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Supplemental Material

Table S1. characteristic components in geographic and stratigraphic coordinates calculated for each individual sample. Site: sample name; level (m): stratigraphic position in meters; Dg: declination in geographic coordinates; Ig: inclination in geographic coordinates; Ds: declination in stratigraphic coordinates; Is: inclination in stratigraphic coordinates; latp: latitude of the VGP, int: intensity ($E 10^{-6}$ A/m); MAD: maximum angular deviation; Q: quality; comment: temperature interval selected to calculate the characteristic component, usually forced to origin, unless specified by *, which means not forced to origin.

Table S2. $^{87}\text{Sr}/^{86}\text{Sr}$ ratios as well as minimum, maximum and mean defined ages for each sample.

Table S3. Distribution chart of Neogene calcareous nannofossils. RR: very rare (<0.1 specimen/field of view), rare ($0.1\text{--}1$ spp/fv), F: few ($1\text{--}10$ spp/fv), C: common ($10\text{--}20$ spp/fv), A: abundant (>20 spp/fv); PP: very poor preservation, P: poor preservation, M: moderate preservation, G: good preservation.

Table S4. Rheological parameters of numerical modeling.

Table S1. characteristic components in geographic and stratigraphic coordinates calculated for each individual sample. Site: sample name; level (m): stratigraphic position in meters; Dg: declination in geographic coordinates; Ig: inclination in geographic coordinates; Ds: declination in stratigraphic coordinates; Is: inclination in stratigraphic coordinates; latp: latitude of the VGP, int: intensity ($E \cdot 10^{-6} \text{ A/m}$); MAD: maximum angular deviation; Q: quality; comment: temperature interval selected to calculate the characteristic component, usually forced to origin, unless specified by *, which means not forced to origin.

Site	level (m)	Dg	Ig	Ds	Is	latp	int	MAD	Q	comment	X (WGS84-decimal degree)	Y (WGS84-decimal degree)	Z (m)
DW200-2A	0	342.1461	57.35456	354.7213	25.91105	74.75	5256.294	1.865705	1	300-540tc	52.332067	28.0911	230
DW201-2A	10	321.4331	53.02882	340.7645	26.72085	67.32	695.0686	8.510953	2	420-500tc	52.327367	28.076883	252
DW202-1A	20	339.1049	38.16725	346.49	8.27901	62.84	1858.981	7.040197	1	300-580tc	52.327417	28.077217	244
DW203-1A	27	3.813764	30.34098	3.813764	30.34098	77.71	10388.21	5.369872	2	340-640tc	52.3274	28.0774	238
DW204-1A	40	354.6557	11.59839	354.6557	11.59839	67.2	7564.195	3.655373	1	340-580tc	52.327383	28.077617	245
DW205-1A	58	348.037	62.94448	359.7318	30.41417	78.27	2307.434	3.282906	1	300-580tc	52.327317	28.078083	239
DW207-1B	82	319.7321	46.62384	338.548	28.08287	66.17	10393.54	2.69059	1	300-610tc	52.327217	28.078467	252
DW207-1A	82	315.1212	35.86947	329.3886	20.46515	56.38	7529.152	2.532815	1	300-580tc	52.32725	28.078367	253
DW208-1A	92	2.350477	50.93559	8.848022	22.08853	71.43	7801.919	2.841018	1	340-670tc	52.32715	28.078667	248
DW209-2A	100	7.134166	66.00106	14.64316	36.49767	74.56	2309.591	3.354228	2	300-500tc	52.327133	28.078767	247
DW210-1A	110	338.7146	65.60434	0.5172269	39.70712	84.44	7860.336	3.443557	2	460-670tc	52.33175	28.091267	236
DW211-1A	120	156.3451	-35.32176	165.3503	-12.50785	-64.19	29500.15	2.508863	1	300-670tc	52.327083	28.0789	244
