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Sandy coastlines under threat of erosion

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Sandy coastlines under threat of erosion by Vousdoukas et al.: Supplementary information

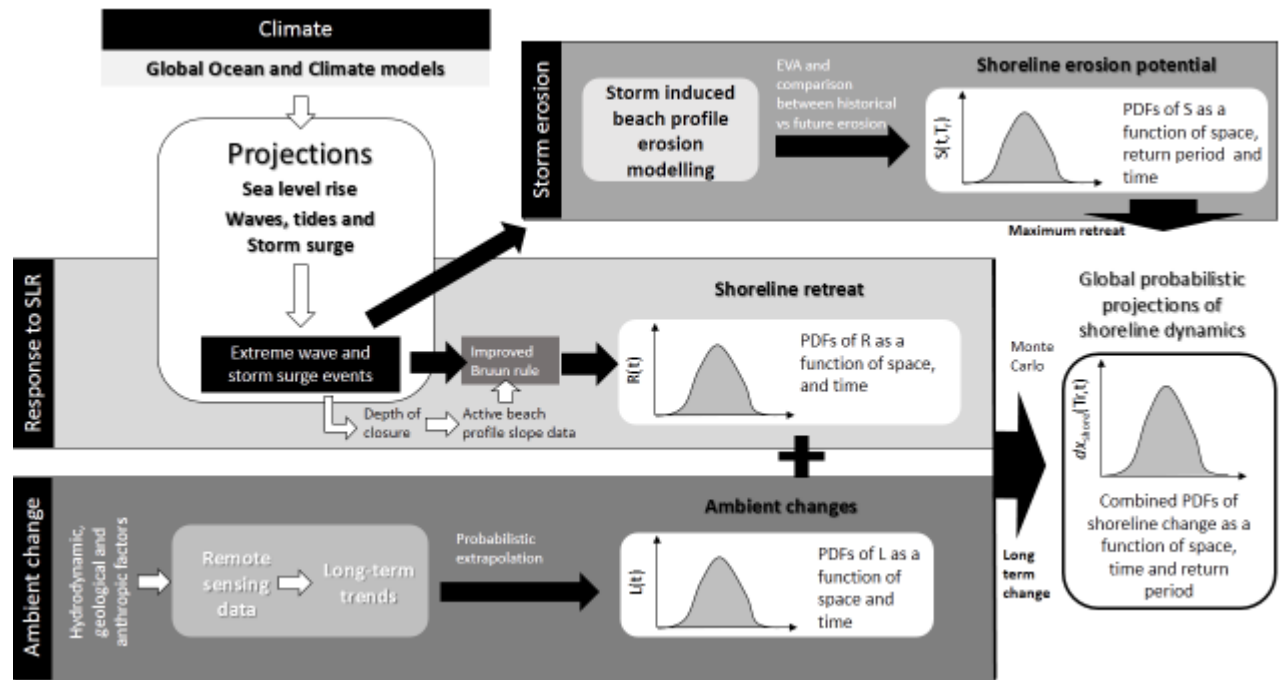


Figure S1. Flow diagram showing the procedure to generate the global shoreline dynamics projections. Key: PDF, probability density function; EVA, extreme value analysis; SLR, sea level rise; R, shoreline retreat driven by SLR; S, episodic shoreline retreat during extreme events; AC, ambient shoreline change trends driven by natural, anthropic and geological processes; dx_{shore} , shoreline change.

Table S1. Projected long term shoreline change ($dx_{shore,Lr}$) for the 26 IPCC SREX sub- regions and the worldwide under RCP4.5 and RCP8.5 by the years 2050 and 2100. Values express the median value, combined with the very likely range in brackets; 5th, 95th percentile.

