



Supplement of

Decadal and spatially complete global surface chlorophyll-*a* data record from satellite and BGC-Argo observations

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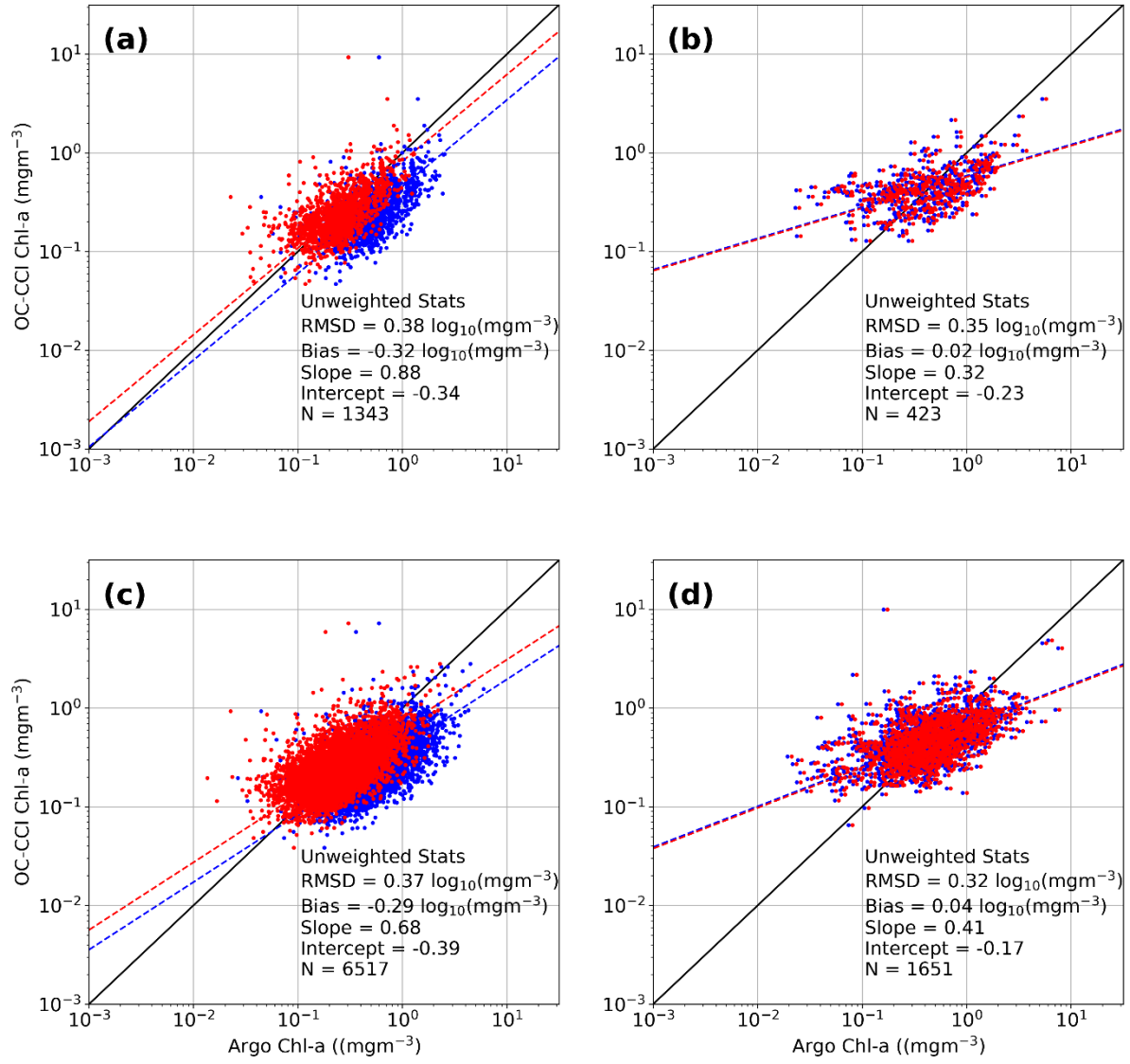
