Supplementary Material

Neogene mass accumulation rate of carbonate sediment across northern Zealandia, Tasman Sea, southwest Pacific

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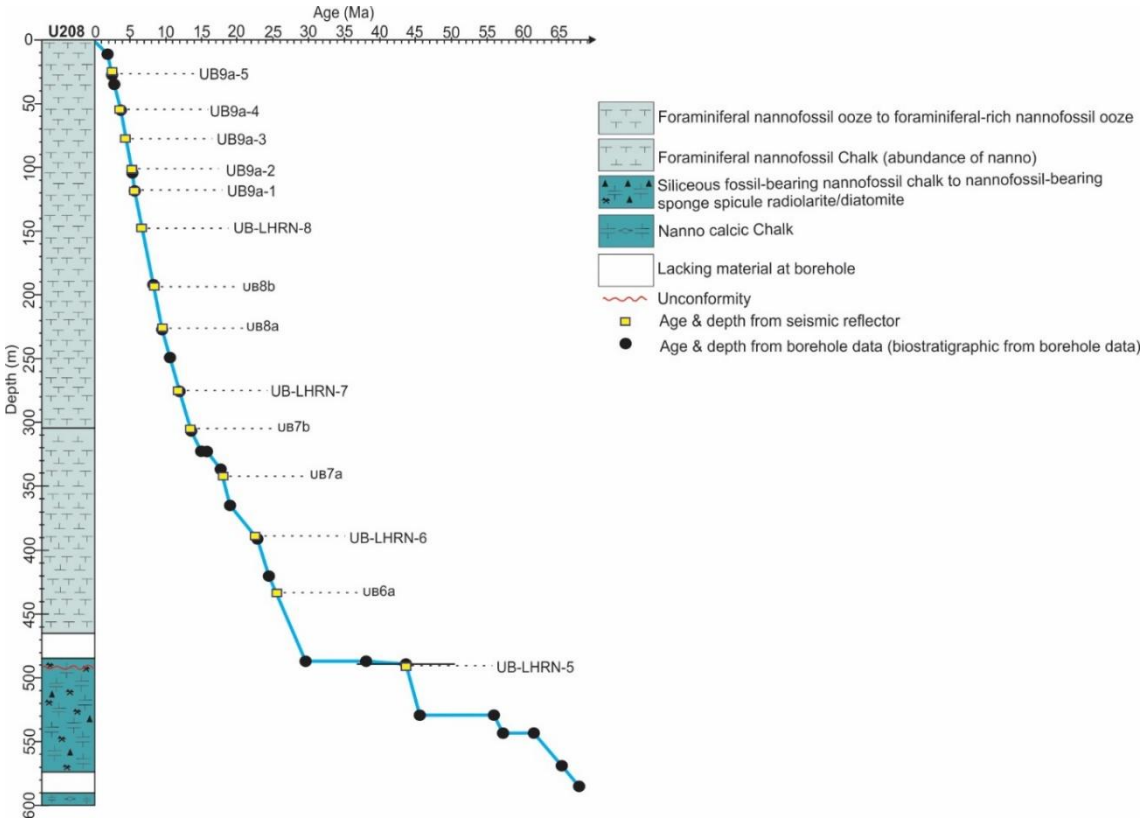


Figure S1. Borehole U208.

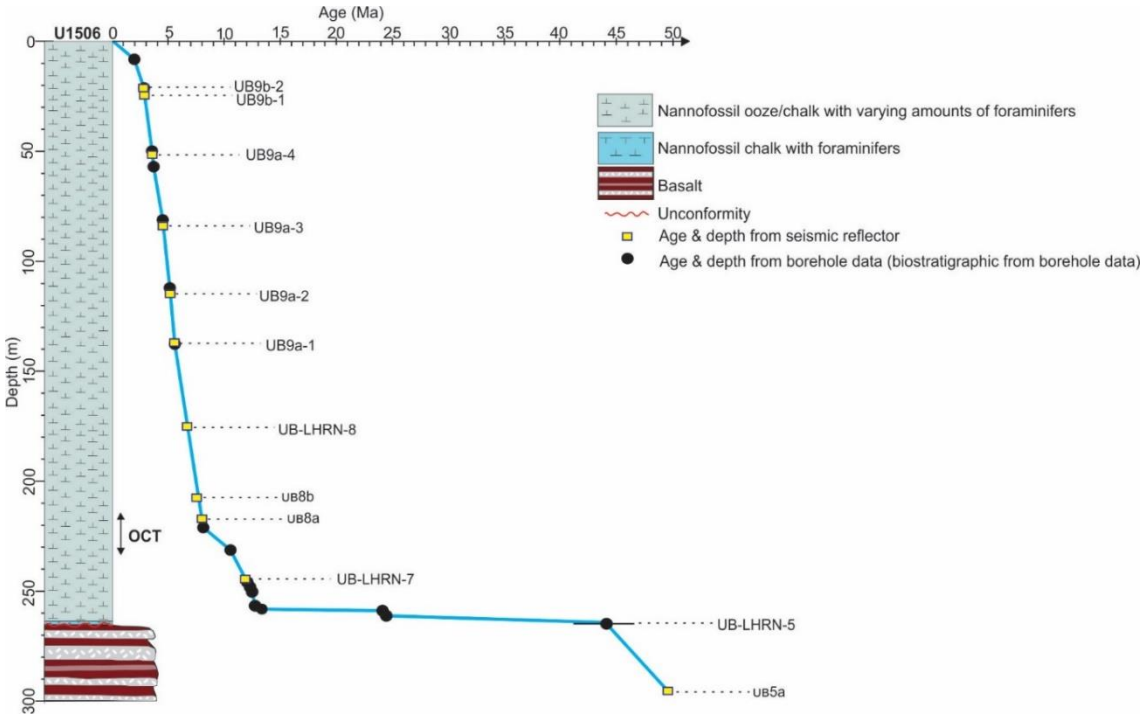


Figure S2. Borehole U1506.