	RCP4.5		RCP8.5	
	2050	2100	2050	2100
West North America	-31.9 ±[-50.0 -15.7]	-73.3 ±[-103.8 -47.5]	-37.6 ±[-63.4 -15.8]	-103.5 ±[-161.1 -61.8]
Central North America	-41.7 ±[-90.9 4.3]	-90.9 ±[-163.1 -25.4]	-53.6 ±[-125.1 7.2]	-150.8 ±[-272.9 -55.7]
East North America	-47.3 ±[-91.8 -5.8]	-107.2 ±[-175.4 -46.1]	-56.9 ±[-115.8 -5.3]	-159.2 ±[-272.6 -71.9]
Central America/Mexico	-40.7 ±[-92.4 8.5]	-96.7 ±[-169.0 -28.7]	-47.7 ±[-114.2 11.6]	-133.2 ±[-236.3 -46.7]
Amazon	-57.2 ±[-108.9 -7.9]	-140.9 ±[-214.2 -72.7]	-64.4 ±[-133.1 -3.8]	-180.7 ±[-287.4 -91.8]
North-East Brazil	-30.1 ±[-72.1 8.7]	-63.3 ±[-156.6 22.8]	-39.4 ±[-97.0 11.5]	-116.8 ±[-254.9 -2.2]
West Coast South America	-25.6 ±[-57.8 4.4]	-63.3 ±[-117.3 -16.4]	-31.3 ±[-68.6 2.4]	-97.3 ±[-175.9 -33.3]
Southeastern South America	-82.4 ±[-149.9 -18.0]	-210.9 ±[-308.2 -119.3]	-90.4 ±[-170.6 -15.7]	-256.6 ±[-385.3 -143.0]
North Europe	-29.3 ±[-66.6 4.9]	-63.4 ±[-136.3 3.1]	-39.5 ±[-89.4 4.2]	-111.8 ±[-222.8 -23.5]
Central Europe	-56.7 ±[-95.5 -21.8]	-132.6 ±[-194.3 -78.8]	-67.6 ±[-121.9 -20.9]	-187.9 ±[-296.0 -105.9]
South Europe/Mediterranean	-24.0 ±[-46.7 -3.4]	-56.6 ±[-92.5 -25.4]	-29.1 ±[-59.2 -3.1]	-81.9 ±[-141.3 -37.2]
Sahara	-38.0 ±[-78.1 -0.3]	-92.0 ±[-152.4 -37.1]	-44.5 ±[-95.0 0.7]	-126.4 ±[-217.4 -53.7]
West Africa	-42.5 ±[-82.9 -4.8]	-98.5 ±[-163.0 -40.2]	-51.2 ±[-106.2 -2.4]	-145.9 ±[-250.6 -62.0]
East Africa	-39.4 ±[-80.6 -1.0]	-97.1 ±[-163.8 -35.2]	-45.6 ±[-99.7 2.3]	-131.3 ±[-225.6 -51.1]
Southern Africa	-28.4 ±[-88.8 29.5]	-68.7 ±[-153.8 11.6]	-35.0 ±[-108.1 32.2]	-106.4 ±[-221.7 -7.1]
West Asia	-56.7 ±[-106.8 -8.8]	-143.8 ±[-215.4 -76.9]	-62.4 ±[-123.4 -5.9]	-176.6 ±[-272.4 -93.4]
East Asia	14.5 ±[-26.6 52.5]	44.2 ±[-17.8 99.8]	6.0 ±[-50.0 54.8]	-1.8 ±[-100.9 77.8]
South Asia	-162.0 ±[-219.8 -109.0]	-416.2 ±[-545.9 -294.9]	-172.8 ±[-252.1 -104.9]	-474.4 ±[-649.1 -325.3]
Southeast Asia	-36.8 ±[-91.9 14.6]	-91.1 ±[-174.0 -15.8]	-46.5 ±[-116.9 16.2]	-144.0 ±[-271.0 -40.8]