DW212-1A	140	198.0026	-28.86883	198.5244	1.063865	-56.31	2522.494	4.715857	1	200-500tc	52.328467	28.0794	244
DW213-1A	152	178.6699	-72.11646	192.5324	-43.11042	-78.4	2811.649	2.908355	1	250-610tc	52.3288	28.079683	244
DW214-2A	163	173.9042	-21.59999	175.9331	5.194366	-59.06	429.055	13.50068	2	* 340-500tc	52.3288	28.07975	236
DW215-2A	168	353.875	54.38857	4.201854	26.60141	75.43	10638.99	2.212064	1	200-580tc	52.328667	28.079983	234
DW216-1A	180	193.8382	-47.95792	192.7469	-16.99957	-67.18	481.1234	3.487666	2	420-500tc	52.329	28.08015	240
DW217-1A	188	204.6782	-21.5966	204.6782	-21.5966	-61.38	1208.302	7.096821	2	420-670tc	52.3292	28.080283	263
DW218-1A	200	311.0584	38.42263	324.8564	19.00966	52.27	1653.365	5.374381	2	380-500tc	52.329417	28.080533	258
DW219-2A	208	345.4128	24.47112	347.7089	-4.043661	57.65	4105.553	13.7232	2	300-460tc	52.329367	28.080767	251
DW220-2A	230	16.42583	76.21302	12.30462	45.27193	79.01	3413.651	7.143086	1	340-540tc	52.33085	28.09155	237
DW221-1A	240	357.1474	64.86972	3.535931	34.26059	80.17	6688.493	3.29146	1	380-640tc	52.329267	28.081133	246
DW222-1A	250	3.867163	9.497169	3.867163	9.497169	66.4	17074.48	2.002406	1	340-640tc	52.329117	28.081467	240
DW223-1A	255	343.4099	28.44267	343.4099	28.44267	69.91	6999.995	6.507113	2	380-580tc	52.32915	28.081617	230
DW224-2A	262	10.85643	47.7123	10.66116	16.71366	68.01	7370.271	1.968152	1	300-580tc	52.3291	28.08165	232
DW225-1B	271	327.2177	54.7255	343.4936	28.82896	70.13	2538.076	6.242948	1	250-540tc	52.32935	28.081867	237
DW226-2A	280	54.5737	55.27304	37.48583	29.65425	53.34	6497.516	1.947043	1	300-610tc	52.3299	28.081933	232
DW227-2A	290	11.27728	60.58839	10.80836	29.59134	74.2	1377.899	7.026445	1	250-580tc	52.3299	28.0821	235
DW228-1A	300	211.5239	-53.75642	203.8177	-24.05796	-62.91	278.5467	5.202324	2	250-300tc	52.3299	28.08225	235
DW229-2A	310	176.6805	-19.74944	177.2707	10.46692	-56.53	44.43074	18.18564	2	* 380-540tc	52.329883	28.082517	246
DW230-1A	320	157.6642	-58.1455	171.0817	-29.92805	-75.42	671.5774	4.712361	2	300-380tc	52.330733	28.091733	233
DW231-1A	330	189.5573	-55.03921	189.7967	-24.04037	-71.99	2570.286	2.583887	2	300-540tc	52.329783	28.082683	243
DW232-1A	340	222.3099	-54.45066	210.3731	-26.34437	-58.43	5626.742	3.299945	1	250-610tc	52.329717	28.083017	234
DW233-1A	350	77.25202	71.43614	36.44401	48.47253	58.16	521.2075	12.07999	2	300-420tc	52.329617	28.0832	232
DW234-1A	360	70.26131	38.85669	55.99873	19.73086	34.66	1885.784	3.092688	2	250-420tc	52.32975	28.0834	240
DW235-2A	367	46.75976	63.3069	29.61498	36.39281	61.94	1108.108	14.04689	2	300-500tc	52.329917	28.083533	238
DW236-2A	380	355.4572	63.02764	2.240233	33.53935	80.03	5077.034	3.143229	1	340-580tc	52.329833	28.083733	241
DW237-2A	388	9.623259	68.21863	9.927603	38.21931	78.84	5262.002	3.220878	1	300-580tc	52.329717	28.083867	250
DW238-1A	400	342.4507	41.39472	349.1082	13.92811	66.59	6860.754	1.716062	1	300-500tc	52.329967	28.084017	248
DW239-2A	408	356.6837	59.64371	2.352536	30.10614	77.88	1817.093	5.33209	1	340-540tc	52.3303	28.084133	245
DW240-2A	417	9.516004	39.71366	9.666186	9.715255	65.05	4468.869	4.962463	1	340-640tc	52.33055	28.091817	240
DW241-2A	430	6.773977	59.63624	8.207729	29.66602	75.64	3933.358	2.104512	1	300-580tc	52.33035	28.084333	243
DW242-1A	438	146.8682	-20.97498	146.8682	-20.97498	-54.51	1456.834	4.259676	2	420-610tc	52.33215	28.084333	250
