Supplementary Material for *"Multidecadal and climatological surface current simulations for the southwestern Indian Ocean at 1/50°"*

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Supplementary Tables

Site	Longitude	Latitude	Tide	WINDS (cm)	WINDS - TPXO9 (cm)
Coastal sites					
Réunion	55.2	-20.9	M2	17.2	2.6
France			S2	6.7	-1.0
			N2	4.5	0.6
			K1	5.1	-0.2
			O1	2.9	0.1
Mayotte	45.3	-13.0	M2	105.4	-3.0
France			S2	55.9	6.1
			N2	17.6	-1.4
			K1	13.7	-1.1
			O1	7.9	0.1
Glorioso Islands	47.3	-11.5	M2	91.3	-2.3
France			S2	47.3	5.0
			N2	16.8	-0.2
			K1	14.6	-1.4
			O1	8.1	-0.1
Mauritius	57.8	-20.4	M2	25.5	1.8
Mauritius			S2	14.2	2.1
			N2	5.2	0.4
			K1	6.0	-0.8
			O1	2.5	-0.2
St. Brandon	59.6	-16.6	M2	23.6	2.7
Mauritius			S2	13.6	5.1
			N2	5.7	0.5
			K1	6.5	-1.8
			O1	3.6	-0.8
Rodrigues	63.4	-19.6	M2	41.3	1.4
Mauritius			S2	22.8	3.3
			N2	8.1	0.9
			K1	5.9	-1.5
			O1	3.3	0.2
Vingt Cinq	56.6	-10.4	M2	30.5	0.5
Mauritius			S2	13.3	3.0
			N2	7.7	0.5
			K1	10.4	-1.9
			O1	6.4	-0.3
Diego Garcia	72.4	-7.4	M2	47.6	0.1
Chagos			S2	28.2	3.6
			N2	8.7	0.4
			K1	3.6	-1.7
			O1	3.3	-0.2
Grand Chagos Bnk	72.0	-6.2	M2	42.6	-0.2
Chagos			S2	25.7	2.9
			N2	7.9	0.3
			K1	6.0	-0.5
			O1	3.6	-0.1

Blenheim Reef	72.5	-5.2	M2	42.7	3.5
Chagos			S2	25.5	4.7
			N2	7.4	0.6
			K1	6.4	-0.2
			O1	3.9	0.2
Fuvahmulah Atoll	73.4	-0.4	M2	29.4	0.0
Maldives			S2	18.4	2.6
			N2	4.9	0.4
			K1	8.9	-0.5
			O1	3.9	-0.6
Coëtivy	56.3	-7.2	M2	35.2	-1.0
Seychelles			S2	16.4	3.0
			N2	8.8	1.0
			K1	16.3	0.6
			O1	7.8	-0.1
Platte	55.3	-5.9	M2	40.8	-1.6
Seychelles			S2	19.4	2.7
			N2	8.7	0.2
			K1	16.1	-1.4
			O1	9.0	0.4
Mahé	55.4	-4.7	M2	41.8	-2.5
Seychelles			S2	19.6	1.6
			N2	8.4	-0.5
			K1	18.6	-0.4
			O1	9.1	0.1
Bird Island	55.2	-3.7	M2	36.7	-1.8
Seychelles			S2	16.6	0.7
			N2	7.6	0.3
			K1	21.1	-0.7
			O1	10.2	0.3
D Arros	53.3	-5.5	M2	53.4	-0.9
Seychelles			S2	24.0	1.1
			N2	9.4	-0.9
			K1	18.0	-1.5
			O1	9.3	-0.1
Alphonse Island	52.7	-7.0	M2	55.6	1.4
Seychelles			S2	26.4	3.9
			N2	10.1	-0.4
			K1	16.6	-1.1
			O1	8.9	-1.1
Farquhar Atoll	51.0	-10.2	M2	53.7	-5.6
Seychelles			S2	25.7	1.8
			N2	10.5	-1.1
			K1	13.1	-1.3
			O1	7.5	0.0
Aldabra Atoll	46.3	-9.3	M2	94.0	1.0
Seychelles			S2	47.4	5.6
			N2	16.5	-0.4

