



Supplement of

Evaluation of factors affecting total ozone column and its trend at three Antarctic stations in the years 2007–2023

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Table S1: Daily TOC characteristics expressed by the medians, 25th (Q1) and 75th (Q3) percentiles and standard deviations (sd) in individual months for stations Marambio, Troll and Concordia.

Marambio				
Month	median	Q25	Q75	sd
SEP	207.52	183.03	248.82	49.95
OCT	223.37	178.78	292.46	69.42
NOV	284.30	215.83	331.26	65.82
DEC	308.31	288.20	323.38	31.05
JAN	290.14	279.31	301.77	16.43
FEB	282.18	267.75	294.15	20.07
MAR	277.15	263.60	294.04	23.16
APR	281.55	263.31	297.73	25.67
Troll				
Month	median	Q25	Q75	sd
SEP	173.20	155.43	191.78	27.47
OCT	156.23	138.65	175.35	27.12
NOV	208.80	180.21	294	67.60
DEC	292.40	246.45	312.5	47.04
JAN	286.90	274.79	298.91	17.85
FEB	277.30	262.41	288.95	18.92
MAR	265.10	251.85	278.29	20.17
APR	268.65	254.24	281.21	20.97
Concordia				
Month	median	Q25	Q75	sd
SEP	198.2	172.74	229.28	51.18
OCT	192.93	169.88	250.41	64.08
NOV	242.55	193.58	329.34	73.79
DEC	296.42	273.51	317.86	37.12
JAN	295.81	282.57	305.39	17.64
FEB	290.55	280.79	301.38	14.88
MAR	291.03	278.61	301.29	18.45
APR	290.60	278.55	304.45	19.74