DW243-2A	450	144.4258	-58.24432	163.2896	-33.56193	-71.85	1422.392	3.536347	1	340-540tc	52.332217	28.084483	247
DW244-1	459	192.5963	-34.61305	192.5963	-34.61305	-75.35	4654.803	4.992719	1	300-640tc	52.332267	28.0846	247
DW245-1A	468	198.6848	-59.60368	195.1347	-29.78632	-71.49	10257.54	3.890182	2	250-580tc	52.332383	28.084733	238
DW246-2A	478	182.2038	-54.51299	185.1008	-24.69083	-74.13	2037.339	3.154395	1	250-380tc	52.332317	28.084967	237
DW247-2A	490	111.4414	-15.24797	117.4804	-7.684716	-25.97	396.323	7.31705	2	500-580tc	52.3325	28.085083	239
DW248-1A	500	143.6327	-73.01167	172.1778	-46.70224	-83.09	2524.066	2.02832	1	340-580tc	52.332583	28.0853	243
DW249-1A	520	161.4608	-53.7165	171.7406	-26.01841	-73.7	13609.78	2.746768	1	250-640tc	52.332983	28.085617	241
DW250-2A	532	212.9881	-62.26177	202.6852	-33.50112	-67.03	906.0466	7.710044	2	250-500tc	52.332933	28.08585	238
DW251-1A	540	194.8846	-85.02954	190.9076	-55.04401	-78.1	414.0003	2.641248	2	500-540tc	52.332983	28.08595	238
DW252-2A	550	216.6589	-70.13949	201.8578	-41.48648	-69.93	1290.984	4.268612	2	300-420tc	52.333233	28.086133	238
DW253-2A	575	165.3328	-66.10641	177.8111	-47.44962	-82.59	3474.053	2.602691	2	420-610tc	52.33315	28.086683	238
DW254-1A	580	115.3637	-76.14291	167.0139	-54.04678	-77.16	2379.697	3.613972	1	340-610tc	52.3331	28.08685	240
DW255-1A	595	184.4435	-71.65769	187.7764	-41.71857	-81.92	2676.801	1.930452	1	200-500tc	52.333167	28.087083	238
DW256-1A	607	198.6895	-66.22558	194.4394	-36.38261	-74.67	13562.29	2.457544	1	300-610tc	52.333167	28.087283	241
DW01-1A	627	280.1115	-61.95933	233.046	-46.26778	-43.48	700.3074	10.14858	2	* 380-610tc	52.333	28.0877	245
DW02-2A	637	148.715	-72.3919	174.8969	-40.60135	-83.29	6601.563	3.069686	1	250-670tc	52.332933	28.087867	251
DW03-1A	647	144.7605	-64.10292	168.1165	-34.13311	-75.64	7155.921	1.865631	1	300-610tc	52.331667	28.088167	242
DW04-1A	662	202.4842	-69.18293	195.4646	-34.5068	-73.17	2820.086	4.808881	2	380-580tc	52.33265	28.088267	259
DW05-1A	672	168.7883	-60.96989	178.7108	-27.20075	-76.27	7400.68	3.868108	1	420-680tc	52.3327	28.088433	258
DW06-1A	687	156.9261	-50.49506	168.8058	-24.31607	-71.43	13348.74	2.704098	1	250-680tc	52.332667	28.088617	253
DW07-1A	702	107.4347	-56.39674	142.5056	-44.49683	-56.71	9696.412	4.75019	1	250-680tc	52.332583	28.08875	241
DW08-2A	712	184.5325	-2.067719	184.5325	-2.067719	-62.6	18914.51	2.924737	2	250-610tc	52.332467	28.088883	232
DW09-1A	727	155.0503	-53.4712	168.7093	-27.50709	-72.91	3377.743	3.090955	2	250-540tc	52.332383	28.089133	232
DW10-1A	737	178.7081	-55.23538	184.0799	-25.81132	-75.02	14281.17	2.495444	1	300-680tc	52.33025	28.104	299

DW11-1A	747	185.5145	-70.21046	189.7952	-40.32465	-79.81	542.5856	6.35868	1	300-670tc	52.333483	28.105167	311
DW12-1B	762	151.2827	-36.4919	159.8293	-12.46969	-61.03	2763.406	17.83083	2	* 340-690tc	52.334783	28.105883	308
DW13-1A	772	268.0483	-75.13015	217.7874	-53.46426	-57.28	30320.91	1.870113	1	250-690tc	52.3322	28.1089	316
DW14-1A	782	195.2383	-21.88556	195.2383	-21.88556	-68.01	8351.33	3.722428	1	3340-690tc	52.337017	28.113083	290
DW15-1A	792	141.4866	-32.1145	150.4933	-11.41977	-54.21	17277.93	1.751102	1	300-690tc	52.33855	28.118167	288
DW16-2A	802	189.8536	-58.56153	192.8798	-27.70414	-72.06	412.2112	27.5977	2	300-500tc	52.332567	28.090433	231
