Supplementary materials for

Global tropical cyclone size and intensity reconstruction dataset for 1959–2022 based on IBTrACS and ERA5 data

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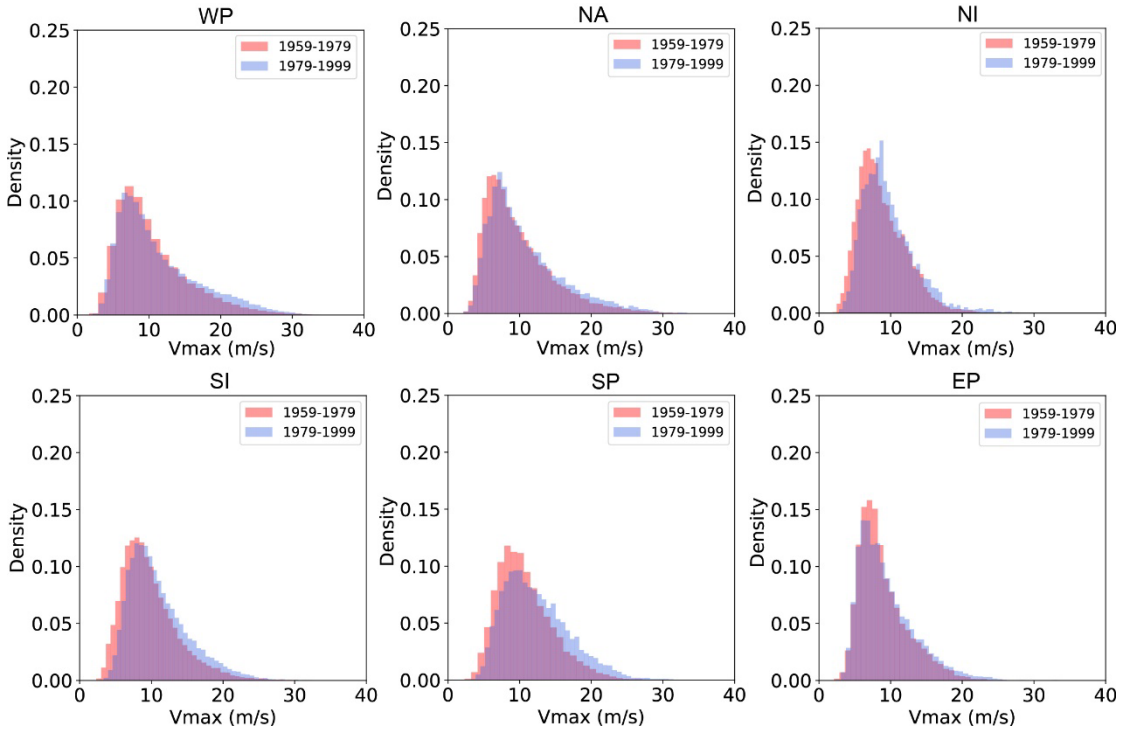

Figure S1: Histogram comparison of ERA5 V_{max} for tropical cyclones from 1959-1979 (red) and from 1979-1999 (blue).