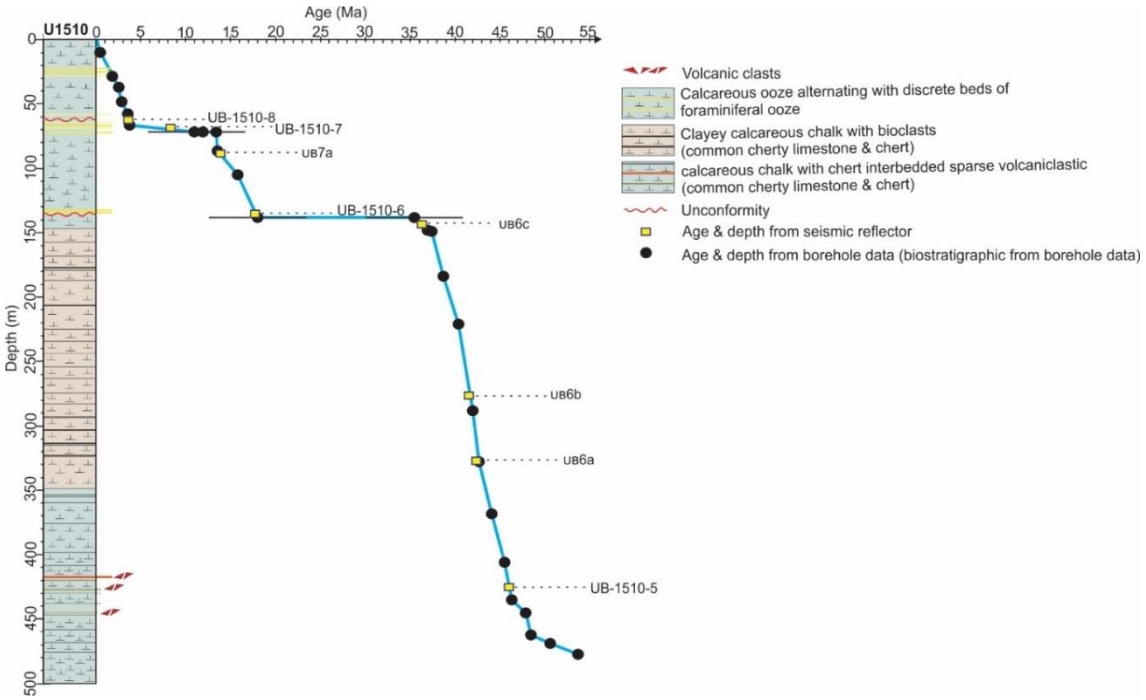
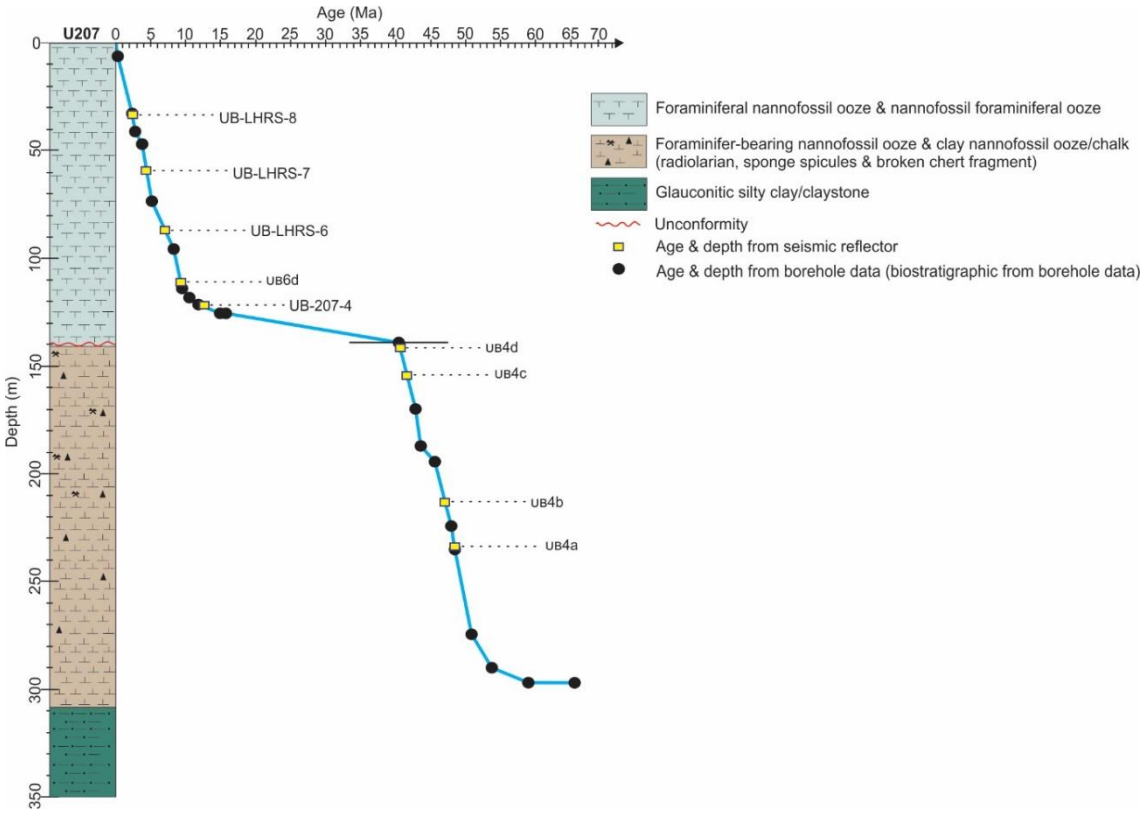


Figure S3. Borehole U1510.



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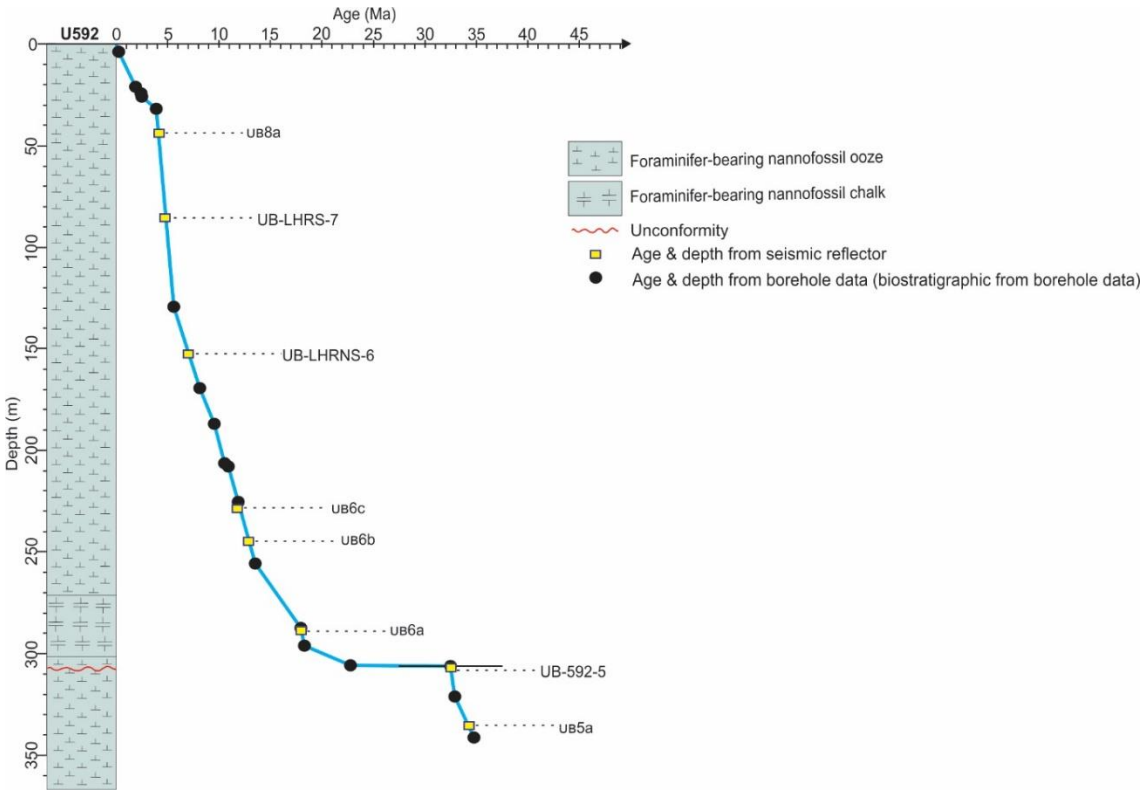

Figure S5. Borehole U592.