DW17-1A	812	343.3899	17.66132	343.3899	17.66132	65.36	10686.91	2.920822	1	420-680tc	52.332667	28.090533	231
DW18-1A	827	7.970447	50.40248	10.96767	19.66086	69.29	660.7809	11.07327	2	300-540tc	52.33255	28.090733	231
DW19-2A	835	114.0699	82.93652	30.9607	59.11926	61.93	1731.215	7.29417	2	380-580tc	52.332117	28.090933	232
DW20-1A	842	316.5811	72.96526	354.679	48.20518	85.2	7586.329	3.323485	1	380-680tc	52.3274	28.077083	249
DW21-1A	852	353.7199	49.57913	1.215505	20.25908	72.33	2986.093	2.406905	1	340-670tc	52.327033	28.0791	245
DW22-1A	867	29.36629	64.59437	23.45656	33.93641	66.52	3661.583	2.672829	1	340-640tc	52.3292	28.08125	236
DW23-1A	882	325.8306	38.16675	337.4699	16.07476	60.89	1108.114	8.455881	2	340-540tc	52.32975	28.08285	238
DW24-1A	892	351.573	13.98325	351.573	13.98325	67.54	1941.074	5.09195	1	340-610tc	52.332067	28.084167	258
DW25-2A	899	282.8182	65.08941	333.504	52.56055	66.71	2333.126	5.426198	1	540-680tc	52.330517	28.091917	231
DW26-1A	909	348.5203	50.01522	348.5203	50.01522	79.65	2482.246	4.224241	1	460-680tc	52.33035	28.092067	243
DW27-2A	917	3.869155	73.01669	11.97305	42.33006	78.68	1128.508	4.623705	2	340-610tc	52.330167	28.092317	233
DW28-1B	927	348.3395	19.49524	349.8467	-7.998537	56.43	3633.951	3.737683	2	380-580tc	52.329933	28.09245	242
DW29-1A	935	334.6449	-4.529278	334.6449	-4.529278	51.07	4285.521	3.130268	2	340-610tc	52.32975	28.092583	241
DW30-1A	949	64.16196	71.65356	36.0727	44.66478	57.98	2880.098	6.492368	1	380-610tc	52.32965	28.092783	259
DW31-2A	959	10.23854	54.28415	12.77769	23.42247	70.14	17947.51	2.178282	1	300-680tc	52.330233	28.093033	240
DW32-2A	972	162.7815	-38.47703	170.3479	-11.57889	-65.95	164.5578	12.26538	3	* 300-380tc	52.331217	28.093067	238
DW33-1A	979	195.6549	-36.61539	195.9538	-5.624044	-60.5	952.1179	14.15416	2	* 300-580tc	52.334367	28.092633	230
DW34-1A	992	232.1643	-63.60313	215.4279	-35.46076	-56.63	8221.224	3.360722	1	250-690tc	52.33445	28.09295	239
DW35-2A	1002	342.7808	-75.62595	220.6574	-69.35909	-51.15	1684.728	10.02402	2	* 340-610tc	52.334517	28.0932	237
DW36-1A	1012	115.5281	-71.73402	166.7719	-52.24112	-77.66	2721.51	4.438765	2	* 380-610tc	52.3345	28.0934	246
DW37-1A	1019	140.4935	-54.94474	162.4426	-32.63543	-70.85	4389.922	2.067074	1	250-610tc	52.334633	28.09345	240
DW39-1B	1037	116.481	64.11198	64.11644	53.8443	35.71	1743.418	5.46946	2	30-610tc	52.327833	28.09465	226
DW40-2A	1052	359.8529	59.57494	7.224357	29.35182	75.93	2801.976	6.760631	2	340-680tc	52.326967	28.09495	226
DW42-2A	1072	2.782591	47.87924	7.113941	17.53174	69.74	579.0743	10.82324	2	460-640tc	52.32705	28.0954	231
DW43-2A	1082	0.0227597	52.26483	5.94818	22.13183	72.49	3588.252	2.727637	1	380-640tc	52.326683	28.095533	235
DW44-2A	1092	334.4379	66.56079	356.7136	39.49605	83.58	2718.21	2.983809	1	300-580tc	52.327167	28.095667	232
DW46-2A	1122	169.8082	-23.87432	169.8082	-23.87432	-71.72	4316.438	3.226394	1	250-640tc	52.327383	28.096033	235
DW47-1A	1132	192.2816	-22.3651	192.2816	-22.3651	-69.92	3186.557	5.447198	1	* 250-690tc	52.32545	28.096617	229
DW48-1A	1142	302.2369	41.34375	322.173	27.76885	52.54	3031.776	3.056688	2	300-540tc	52.3251	28.096783	236
DW49-1A	1152	182.0774	-66.05444	189.721	-35.5627	-77.77	14176.49	2.719954	1	250-690tc	52.32505	28.0969	237
DW50-1A	1165	267.4538	56.74408	314.9786	54.31252	51.33	390.3467	16.20074	2	380-540tc	52.32445	28.09715	229