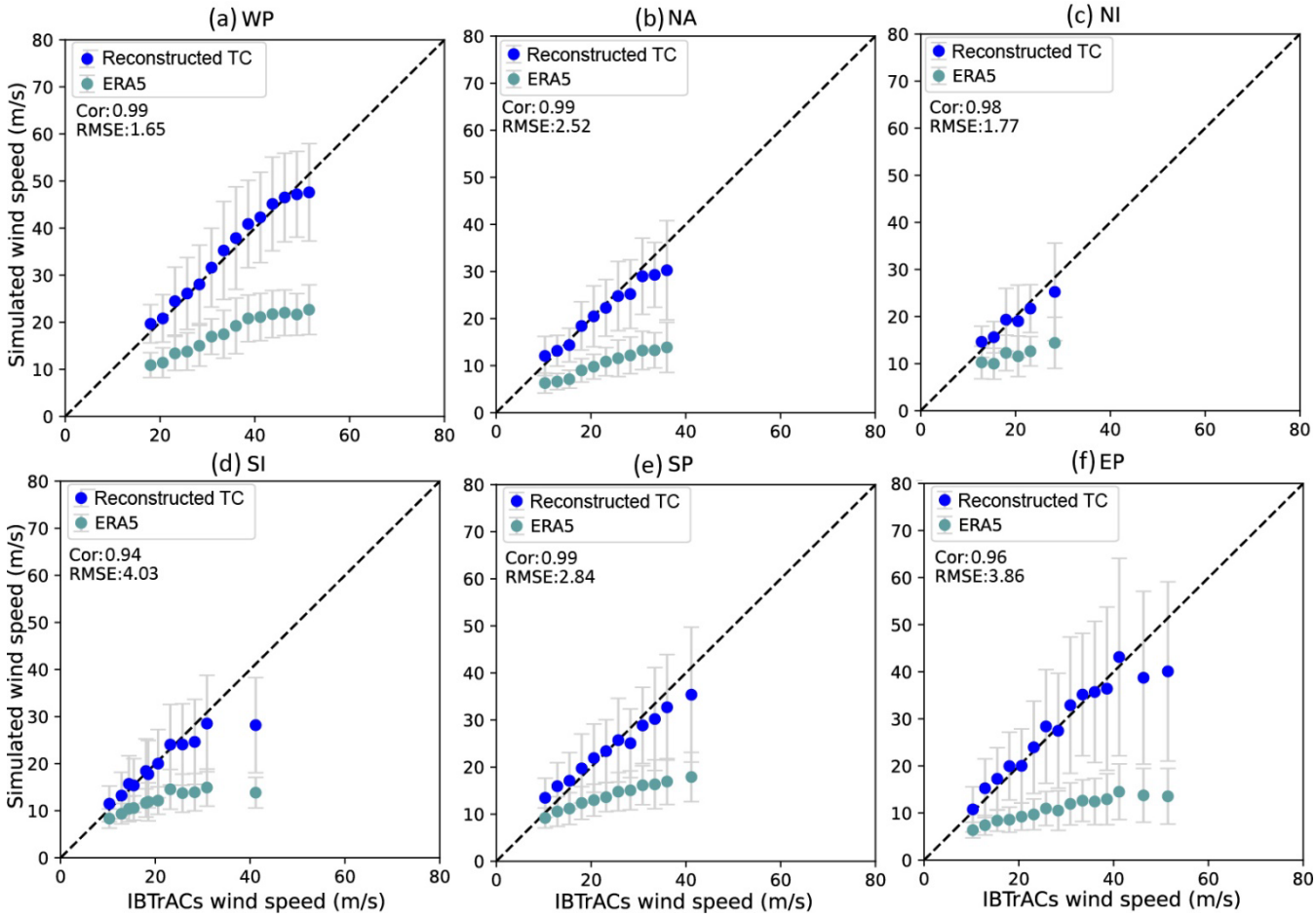

Figure S2: Comparison between value-averaged maximum wind speeds (V_{max}) from ERA5-derived and reconstructed (ERA5 + Random forest) data and IBTrACS maximum wind speeds for tropical cyclones during El Niño years in (a) Western Pacific, (b) North Atlantic, (c) North Indian, (d) South Indian, (e) South Pacific and (f) Eastern Pacific basins. Grey lines represent the error bar, given as one standard deviation from the mean.