			K1	16.4	-1.3
			O1	8.9	0.0
Ngazidja	43.2	-11.6	M2	110.4	1.1
Comoros			S2	58.1	8.5
			N2	20.0	0.7
			K1	14.6	-1.1
			O1	8.4	0.1
Manakara	48.1	-22.2	M2	10.9	0.0
Madagascar			S2	6.1	0.3
			N2	2.8	-0.1
			K1	2.9	0.3
			O1	1.8	0.1
Fenerive	49.5	-17.3	M2	23.9	1.6
Madagascar			S2	10.3	2.4
			N2	5.7	0.0
			K1	3.7	0.3
			O1	3.5	0.2
Antongil Bay	49.9	-16.0	M2	29.4	-1.5
Madagascar			S2	13.6	3.7
			N2	7.1	-0.7
			K1	5.2	0.0
			O1	4.3	0.3
Helodr. Nar. Bay	47.5	-14.9	M2	114.5	-3.4
Madagascar			S2	61.4	6.4
			N2	19.9	-1.0
			K1	14.1	-0.7
			O1	7.1	-0.6
Hell-Ville	48.2	-13.6	M2	107.9	0.8
Madagascar			S2	56.8	7.7
			N2	19.5	-0.5
			K1	14.3	-1.2
			O1	7.9	-0.1
Cape Amber	49.2	-11.9	M2	75.6	-3.4
Madagascar			S2	36.8	2.6
			N2	14.6	0.0
			K1	13.8	-1.2
			O1	7.2	-0.5
Ankerefo	44.4	-16.2	M2	122.6	-9.0
Madagascar			S2	66.7	4.8
			N2	21.3	-1.0
			K1	11.7	-1.1
			O1	6.8	0.4
Belo Tsiribihina	44.4	-19.5	M2	113.8	-2.5
Madagascar			S2	65.9	7.7
			N2	19.0	-0.1
			K1	6.1	-0.3
			O1	4.3	0.0
Morombe	43.3	-21.8	M2	98.1	0.9
Madagascar			S2	57.3	8.2

			N2	16.2	0.5
			K1	5.0	-0.1
			O1	3.1	-0.1
Beira	34.9	-20.0	M2	129.1	-15.5
Mozambique			S2	76.1	4.5
			N2	20.8	-3.9
			K1	1.4	0.7
			O1	4.0	-0.1
Quelimane	37.1	-18.0	M2	112.6	0.4
Mozambique			S2	64.3	4.6
			N2	18.5	-0.1
			K1	3.3	0.3
			O1	4.7	0.2
Nacala	40.9	-14.5	M2	111.8	-2.4
Mozambique			S2	60.6	7.3
			N2	19.3	-0.5
			K1	10.9	-0.9
			O1	7.3	0.2
South Quirimbas	40.6	-12.5	M2	113.2	-2.6
Mozambique			S2	59.0	5.7
			N2	19.6	-0.7
			K1	13.2	-1.1
			O1	7.8	-0.1
North Quirimbas	40.6	-11.0	M2	109.9	-7.1
Mozambique			S2	56.9	3.8
			N2	18.9	-1.4
			K1	15.1	-1.0
			O1	8.6	0.2
Lindi	39.9	-9.9	M2	107.7	-1.0
Tanzania			S2	55.5	7.1
			N2	18.4	-0.8
			K1	16.7	-0.5
			O1	8.8	0.1
Mafia Island	39.7	-7.8	M2	111.4	-11.5
Tanzania			S2	57.0	1.5
			N2	20.1	-1.8
			K1	18.1	-1.2
			O1	9.2	-0.4
Zanzibar Channel	39.0	-6.3	M2	116.5	-11.0
Tanzania			S2	59.5	1.5
			N2	21.0	-2.0
			K1	18.6	-2.0
			O1	10.0	0.0
Pemba Island	39.9	-5.0	M2	100.9	-1.9
Tanzania			S2	52.2	6.8
			N2	18.8	0.5
			K1	19.9	-0.5
			O1	9.8	-0.1
Watamu	40.1	-3.5	M2	101.5	1.5
Kenya			S2	50.8	6.8
			N2	18.2	0.4

			K1	20.2	-0.6
			O1	10.2	0.2
Lamu	41.1	-2.3	M2	92.4	1.6
Kenya			S2	48.0	8.5
			N2	16.9	0.8
			K1	20.4	-0.6
			O1	10.8	1.1
Kismayo	42.6	-0.4	M2	85.0	-3.1
Somalia			S2	43.0	4.5
			N2	15.8	0.1
			K1	21.5	-1.7
			O1	11.4	0.5
Open ocean sites					
Moz. Channel N	42.5	-15.0	M2	114.5	-1.3
			S2	62.9	8.6
			N2	19.0	-0.9
			K1	11.1	-0.5
			O1	6.8	-0.1
Moz. Channel S	40.0	-20.0	M2	105.3	1.5
			S2	60.0	7.5
			N2	17.5	0.6
			K1	3.1	-0.1
			O1	3.4	-0.5
W Seychelles	45.0	-5.0	M2	90.3	0.5
			S2	45.5	5.6
			N2	16.4	0.2
			K1	19.8	-1.0
			O1	10.3	0.2
E Seychelles	65.0	-5.0	M2	21.8	0.1
			S2	13.0	1.2
			N2	4.9	0.5
			K1	13.4	-0.6
			O1	6.8	0.0
N Mascarene	55.0	-12.5	M2	29.4	-1.7
			S2	11.3	0.7
			N2	7.8	0.3
			K1	9.9	-0.6
			O1	6.4	0.4
Mascarene Plat.	61.4	-10.7	M2	26.0	0.0
			S2	14.4	1.8
			N2	6.4	0.5
			K1	9.6	-0.6
			O1	5.5	0.1
S Mascarene	52.5	-20.0	M2	16.4	1.4
			S2	7.1	0.5
			N2	4.1	-0.2
			K1	3.5	-0.4
			O1	2.6	-0.1