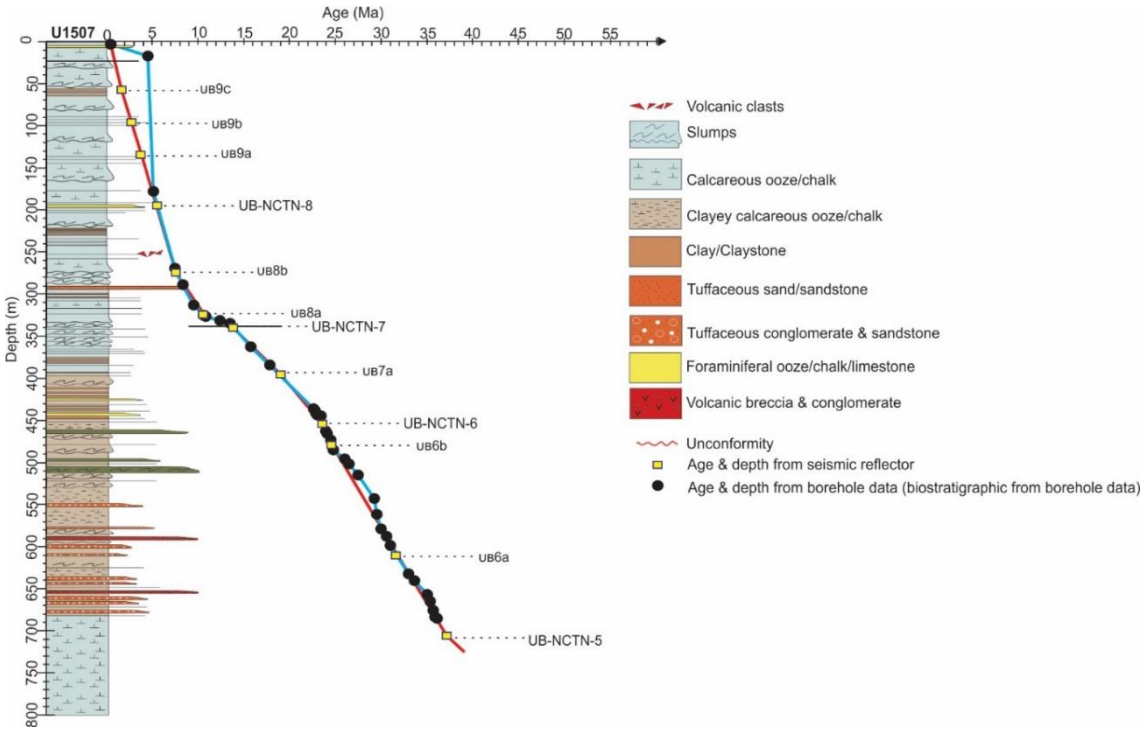

Figure S6. Borehole U1507.

Horizontal dash lines = seismic reflection/time horizons picked for units boundaries, red solid line=age model correlation for microfossil datum accounting for reworking (correction from U-NCTN-B9a to U-NCTN-B9c) and blue solid line= published age model from borehole data/sediment sampled at borehole U1507 (includes a single biostratigraphic datum that is inferred here to be reworked within a debris flow).

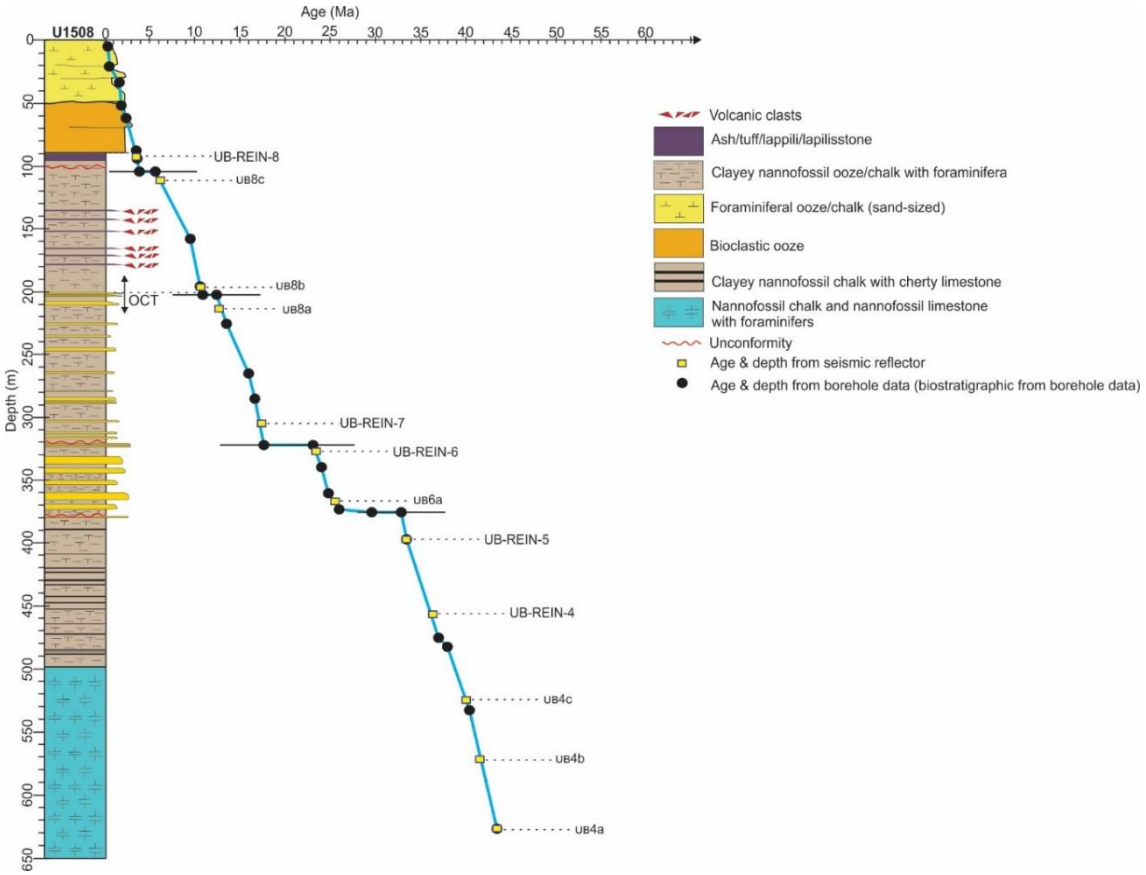

Figure S7. Borehole U1508.