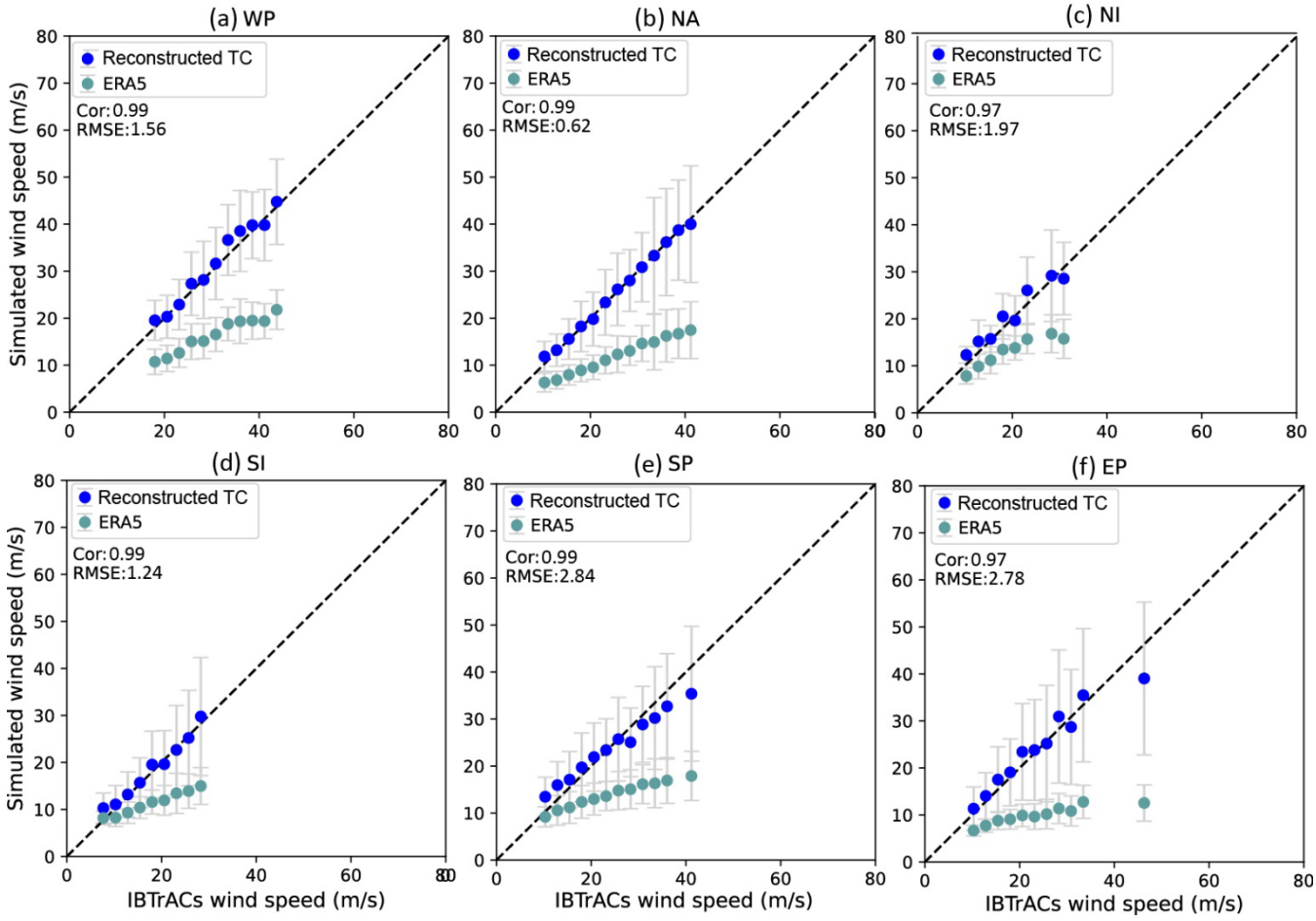

Figure S3: Similar to Figure S2, but during La Niña years.

