Cloudiness delays projected impact of climate change on coral reefs

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Supplementary material

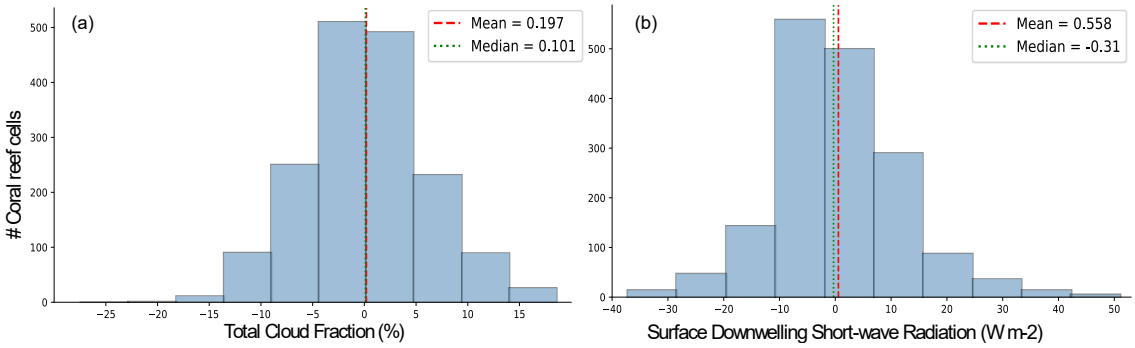

Fig A in S1 Text: Differences between model and bias corrected climatology in a) cloud fraction, and b) downward short-wave radiation at the surface in reef cells using the base period 2001-2014.

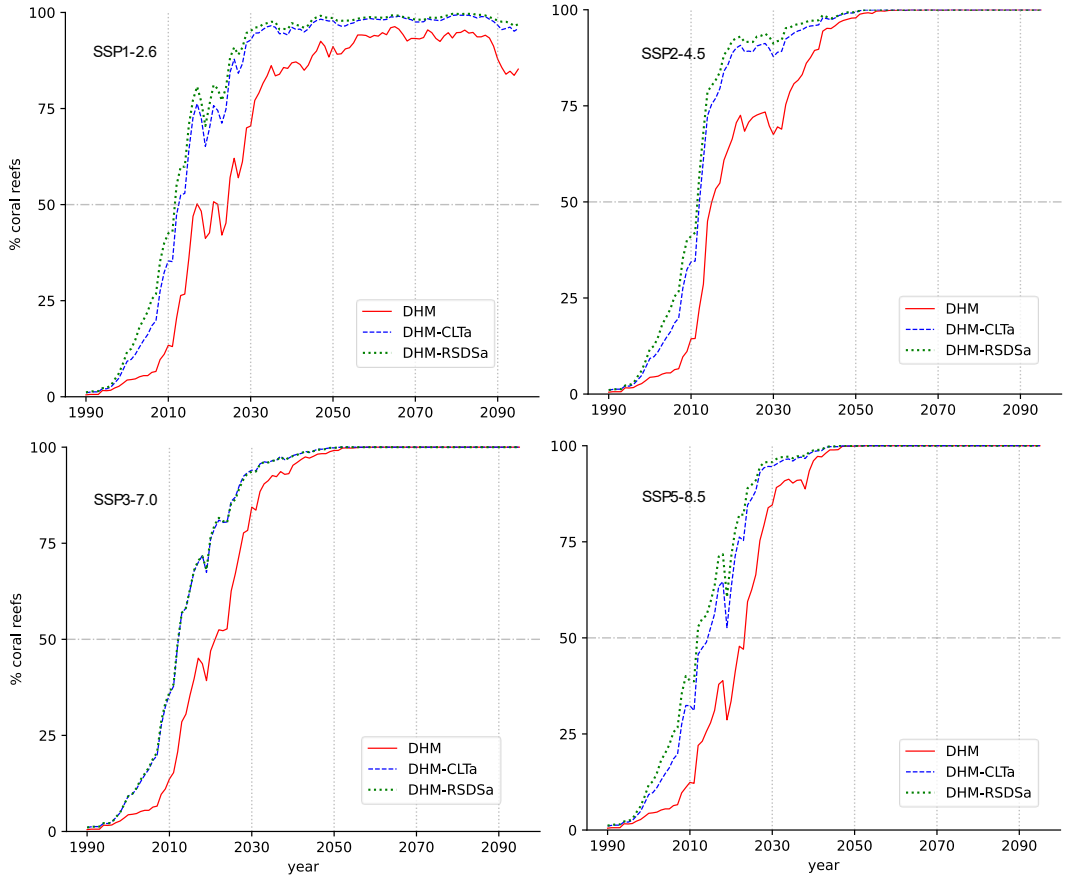

Fig B in S1 Text: Fraction of coral reef cells projected to experience high-frequency bleaching conditions under four SSP scenarios by 2100, using the GFDL-ESM4 model with delta change correction for all variables. High-frequency bleaching conditions are defined as a reef cell that experiences two or more severe coral bleaching events in ten years.