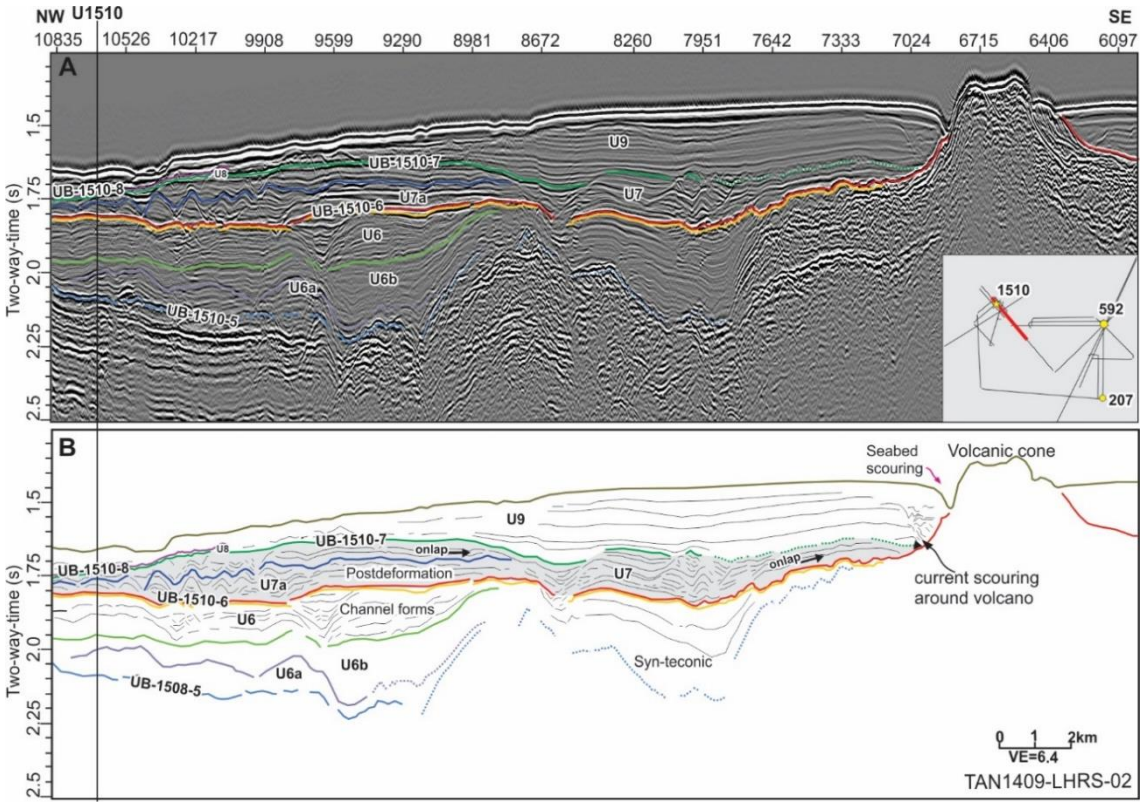

Figure S8. Southern Lord Howe Rise seismic reflection line TAN1409-LHRS-02 through borehole U1510, (A) seismic reflection image, and (B) illustrates Eocene reverse faulting, deformation, volcanism and erosional unconformity.

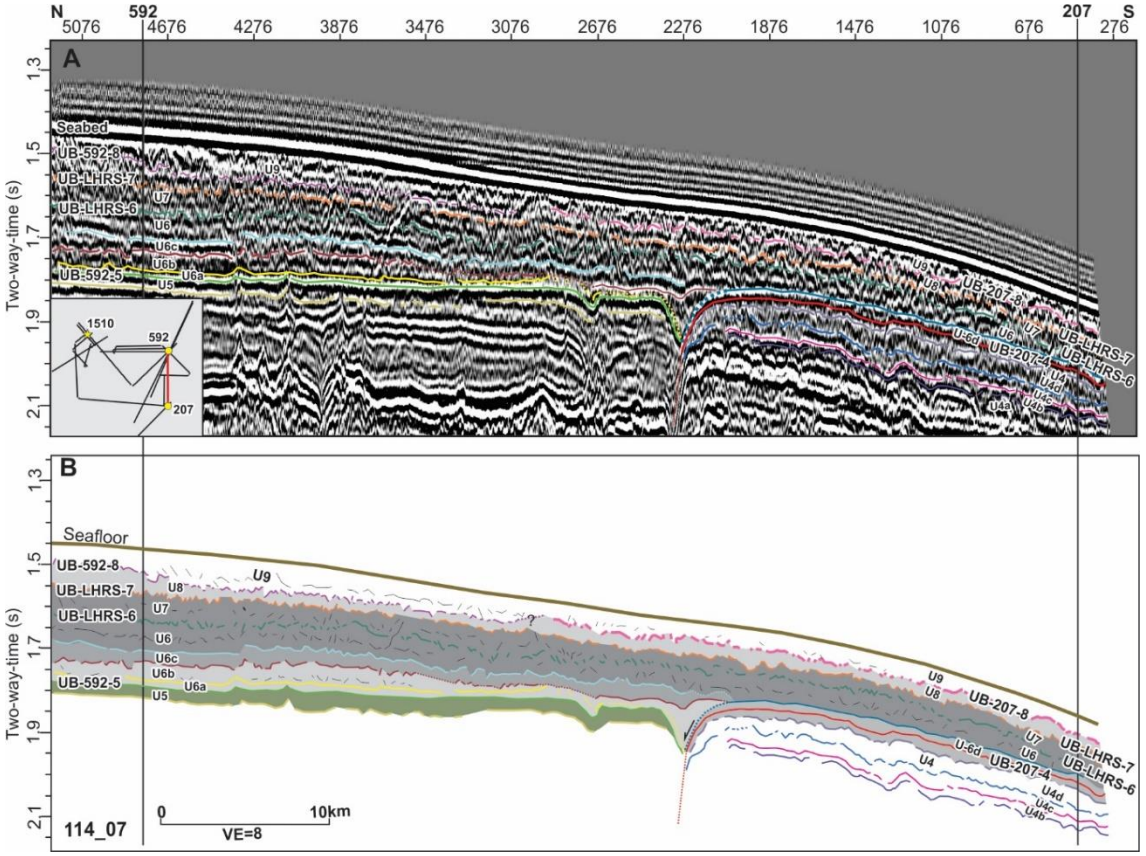

Figure S9. Southern Lord Howe Rise seismic reflection line 114_07 between Sites U592 and U207: (A) seismic reflection image, and (B) two sites show a lack of continuity of strata beneath a Miocene-Paleogene unconformity.

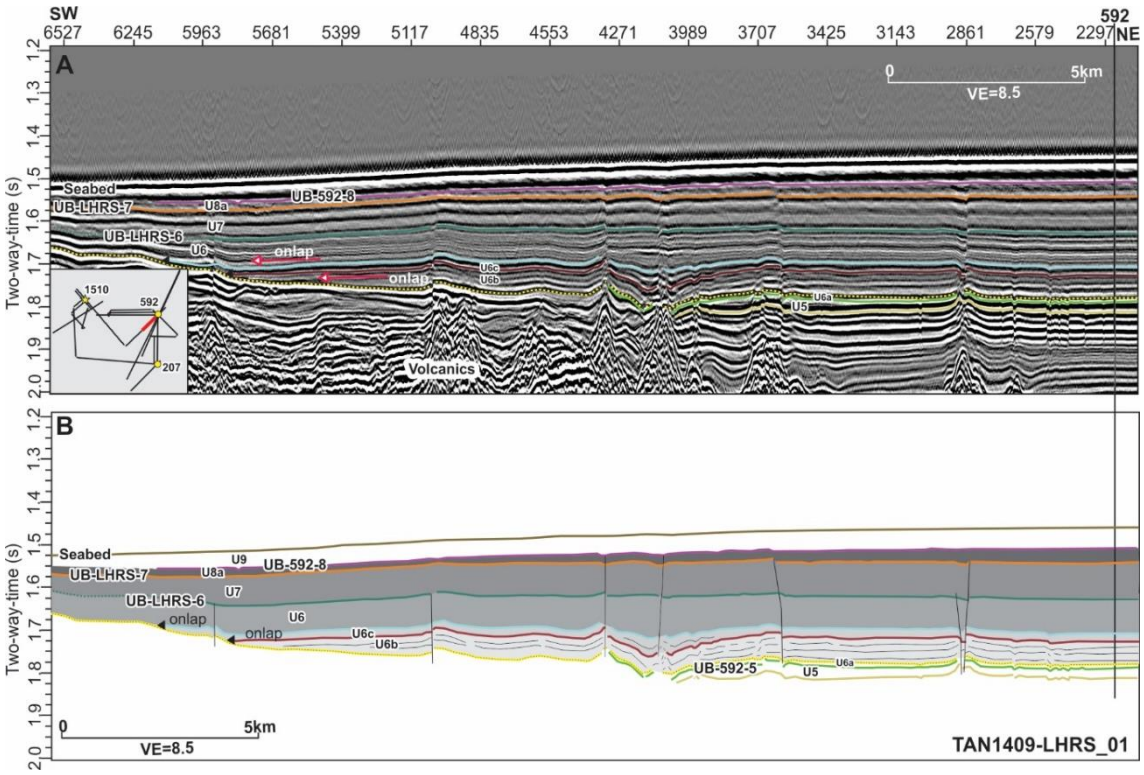

Figure S10. Southern Lord Howe Rise seismic line TAN1409-LHRS_01 near Site U592: (A) seismic reflection image, and (B) sketch of onlapping section just above Miocene unconformity (black yellow dash line).

