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Figure S1: Dataset used for the structural study

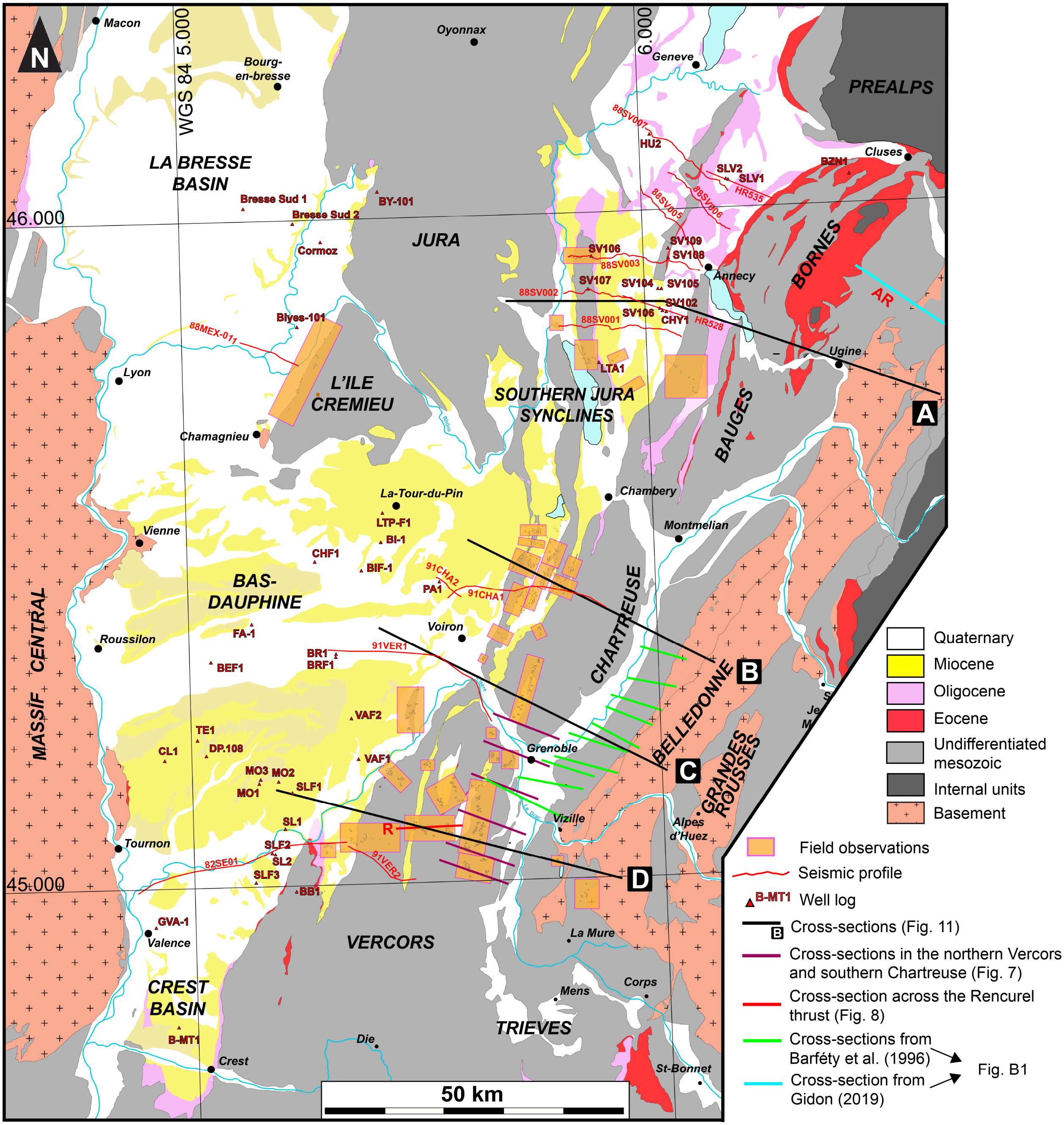

Figure S1: Dataset used for the structural study with localization of field observations, seismic lines, well logs, cross-sections presented in this study, and useful cross-sections available from the literature.

