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Supplement of

A novel sea surface pCO$_2$-product for the global coastal ocean resolving trends over 1982–2020

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Table S1: Bias (mean of the residuals between the reconstructed coastal pCO$_2$-product and SOCAT_a, in µatm), Root Mean Square Error (RMSE, µatm) and coefficient of determination (r^2) calculated for each year. The number of grid cells used for the comparison is also provided.

|	bias (µatm)	RMSE (µatm)	r^2	cells
1982-12020	0	29	0.7	472134
1982	1	20	0.7	568
1983	5	15	0.7	209
1984	-1	13	0.7	341
1985	5	18	0.4	192
1986	-2	11	0.8	310
1987	-6	31	0.4	456
1988	-1	27	0.6	323
1989	-2	42	0.5	453
1990	2	26	0.2	181
1991	0	17	0.8	1094
1992	2	16	0.7	1176
1993	4	30	0.6	2067
1994	0	25	0.6	2939
1995	0	24	0.8	6220
1996	0	28	0.7	5130
1997	3	32	0.8	4928
1998	1	28	0.7	5259
1999	0	31	0.8	5183
2000	-2	32	0.7	6289
2001	-1	33	0.7	7055
2002	3	26	0.7	8833
2003	-3	24	0.8	8772
2004	-1	26	0.8	12276
2005	-1	25	0.7	14980
2006	0	28	0.7	22512
2007	2	29	0.7	21724
2008	2	26	0.8	19784
2009	1	30	0.7	18313
2010	0	28	0.7	21149
2011	0	34	0.7	27382
2012	-1	31	0.7	24474
2013	-1	30	0.7	21674
2014	0	32	0.7	27817
2015	0	30	0.7	28386
2016	1	25	0.8	29319
2017	2	26	0.8	34210
2018	1	28	0.7	30488
2019	-1	30	0.7	29283
2020	-2	30	0.8	20367