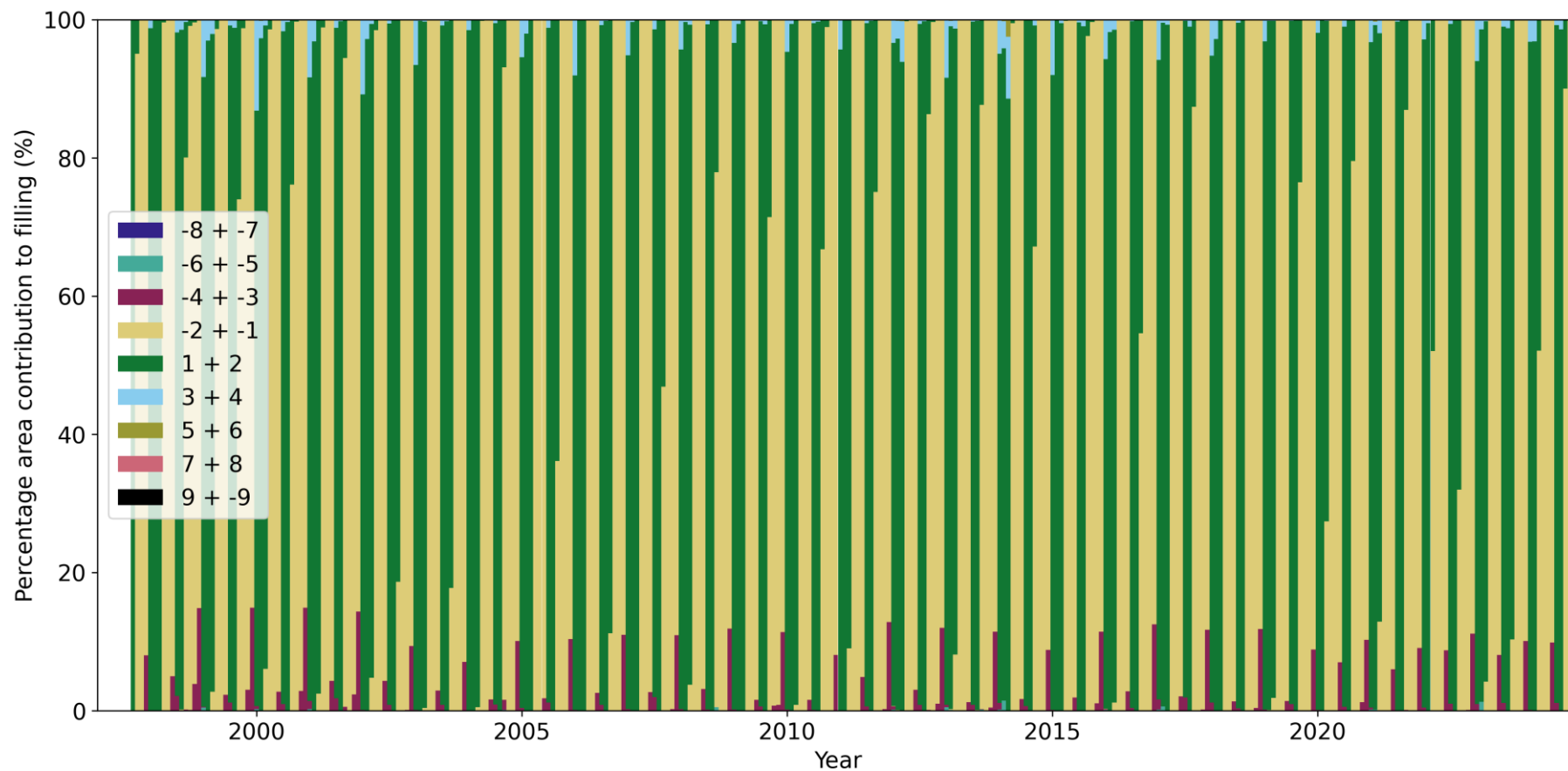
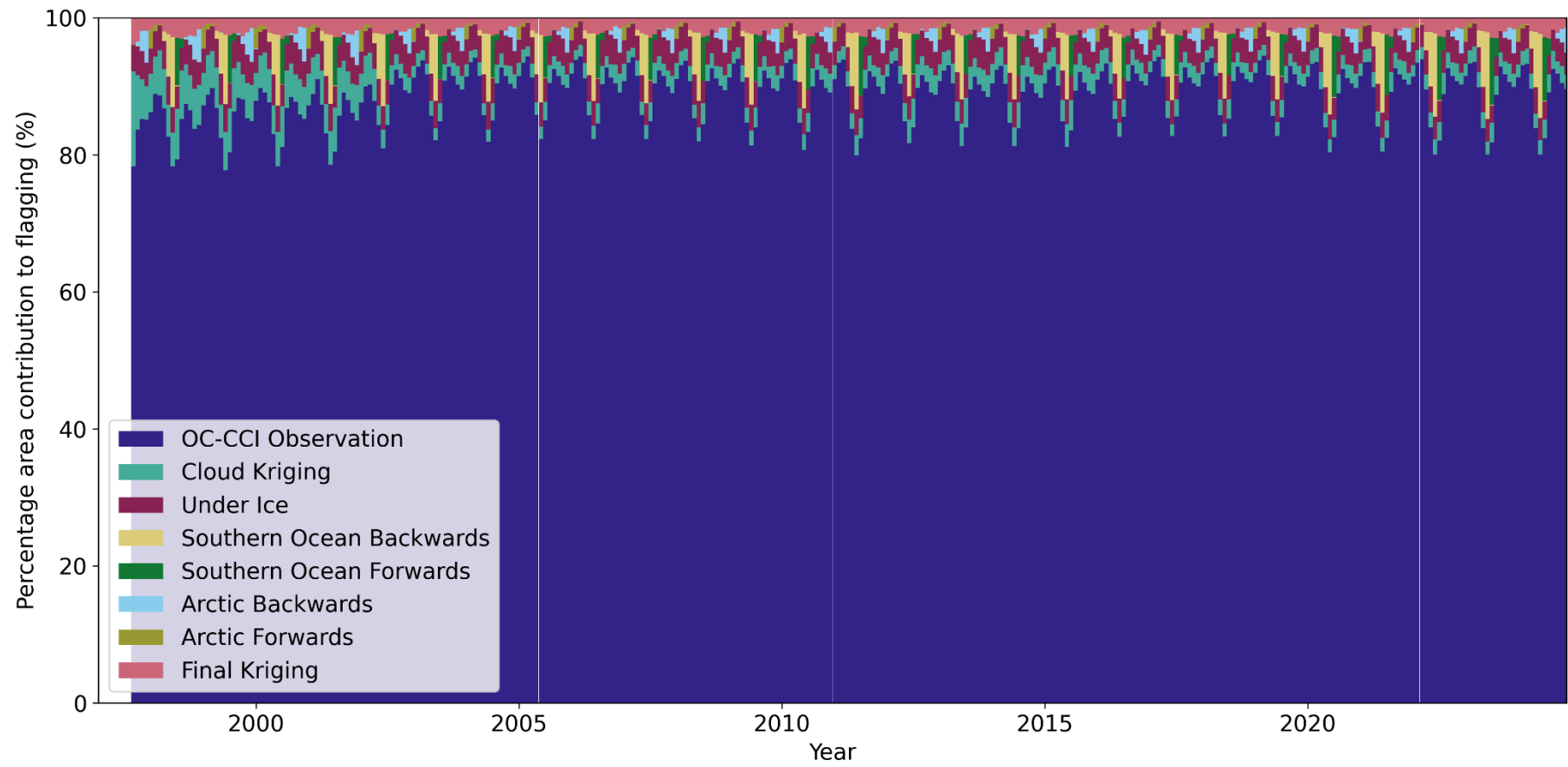