Figure S2 and S3: Paleomagnetic results

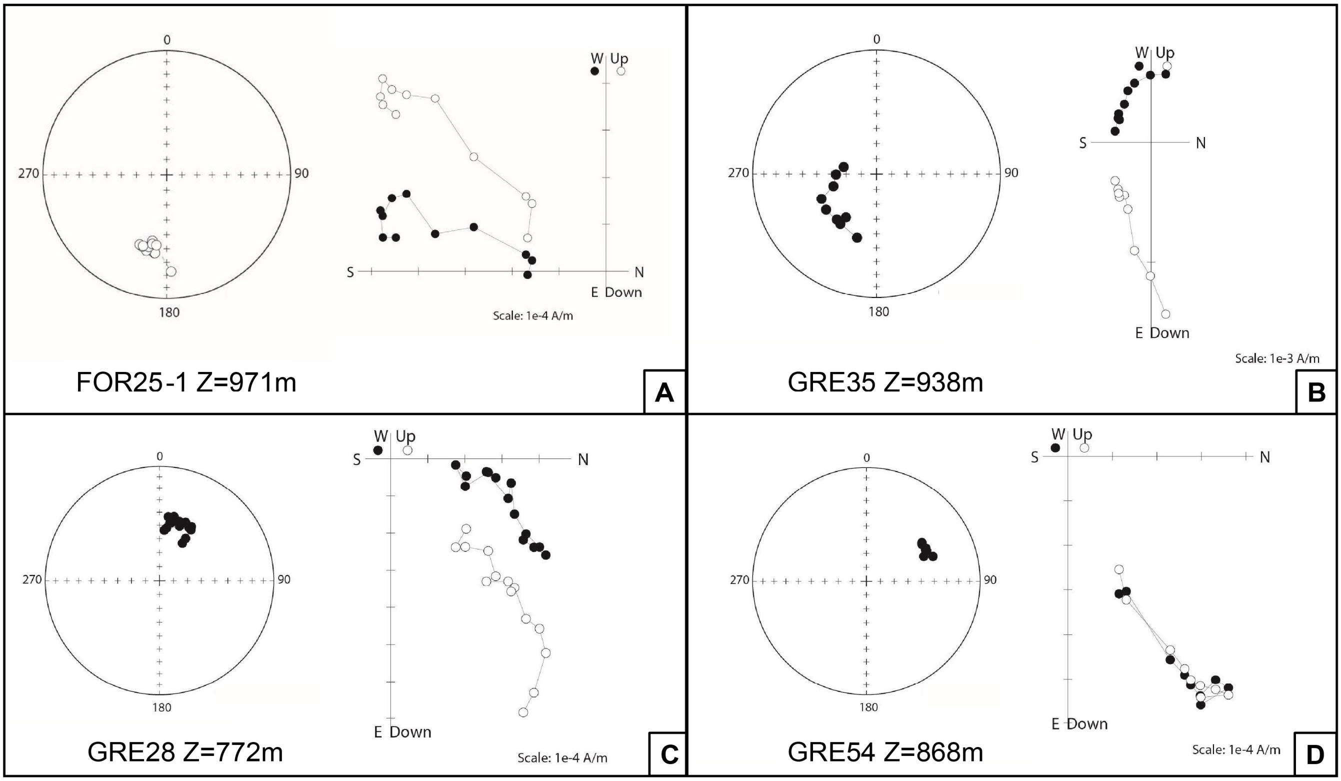

Figure S2: Stereographic and orthogonal projections displaying the different demagnetization patterns of the NRM.