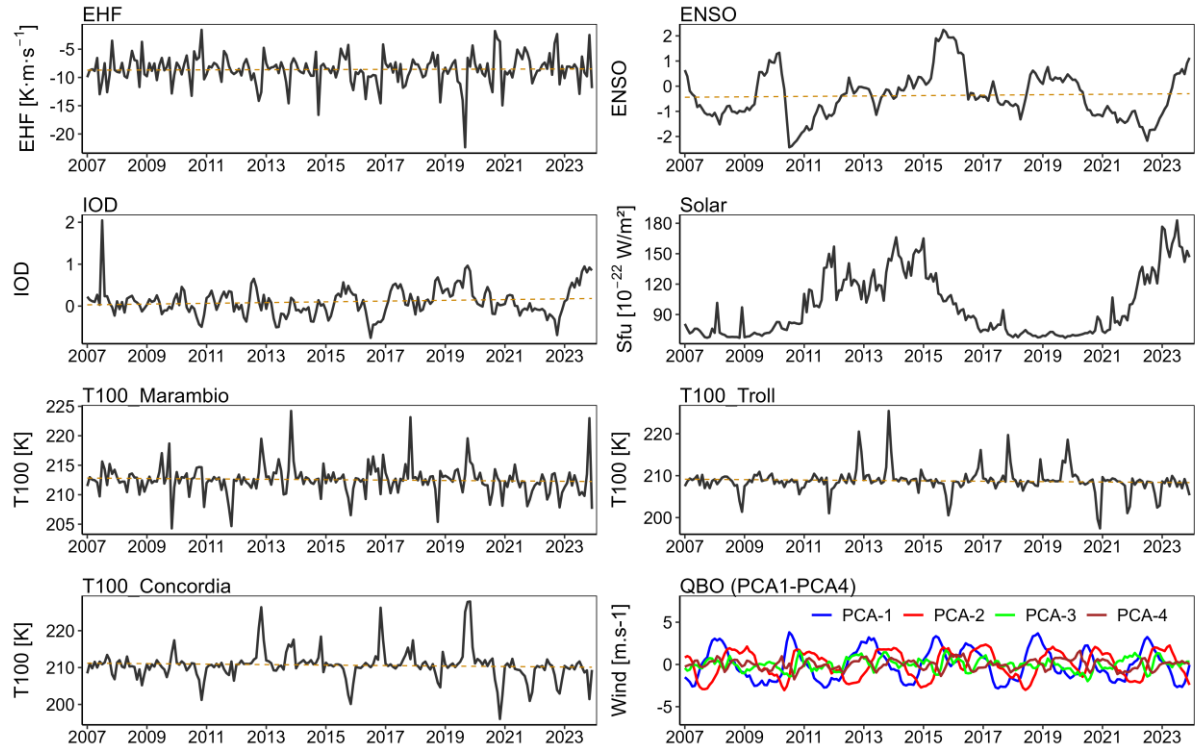


Figure S1: Time series of predictors supplemented with a linear trend (red; except for the solar predictor), which was statistically insignificant at the significance level of $p = 0.05$. Note that trends for QBO are not shown in the plot.

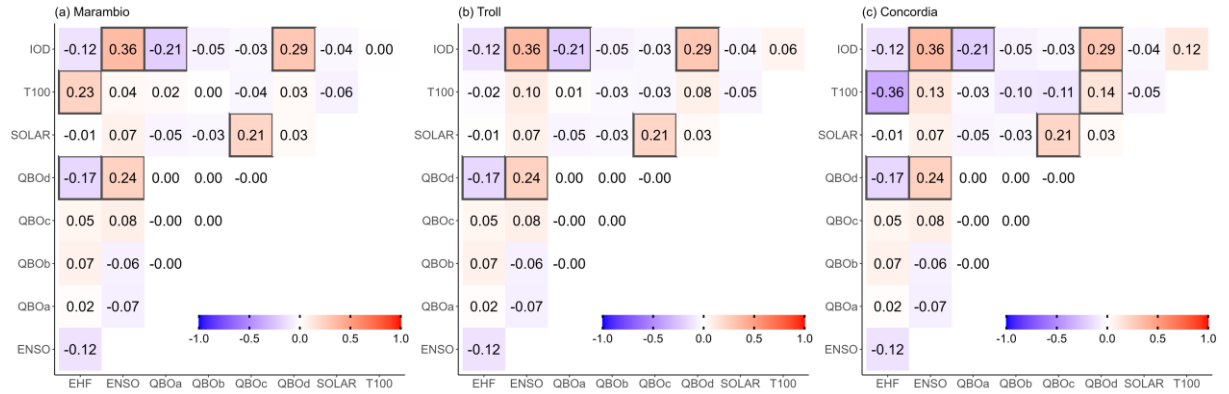


Figure S2: Pearson correlation coefficients of the used predictors for Marambio (a), Troll (b) and Concordia (c). Statistically significant correlations ($p < 0.05$) are marked with a grey border.