N Chagos	75.0	-2.5	M2	36.8	0.0
			S2	22.1	2.8
			N2	6.7	0.6
			K1	4.8	-0.0
			O1	3.1	0.2
S Chagos	70.0	-15.0	M2	52.6	-1.1
			S2	31.3	3.5
			N2	9.8	0.1
			K1	6.7	0.0
			O1	3.6	0.0

Table S1: *Amplitudes of the 5 largest tidal constituents at 50 coastal and open-ocean sites across the SWIO, extracted from WINDS (based on the first 55 days of WINDS-M_1994 with the free surface output at 2-hourly frequency) using t_tides, compared to predictions from TPXO9-atlas* (Egbert & Erofeeva, 2002)

Supplementary Figures

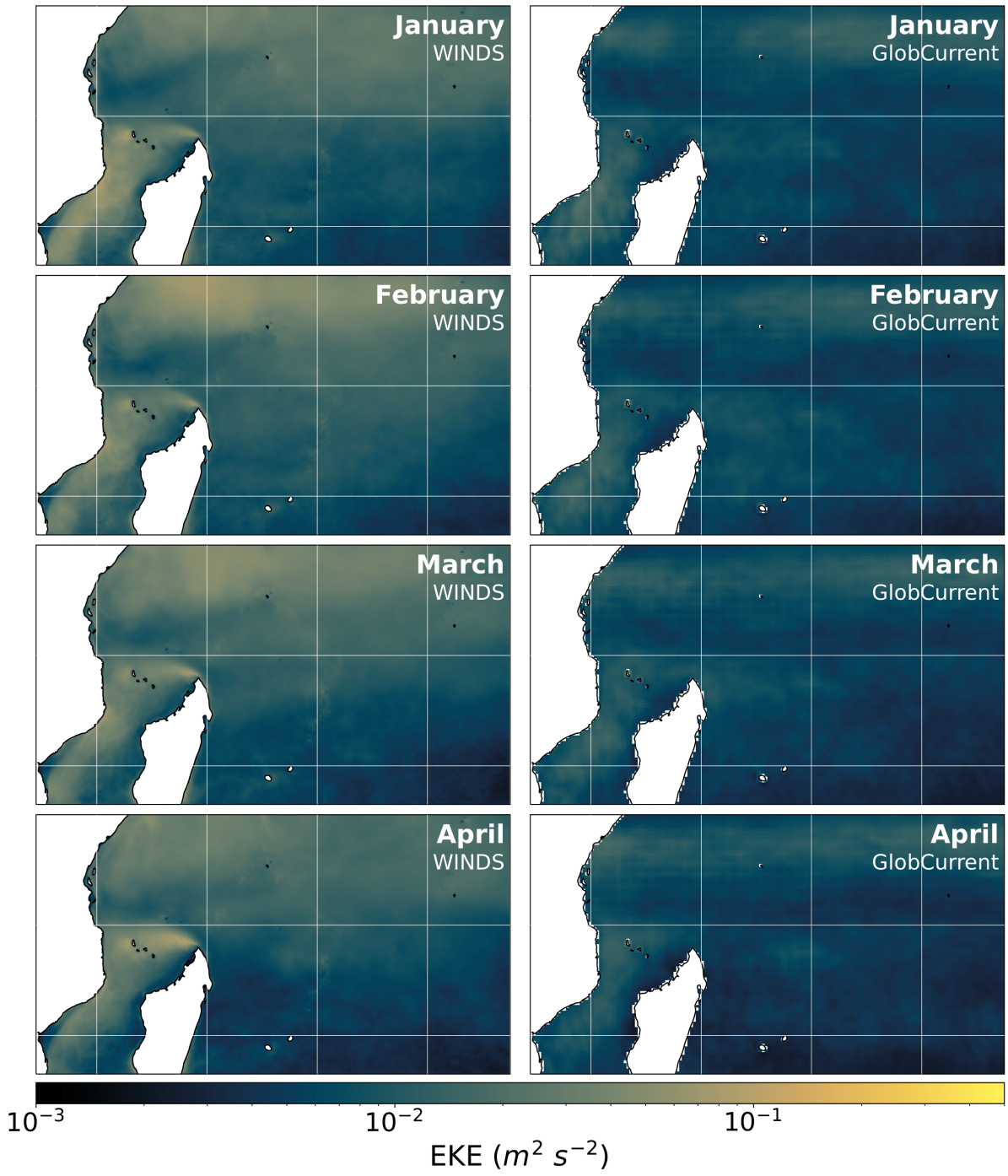

***Figure S1**: EKE for January-April in WINDS (left) and Copernicus GlobCurrent (right).*

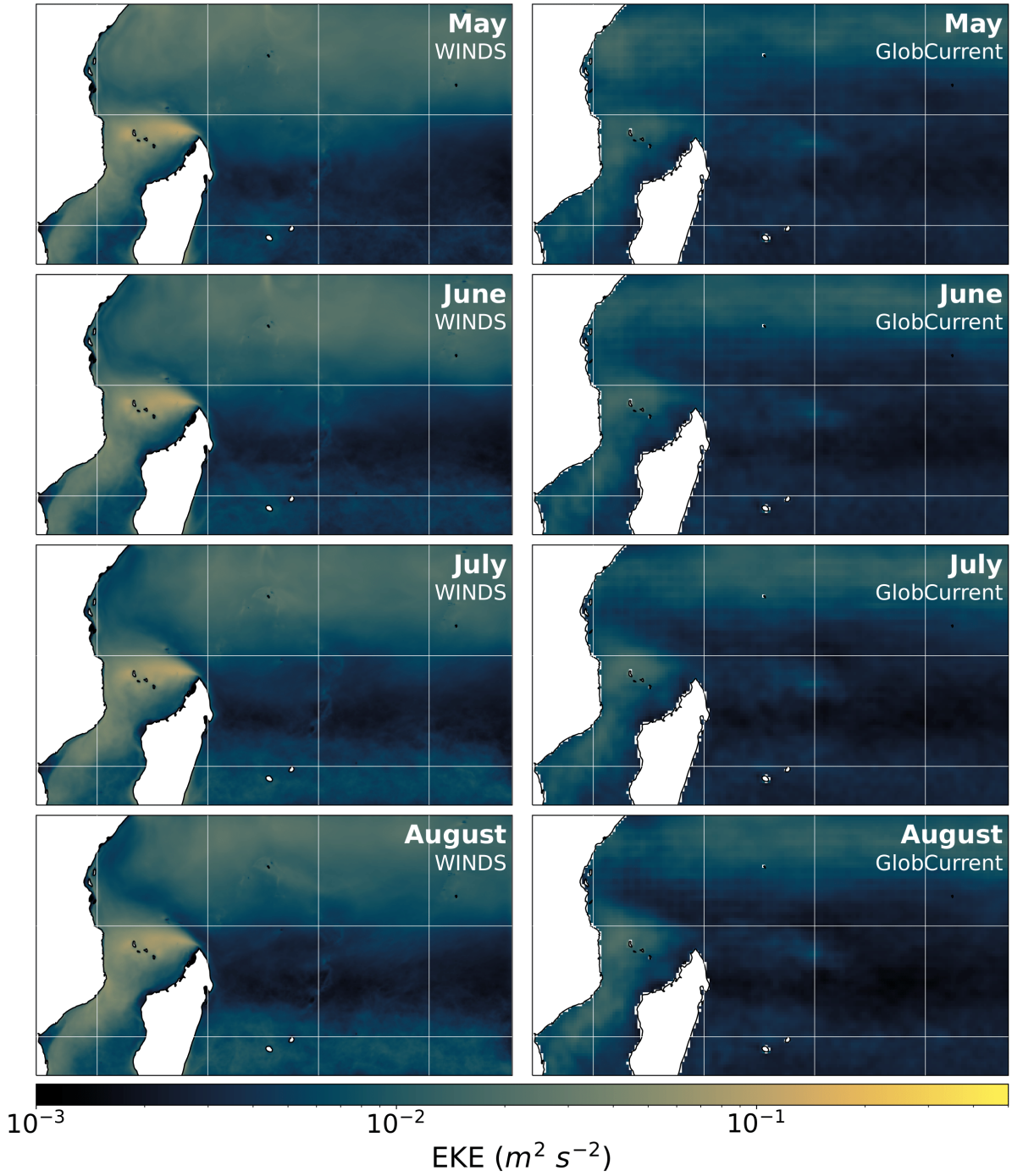

Figure S2: EKE for May-August in WINDS (left) and Copernicus GlobCurrent (right).