DW51-1A	1172	340.2404	29.66745	340.2404	29.66745	68.05	1623.7	5.629579	1	380-640tc	52.3239	28.09735	225
DW52-2A	1187	6.864893	33.92862	6.864893	33.92862	78.61	737.908	5.76057	1	420-670tc	52.323967	28.097567	227
DW53-1A	1197	2.904425	15.14884	2.904425	15.14884	69.44	5475.608	1.193825	1	340-670tc	52.323617	28.097733	235
DW54-1A	1207	323.9514	52.61042	343.1752	29.59794	70.21	2041.466	7.168835	2	* 340-610tc	52.323333	28.097917	245
DW55-1A	1217	356.9706	76.15028	10.38494	45.77152	80.76	3432.489	2.191026	1	380-670tc	52.3231	28.09805	241
DW56-1A	1227	347.5096	53.5674	358.2476	25.08271	74.99	3006.081	3.184418	1	420-670tc	52.322967	28.0982	238
DW57-1A	1242	114.1814	60.83798	65.97323	47.28412	32.69	1427.315	9.128907	2	340-460tc	52.322467	28.0985	240
DW58-1A	1252	338.9832	59.26553	357.5736	28.92063	77.15	2133.781	4.283681	2	380-580tc	52.322317	28.098717	234
DW59-1A	1262	316.8865	47.61173	338.3142	25.55392	65.06	2915.628	1.910423	1	460-640tc	52.322167	28.09895	233
DW60-2A	1272	323.4383	64.5406	344.8356	36.75892	74.24	1372.177	4.883676	2	380-540tc	52.32205	28.099133	233
DW61-1A	1279	355.8287	1.174458	355.8287	1.174458	62.21	2212.701	8.058961	1	420-640tc	52.322017	28.099267	231
DW62-1A	1292	17.71469	11.4572	17.71469	11.4572	62.08	1892.621	4.923073	1	460-670tc	52.321917	28.099533	233
DW63-1B	1302	5.030973	38.07713	5.274578	6.082132	64.46	1246.417	10.70159	2	460-610tc	52.3219	28.099717	234
DW64-1A	1312	11.5906	25.96807	11.5906	25.96807	72.01	3035.852	3.205574	1	420-610tc	52.321783	28.099817	233
DW65-2A	1322	233.4063	18.75774	233.4063	18.75774	-26.08	5609.727	1.897656	1	300-690tc	52.3218	28.09995	232
DW66-1A	1332	5.444737	28.77209	5.444737	28.77209	76.3	4922.353	1.657492	1	420-690tc	52.321767	28.100067	236
DW67-1B	1342	27.25807	40.2598	22.35777	9.826697	58.59	5099.76	2.834033	1	420-690tc	52.32175	28.100183	243
DW68-1A	1352	343.1811	20.96856	343.1811	20.96856	66.63	4992.925	5.475184	1	300-540tc	52.321617	28.100317	255
DW69-1B	1362	350.8989	23.55914	350.8989	23.55914	72.07	1973.706	6.343017	2	* 420-670tc	52.321667	28.100467	252
DW70-1A	1372	333.1793	57.77174	346.8485	28.7138	72.35	592.6868	12.97915	2	380-500tc	52.321683	28.10055	264
DW71-1B	1382	3.581104	27.96072	3.581104	27.96072	76.36	3318.784	6.004534	2	540-690tc	52.321717	28.100733	265
DW72-1A	1392	110.9424	51.28886	71.47207	48.25143	28.34	933.3616	2.40075	2	420-540tc	52.321717	28.100933	243
DW73-1B	1399	327.5395	65.06114	347.0779	36.47688	75.88	2043.152	5.650687	1	* 380-610tc	52.321733	28.101017	243
DW74-1A	1412	324.7779	-24.1928	307.2196	-45.23496	15.34	5594.593	2.359862	1	340-670tc	52.3218	28.10115	236
DW75-1B	1422	328.1831	55.79748	343.155	27.82071	69.48	761.0975	26.93055	2	* 340-610tc	52.321917	28.1013	231
DW76-1A	1429	66.72956	47.93938	47.11572	27.06301	44.28	1000.847	8.364886	1	340-540tc	52.321967	28.101383	236
DW77-1A	1440	110.2579	53.71855	68.19495	49.44638	31.36	375.2464	9.988195	2	340-460tc	52.3221	28.10135	244
DW78-1A	1447	142.7538	-8.209864	141.3862	15.0516	-38.35	1474.066	1.79536	2	640-690tc	52.322383	28.101333	248
DW79-1A	1462	350.9019	24.2965	350.9019	24.2965	72.44	8066.903	1.965574	1	460-680tc	52.32255	28.101483	244
DW80-2A	1472	81.40975	31.14112	81.40975	31.14112	15.21	620.7361	6.742936	2	420-540tc	52.32255	28.101667	244