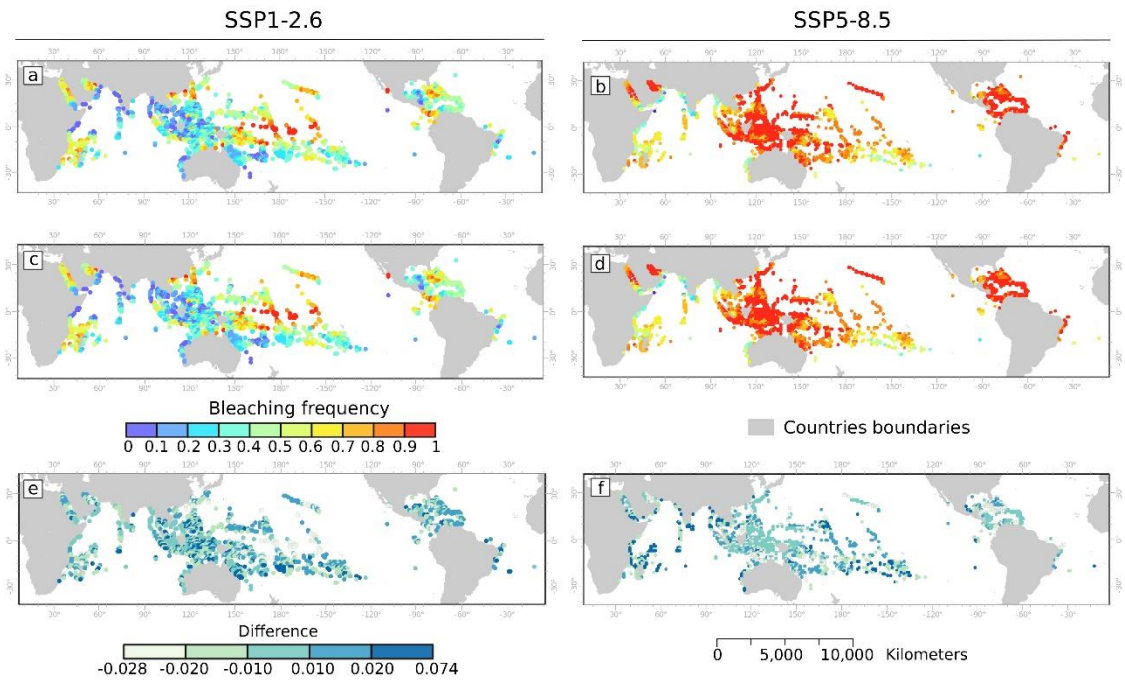

Fig C in S1 Text: Sensitivity analysis for model DHM-CLTa in emission scenarios SSP1-2.6 and SSP5-8.5 by year 2050. Maps show projected frequency of bleaching conditions using the "modelled" total cloud anomaly CLTa (a and b), "observed" total cloud anomaly CLTa (c and d), and the difference (e and f). This figure uses a public domain map from the Natural Earth data website.