North Australia	-63.1 ±[-119.1 -10.9]	-154.8 ±[-551.2 232.1]	-74.2 ±[-146.4 -9.2]	-221.2 ±[-672.1 200.1]
South Australia/New Zealand	-35.0 ±[-70.0 -2.5]	-82.9 ±[-142.6 -30.1]	-43.1 ±[-86.1 -3.6]	-129.7 ±[-226.8 -52.5]
North Tropical Pacific	-3.4 ±[-14.8 6.8]	-3.4 ±[-20.8 11.5]	-6.5 ±[-22.8 7.1]	-18.7 ±[-50.2 4.3]
Equatorial Pacific SIDS	-27.1 ±[-55.7 -0.7]	-65.8 ±[-103.7 -30.3]	-30.6 ±[-71.7 3.8]	-85.5 ±[-140.0 -39.9]
Caribbean SIDS	-106.0 ±[-145.5 -68.0]	-267.2 ±[-323.7 -214.0]	-112.8 ±[-165.4 -66.4]	-301.9 ±[-385.7 -232.2]
Southern Tropical Pacific	-33.3 ±[-53.5 -15.0]	-83.5 ±[-116.1 -54.4]	-37.0 ±[-62.8 -14.5]	-105.4 ±[-156.7 -64.7]
West Indian Ocean	-32.1 ±[-52.2 -13.3]	-89.8 ±[-117.4 -64.2]	-34.5 ±[-62.9 -10.6]	-105.4 ±[-146.6 -71.7]
WORLD	-39.2 ±[-79.2 -2.2]	-93.4 ±[-171.1 -21.7]	-47.0 ±[-99.2 -0.8]	-135.0 ±[-246.9 -42.2]

Table S2. Projected ambient shoreline change (AC) for the 26 IPCC SREX sub- regions and the worldwide under RCP4.5 and RCP8.5 by the years 2050 and 2100. Values express the median value, combined with the very likely range in brackets; 5th, 95th percentile.

	RCP4.5		RCP8.5	
	2050	2100	2050	2100
West North America	-11.3 ±[-16.7 -5.9]	-29.5 ±[-37.0 -22.0]	-11.3 ±[-16.8 -5.8]	-29.5 ±[-37.0 -22.0]
Central North America	0.6 ±[-27.1 27.4]	1.7 ±[-34.1 37.7]	0.6 ±[-25.9 26.9]	1.7 ±[-34.1 37.7]
East North America	-11.7 ±[-36.1 12.9]	-30.8 ±[-63.5 1.9]	-11.7 ±[-36.2 12.8]	-30.8 ±[-63.5 1.9]
Central America/Mexico	-13.7 ±[-50.2 22.9]	-37.1 ±[-86.3 12.3]	-13.7 ±[-50.1 23.5]	-37.1 ±[-86.3 12.3]
Amazon	-25.5 ±[-61.1 9.9]	-70.3 ±[-117.2 -23.7]	-25.5 ±[-60.7 9.4]	-70.3 ±[-117.2 -23.7]
North-East Brazil	10.8 ±[-6.3 28.3]	28.5 ±[-22.6 79.7]	10.8 ±[-6.5 28.2]	28.5 ±[-22.6 79.7]
West Coast South America	-3.1 ±[-20.6 14.7]	-8.0 ±[-32.1 15.8]	-3.1 ±[-20.4 14.6]	-8.0 ±[-32.1 15.8]
Southeastern South America	-51.5 ±[-101.1 -1.4]	-138.0 ±[-204.5 -71.3]	-51.5 ±[-101.7 -1.7]	-138.0 ±[-204.5 -71.3]
North Europe	-3.7 ±[-24.4 16.9]	-10.2 ±[-53.9 33.8]	-3.7 ±[-24.4 17.0]	-10.2 ±[-53.9 33.8]