Figure S1: (a) Comparison between daily matched Ocean Colour Climate Change Initiative (OC-CCI; 4km) and BGC-Argo chlorophyll-a (chl-a) within the Southern Hemisphere. Blue points indicate the uncorrected BGC-Argo data, and red points indicate the slope-corrected BGC-Argo data. Solid line is 1:1, and dashed blue line indicates a Type-II linear regression. The statistics are for the uncorrected BGC-Argo data, and acronyms are root mean square difference (RMSD) and number of samples (N). (b) same as (a), but for the Northern Hemisphere. (c) same as (a) but using monthly 0.25° composites of OC-CCI chl-a and BGC-Argo observations averaged to the same grid for the Southern Hemisphere. (d) same as (c), but for the Northern Hemisphere.



10 **Figure S2: The monthly percentage area contributions of the BGC-Argo relationships month lags applied to gap filled Ocean Colour Climate Change Initiative (OC-CCI) data between 1997 and 2024. Positive values in the legend indicate that the forward relationship was applied and negative values that the backward relationship was applied. The time lags are grouped as shown in the legend, e.g., the '1+2' (green) bars indicate the forward relationship for which 1- or 2-month time lags were applied.**



15 **Figure S3: The monthly percentage area contribution of pixels flagged by each gap filling approach between 1997 and 2024.**

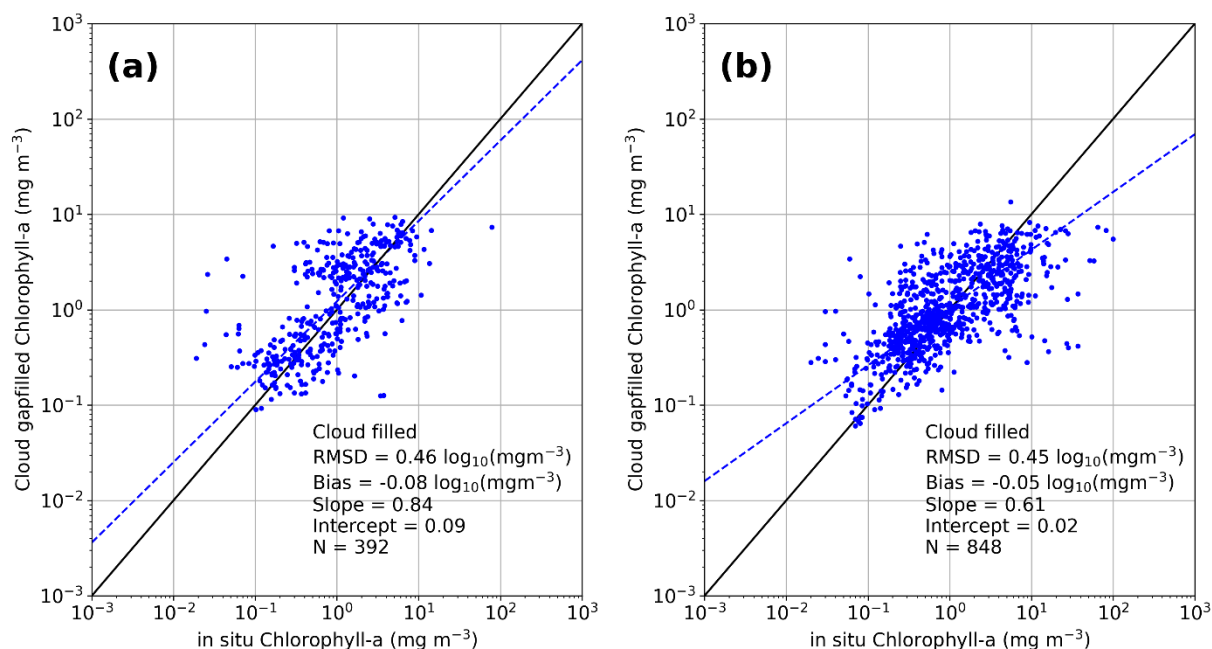


Figure S4: (a) Comparison between monthly 0.25°-gridded *in situ* HPLC chl-a concentrations and the gap-filled chl-a data using a spatial kriging approach. Solid line is 1:1 and dashed blue line indicates a Type-II linear regression. In text the abbreviations for the statistical measures are root mean square difference (RMSD) and number of samples (N). (b) Comparison between monthly 0.25°-gridded *in situ* fluorometric chl-a concentrations and the gap-filled chl-a.