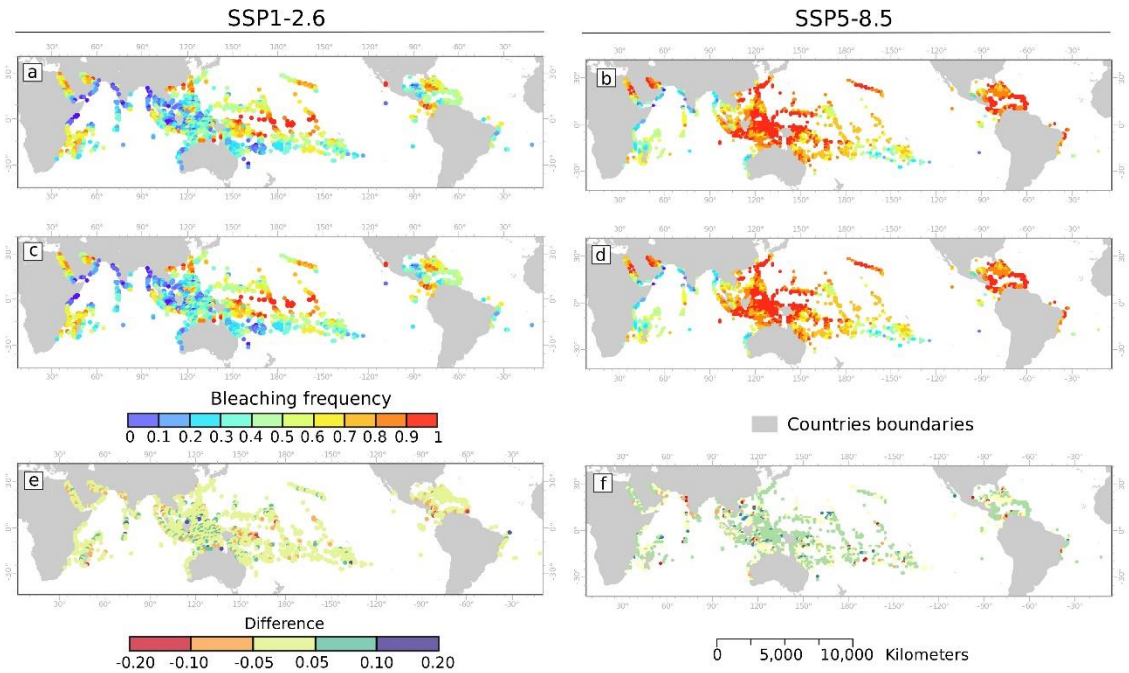

Fig D in S1 Text: Sensitivity analysis for model DHM-RSDSa in emission scenarios SSP1-2.6 and SSP5-8.5 by year 2050. Maps show projected frequency of bleaching conditions using the "modelled" solar radiation anomaly RSDAa (a and b), "observed" solar radiation anomaly RSDAa (c and d), and the difference (e and f). This figure uses a public domain map from the Natural Earth data website.

Table A in S1 Text: Geographical position comparison for the mixed-effects models performance.

Geagraphical position	Model name	Variables	Relation	Coefficients	p-value
LAT	DHM-only (control)	DHM	+	7.787e-01	< 2e-16
	Cloud	DHM CLTa DHM:CLTa	+ - +	7.796e-01 -3.108e-03 2.662e-03	< 2e-16 6.28e-06 0.00341
	Solar radiation	DHM RSDSa DHM:RSDSa	+ + -	7.786e-01 2.480e-03 -3.208e-04	< 2e-16 5.41e-09 0.57
LON	DHM-only (control)	DHM	+	7.655e-01	< 2e-16
	Cloud	DHM CLTa DHM:CLTa	+ - +	7.662e-01 -2.212e-03 2.064e-03	< 2e-16 0.00101 0.02135
	Solar radiation	DHM RSDSa DHM:RSDSa	+ + -	7.655e-01 1.700e-03 1.344e-04	< 2e-16 4.03e-05 0.809
LAT-LON	DHM-only (control)	DHM	+	7.628e-01	< 2e-16
	Cloud	DHM CLTa DHM:CLTa	+ - +	7.636e-01 -2.286e-03 2.101e-03	< 2e-16 0.000677 0.018863
	Solar radiation	DHM RSDSa DHM:RSDSa	+ + +	7.628e-01 1.785e-03 1.271e-04	< 2e-16 1.67e-05 0.819

Table B in S1 Text: Fraction of reef cells experiencing high-frequency bleaching conditions, by decade. Each year represents the midpoint running mean value from 10-year period.

Scenario	ID	Model	% Reefs experiencing high-frequency bleaching						
			2000	2010	2020	2030	2040	2050	2100
SSP 1-2.6	1a	DHM	4	13	43	70	87	91	85
	2a	DHM + CLTa	3	8	29	50	74	78	69
	3a	DHM + RSDSa	3	9	31	54	74	78	71
SSP 2-4.5	1b	DHM	4	14	66	68	89	98	100
	2b	DHM + CLTa	3	8	44	47	79	96	100
	3b	DHM + RSDSa	4	10	51	53	83	97	100
SSP 3-7.0	1c	DHM	4	14	47	84	95	99	100
	2c	DHM + CLTa	3	7	28	68	93	98	100
	3c	DHM + RSDSa	3	7	28	67	92	98	100
SSP 5-8.5	1d	DHM	4	12	34	85	96	100	100
	2d	DHM + CLTa	3	6	18	68	92	100	100
	3d	DHM + RSDSa	4	8	22	75	94	100	100