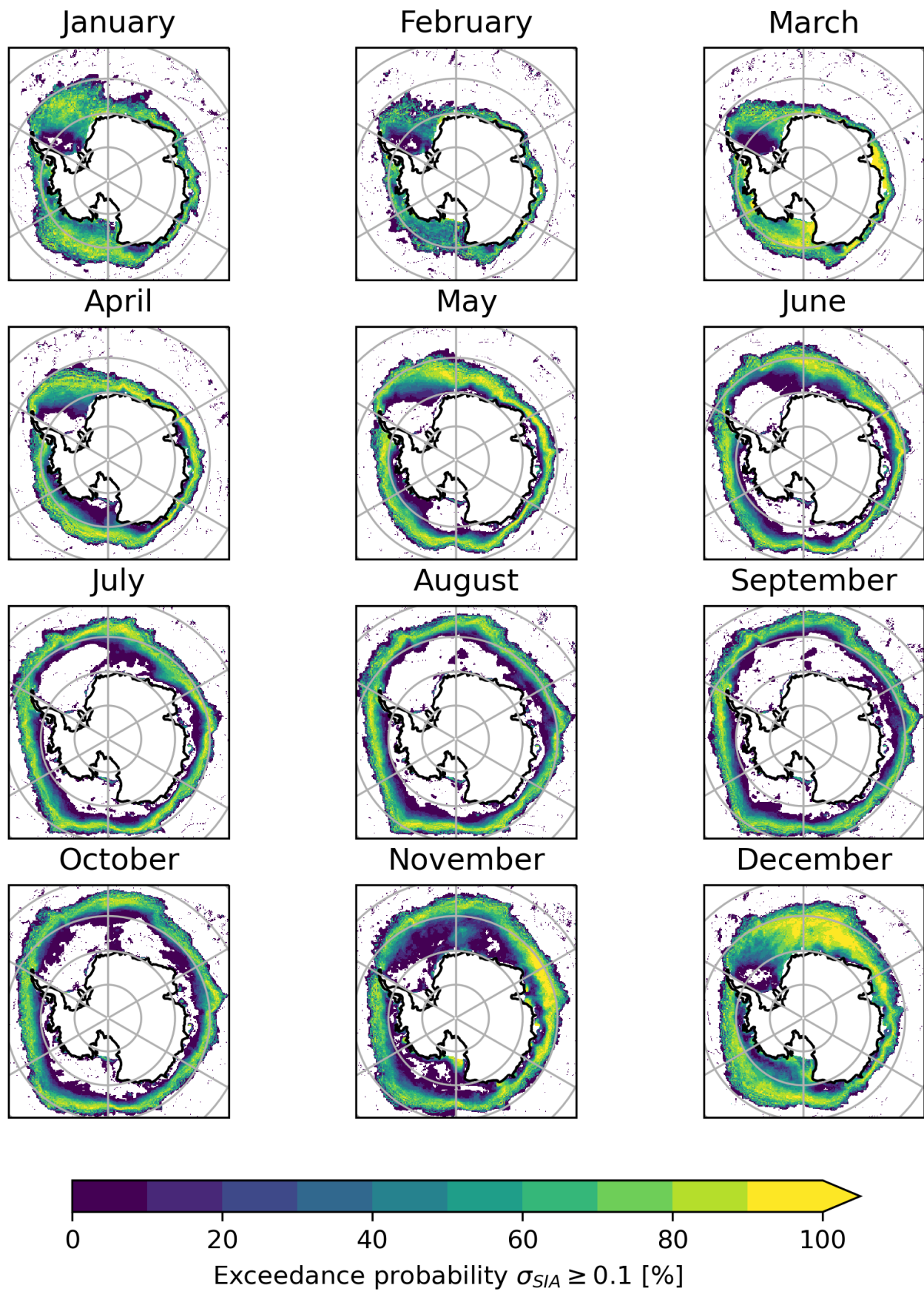


Fig. S9: Monthly values of the exceedance probability for a threshold  $\sigma_{SIA} \geq 0.1$  from the NOAA/NSIDC CDR.