Central Europe	-21.4 ±[-38.0 -4.8]	-56.3 ±[-80.8 -31.5]	-21.4 ±[-38.0 -4.8]	-56.3 ±[-80.8 -31.5]
South Europe/Mediterranean	-6.4 ±[-18.0 5.0]	-16.6 ±[-32.1 -1.1]	-6.4 ±[-18.0 5.0]	-16.6 ±[-32.1 -1.1]
Sahara	-14.3 ±[-39.6 11.1]	-38.0 ±[-72.9 -3.0]	-14.3 ±[-39.6 11.1]	-38.0 ±[-72.9 -3.0]
West Africa	-6.5 ±[-24.7 11.5]	-17.8 ±[-44.9 9.2]	-6.5 ±[-24.9 11.8]	-17.8 ±[-44.9 9.2]
East Africa	-15.1 ±[-41.9 11.2]	-40.3 ±[-84.1 3.2]	-15.1 ±[-41.8 11.4]	-40.3 ±[-84.1 3.2]
Southern Africa	-0.9 ±[-45.6 43.6]	-4.5 ±[-64.0 55.1]	-0.9 ±[-45.6 43.5]	-4.5 ±[-64.0 55.1]
West Asia	-35.9 ±[-76.1 3.0]	-95.9 ±[-148.1 -43.8]	-35.9 ±[-75.3 0.6]	-95.9 ±[-148.1 -43.8]
East Asia	44.7 ±[22.0 67.5]	117.1 ±[86.7 147.6]	44.7 ±[22.0 67.5]	117.1 ±[86.7 147.6]
South Asia	-128.4 ±[-166.2 -91.0]	-335.0 ±[-431.8 -238.2]	-128.4 ±[-166.4 -90.9]	-335.0 ±[-431.8 -238.2]
Southeast Asia	-0.7 ±[-32.7 31.6]	-3.4 ±[-46.8 39.8]	-0.7 ±[-33.2 31.5]	-3.4 ±[-46.8 39.8]
North Australia	-17.6 ±[-45.9 10.8]	-47.7 ±[-393.3 297.3]	-17.6 ±[-46.1 10.6]	-47.7 ±[-393.3 297.3]
South Australia/New Zealand	-2.2 ±[-17.4 13.0]	-5.9 ±[-26.2 14.4]	-2.2 ±[-17.2 12.9]	-5.9 ±[-26.2 14.4]
North Tropical Pacific	7.1 ±[2.7 11.6]	19.7 ±[13.7 25.7]	7.1 ±[2.6 11.6]	19.7 ±[13.7 25.7]
Equatorial Pacific SIDS	-11.6 ±[-31.3 9.0]	-31.3 ±[-57.5 -4.0]	-11.6 ±[-31.1 8.9]	-31.3 ±[-57.5 -4.0]
Caribbean SIDS	-80.9 ±[-109.4 -52.5]	-212.1 ±[-250.0 -174.2]	-80.9 ±[-109.3 -52.6]	-212.1 ±[-250.0 -174.2]
Southern Tropical Pacific	-17.0 ±[-27.9 -6.1]	-45.2 ±[-59.8 -30.7]	-17.0 ±[-27.9 -6.1]	-45.2 ±[-59.8 -30.7]
West Indian Ocean	-21.1 ±[-34.1 -7.6]	-63.9 ±[-81.3 -46.1]	-21.1 ±[-34.1 -7.7]	-63.9 ±[-81.3 -46.1]
WORLD	-11.5 ±[-34.7 11.7]	-30.4 ±[-79.1 18.2]	-11.5 ±[-34.7 11.5]	-30.4 ±[-79.1 18.2]

Table S3. Projected sea level rise driven retreat (R) for the 26 IPCC SREX sub- regions and the worldwide under RCP4.5 and RCP8.5 by the years 2050 and 2100. Values express the median value, combined with the very likely range in brackets; 5th, 95th percentile.