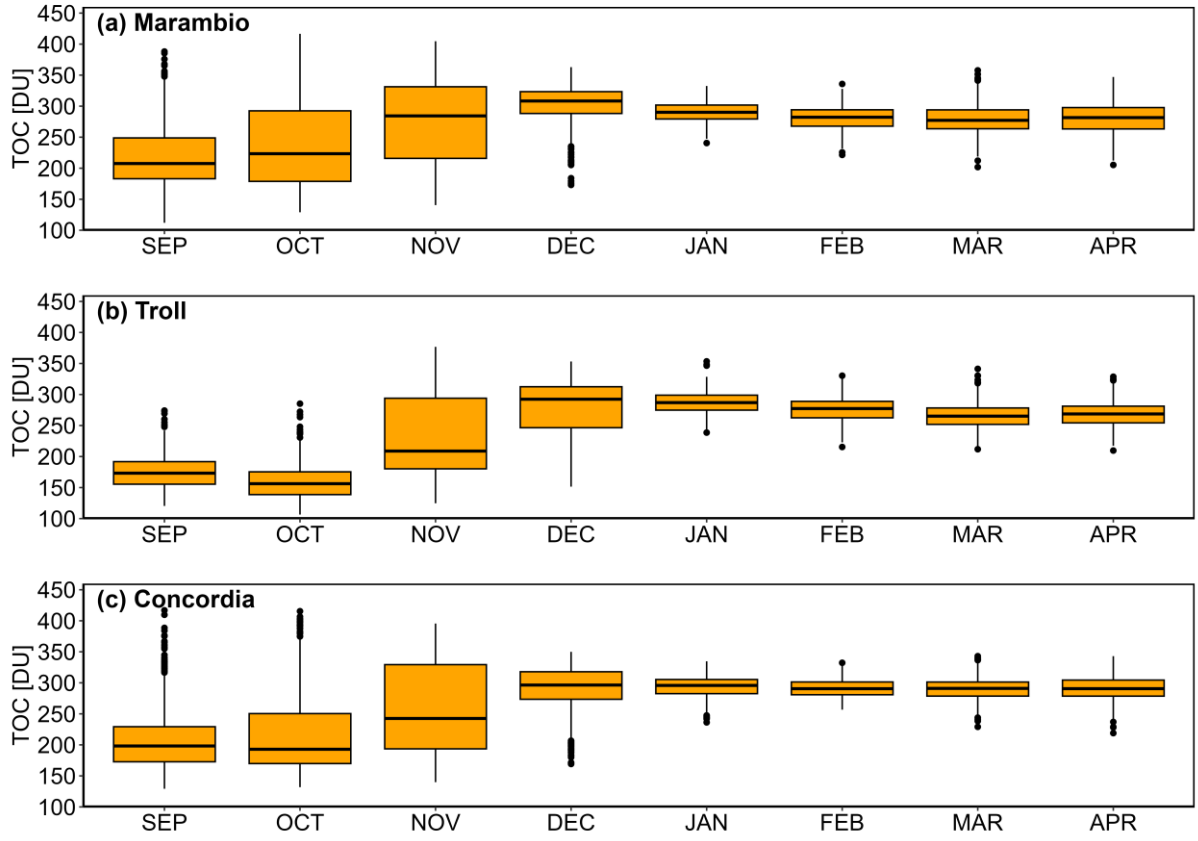


Figure S3: Annual run of available daily TOC at stations Marambio (a), Troll (b) and Concordia (c) in the period 2007–2023. The black line shows the median, the boxes the 25th (Q1) and 75th (Q3) percentiles, the whiskers $Q1(3) - 1.5 \times IQR$ (interquartile range) and the black dots the outliers.

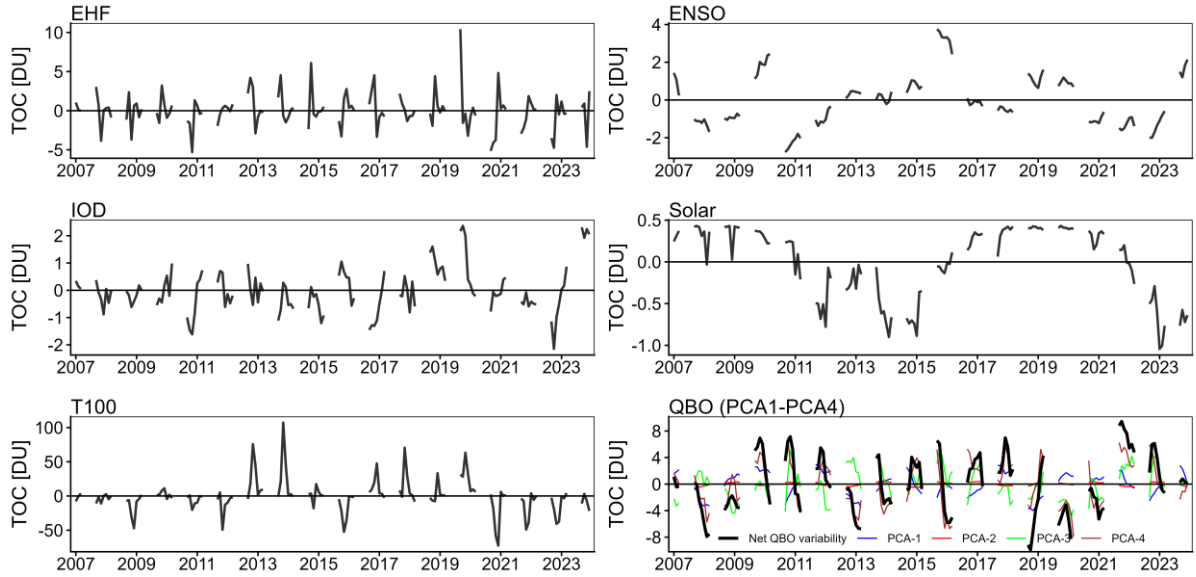


Figure S4: Predictor contribution ($\beta_n \cdot X_n$ with coefficient β_n and predictor X_n) at Troll.