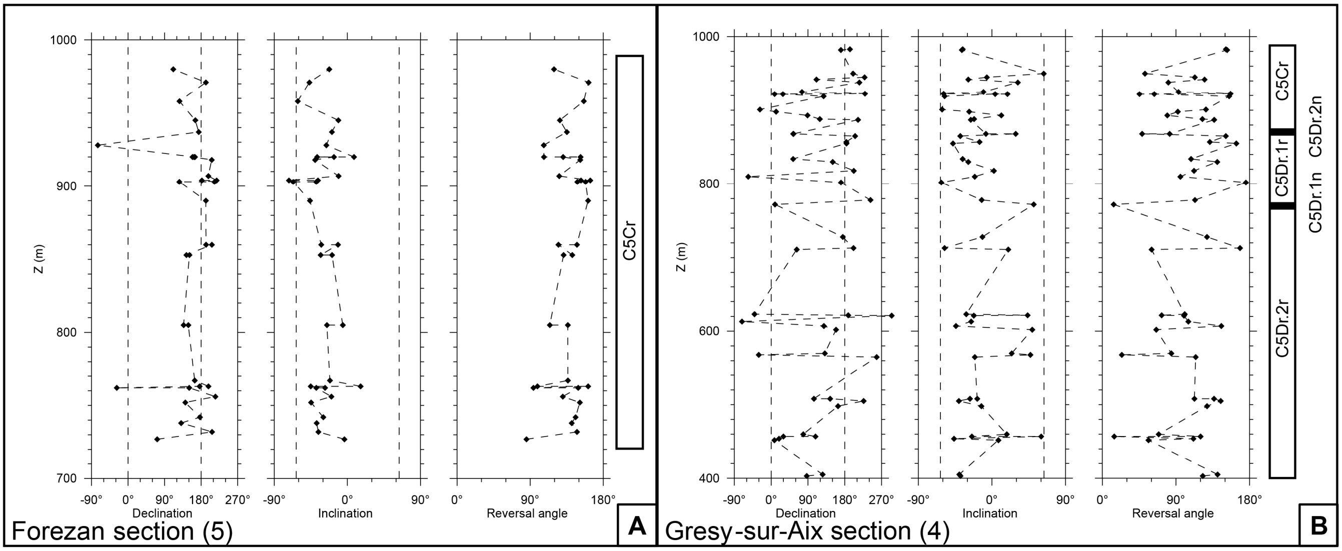

Figure S3: Declination, inclination and reversal angle for calculated paleomagnetic results (A for Forezan section and B for Grésy-sur-Aix section).

Figure S4: Synthesis of the Miocene biostratigraphy of the subalpine massifs, southern Jura and adjacent basins