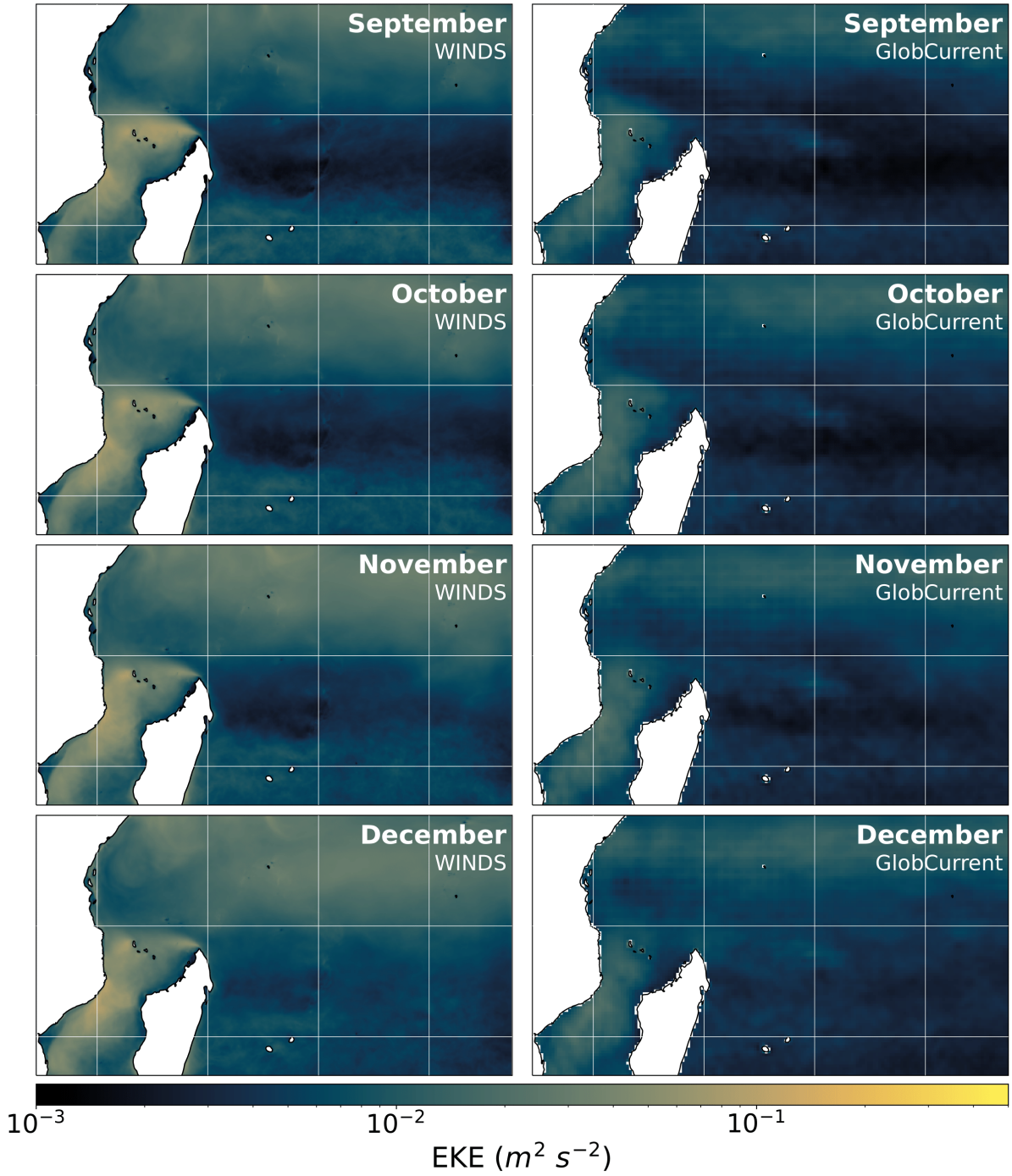

***Figure S3**: EKE for September-December in WINDS (left) and Copernicus GlobCurrent (right).*

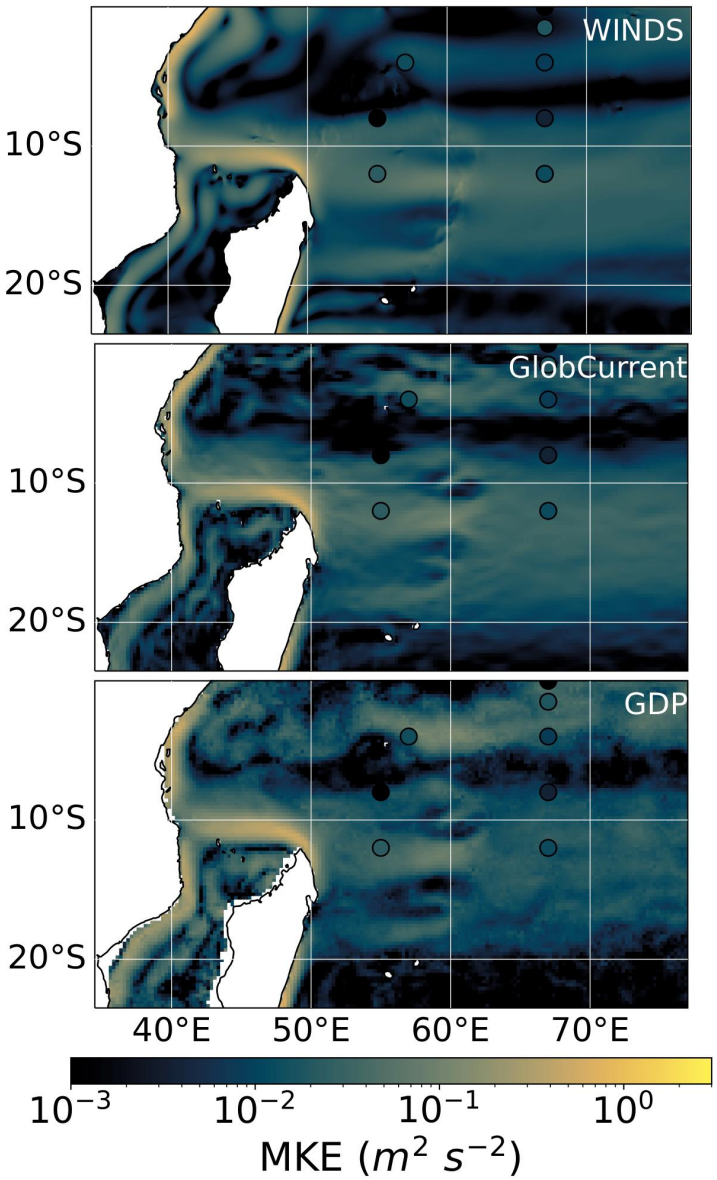

Figure S4: Mean Kinetic Energy (MKE) computed from the time-mean velocity field, from WINDS (top), Copernicus GlobCurrent (centre), and surface velocities based on Global Drifter Program floats (bottom).