DW81-1A	1482	133.8954	-68.6839	175.3984	-44.7339	-85.56	3014.941	7.127366	1	* 340-610tc	52.32255	28.10185	243
DW82-1A	1490	275.955	15.90279	288.1752	23.29926	21.6	302.471	10.73205	2	420-640tc	52.322433	28.102117	234
DW83-2A	1502	193.533	17.44165	188.0457	50.60193	-30.09	1192.616	3.950174	2	610-670tc	52.322483	28.10225	238
DW84-1A	1514	239.5088	-73.1374	217.111	-41.37777	-56.48	4202.825	4.566365	2	* 250-580tc	52.322683	28.102417	240
DW85-2A	1520	128.3516	-57.85981	162.6153	-38.99516	-73.15	856.1453	15.11463	2	* 340-610tc	52.322667	28.10255	240
DW86-1A	1532	175.6838	-50.89322	175.6838	-50.89322	-84.87	1467.987	3.529347	1	380-670tc	52.321867	28.103283	246
DW87-2A	1542	118.9784	-75.18474	182.3706	-50.79017	-86.02	1859.455	4.172063	1	300-610tc	52.321983	28.103433	249
DW88-1A	1549	181.9607	-40.50101	187.8772	-								

DW90-1A	1570	166.2128	-43.06312	177.4057	-12.90707	-68.31	8401.705	1.175663	2	340-500tc	52.322483	28.1038	254
DW91-1A	1582	216.0838	-29.5821	216.0838	-29.5821	-54.53	994.1581	8.246552	2	380-540tc	52.3226	28.10385	252
DW92-2A	1592	180.5966	13.66299	180.5966	13.66299	-54.98	1736.171	3.336684	2	340-460tc	52.322733	28.104	251
DW93-1A	1599	153.1514	-53.73501	153.1514	-53.73501	-66.29	1615.187	6.677382	1	* 380-640tc	52.3228	28.104183	258
DW94-1A	1612	171.7518	-22.40167	174.3187	8.037271	-57.41	3399.085	2.970582	3	460-540tc	52.322767	28.10445	262
DW95-2A	1632	211.2526	-48.53867	209.6259	-12.62745	-54.54	1181.951	1.55036	2	580-610tc	52.3227	28.104767	268
DW96-2A	1642	225.8902	-53.96942	218.3137	-19.19144	-49.7	2078.091	1.740372	2	380-420tc	52.322717	28.104833	266
DW97-1A	1657	175.6072	-36.1731	181.8812	-3.960356	-63.83	5791.295	1.941743	1	250-460tc	52.32375	28.104733	265
DW98-2A	1667	156.747	-22.97013	156.747	-22.97013	-62.94	3879.421	3.005451	1	340-640tc	52.324033	28.104867	263
DW99-1A	1677	172.0907	-6.34815	168.8667	23.21805	-48.38	263.2346	2.556748	3	640-670tc	52.3244	28.10495	267
DW100-2A	1687	193.1857	-34.84943	195.5498	0.4405875	-58.01	13938.36	2.080515	2	250-580tc	52.332367	28.0895	240
DW101-1A	1697	183.0732	1.353778	183.0732	1.353778	-61.08	2327.181	3.780205	2	500-610tc	52.325033	28.1049	272
DW102-2A	1707	198.9516	-30.07344	199.9004	5.692456	-53.62	2821.823	1.47861	2	640-670tc	52.330417	28.104183	304
DW103-1A	1717	310.7071	-31.26468	310.7071	-31.26468	24.44	1109.495	8.305354	3	380-500tc	52.331033	28.10425	304
DW105-2A	1737	343.4035	15.79625	343.4035	15.79625	64.56	2825.728	4.579734	1	380-670tc	52.32995	28.104783	302
DW106-1A	1747	206.4941	-71.48431	206.3147	-35.48448	-64.55	785.8309	10.19537	2	380-610tc	52.329433	28.105017	306
DW108-1A	1757	163.9634	-20.05031	163.9634	-20.05031	-66.73	1247.239	6.919497	2	500-580tc	52.33235	28.10485	319
DW107-1A	1762	116.5655	-68.06946	171.8847	-48.51022	-82.75	4856.139	3.639034	2	580-640tc	52.329783	28.105267	315
DW109-1A	1772	176.3854	-55.34834	176.3854	-55.34834	-81.63	2305.785	4.422388	1	460-640tc	52.3326	28.104983	315
DW110-1A	1782	173.8533	-34.22675	144.1275	-59.95421	-58.08	3572.339	4.71916	2	340-640tc	52.332883	28.10505	313
DW111-2A	1792	34.28929	-44.49599	33.14852	-8.557832	44.53	407.8216	5.014337	2	380-540tc	52.333067	28.105117	310
DW112-2A	1802	264.5943	-22.44206	264.5943	-22.44206	-10.17	519.8983	3.642393	2	640-670tc	52.33355	28.105233	316
DW113-1A	1809	107.0873	-69.37437	107.0873	-69.37437	-32.15	150.2438	12.3268	3	640-670tc	52.333817	28.1053	309