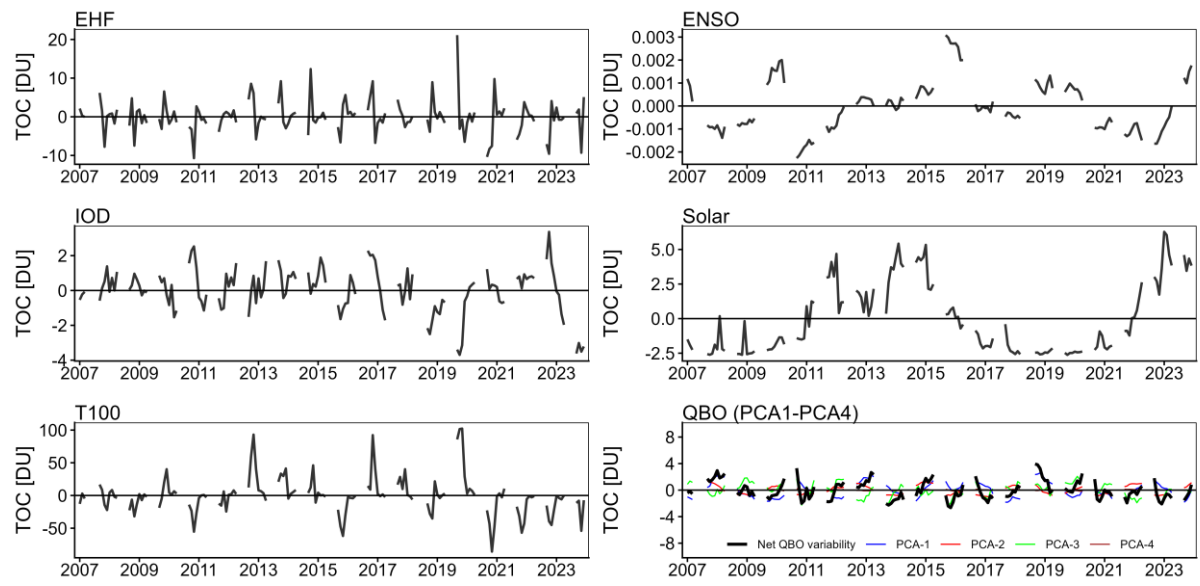


Figure S5: Predictor contribution ($\beta_n \cdot X_n$, with coefficient β_n and predictor X_n) at Concordia.

Tab. S2 Linear trends of TOC at the three Antarctic stations (Marambio, Troll, and Concordia) in 2007–2023 compiled time series, OMI and MERRA-2 data. The table presents the estimated trend (DU/decade), the associated uncertainty, the p-value, and the adjusted R² for each station. A statistically significant trend is marked in bold ($p < 0.05$).

Station	Fit results	Trend [DU/decade]	Uncertainty [DU/decade]	p-value	Adjusted R ²
Marambio	Compiled	3.43	±3.22	0.04	0.94
	OMI	4.58	±2.97	0.00	0.95
	MERRA-2	4.20	±3.00	0.01	0.95
Troll	Compiled	-1.09	±3.91	0.58	0.97
	OMI	2.42	±3.30	0.15	0.98
	MERRA-2	1.59	±3.31	0.34	0.98
Concordia	Compiled	1.15	±4.25	0.59	0.95
	OMI	1.47	±4.61	0.53	0.95
	MERRA-2	0.47	±4.40	0.83	0.95