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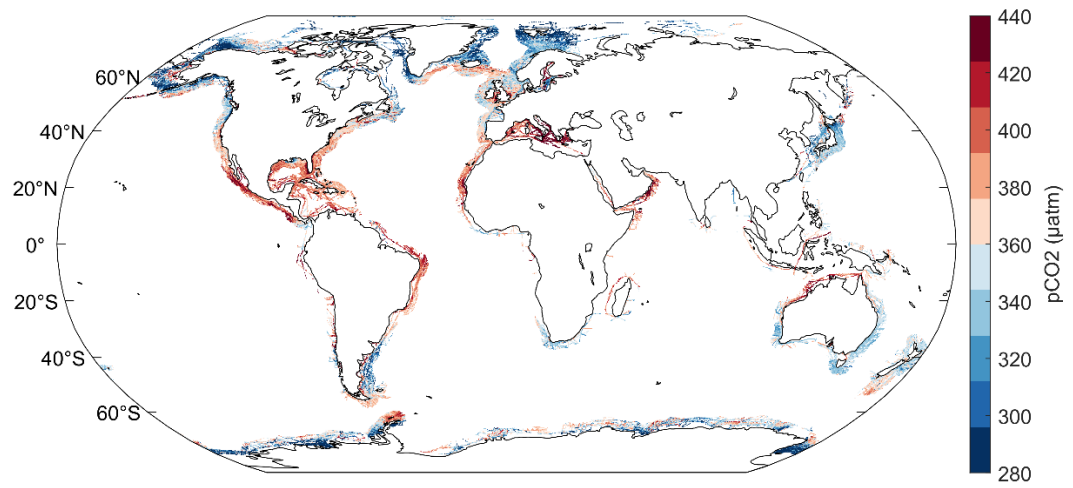
Figure S1. Global map of the climatological (1982-2020 period) averaged gridded sea surface coastal pCO$_2$ (µatm) from the SOCATv2022 database used as an independent dataset against for which the reconstructed coastal pCO$_2$-product is evaluated (SOCAT_b).
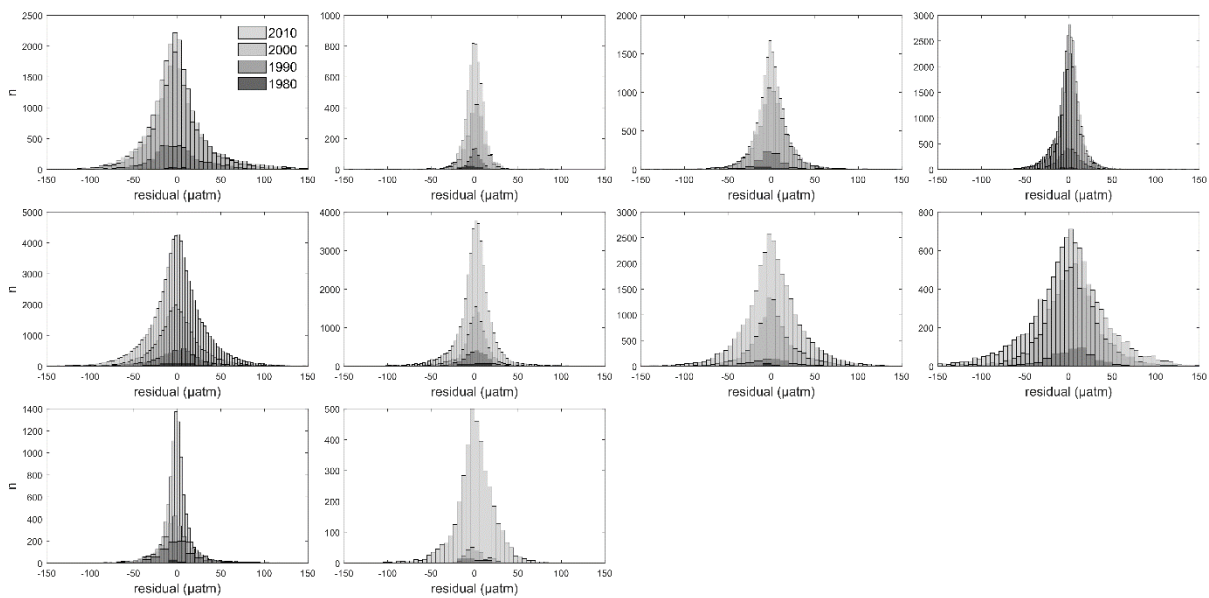
Figure S2: Histograms of the residuals (in µatm) between the reconstructed coastal pCO$_2$-product and SOCAT_b for each of the four decades in each biogeochemical province.
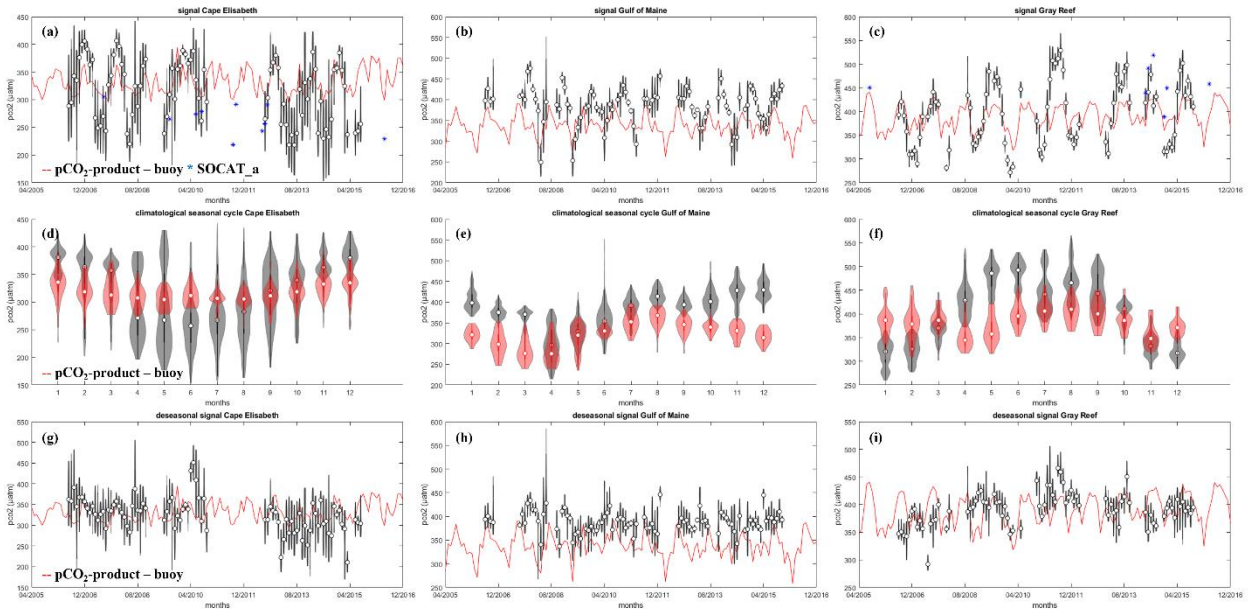
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Figure S3. Comparison between the reconstructed coastal pCO₂-product (red) against times series from 3 coastal buoys (black) namely in Cape Elizabeth (NDBC Buoy 46041), in Gray's Reef (NDBC Buoy 41008) and in the Gulf of Maine (Coastal Western Gulf of Maine mooring, Sutton et al., 2019). (a-c) Monthly time series, (d-f) climatological mean seasonal cycles, (g-i) linear trends from deseasonalized data. The violins for the buoys represent the intra variability on the pCO₂ measurements. The violins in panels (d) to (g) for the reconstructed pCO₂ represent the pCO₂ variability of the month x around its monthly climatological pCO₂ mean.