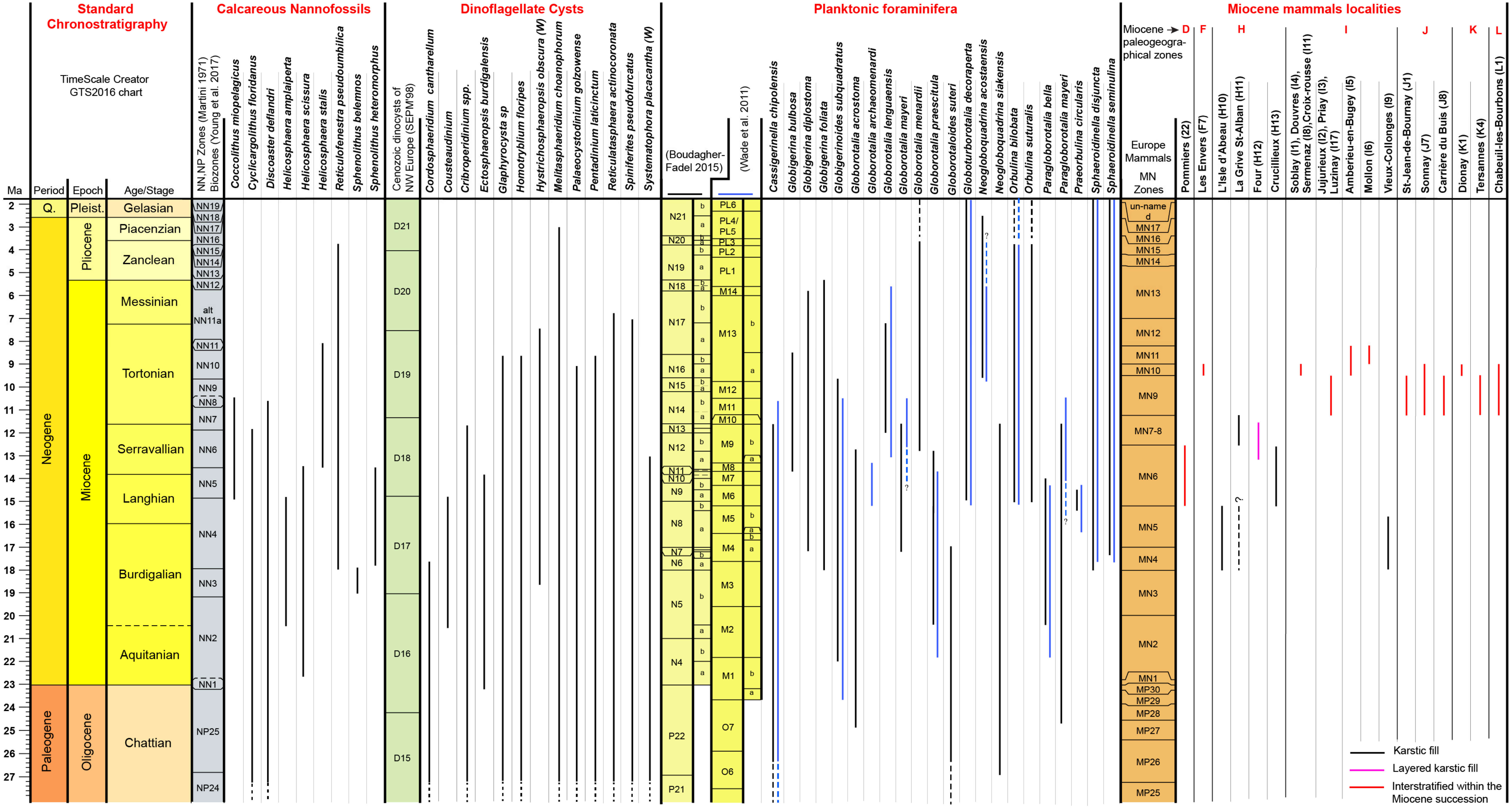

Figure S4: Synthesis of the Miocene biostratigraphy of the subalpine massifs, southern Jura and adjacent basins (Bas-Dauphiné, Crest, La Bresse). Geochronology calibrated on the GTS of Ogg et al. (2016). References for Miocene mammals datations: **D22, F7**: Clauzon et al. (1990) ; **H9**: Truc (1975) ; **H10** : Guerin and Mein (1971), Costeur (2005); **H11** ; Mein and Guinsbourg (2002) ; **H12** ; Maridet et al. (2000, 2002), Maridet (2003) ; **H13**; Maridet (2003) ; **I1** : Ménouret and Mein (2008) ; **I3** : Combémorel et al. (1970), Ménouret and Mein (2008) ; **I4, I5, I6, I8** ; Guerin and Mein (1971), Mein (1999) ; **I9** : Mein (1958), Guerin and Mein (1971), Mein and freudenthal (1971), Maridet (2003) ; **I11** : Mein et al. (1961), Guerin and mein (1971), Ménouret and Mein (2008) ; **I14, I17** : Guerin and Mein (1971) ; **J1, L1** : Guerin and Mein (1971) ; Ménouret and Mein (2008) ; **J7** : Depéret (1987), Guerin and Mein (1971) ; **J8** : Mein (1990) ; **K1** : Clauzon et al. (1990), Mein (1999), Lazzari et al. (2010) ; **K2** : Guerin and Mein (1971).