	RCP4.5		RCP8.5	
	2050	2100	2050	2100
West North America	-20.5 ±[-31.7 - 10.5]	-43.8 ±[-70.3 -22.2]	-26.3 ±[-41.3 - 13.0]	-74.1 ±[-128.2 -36.3]
Central North America	-42.2 ±[-63.6 - 22.1]	-92.6 ±[-145.2 -48.4]	-54.2 ±[-83.2 - 27.5]	-152.5 ±[-258.0 - 76.6]
East North America	-35.6 ±[-54.2 - 18.5]	-76.5 ±[-121.3 -39.5]	-45.1 ±[-70.3 - 22.8]	-128.4 ±[-220.5 - 64.1]
Central America/Mexico	-27.0 ±[-40.9 - 13.7]	-59.6 ±[-94.3 -30.4]	-34.0 ±[-52.5 - 16.7]	-96.1 ±[-164.0 -47.0]
Amazon	-31.6 ±[-47.3 - 16.0]	-70.7 ±[-110.7 -36.1]	-38.9 ±[-59.0 - 18.5]	-110.5 ±[-186.9 - 53.3]
North-East Brazil	-40.9 ±[-61.3 - 20.8]	-91.9 ±[-144.1 -47.2]	-50.2 ±[-75.7 - 24.2]	-145.3 ±[-243.5 - 71.1]
West Coast South America	-22.5 ±[-35.9 - 11.5]	-55.3 ±[-89.5 -28.4]	-28.2 ±[-44.1 - 14.4]	-89.3 ±[-149.0 -44.6]
Southeastern South America	-30.9 ±[-47.7 - 15.7]	-72.8 ±[-115.7 -37.2]	-38.9 ±[-59.5 - 19.2]	-118.6 ±[-195.0 - 58.2]
North Europe	-25.6 ±[-41.7 - 11.5]	-53.3 ±[-90.3 -23.4]	-35.8 ±[-57.5 - 16.7]	-101.6 ±[-179.0 - 48.9]
Central Europe	-35.3 ±[-54.7 - 18.4]	-76.4 ±[-122.0 -39.4]	-46.1 ±[-72.1 - 23.4]	-131.6 ±[-225.2 - 65.8]
South Europe/Mediterranean	-17.5 ±[-27.7 -8.8]	-40.0 ±[-65.1 -20.1]	-22.6 ±[-36.3 - 11.1]	-65.3 ±[-115.0 -31.3]
Sahara	-23.7 ±[-37.1 - 12.1]	-54.0 ±[-86.9 -27.5]	-30.2 ±[-48.2 - 14.9]	-88.4 ±[-153.6 -43.1]
West Africa	-36.0 ±[-53.7 - 18.2]	-80.7 ±[-126.4 -41.2]	-44.7 ±[-67.2 - 21.5]	-128.2 ±[-214.8 - 62.5]
East Africa	-24.3 ±[-37.1 - 12.3]	-56.8 ±[-89.8 -29.2]	-30.5 ±[-46.8 - 14.6]	-91.0 ±[-153.3 -43.6]
Southern Africa	-27.5 ±[-41.5 - 13.9]	-64.2 ±[-101.3 -32.8]	-34.1 ±[-52.2 - 16.4]	-101.9 ±[-172.4 - 49.5]
West Asia	-20.8 ±[-32.4 - 10.8]	-47.9 ±[-77.3 -24.9]	-26.5 ±[-41.0 - 12.8]	-80.7 ±[-135.9 -39.1]
East Asia	-30.2 ±[-46.4 - 15.6]	-72.9 ±[-115.5 -37.8]	-38.7 ±[-59.7 - 19.1]	-119.0 ±[-200.2 - 58.2]
South Asia	-33.7 ±[-53.3 - 17.7]	-81.2 ±[-132.7 -41.9]	-44.4 ±[-69.6 - 22.1]	-139.4 ±[-238.4 - 68.9]
Southeast Asia	-36.1 ±[-55.0 - 18.6]	-87.7 ±[-138.2 -45.5]	-45.8 ±[-70.3 - 22.6]	-140.6 ±[-237.2 - 69.1]