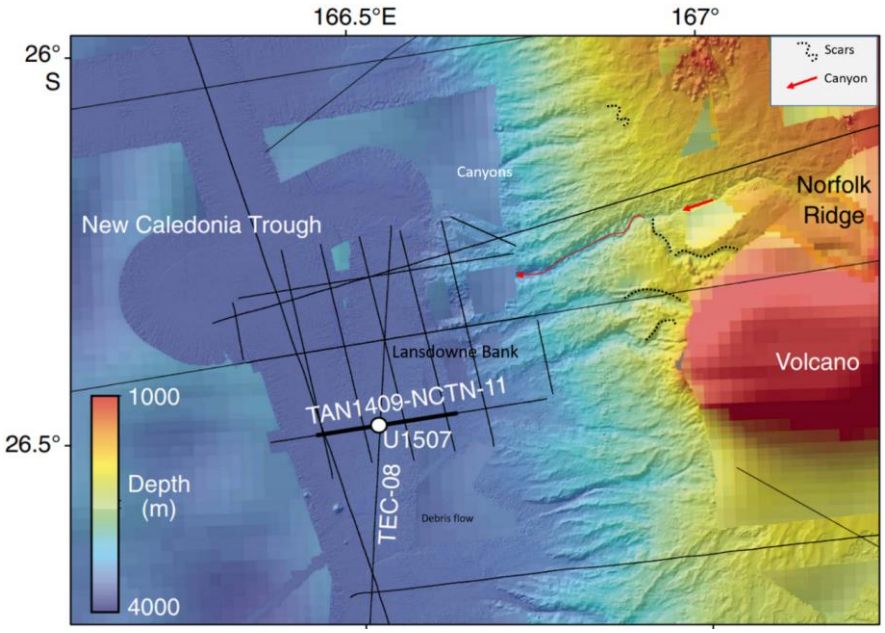

Figure S11. Bathymetric map showing local setting of Site U1507, with canyons and landslide scars on the adjacent flank of Norfolk Ridge.

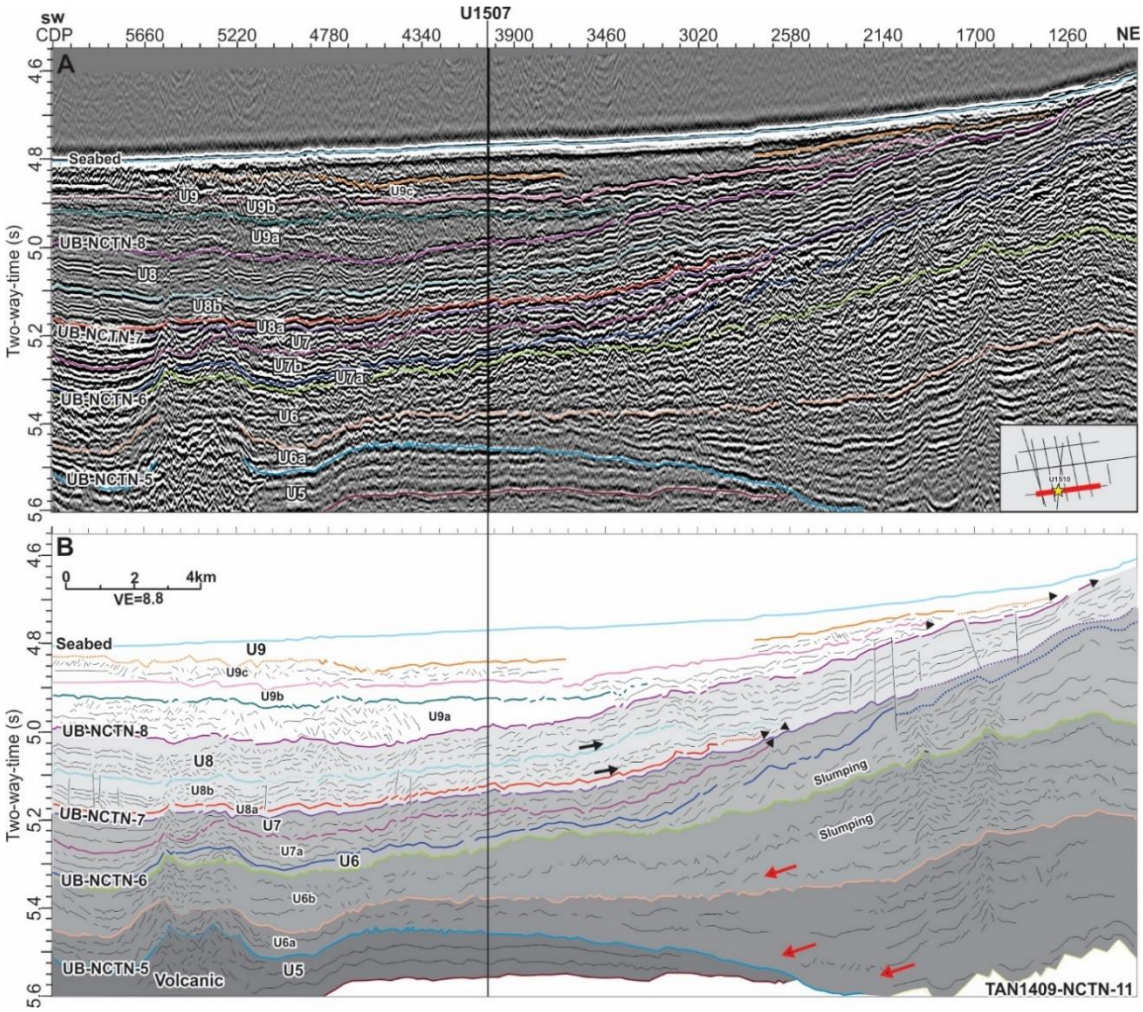

Figure S12. Seismic line line TAN1409-NCTN-11 at Site U1507, (A) seismic reflection image with horizons picked in colour, and (B) sketch of onlapping and downlapping strata near Site U1507. Stratigraphic onlaps are shown with small black arrow facing northeast and small two arrows with purple and blue colour are toplapping reflectors. Black line is polygonal faulting. Blank areas are transparent acoustically and interpreted as large-scale debris flows.