Table S1: Magnetostratigraphy

Z (m)	Id	Treatement	Statistics	Demag field	Demag steps	Declination (°)	Inclination (°)	MAD (°)	Reversal angle (°)
				[A] Forezan section					
727	FOR01-1	Therm+AF	DirOKir	200-350	4	71.6	-3.7	7.5	85.3
732	FOR02FD	Therm+AF	DirOKir	010-035	5	206.7	-35.7	7.9	147.6
738	FOR03-1	Therm+AF	DirOKir	200-350	4	130.6	-37.9	4	141.1
742	FOR04FD	Therm+AF	DirOKir	200-300	3	176.9	-29.7	3.4	145.8
752	FOR05-1	Therm+AF	DirOKir	250-015	6	140.9	-44.7	13.9	151.0
756	FOR06-1	Therm+AF	Dir Kir	250-030	5	214.9	-19.7	16.3	130.0
762	FOR07FD	Therm+AF	Dir Kir	300-400	5	150.4	-38.3	14.6	149.0
762	FOR07-1	Therm+AF	Dir Kir	005-060	5	-27.9	-27.5	8.6	93.9
763	FOR08-1	Therm+AF	Dir Kir	300-030	5	176	-45.2	25	161.3
763	FOR10-1	Therm+AF	Dir Kir	250-025	6	197.9	16.2	20.1	98.8
767	FOR11	Therm+AF	Dir Kir	010-050	7	164	-21.5	14.1	136.4
805	FOR12-1	Therm+AF	DirOKir	030-040	3	148.4	-25.2	16.3	136.2
805	FOR12-2	Therm+AF	DirOKir	020-030	3	136.8	-5.7	10.7	114.2
853	FOR13-1	Therm+AF	DirOKir	005-040	8	151.1	-18.9	4.3	131.0
853	FOR13-2	Therm+AF	DirOKir	020-030	3	143.6	-32.9	3.3	141.8
860	FOR14FD	Therm+AF	DirOKir	250-610	11	206.3	-11.6	3.1	124.6
860	FOR14-1	Therm+AF	Dir Kir	300-130	21	191.9	-32.2	4.6	147.5
890	FOR15-1	Therm+AF	DirOKir	200-040	7	191.5	-46.1	9.9	161.2
903	FOR16FD	Therm+AF	Dir Kir	250-400	6	126.1	-66.8	9.9	158.0
903	FOR16	Therm+AF	DirOKir	030-060	5	212.8	-38.3	13	147.9
904	FOR17-1	Therm+AF	Dir Kir	250-090	6	181.6	-36.3	12.9	152.5
904	FOR17-2	Therm+AF	DirOKir	150-010	4	218	-72	6.4	163.9
907	FOR18-1	Therm+AF	Dir Kir	250-030	7	197.6	-10.9	12.5	125.7
918	FOR19-1	Therm+AF	DirOKir	300-120	17	205.9	-39.8	3.7	151.6
920	FOR20AFD	Therm+AF	Dir Kir	250-425	6	158.5	-16.6	6.2	130.5
920	FOR20BF	Therm+AF	Dir Kir	250-375	4	164.7	-37.3	6.6	151.9
920	FOR20-1	Therm+AF	Dir Kir	250-025	8	162.3	8.1	13.1	106.9
928	FOR21-1	Therm+AF	DirOKir	200-040	9	-74.6	-25.9	15.6	106.6
937	FOR22	Therm+AF	DirOKir	250-035	6	173.8	-19.1	3.5	135.1
945	FOR23-1	Therm+AF	Dir Kir	250-080	13	165.6	-11.2	11.8	126.4
958	FOR24	Therm+AF	DirOKir	000-020	5	126.5	-61.1	8	155.8

971	FOR25-1	Therm+AF	Dir Kir	250-080	8	191.5	-46.8	9.9	161.8
980	FOR26-1	Therm+AF	DirOKir	005-015	3	111.2	-22.3	6.3	119.2