DW115-1A	1822	339.3033	38.00699	347.5744	9.098009	63.69	1474.608	9.051968	2	250-340tc	52.333983	28.10535	307
DW116-2A	1830	179.4668	-27.8888	179.4668	-27.8888	-76.72	1543.007	8.960947	2	460-610tc	52.334033	28.105483	305
DW117-1A	1852	189.7506	-67.64526	190.0052	-28.64574	-74.19	4567.018	4.49518	1	340-640tc	52.334133	28.105567	309
DW118-1A	1859	70.52191	-82.38019	178.8269	-54.25261	-83.23	3573.052	3.589219	2	460-640tc	52.334183	28.105667	309
DW119-1A	1870	188.0055	-57.86504	188.9666	-18.8799	-69.77	1718.013	7.110946	2	* 340-540tc	52.334317	28.105783	306
DW120-1A	1878	163.9857	-23.92423	163.9857	-23.92423	-68.41	2674.113	4.664267	2	580-670tc	52.332667	28.089767	231
DW121-2A	1888	85.54132	-58.37506	140.6658	-48.18021	-55.62	872.3352	11.82141	2	340-500tc	52.33445	28.105833	306
DW122-1A	1899	337.0756	24.41381	337.0756	24.41381	63.71	1286.587	5.794384	1	380-610tc	52.334583	28.106083	307
DW123-1A	1911	300.8781	2.755964	300.8781	2.755964	27.64	941.8488	5.575944	3	640-670tc	52.334483	28.106167	316
DW124-2A	1917	221.5243	8.221267	221.5243	8.221267	-38.67	535.5038	8.048625	3	640-670tc	52.3345	28.106283	312
DW125-1A	1927	358.0617	14.6316	358.0617	14.6316	69.27	4511.118	3.076311	1	420-670tc	52.334883	28.1065	304
DW126-1A	1939	25.50814	38.62574	25.50814	38.62574	66.08	2561.529	3.152084	2	420-500tc	52.33475	28.106633	320
DW127-1A	1952	354.4679	5.147078	354.4679	5.147078	63.95	3674.052	2.887067	2	420-540tc	52.335117	28.106733	306
DW128-2A	1960	3.972243	0.9372066	354.2453	35.87637	80.26	2852.51	3.654907	2	340-580tc	52.3338	28.10815	308
DW129-1A	1969	334.5349	12.3149	318.784	27.0325	49.41	12206.97	1.736939	1	380-670tc	52.3335	28.108267	317
DW130-1A	1982	333.0705	39.83187	291.2281	43.24462	29.3	4045.177	5.195996	1	380-670tc	52.33265	28.08995	238
DW131-1A	1992	345.5875	35.13517	314.8229	42.71539	49.64	3362.528	3.989986	2	380-500tc	52.332967	28.108417	308
DW132-1A	2002	33.70496	29.37304	17.39993	63.78107	67.85	1443.544	7.239392	2	380-540tc	52.332033	28.10885	316
DW133-1A	2012	216.3952	-13.72491	209.8692	-49.42683	-63.91	427.8404	4.719386	2	610-640tc	52.331733	28.108967	335
DW134-1A	2022	167.9081	0.1899587	162.9332	-16.64438	-64.65	2895.571	4.472399	2	540-610tc	52.331667	28.108967	324
DW135-1A	2032	185.4043	-20.36644	185.4043	-20.36644	-71.71	1796.255	4.407336	2	500-610tc	52.33115	28.109283	331
DW136-1A	2035	130.2629	-32.09441	136.3416	-14.86561	-44	1057.374	15.58775	2	* 250-420tc	52.3375	28.112117	300
DW137-1C	2041	348.5849	53.7614	349.6866	31.7911	75.57	4651.533	5.36584	2	340-460tc	52.337717	28.112267	300
DW138-1B	2057	217.1977	-32.14191	210.6343	-15.60364	-54.78	1366.399	3.658215	2	640-670tc	52.337483	28.112683	292
DW140-1A	2075	21.76199	43.69795	15.78466	21.4596	67.49	1343.625	2.683311	3	540-580tc	52.33725	28.112867	295
DW141-1A	2087	167.3264	-42.90496	169.3317	-19.12106	-69.17	651.6662	31.43761	2	* 300-420tc	52.33265	28.090133	239
DW142-1A	2099	162.4216	-62.23984	168.0353	-38.63861	-77.46	233.5323	3.901427	2	300-340tc	52.336917	28.113267	291
DW143-1A	2107	183.3155	-52.7911	181.1769	-37.93454	-83.12	2297.753	9.684205	1	* 250-580tc	52.339067	28.114217	285
DW144-1A	2117	225.6286	-23.30238	221.8076	-13.52659	-45.16	612.0743	20.18222	2	* 420-540tc	52.339167	28.114483	283
DW145-1A	2127	188.6607	-36.31239	186.7093	-21.71931	-72.04	1345.703	17.5589	2	* 300-460tc	52.339167	28.114983	287