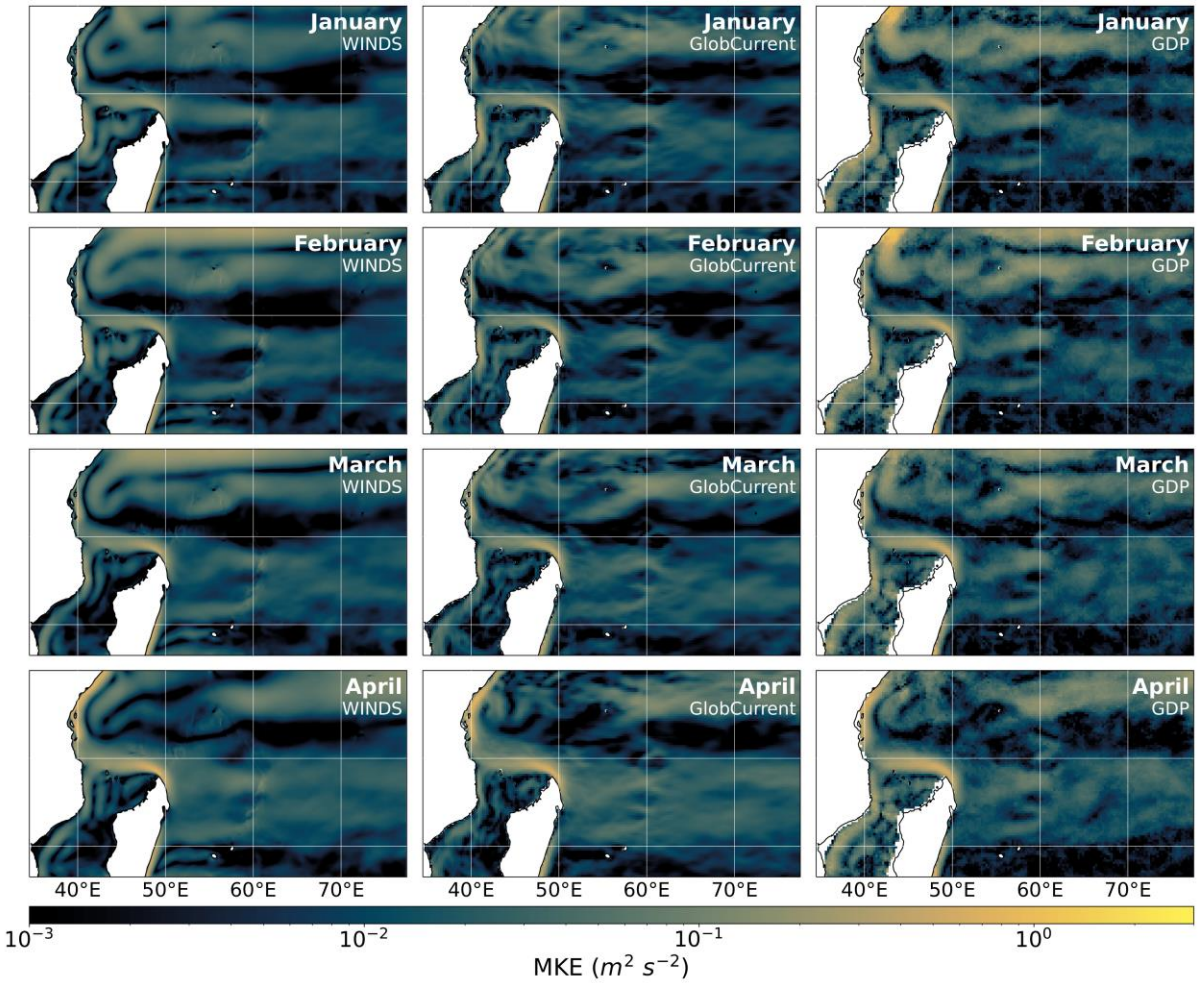

Figure S5: MKE for January-April from WINDS (left), Copernicus GlobCurrent (centre), and surface velocities from the Global Drifter Program (right).