Table S1. Basic information on evaluation indices for R_{34}, R_{50} and R_{64} in Western Pacific. ME, mean errors; MAE, mean of the absolute bias; RMSE, root mean square error; CE, correlation coefficients. H80, D87, W06, E11, F13 and CLE15 refer to the wind field models proposed by Holland (1980), DeMaria (1987), Willoughby et al. (2006), Emanuel and Rotunno (2011), Frisius and Scgönemann (2013) and Chavas et al. (2015)

	ME (km)	MAE (km)	RMSE (km)	CE
$H80_{R34}$	-80.39	89.34	110.54	0.68
$D87_{R34}$	-66.36	82.35	103.63	0.60
$W06_{R34}$	-24.79	46.75	64.54	0.89
$E11_{R34}$	-60.24	73.72	93.24	0.71
$F13_{R34}$	-106.04	110.49	132.57	0.68
$CLE15_{R34}$	-60.60	74.80	93.53	0.72
$H80_{R50}$	-50.42	54.66	64.76	0.54
$D87_{R50}$	-39.40	47.11	56.91	0.52
$W06_{R50}$	-14.60	26.00	33.27	0.82
$E11_{R50}$	-28.29	46.90	56.26	0.25
$F13_{R50}$	-65.31	67.30	77.81	0.50
$CLE15_{R50}$	-39.87	46.93	56.52	0.56
$H80_{R64}$	-32.13	33.66	39.06	0.60
$D87_{R64}$	-23.97	26.75	32.27	0.62
$W06_{R64}$	-14.14	18.28	22.71	0.78
$E11_{R64}$	-26.36	28.71	34.01	0.62
$F13_{R64}$	-41.06	41.86	47.22	0.56
$CLE15_{R64}$	-24.32	27.25	32.73	0.61

Table S2. Similar to Table S1, but in North Atlantic.

	ME (km)	MAE (km)	RMSE (km)	CE
$H80_{R34}$	-50.20	63.41	89.89	0.87
$D87_{R34}$	-22.85	58.87	82.83	0.85
$W06_{R34}$	-41.75	67.06	112.55	0.81
$E11_{R34}$	-19.90	54.17	80.59	0.85
$F13_{R34}$	-91.60	94.33	122.41	0.87
$CLE15_{R34}$	-25.19	53.00	78.77	0.87
$H80_{R50}$	-25.33	43.75	62.34	0.82
$D87_{R50}$	-6.81	45.40	66.86	0.79
$W06_{R50}$	-11.58	32.71	57.39	0.84
$E11_{R50}$	25.41	61.73	89.89	0.82
$F13_{R50}$	-50.70	54.88	72.66	0.83
$CLE15_{R50}$	-10.75	41.50	60.52	0.82
$H80_{R64}$	-15.35	27.55	39.46	0.82
$D87_{R64}$	-6.39	26.98	39.04	0.81
$W06_{R64}$	2.67	18.52	30.37	0.87
$E11_{R64}$	-8.73	26.15	37.58	0.83
$F13_{R64}$	-27.81	31.47	42.17	0.85
$CLE15_{R64}$	-5.52	26.38	37.92	0.83

Table S3. Similar to Table S1, but in North Indian.

	ME (km)	MAE (km)	RMSE (km)	CE
$H80_{R34}$	-71.01	72.12	87.65	0.17
$D87_{R34}$	-62.28	64.64	81.20	0.18
$W06_{R34}$	-23.19	31.19	41.59	0.74
$E11_{R34}$	-59.22	61.89	77.41	0.27
$F13_{R34}$	-88.25	88.42	102.12	0.12
$CLE15_{R34}$	-59.04	61.77	78.04	0.22
$H80_{R50}$	-40.23	41.11	49.98	-0.17
$D87_{R50}$	-32.57	35.01	45.31	-0.24
$W06_{R50}$	-14.66	20.49	25.69	0.63
$E11_{R50}$	-20.03	37.42	43.99	-0.57
$F13_{R50}$	-49.46	50.07	57.74	-0.29
$CLE15_{R50}$	-32.77	34.95	44.63	-0.18
$H80_{R64}$	-24.54	27.28	33.41	-0.18
$D87_{R64}$	-19.30	24.63	30.47	-0.23
$W06_{R64}$	-11.63	16.62	21.17	0.62
$E11_{R64}$	-22.20	25.82	31.92	-0.19
$F13_{R64}$	-29.87	31.81	38.26	-0.47
$CLE15_{R64}$	-18.94	24.54	30.71	-0.33

Table S4. Similar to Table S1, but in South Indian.