DW146-1A	2137	175.2307	-10.39825	175.2307	-10.39825	-66.71	5368.471	4.095102	1	* 250-610tc	52.339167	28.115433	287
DW147-1B	2157	236.2198	-36.21849	228.1525	-28.21408	-43.67	1521.884	13.14301	2	* 380-540tc	52.338967	28.115717	283
DW148-1A	2167	213.4024	-54.83469	203.7281	-42.38633	-68.47	592.6279	35.37978	2	* 380-580tc	52.339033	28.1164	286
DW149-1A	2177	178.5026	-47.12844	177.8718	-37.15237	-82.41	1150.082	7.720856	2	* 340-500tc	52.338683	28.117217	291
DW150-1A	2185	123.4054	-43.79761	125.4793	-32.08987	-39.01	899.0335	15.12502	2	* 300-460tc	52.3329	28.090233	232
DW151-1A	2192	192.7979	-26.47194	188.7053	-19.32131	-70.09	357.5085	9.132887	2	* 420-500tc	52.338633	28.117683	291

Table S2. $^{87}\text{Sr}/^{86}\text{Sr}$ ratios as well as minimum, maximum and mean defined ages for each sample

DATA				LowessCAL			Coordinate (WGS84-decimal degree)	
Sample	⁸⁷ Sr/ ⁸⁶ Sr	Error	Min-Max	Min Age	Mean Age	Max Age	X	Y
SR-76	0.708839	0.000006	0.708845	11.17	11.45	11.90	52.32693698	28.07555
				11.43	11.86	12.19		
			0.708833	11.82	12.17	12.45		
SR-76 MEAN AGE: 11.83 ± 0.64								
SR-93	0.708757	0.000006	0.708763	15.23	15.33	15.42	52.32621908	28.05755
				15.33	15.42	15.51		
			0.708751	15.41	15.51	15.60		
SR-93 MEAN AGE: 15.42 ± 0.18								
SR-85	0.708843	0.000005	0.708848	11.06	11.30	11.71	52.3250486	28.06537
				11.25	11.59	12.00		
			0.708838	11.50	11.92	12.24		
SR-85 MEAN AGE: 11.63 ± 0.57								
SR-81	0.708829	0.000006	0.708835	11.70	12.07	12.37	52.32615346	28.05998
				12.05	12.37	12.63		
			0.708823	12.35	12.63	12.88		
SR-81 MEAN AGE: 12.32 ± 0.61								
SR-82	0.708851	0.000006	0.708857	10.72	10.95	11.19	52.32590231	28.06145
				10.94	11.18	11.47		
			0.708845	11.17	11.45	11.90		
SR-82 MEAN AGE: 11.27 ± 0.59								
SR-83	0.708837	0.000006	0.708843	11.25	11.59	12.00	52.32539586	28.06296
				11.57	11.97	12.29		
			0.708831	11.93	12.27	12.54		
SR-83 MEAN AGE: 11.92 ± 0.64								
SR-80	0.708789	0.000006	0.708795	14.23	14.60	14.81	52.32601929	28.05892
				14.58	14.79	14.95		
			0.708783	14.78	14.95	15.09		
SR-80 MEAN AGE: 14.70 ± 0.43								

Table S3. Distribution chart of Neogene calcareous nannofossils. RR: very rare (<0.1 specimen/field of view), rare (0.1-1 spp/fv), F: few (1-10 spp/fv), C: common (10-20 spp/fv), A: abundant (>20 spp/fv); PP: very poor preservation, P: poor preservation, M: moderate preservation, G: good preservation

[illegible]

Table S4. Rheological parameters of numerical modeling

Applied flow laws for crustal rocks: $\dot{\epsilon} = A \cdot \sigma^n \cdot \exp(-Q/RT)$							
Rock type	Rheology	A (Pa ⁿ s ⁻¹)	Q (kJ mol ⁻¹)	n (-)	C_p (m ² K ⁻¹ s ⁻²)	k (W m ⁻¹ K ⁻¹)	ρ (kg m ⁻³)
sticky-air	linear	$1 \cdot 10^{-17}$	-	1	$3 \cdot 10^6$	200	1
sediments	wet quartzite ^a	$3.99 \cdot 10^{-18}$	154	2.3	$1 \cdot 10^3$	2.5	2500
upper crustal sequence	wet quartzite ^a	$3.99 \cdot 10^{-18}$	154	2.3	$1 \cdot 10^3$	2.5	2700
intermediate décollements	linear	$1 \cdot 10^{-20}$	154	1	$1 \cdot 10^3$	2.5	2200
lower décollement	linear	$1 \cdot 10^{-20}$	212	1	$1 \cdot 10^3$	2.5	2200
basement	diabase ^b	$6.31 \cdot 10^{-20}$	276	3.05	$1 \cdot 10^3$	2.5	2800
^a Ranalli and Murphy, 1987 (fitting more recent quartzite flow laws; see Stöckhert et al., 1999); ^b Wilks and Carter, 1990.							