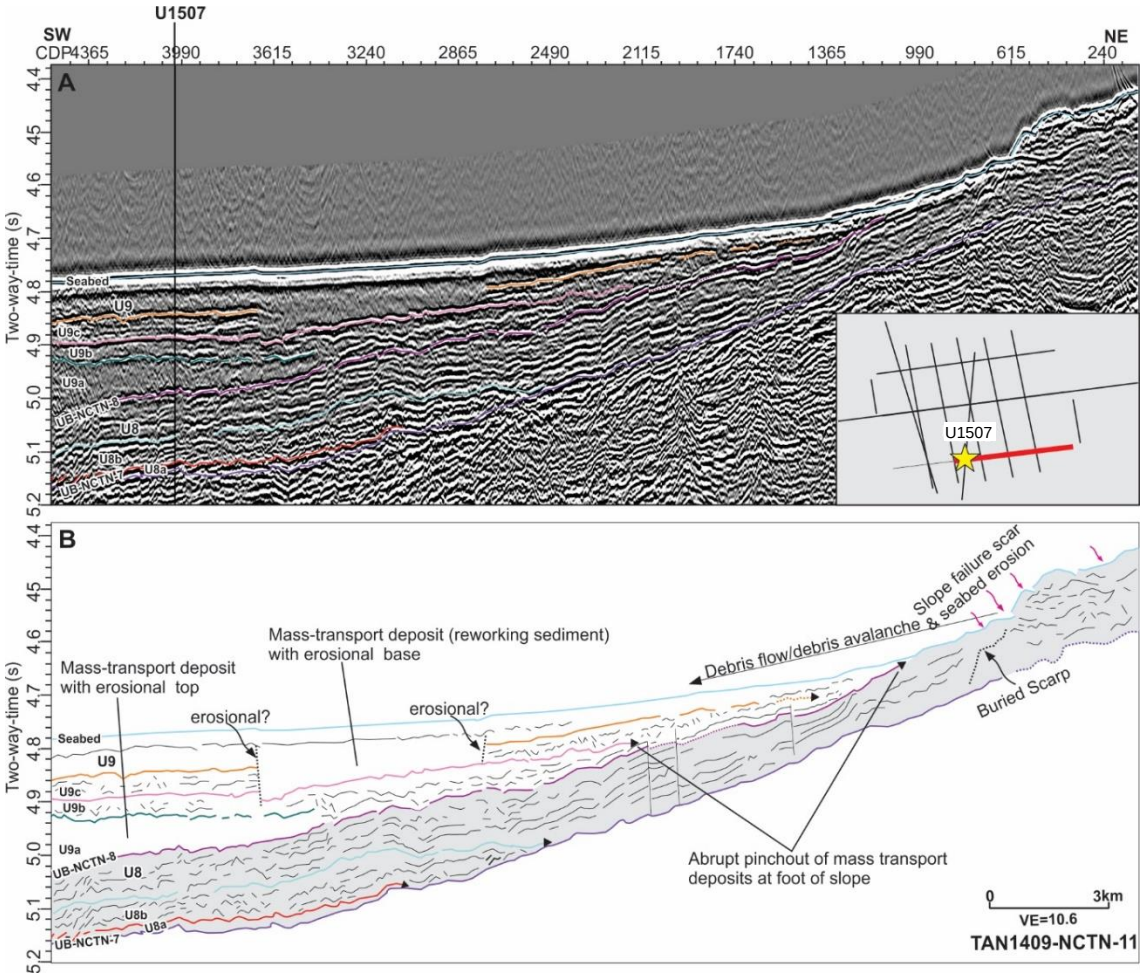

Figure S13. Seismic line TAN1409-011 near Site U1507 shows deposition of reworking sediment at the basin; (A) seismic reflection image, and (B) interpreted illustrating the relative position of slope failure scars at seabed and pinchout or onlap mass transport deposits at the edge of the basin, and buried escarpments on the slope.

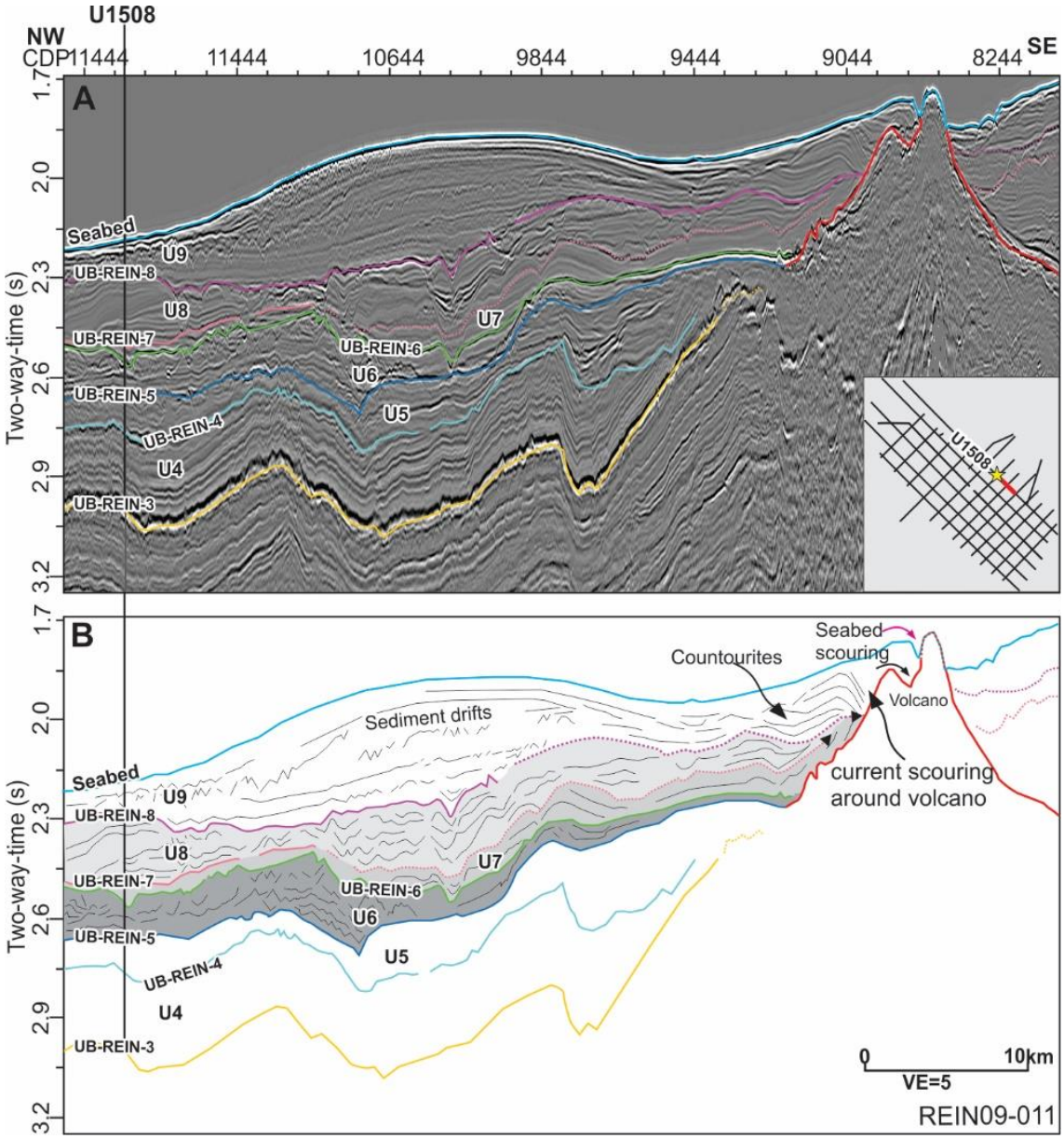

Figure S14. Reinga Basin seismic reflection line REIN09-011 illustrates horizons picked and seismic units near Site U1508**:** (A) seismic reflection image and, (B) interpreted seismic reflection presenting key seismic stratigraphic relationship along the strike. UB-REIN-5 appeared to correspond with the base strata, UB-REIN-6 and UB-REIN-7 onlap the volcano in the SE where seabed seems scouring against the volcano.

