Supporting Online Material

Pacific

Location	Site	LAT	LON	Reef Type	Vert. Motion (mm/yr)	Vert. Motion References	Method	Max Age	Accretion Rate (mm/yr)	Coral Growth Citation
Papua New Guinea	Gagar Anununai	-6.0065	147.4827	UTs	0.94	Bloom et al., 1974	U-Series (Uplifted Corals)	> MIS 7	7	Montaggioni, 2005
	Sialum	-6.0983	147.6058	UTs	1.65	Bloom et al., 1974	U-Series (Uplifted Corals)	> MIS 7	7	Montaggioni, 2005
	Kanzaura	-6.2157	147.6692	UTs	2.56	Bloom et al., 1974	U-Series (Uplifted Corals)	> MIS 7	7	Montaggioni, 2005
	Huon Gulf	-7.2563	147.4132	DPs	-4	Webster et al., 2004	U Series (Drowned Corals)	MIS 9	7	Montaggioni, 2005
Vanuatu	Espiritu Santo	-15.6089	166.8907	UTs	4.7	Cabioch, 2003	^{14}C (Uplifted Corals)	Holocene	2.5	Montaggioni, 2005
	Malekula	-15.9524	167.2916	UTs	3.5	Taylor et al., 1980	^{14}C (Uplifted Corals)	Holocene	[2.5]	Montaggioni, 2005
New Caledonia	Poum	-20.2541	164.0056	BR	-0.08	Cabioch, 2003	U-Series/^{14}C	Holocene	5.5	Cabioch et al., 1995
	Pouebo	-20.3716	164.5916	BR	-0.14	Cabioch, 2003	U-Series/^{14}C	Holocene	5.5	Cabioch et al., 1995
	Poindimie	-20.9404	165.4063	BR	-0.1	Cabioch, 2003	U-Series/^{14}C	Holocene	5.5	Cabioch et al., 1995
	Ilot Tenia	-22.0098	165.9383	BR	-0.11	Cabioch, 2003	U-Series/^{14}C	Holocene	5.5	Cabioch et al., 1995
	Ilot Amedee	-22.4768	166.4690	BR	-0.14	Cabioch, 2003	U-Series/^{14}C	Holocene	5.5	Cabioch et al., 1995
	Yate	-22.1625	166.9583	FR	0.03	Cabioch, 2003	U-Series/^{14}C	Holocene	5.5	Cabioch et al., 1995
	Ricaudy (Noumee)	-22.3139	166.4556	BR	-0.07	Cabioch, 2003	U-Series/^{14}C	Holocene	5.5	Cabioch et al., 1995
Loyalty Islands	Maré	-21.4564	167.9824	FR(e)	0.175	Marshall and Launay, 1978	U-Series (Uplifted Corals)	MIS 5	[5.5]	
	Lifou	-20.8469	167.2740	FR(e)	0.145	Marshall and Launay, 1978	U-Series (Uplifted Corals)	MIS 6	[5.5]	
Cook Islands	Mangaia	-21.9045	-157.9061	FR(e)	0.085	Woodroffe et al., 1991	U-Series (Uplifted Corals)	MIS 5	3.5	Montaggioni, 2005
	Atiu	-20.0147	-158.0966	FR(e)	0.05	Woodroffe et al., 1991	U-Series (Uplifted Corals)	MIS 5	[3.5]	Montaggioni, 2005
	Mitiaro	-19.8717	-157.6854	FR(e)	0.03	Woodroffe et al., 1991	U-Series (Uplifted Corals)	MIS 5	[3.5]	Montaggioni, 2005
	Mauke	-20.1458	-157.3560	FR(e)	0.04	Woodroffe et al., 1991	U-Series (Uplifted Corals)	MIS 5	[3.5]	Montaggioni, 2005
	Rarotonga	-21.2352	-159.8115	FR	-0.02	Woodroffe et al., 1991		MIS 5	[3.5]	Montaggioni, 2005
Society Islands	Tahiti	-17.5319	-149.5800	BR	-0.25	Bard et al., 1996	K-Ar (Drowned Subaerial Lava Flows)	Holocene	6.5 (36)	Montaggioni, 2005
	Moorea	-17.4888	-149.8690	BR	-0.185	Menard, 1983	Inferred Coral Thickness/Island Age	1.55 Ma	5 (>10)	Montaggioni, 2005
	Raiatea	-16.7692	-151.4078	BR	-0.13	Menard, 1983	Inferred Coral Thickness/Island Age	2.5 Ma	[5.75]	Montaggioni, 2005
	Bora Bora	-16.4916	-151.7113	BR	-0.09	Menard, 1983	Inferred Coral Thickness/Island Age	3.25 Ma	[5.75]	Montaggioni, 2005
Hawaiian Islands	Big Island	19.9836	-156.0134	DTs	-2.6	Ludwig et al., 1991	U-Series (Drowned Corals)	MIS 12	2.875	Webster et al., 2007
	Oahu	21.6670	-158.0473	FR(e)	0.06	McMurtry et al., 2009	U-Series (Drowned Corals)	MIS 9	1.58	Montaggioni, 2005
	Molokai/Lanai/Maui	20.6916	-156.7637	DBRs/DTs	-0.58	Webster et al., 2010 Faichney et al., 2009	^{87}Sr/^{86}Sr (Drowned Corals)	<500 ka	5.75	Montaggioni, 2005
Ryukus	Kikai	28.2998	129.9714	UTs	1.8	Ota and Omura, 1992	U-Series (Uplifted Corals)	MIS 5	[4.9]	Montaggioni, 2005
	Hateruma	24.0576	123.7905	FR(e)	0.3	Ota and Omura, 1992	U-Series (Uplifted Corals)	MIS 6	[4.9]	Montaggioni, 2005
	Yonaguni	24.4457	122.9715	FR(e)	0.2	Ota and Omura, 1992	U-Series (Uplifted Corals)		[4.9]	Montaggioni, 2005
	Kita-Daito	25.9486	131.3018	FR(e)	0.3	Ota and Omura, 1992	U-Series (Uplifted Corals)	MIS 5	[4.9]	Montaggioni, 2005
	Minami-Daito	25.8265	131.2242	FR(e)	0.05	Ota and Omura, 1992	U-Series (Uplifted Corals)	MIS 5	[4.9]	Montaggioni, 2005