North Australia	-45.5 ±[-68.3 - 23.7]	-107.1 ±[-167.7 - 55.5]	-56.6 ±[-85.9 - 28.2]	-173.5 ±[-289.9 - 86.6]
South Australia/New Zealand	-32.8 ±[-50.2 - 16.9]	-77.0 ±[-121.9 -39.3]	-40.8 ±[-62.6 - 20.1]	-123.8 ±[-207.5 - 60.9]
North Tropical Pacific	-10.5 ±[-16.3 -5.2]	-23.0 ±[-37.4 -11.5]	-13.6 ±[-21.6 -6.6]	-38.4 ±[-67.3 -18.4]
Equatorial Pacific SIDS	-15.5 ±[-23.6 -7.8]	-34.5 ±[-54.8 -17.4]	-19.0 ±[-29.3 -9.0]	-54.3 ±[-92.3 -26.3]
Caribbean SIDS	-25.0 ±[-37.8 - 12.9]	-55.1 ±[-86.9 -28.4]	-31.9 ±[-49.0 - 15.9]	-89.8 ±[-152.4 -44.5]
Southern Tropical Pacific	-16.3 ±[-24.9 -8.4]	-38.2 ±[-60.8 -19.6]	-20.0 ±[-30.8 -9.7]	-60.2 ±[-102.1 -29.3]
West Indian Ocean	-11.0 ±[-17.1 -5.5]	-25.9 ±[-41.6 -13.1]	-13.4 ±[-21.2 -6.3]	-41.5 ±[-71.9 -19.7]
WORLD	-27.7 ±[-42.9 - 14.1]	-62.9 ±[-100.7 -32.1]	-35.4 ±[-55.1 - 17.5]	-104.6 ±[-178.1 - 51.4]

Table S4. Projected maximum shoreline change ($dx_{shore,max}$) for the 26 IPCC SREX sub- regions and the worldwide under RCP4.5 and RCP8.5 by the years 2050 and 2100. Values express the median value, combined with the very likely range in brackets; 5th, 95th percentile.

	RCP4.5		RCP8.5	
	2050	2100	2050	2100
West North America	-41.1 ±[-59.4 -24.8]	-82.3 ±[-113.0 -56.3]	-46.7 ±[-72.8 -24.6]	-112.5 ±[-170.4 -70.5]
Central North America	-53.9 ±[-103.2 -7.8]	-103.3 ±[-175.7 -37.7]	-66.9 ±[-138.2 -6.2]	-163.6 ±[-286.3 -68.0]
East North America	-57.4 ±[-102.1 -16.0]	-117.5 ±[-185.8 -56.3]	-73.1 ±[-136.8 -20.2]	-175.0 ±[-298.2 -85.8]
Central America/Mexico	-51.9 ±[-103.5 -2.4]	-107.5 ±[-180.2 -39.2]	-66.4 ±[-135.2 -6.4]	-143.5 ±[-248.3 -55.8]
Amazon	-64.7 ±[-116.4 -15.8]	-148.6 ±[-221.9 -80.3]	-72.0 ±[-140.9 -10.7]	-188.5 ±[-295.5 -99.5]
North-East Brazil	-38.6 ±[-80.5 0.3]	-72.0 ±[-165.3 14.1]	-48.3 ±[-106.6 2.8]	-125.7 ±[-264.5 -10.9]
West Coast South America	-34.0 ±[-66.7 -4.1]	-71.9 ±[-126.2 -24.8]	-40.1 ±[-77.8 -6.2]	-106.1 ±[-185.2 -41.8]
Southeastern South America	-91.8 ±[-160.6 -27.1]	-220.4 ±[-317.7 -128.8]	-99.9 ±[-180.2 -25.7]	-266.3 ±[-395.0 -152.5]