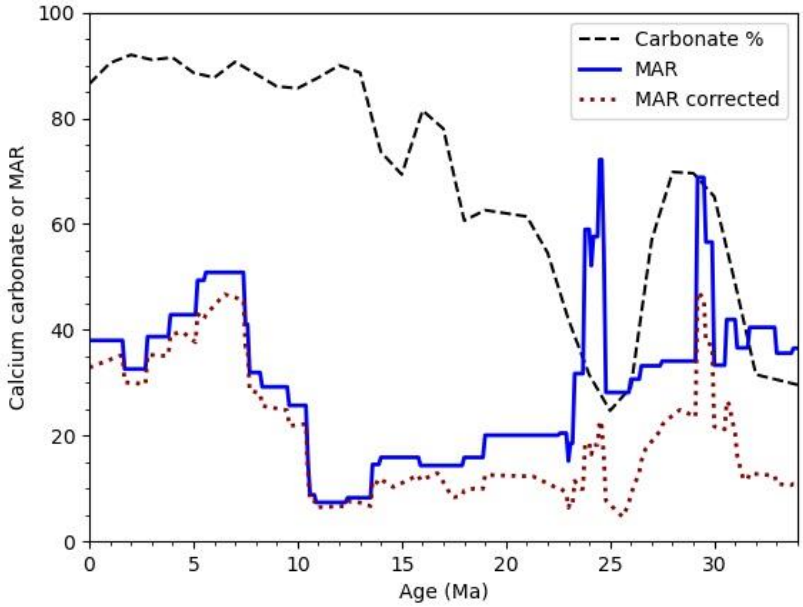

Figure S15. Site U1507 calcium carbonate (black dashed, wt %) values binned by sample age, averaged, and then interpolated to fill gaps. The NCTN average MAR curve (blue; Fig. 11) is corrected using the calcium carbonate curve to determine the carbonate component of MAR (red dotted; kg kyr^{-1} m^{-2}).

Table S1. Biostratigraphy for DSDP Leg 21 revised to be consistent with Sutherland et al. (2019). B = base, T = top, Bc = base common, Tc = top common.

Event	Zone	Age	U205		U206		U207		U208		U209		U210	
			m bsf	± m	m bsf	± m	m bsf	± m	m bsf	± m	m bsf	± m	m bsf	± m
B Emiliania huxleyi	NN21	0.29					6.00	6.00						
T Dicoaster brouweri	NN19	1.93			85.25	5.25	32.75	3.75	11.75	11.75	18.75	3.75	115.50	11.00
T Discoaster pentraradiatus	NN18	2.39			98.00	9.00	32.75	3.75	27.25	2.25	18.75	3.75	115.50	11.00
T Discoaster surculus	NN17	2.49			98.00	9.00	32.75	3.75	27.25	2.25	18.75	3.75	115.50	11.00
T Discoaster tamalis	NN17	2.80			115.25	9.75	41.00	6.00	35.25	7.25	27.75	3.75	170.00	9.50
T Sphenolithus spp.	NN17	3.54			148.49	6.98	47.00	1.50	55.25	5.25	40.50	4.50	170.00	9.50
T Reticulofenestra pseudoumbilicus	NN16	3.70			148.49	6.98	47.00	1.50	55.25	5.25	40.50	4.50	170.00	9.50
Bc Discoaster asymmetricus	NN14	4.13							64.25	5.25	40.50	4.50	217.00	39.00
T Ceratolithus acutus	NN14	5.04	29.63	10.13	168.49	14.52	73.25	18.75	95.25	5.25			341.71	10.28
B Ceratolithus rugosus	NN13	5.12	29.63	10.13	168.49	14.52	73.25	18.75	95.25	5.25			341.71	10.28
B Ceratolithus acutus	NN13	5.35	29.63	10.13	187.25	5.75	73.25	18.75	104.25	5.25			341.71	10.28
T Discoaster quinqueramus	NN12	5.59			187.25	5.75	73.25	18.75	118.50	10.50	48.92	3.92	341.71	10.28
B Discoaster berggrenii	NN11	8.29			195.75	5.25	95.75	5.25	191.75	9.75	124.42	73.08		
T Discoaster hamatus	NN10	9.53	68.75	2.25	207.00	4.50	113.99	5.02	227.25	5.25				
B Discoaster hamatus	NN9	10.55	77.75	8.25	215.25	5.25	118.25	0.75	248.75	11.75				
Tc Discoaster kugleri	NN8	11.58	101.00	4.50	225.75	6.75	118.25	0.75	248.75	11.75				
Bc Discoaster kugleri	NN7	11.90	119.00	15.00	247.25	8.75	121.44	3.94	275.25	16.25				
T Sphenolithus heteromorphus	NN6	13.53	166.75	14.25	292.75	3.75	121.42	3.92	306.49	16.49				
T Heliocosphaera ampliaperta	NN5	14.91	262.25	14.75	301.00	6.00	125.38	1.50	322.23	0.75				
Tc Discoaster deflandrei	NN5	15.80	262.25	14.75	301.00	6.00	125.38	1.50	322.23	0.75				
Bc Sphenolithus heteromorphus	NN5	17.71			301.00	6.00			336.49	15.01				
Tc Sphenolithus belemnos	NN4	17.95			301.00	6.00			336.49	15.01				
B Sphenolithus belemnos	NN3	19.03			301.00	6.00			364.48	14.48				
B Discoaster druggii	NN2	22.82	262.25	14.75	310.75	5.25			391.23	13.77				
Tc Cyclicargolithus abisectus	NN1	24.67	277.75	2.25	310.75	5.25			391.23	13.77				
T Sphenolithus ciperoensis	NN1	24.43	282.25	3.75	405.50	6.00			419.69	16.19				
B Sphenolithus ciperoensis	NP24	29.62	307.00	4.50	526.75	61.75			487.00	1.50				
B Sphenolithus distentus	NP24	30.00			612.98	2.02								
T Reticulofenestra umbilicus	NP23	32.02											491.00	46.50
T Coccolithus formosa	NP22	32.92											550.25	14.25
T Chiasmolithus grandis	NP18	37.98			612.98	2.02			487.00	1.50	228.25	32.25		
T Chiasmolithus solitus	NP17	40.40			635.23	21.73	138.94	12.06	487.75	0.75	284.00	1.50		
B Reticulofenestra umbilicus	NP16	42.77			673.48	18.03	169.75	2.25	489.25	2.25				
T Chiasmolithus gigas	NP15c	43.59					187.00	4.50	489.25	2.25				
B Chiasmolithus gigas	NP15b	45.59					194.50	4.50	529.49	11.49				
B Blackites inflatus	NP15a	47.84					224.25	8.75					572.00	9.00
B Discoaster sublodoensis (5-rayed)	NP14	48.48					235.25	4.75					615.50	10.50
B Coccolithus crassus	NP13	50.82			673.48	18.03	274.50	4.50						
B Discoaster lodoensis	NP12	53.70			698.75	8.75	290.25	3.75						
B Discoaster diastypus	NP11	54.95							529.49	11.49				
B Rhomboaster spp.	NP10	55.96							529.49	11.49				
B Discoaster multiradiatus	NP9	57.21							543.23	3.75				
B Discoaster mohleri	NP9	58.97					297.00	4.50						
B Heliolithus kleinpelli	NP6	59.54					297.00	4.50						
B Fasciculithus tympaniformis	NP5	61.51			698.75	8.75	297.00	4.50	543.23	3.75				
B Cruciplacolithus tenuis	NP3	65.47					297.00	4.50	569.25	8.25				
B Nephrolithus frequens	NC23	67.84							585.00	4.50				

Table S2. Biostratigraphy for DSDP Leg 90 revised to be consistent with Sutherland et al. (2019). B = base, T = top.