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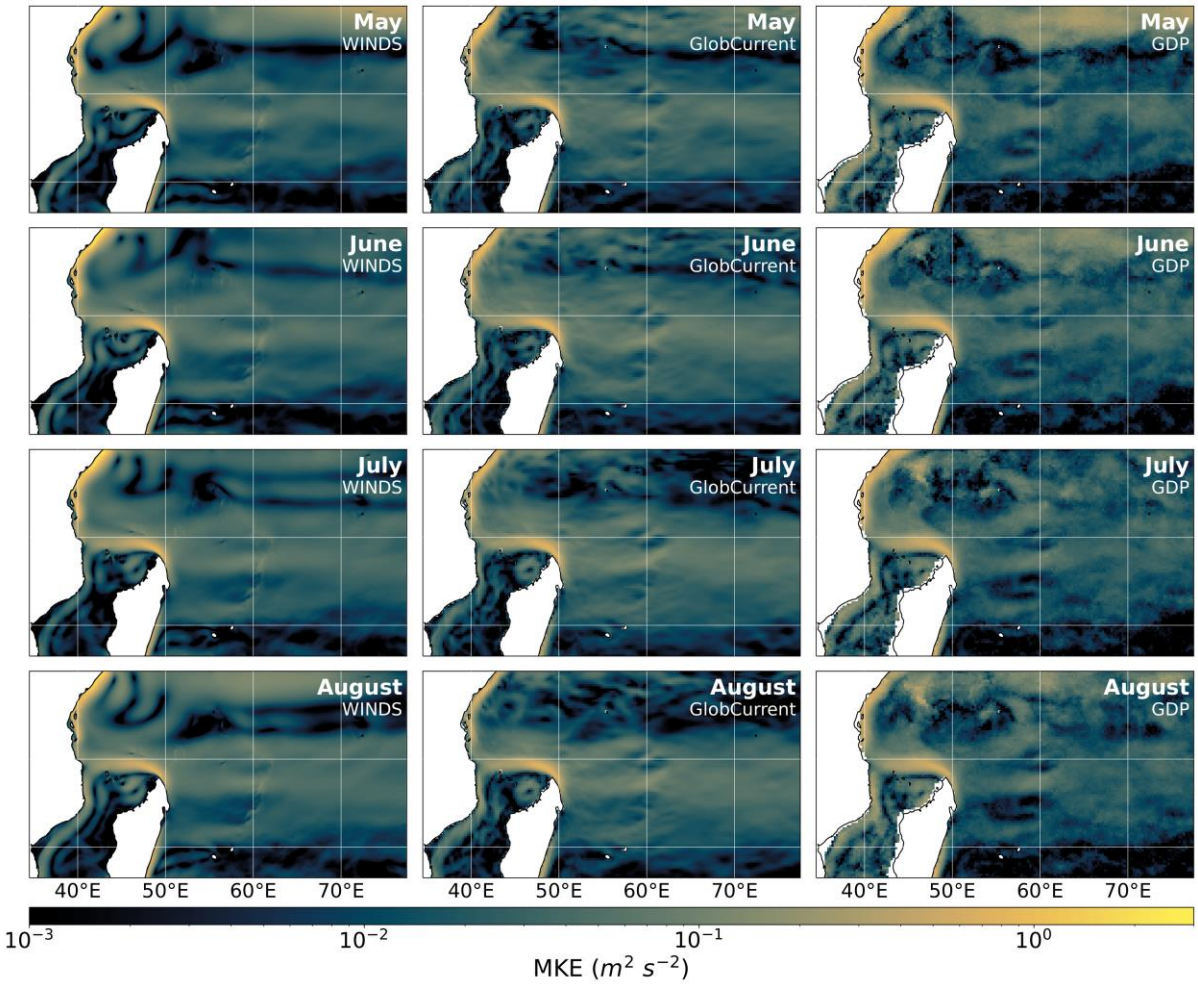

Figure S6: MKE for May-August from WINDS (left), Copernicus GlobCurrent (centre), and surface velocities from the Global Drifter Program (right).