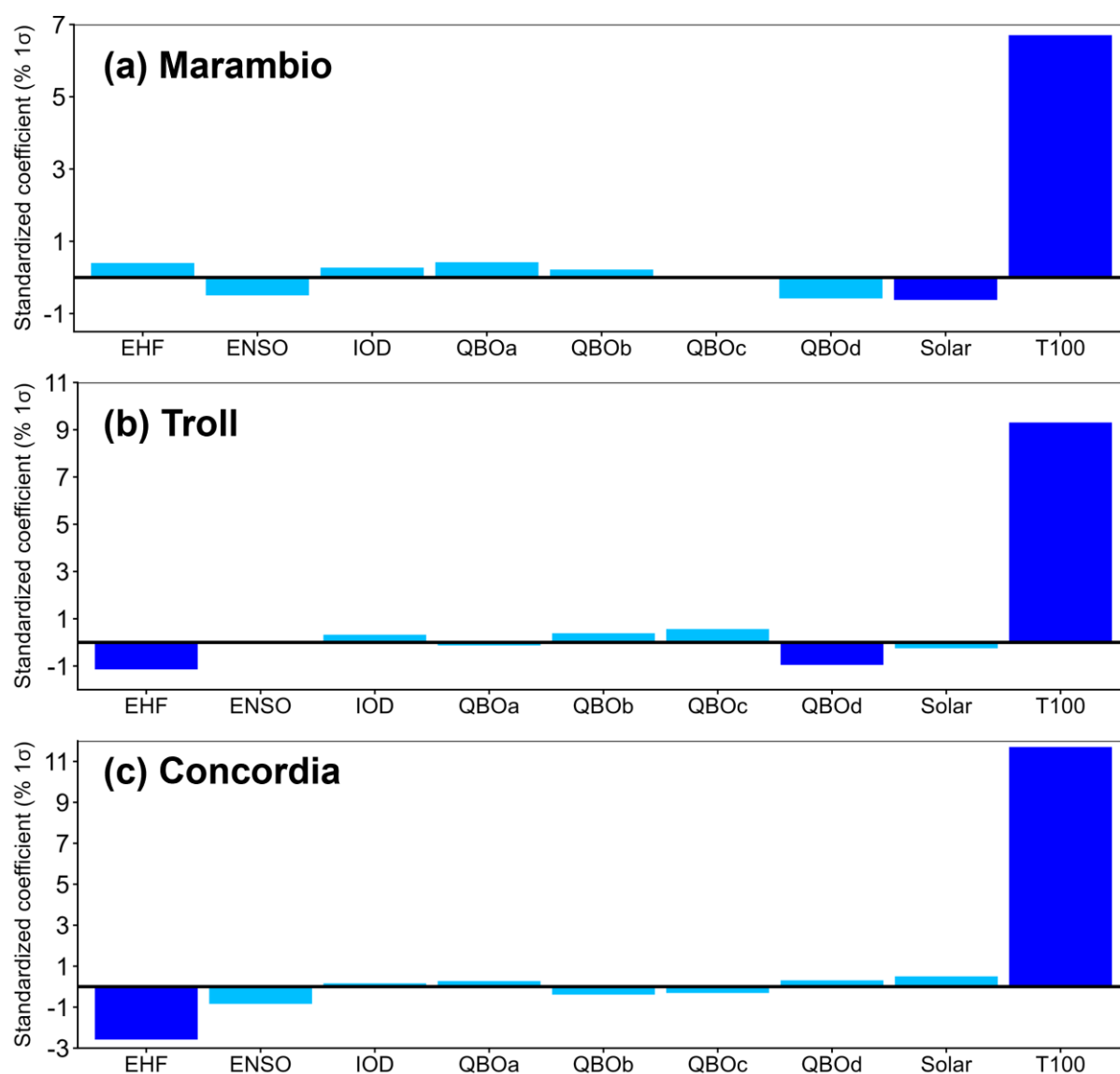


Figure S6: Predictor contributions to the annual regression fit at Marambio (a), Troll (b) and Concordia (c) for OMI overpass data. Standardised coefficients indicate the percentage change in TOC associated with a one standard deviation change in the predictor. Light blue bars denote predictors whose effect on ozone is not statistically significant (p -value of the coefficient < 0.05).