North Europe	-50.0 ±[-87.9 -15.4]	-85.1 ±[-158.7 -18.0]	-85.8 ±[-137.5 -41.4]	-131.9 ±[-244.4 -42.2]
Central Europe	-64.6 ±[-103.6 -29.7]	-140.5 ±[-202.2 -86.6]	-75.6 ±[-130.1 -28.8]	-195.8 ±[-304.0 -113.7]
South Europe/Mediterranean	-27.6 ±[-50.4 -6.9]	-60.2 ±[-96.2 -29.1]	-32.7 ±[-62.7 -6.8]	-85.5 ±[-144.9 -40.8]
Sahara	-42.0 ±[-82.3 -4.4]	-96.1 ±[-156.5 -41.2]	-48.5 ±[-99.2 -3.2]	-130.5 ±[-221.5 -57.7]
West Africa	-46.9 ±[-87.4 -9.5]	-103.0 ±[-167.6 -44.8]	-55.6 ±[-110.7 -7.0]	-150.5 ±[-255.2 -66.6]
East Africa	-43.4 ±[-84.6 -4.9]	-101.1 ±[-167.8 -39.1]	-49.6 ±[-103.7 -1.5]	-135.2 ±[-229.6 -55.1]
Southern Africa	-33.3 ±[-93.1 24.1]	-73.6 ±[-158.8 6.6]	-40.0 ±[-112.7 26.3]	-111.5 ±[-226.8 -12.2]
West Asia	-59.6 ±[-110.0 -13.2]	-146.8 ±[-218.4 -79.9]	-65.3 ±[-125.9 -7.9]	-179.6 ±[-275.4 -96.4]
East Asia	5.4 ±[-35.7 43.3]	35.3 ±[-26.8 90.9]	-3.3 ±[-59.4 45.4]	-11.3 ±[-110.4 68.4]
South Asia	-167.5 ±[-225.1 -114.6]	-421.8 ±[-551.5 -300.5]	-178.6 ±[-258.0 -111.3]	-480.5 ±[-655.4 -331.2]
Southeast Asia	-41.1 ±[-96.3 10.1]	-95.5 ±[-178.5 -20.1]	-51.4 ±[-121.7 11.0]	-148.9 ±[-276.1 -45.5]
North Australia	-74.7 ±[-131.3 -21.6]	-166.5 ±[-563.4 220.7]	-89.7 ±[-164.2 -23.7]	-237.2 ±[-690.2 185.5]
South Australia/New Zealand	-46.1 ±[-80.8 -13.6]	-94.8 ±[-154.5 -42.0]	-53.7 ±[-96.8 -14.3]	-141.0 ±[-238.3 -63.7]
North Tropical Pacific	-9.5 ±[-21.0 0.7]	-9.5 ±[-26.9 5.4]	-13.0 ±[-29.4 0.8]	-25.1 ±[-56.8 -2.0]
Equatorial Pacific SIDS	-32.9 ±[-60.7 -6.2]	-71.5 ±[-109.4 -36.0]	-36.8 ±[-77.8 -2.6]	-91.8 ±[-146.3 -46.1]
Caribbean SIDS	-112.2 ±[-151.7 -74.3]	-273.4 ±[-329.9 -220.1]	-119.4 ±[-172.6 -72.6]	-308.4 ±[-392.8 -238.5]
Southern Tropical Pacific	-40.8 ±[-60.7 -22.1]	-91.0 ±[-123.7 -61.8]	-45.2 ±[-72.0 -21.5]	-113.7 ±[-166.5 -72.0]
West Indian Ocean	-41.2 ±[-61.4 -22.6]	-99.0 ±[-126.6 -73.4]	-43.5 ±[-71.8 -19.2]	-114.1 ±[-155.4 -80.3]
WORLD	-48.2 ±[-88.3 -11.2]	-102.4 ±[-180.3 -30.6]	-58.1 ±[-111.1 -11.7]	-144.4 ±[-257.1 -51.2]