Event	Zone	Age	U587		U588		U589		U590		U591		U592		U593	
			m bsf	± m	m bsf	± m	m bsf	± m	m bsf	± m	m bsf	± m	m bsf	± m	m bsf	± m
B Emiliania huxleyi	NN21	0.29	7.95	7.95	1.61	0.75	2.26	0.75	3.80	0.75	3.23	0.18	3.77	0.73	4.07	1.03
T Emiliania ovata	NN20		16.90	1.00	3.11	0.75			6.53	0.47	7.94	1.50	4.52	0.02	9.64	1.50
T Discoaster brouweri	NN19	1.93	29.10	0.75	20.45	0.75	16.91	0.00	35.83	0.03	49.62	1.78	21.03	0.89	43.70	0.20
T Discoaster pentaradiatus	NN18	2.39	30.88	1.03	25.56	0.75			46.21	0.75	62.54	1.50	24.49	0.75	44.47	0.57
T Discoaster surculus	NN17	2.49	32.44	0.53	27.06	0.75			46.21	0.75	65.54	1.50	25.99	0.75	45.79	0.75
T Amaurolithus tricorniculatus	NN16	3.70	46.80	0.75	75.06	0.75			131.51	0.30	146.22	0.02	69.92	1.78	86.72	4.82
T Reticulofenestra pseudoumbilicus	NN15	3.92	38.70	0.75	50.76	0.75			87.56	0.75	103.44	1.00	31.99	0.75	68.17	2.37
B Discoaster asymmetricus	NN14	4.13	51.90	0.75	92.76	0.75			151.76	0.75	186.32	2.52	119.72	0.02	120.32	0.02
B Ceratolithus rugosus	NN13	5.12	54.90	0.75	92.76	0.75			172.51	0.75	191.57	1.73				
T Discoaster quinqueramus	NN12	5.59	56.40	0.75	102.35	0.75			196.21	0.75	213.64	1.50	129.32	0.02	203.42	3.28
B Discoaster quinqueramus	NN11a	8.11	91.21	1.50	187.71	0.30			324.53	1.77	308.83	0.02	169.24	1.50	227.44	1.50
T Discoaster hamatus	NN10	9.53			212.46	0.75			353.33	1.77	347.58	0.77	186.92	0.02	243.32	1.78
B Discoaster hamatus	NN9	10.55			230.16	0.75			377.33	3.03	370.83	4.77	206.12	0.02	254.72	0.02
B Catinaster coalitus	NN8	10.89			234.96	1.05			383.93	0.03	375.62	0.02	207.64	1.50		
B Discoaster kugleri	NN7	11.90			250.36	0.26			414.26	1.50	385.22	0.02	225.32	0.02	342.64	1.50
T Sphenolithus heteromorphus	NN6	13.53			280.58	0.02			436.46	1.50	437.74	1.50	255.64	1.50	394.25	0.36
B Discoaster exilis					315.31	0.00			460.73	0.03	490.82	0.02	268.24	1.50	408.32	0.02
T Sphenolithus belemnos	NN4	17.95			322.06	0.75			470.33	0.03			287.44	1.50	416.12	1.78
T Triquetrorhabdulus carinatus	NN3	18.28			333.46	1.04			487.73	1.77			296.04	0.50	435.32	1.78
B Discoaster druggii	NN2	22.82			344.97	0.64			491.06	1.50			305.89	0.75	437.12	0.02
T Helicosphaera recta	NN1	23.20			354.46	0.75									470.44	1.50
T Sphenolithus delphix	NN2	23.11			363.96	0.85										
B Sphenolithus delphix	NN2	23.21			398.81	0.71										
T Sphenolithus ciperoensis	NN1	24.43			404.67	1.46										
T Sphenolithus distentus	NP25	26.84			460.81	1.50										
T Sphenolithus predistentus	NP25	26.93			460.81	1.50									507.87	3.52
B Sphenolithus ciperoensis	NP24	29.62			463.61	1.29										
T Reticulofenestra umbilicus	NP23	32.02													525.04	1.50
T Isthmolithus recurvus	NP23	32.49											306.23	0.43	525.04	1.50
T Coccolithus formosus	NP22	32.92											321.10	0.24	534.64	1.50
T Discoaster saipanensis	NP21	34.44											341.45	0.89	561.02	0.95
T Discoaster barbadiensis	NP21	34.76											341.45	0.89	566.46	1.51

Table S3. Ages assigned to reflectors, northern Lord Howe Rise.

Name	Age
seabed	0.0
UB-LHRN-9a-5	2.4
UB-1506-9b	2.8
UB-LHRN-9a-4	3.6
UB-LHRN-9a-3	4.5
UB-LHRN-9a-2	5.2
UB-LHRN-9a-1	5.6
UB-LHRN-8	6.7
UB-LHRN-8b	8.0
UB-LHRN-8a	9.0
UB-LHRN-7	11.9
UB-LHRN-7b	13.5
UB-LHRN-7a	18.0
UB-LHRN-6	22.5
UB-LHRN-6a	25.5
UB-LHRN-5	44.0

Table S4. Ages assigned to reflectors, southern Lord Howe Rise.

Name	Age
seabed	0.00
207-U10	2.44
U1510-U07	3.61
LHRS_U08	4.80
LHRS_U07	7.00
U1510-U06	8.23
U1510-U5C	13.97
U1510-U5B	17.81
U1510-U3B	36.28
U1510-U2B	42.71
U1510-U2A	46.02
207-U5E	9.34
207-U5D	12.74
207-U2E	40.63
207-U2D	41.60
207-U2B	47.03
207-U2A	48.34
592-U6C	11.65
592-U6B	12.90
592-U6A	18.04
592-U04	32.53
592-U3B	34.26

Table S5. Ages assigned to reflectors, northern New Caledonia Trough.

Name	Age
seabed	0
U1507_R9N	1.67
U1507_R9M	2.78
U1507_R9L	3.84
U1507_R9K	5.51
U1507_R9J	7.62
U1507_R9I	10.48
U1507_R9H	13.94
U1507_R9G	18.95
U1507_R9F	23.72
U1507_R9E	24.64
U1507_R9D	31.69
U1507_R9C	37.13
U1507_R9B	43.72
U1507_R9A	57.07

Table S6. Ages assigned to reflectors, Reinga Basin.

Name	Age
seabed	0.00
RB_02A	3.66
RB_04	6.12
RB_06	10.61
RB_08	12.82
RB_09	17.26
RB_10	23.42
RB_11	25.50
RB_13	33.43
RB_14	36.17
RB_15	40.01
RB_16	41.60
RB_17	43.42
RB_18	53.13

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