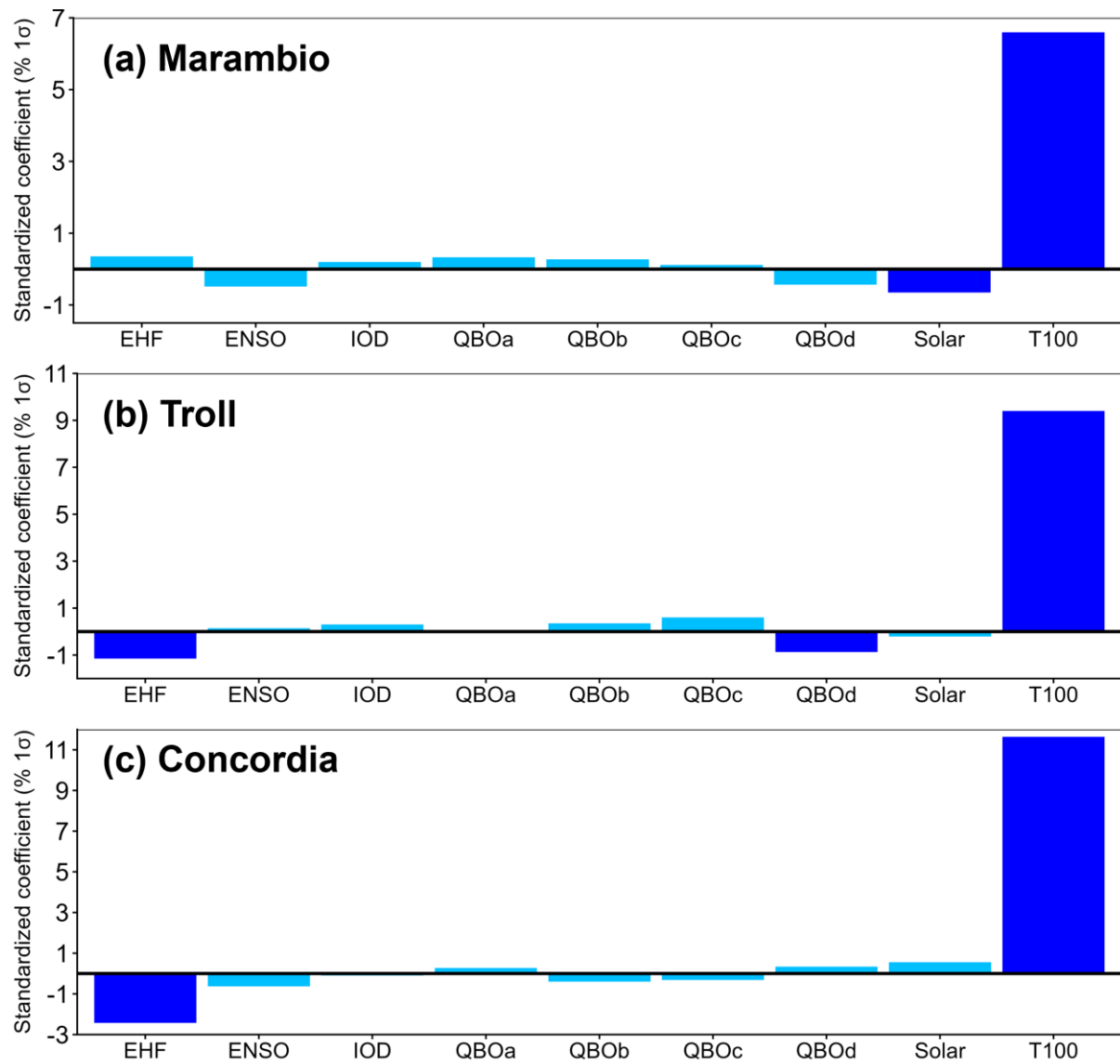


Figure S7: The same as in fig S6, but for MERRA-2 data

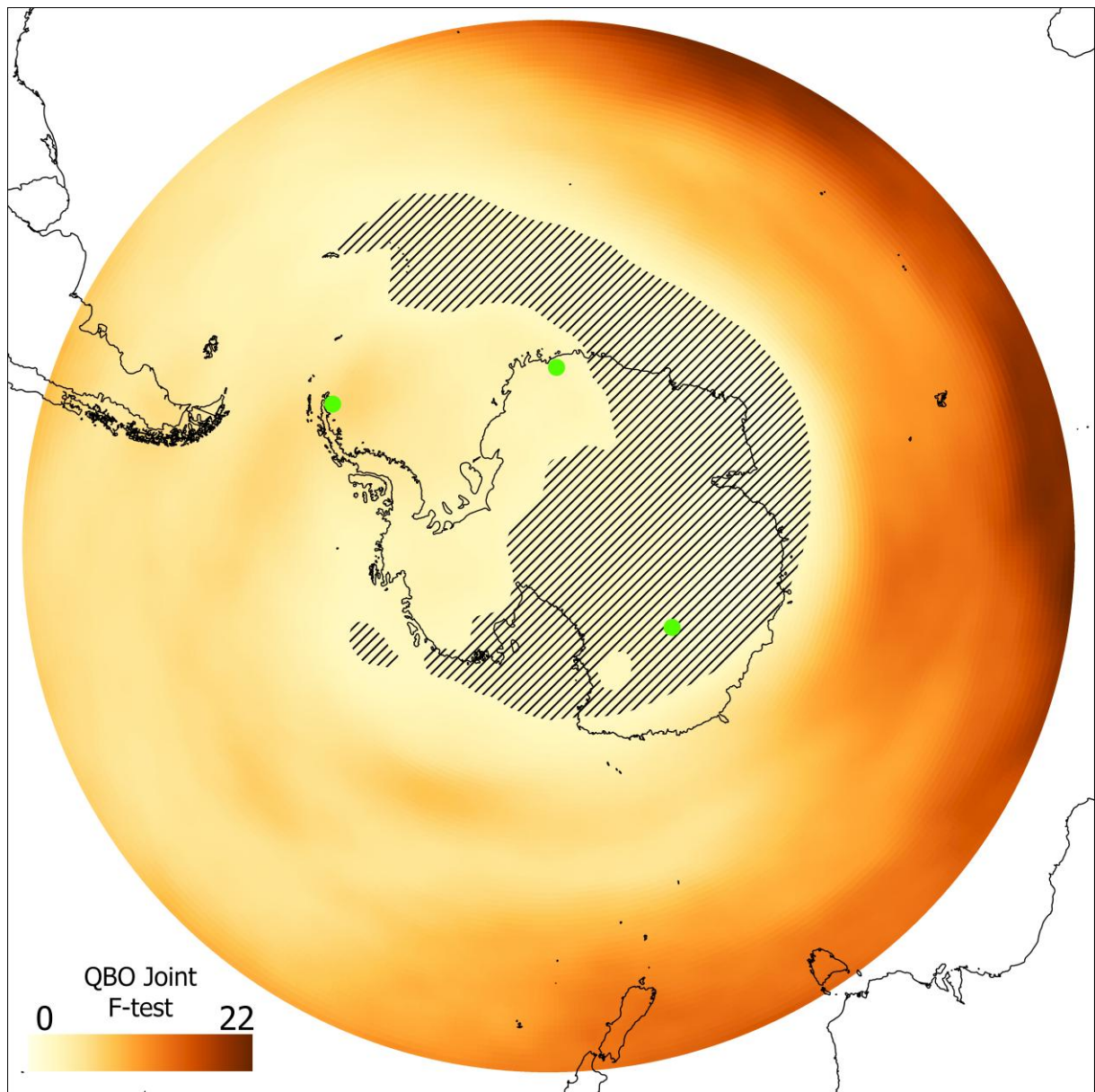


Figure S8 Joint F-test for the net QBO signal for each grid point. Colours indicate the F-statistic values. The unshaded area is statistically significant ($p < 0.05$).