	ME (km)	MAE (km)	RMSE (km)	CE
$H80_{R34}$	-52.37	66.93	86.54	0.40
$D87_{R34}$	-39.35	65.36	83.62	0.24
$W06_{R34}$	3.57	45.71	56.68	0.74
$E11_{R34}$	-32.10	58.83	75.18	0.42
$F13_{R34}$	-77.33	82.86	103.96	0.40
$CLE15_{R34}$	-34.01	58.82	75.05	0.46
$H80_{R50}$	-16.33	33.34	42.84	0.06
$D87_{R50}$	-4.94	33.45	41.81	-0.01
$W06_{R50}$	14.35	29.69	36.18	0.46
$E11_{R50}$	10.50	40.17	49.96	-0.13
$F13_{R50}$	-31.74	39.51	50.65	-0.01
$CLE15_{R50}$	-6.01	33.58	41.64	0.02
$H80_{R64}$	-6.23	18.45	23.88	-0.01
$D87_{R64}$	2.01	18.92	23.27	0.05
$W06_{R64}$	9.68	18.54	21.57	0.43
$E11_{R64}$	-0.55	18.31	22.70	0.12
$F13_{R64}$	-17.11	21.82	28.37	-0.06
$CLE15_{R64}$	0.36	18.21	22.42	0.13

Table S5. Similar to Table S1, but in South Pacific.

	ME (km)	MAE (km)	RMSE (km)	CE
$H80_{R34}$	-59.42	67.85	82.65	0.66
$D87_{R34}$	-46.49	61.37	77.34	0.57
$W06_{R34}$	-5.00	33.51	46.25	0.83
$E11_{R34}$	-39.66	53.81	67.68	0.69
$F13_{R34}$	-85.65	88.49	104.22	0.68
$CLE15_{R34}$	-40.36	53.51	67.32	0.71
$H80_{R50}$	-21.77	30.51	36.71	0.64
$D87_{R50}$	-11.07	26.03	32.12	0.63
$W06_{R50}$	11.75	21.53	27.25	0.77
$E11_{R50}$	2.86	29.22	38.00	0.42
$F13_{R50}$	-38.11	41.99	49.05	0.62
$CLE15_{R50}$	-10.19	24.78	31.18	0.65
$H80_{R64}$	-2.51	13.33	16.38	0.64
$D87_{R64}$	5.80	14.17	17.05	0.66
$W06_{R64}$	12.75	15.60	18.56	0.77
$E11_{R64}$	4.97	14.14	17.02	0.68
$F13_{R64}$	-13.60	16.42	20.91	0.66
$CLE15_{R64}$	7.00	14.58	17.05	0.69

Table S6. Similar to Table S1, but in Eastern Pacific.

	ME (km)	MAE (km)	RMSE (km)	CE
$H80_{R34}$	-18.13	48.97	62.66	0.52
$D87_{R34}$	-7.32	55.07	69.07	0.41
$W06_{R34}$	32.25	44.43	51.31	0.81
$E11_{R34}$	4.02	50.50	64.00	0.53
$F13_{R34}$	-43.59	55.90	70.91	0.54
$CLE15_{R34}$	5.97	48.36	61.56	0.57
$H80_{R50}$	-9.60	27.55	36.73	0.32
$D87_{R50}$	-2.51	28.81	38.34	0.27
$W06_{R50}$	27.19	31.77	36.61	0.68
$E11_{R50}$	10.68	35.00	47.12	0.12
$F13_{R50}$	-23.54	31.68	40.92	0.31
$CLE15_{R50}$	1.73	27.70	37.00	0.34
$H80_{R64}$	-5.67	17.90	23.18	0.14
$D87_{R64}$	-0.32	18.69	23.92	0.11
$W06_{R64}$	18.74	21.66	25.24	0.51
$E11_{R64}$	0.59	17.86	22.98	0.19
$F13_{R64}$	-14.41	19.89	25.70	0.12
$CLE15_{R64}$	1.31	18.27	23.54	0.15