Atlantic

Location	Site	LAT	LON	Reef Type	Vert. Motion (mm/yr)	Uplift References	Method	Max Age	Accretion Rate (mm/yr)	Coral Growth Citation
Barbados	Cave Hill	13.1332	-59.6316	UTs	0.53	Speed and Cheng, 2004	U-Series (Uplifted Corals)	MIS 5	6.3	Hubbard, 2009
Haiti	Mole St. Nicolas	19.8210	-73.3542	UTs	0.35	Dodge et al., 1982	U-Series (Uplifted Corals)	MIS 5	6.1*	Dullo, 2005
Puerto Rico	Isla de Mona	18.1100	-67.9014	FR(e)	0.045	Hubbard et al., 2008		MIS 5	3.77	Hubbard, 2009
St. Croix		17.7906	-64.6195	FR /DT	0.012	Hubbard et al., 2008	U-Series (Uplifted Shell)	MIS 5	2.9	Hubbard, 2009

Indian

Location	Site	LAT	LON	Reef Type	Vert. Motion (mm/yr)	Uplift References	Method	Max Age	Accretion Rate (mm/yr)	Coral Growth Citation
Mauritius	Pointe-aux-Sables	-20.1635	57.4557	FR	-0.04	Camion et al., 1997		MIS 5	3	Montaggioni, 2005
Mayotte	Pamandzi Islet	-12.8280	45.2841	BR	-0.2	Camion et al., 1997		MIS: 5-7	4.5	Montaggioni, 2005
Reunion	La Saline	-21.0919	55.2295	FR	-0.04	Camion et al., 1997			3	Montaggioni, 2005
East Timor	Northern Coast	-8.5170	126.0551	UTs	0.5	Chappell and Veeh, 1978	U-Series (Uplifted Corals)	MIS 5	4.4*	Dullo, 2005
	Dili	-8.5350	125.7051	FR(e)	0.03	Chappell and Veeh, 1978	U-Series (Uplifted Corals)	MIS 5	4.4*	Dullo, 2005
	Atauro	-8.3007	125.5573	UTs	0.47	Chappell and Veeh, 1978	U-Series (Uplifted Corals)	MIS 5	4.4*	Dullo, 2005
Sumba	Cape Laundi	-9.4978	120.1880	UTs	0.35	Bard et al., 1996b	U-Series (Uplifted Corals)	MIS 8	4.4*	Dullo, 2005

Table DR1. Summary of available reef vertical motion and accretion data plotted in Figures 3 and S3. References summarizing data from multiple sites and sources are shown in bold. Mean uplift rate shown for ranges reported in the literature. Accretion rates represent an island-averaged rate based on the mean values observed across sites, as reviewed in the literature. In the case that reef accretion rates had not been measured, the mean value for the particular island chain (indicated with [ ]) or ocean basin (indicated with *) was used. A few exceptions occur: For the Big Island of Hawaii, we used the growth rate that Webster et al. (2007) estimated based on their model results, which does not differ substantially from the average across the Hawaiian Islands. For Tahiti and Moorea, only the accretion rates reported for barrier reefs were used, as the observed rates from inland fringing reefs were substantially higher than all of the other sites. Such fast accretion rates are probably not representative of the geologic past. Indeed, accretion rates >25 mm/yr would outpace known drowning mechanisms, yet drowned reefs and atolls proliferate. Vertical Motion rates represent an average over the interval of study. Reef types are: Uplifted Terraces (Uts), Emergent Fringing Reef (FR(e)), Fringing Reef (FR), Barrier Reef (BR), Drowned Terraces (DTs), Drowned Barrier Reef (DBR).

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Six movies, one for each of the reef types identified in the manuscript, have been compiled to provide a representative sample of how each profile develops over a typical model run. For each of these runs, we used the proxy derived SL curve. Like the plots shown in Figure 1a-1d, an initial slope of 0.05 was used for the Hawaiian Islands and 0.15 for each of the other examples. All other parameters follow those shown in Table DR2.

Drowned Terraces (Hawaii): VideoDR1-VM=-2.6mm/yr, G=2.65mm/yr

Drowned Lagoons (Molokai): VideoDR2-VM=-0.58mm/yr, G=5.75mm/yr

Emergent Fringing (Oahu): VideoDR3-VM=0.06mm/yr. G=2.5mm/yr

Barrier Reef (Tahiti): VideoDR4-VM=-0.275mm/yr, G=6.5mm/yr

Uplifted Terraces (PNG): VideoDR5-VM=2.56mm/yr, G=7mm/yr

Fringing Reef (Reunion): VideoDR6-VM=-0.04mm/yr, G=3mm/yr