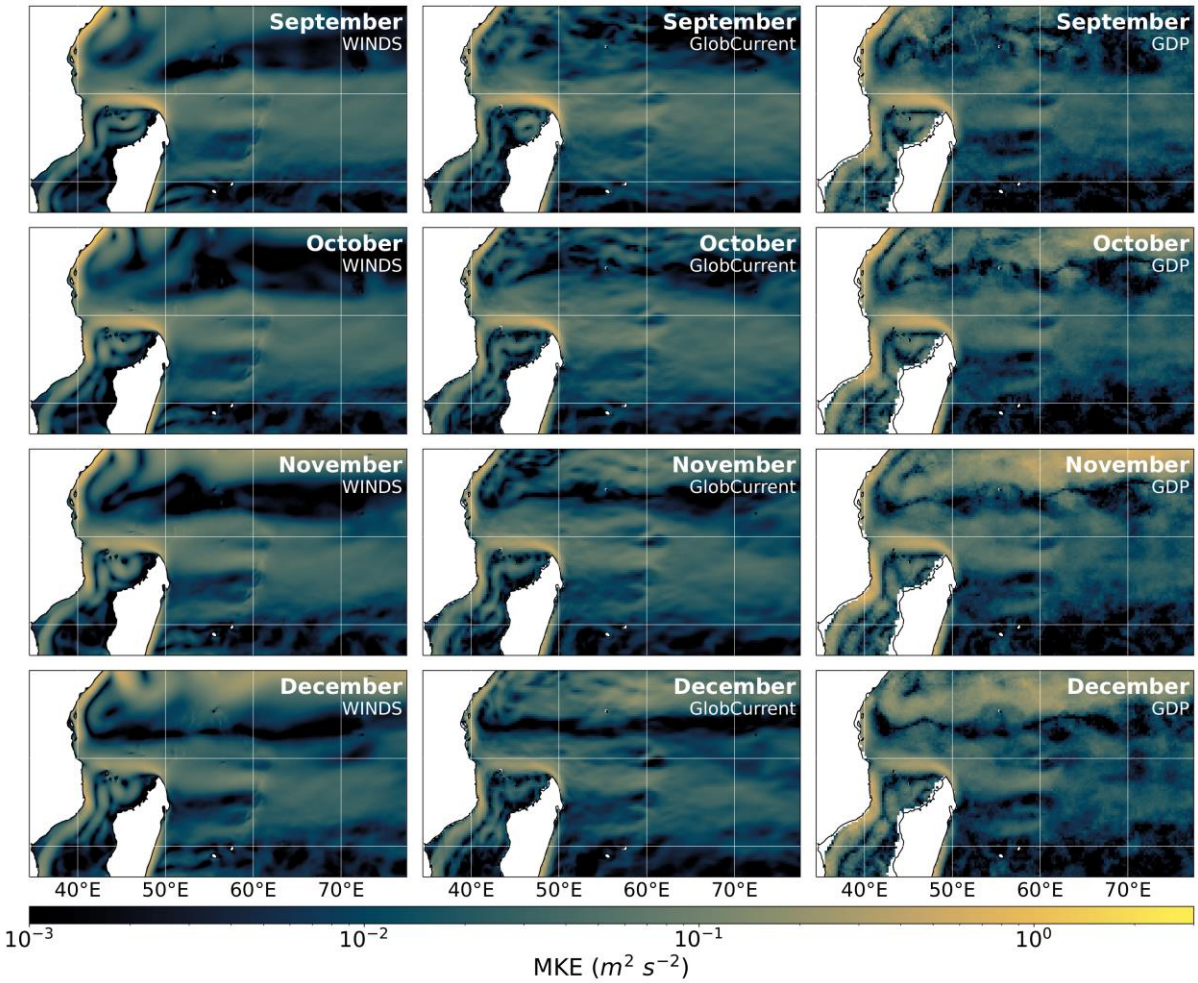

Figure S7: MKE for September-December from WINDS (left), Copernicus GlobCurrent (centre), and surface velocities from the Global Drifter Program (right).

References

Egbert, G. D., & Erofeeva, S. Y. (2002). Efficient inverse modeling of barotropic ocean tides. *Journal of Atmospheric and Oceanic Technology*, *19*(2), 183–204. https://doi.org/10.1175/1520-0426(2002)019<0183:EIMOBO>2.0.CO;2