Z (m)	Id	Treatement	Statistics	Demag field	Demag steps	Declination (°)	Inclination (°)	MAD (°)	Reversal angle (°)
[B] Grésy-sur-aix section									
403	GRE02-1	AF	DirOKir	055-070	3	86.9	-38.5	12.3	122.7
405	GRE03-1	AF	DirOKir	045-050	2	125.9	-40	18	140.8
452	GRE04	Thermal+AF	Dir Kir	015-025	3	7.9	7.8	9	56.3
454	GRE05-1	Thermal+AF	DirOKir	150-020	6	19.1	-46.4	21.8	111.2
457	GRE06	Thermal+AF	DirOKir	020-025	2	29.9	60.1	7.8	14.4
457	GRE06FD	Thermal	Dir Kir	400-580	4	108.3	-24.6	17.7	120.0
460	GRE07-1	Thermal+AF	DirOKir	050-065	4	78.5	18.1	15.8	68.8
498	GRE08-1	Thermal+AF	Dir Kir	200-400	5	163.4	-13	7.1	127.9
505	GRE09-1	AF	DirOKir	000-025	3	226.1	-40.5	30.8	144.6
508	GRE11-2	Thermal+AF	DirOKir	010-030	3	144.1	-26.9	6.4	136.5
508	GRE11-3	Thermal+AF	Dir Kir	020-030	3	104.5	-18	20.5	112.5
565	GRE12	Thermal+AF	DirOKir	020-030	3	258	-21	13.4	114.0
568	GRE13-2	Thermal+AF	Dir Kir	100-010	5	-30.4	47	9.8	23.7
570	GRE14-1	Thermal+AF	DirOKir	025-050	5	131.2	24.1	24.5	84.2
602	GRE15	AF	DirOKir	020-030	4	158.6	49.2	4.8	65.8
607	GRE16-1	Thermal+AF	DirOKir	010-045	5	128.8	-44.1	4.9	145.4
613	GRE17	AF	DirOKir	036-050	4	-71.5	-25.5	11	105.1
621	GRE18	Thermal+AF	DirOKir	000-025	3	294.6	-22.2	9.4	99.7
621.5	GRE19	AF	DirOKir	060-063	2	188.4	43.6	1.9	72.4
623	GRE20-1	Thermal+AF	DirOKir	015-030	4	-40.9	-31.5	12	100.6
711	GRE25	AF	DirOKir	038-064	8	62.4	19.9	10.8	60.1
713	GRE26	Thermal	Dir Kir	300-475	5	201.2	-58	23.7	168.2
728	GRE27-1	Thermal	DirOKir	250-300	2	175.1	-11.7	9	127.8
772	GRE28	AF	DirOKir	018-068	8	9.3	51	10.4	13.7
778	GRE30-1	Thermal	DirOKir	300-350	2	242.8	-12.6	12.4	113.1
802	GRE39-1	Thermal+AF	DirOKir	005-025	5	170.7	-62	8.1	175.4
810	GRE41	Thermal	DirOKir	200-250	2	-56.1	-21.1	1.3	95.4
818	GRE42-1	Thermal	DirOKir	200-350	2	201.9	2.3	4.2	111.9
830	GRE44-1	Thermal	DirOKir	150-300	4	150.4	-29	7.4	140.4
834	GRE45-1	Thermal+AF	DirOKir	100-030	5	53.7	-35.9	10.9	108.3
855	GRE48-1	Thermal+AF	DirOKir	150-030	4	184.2	-47.7	8.5	163.7
857	GRE49	Thermal	DirOKir	200-350	4	183.8	-15.2	13.4	131.3
865	GRE52-1	Thermal+AF	DirOKir	300-350	2	205.2	-38.8	0.4	150.9
868	GRE54	AF	Dir Kir	017-035	7	53.8	29	23.7	48.5
870	GRE55	AF	Dir Kir	026-090	28	54.6	-7.5	9.7	82.2

887	GRE57	Thermal+AF	DirOKir	000-030	5	212.4	-25.9	16.2	136.7
888	GRE58	AF	DirOKir	020-027	4	119	-21.9	6.4	122.2
893	GRE59	Thermal+AF	DirOKir	015-025	3	88.9	11.4	10.5	79.3
898	GRE60-1	Thermal+AF	DirOKir	030-080	6	12	-27.9	13.6	92.2
901	GRE61-1	Thermal+AF	DirOKir	300-035	8	-27.6	-61	5.4	126.5
919	GRE62-1	Thermal	DirOKir	250-400	3	128.1	-58	10.7	154.9
922	GRE63-1	AF	DirOKir	040-100	4	28.6	3.9	16.2	63.4
922	GRE63-2	Thermal+AF	Dir Kir	020-060	12	8.2	18.9	14	45.2
922.5	GRE64	AF	Dir Kir	027-052	5	229.3	-59.1	18	156.6
925	GRE65-1	Thermal+AF	DirOKir	200-025	7	75.2	-10.4	5.9	92.9
938	GRE35	Thermal+AF	DirOKir	020-030	2	215.6	31.6	6.6	80.5
942	GRE32	Thermal+AF	DirOKir	250-015	3	110.7	-29	18.7	124.9
945	GRE33	AF	DirOKir	042-045	2	228.5	-6.3	6.3	112.9
950	GRE34	Thermal	DirOKir	150-300	4	200.4	63.3	8.6	52.0
982	GRE36	Thermal+AF	DirOKir	000-100	13	170.4	-36.9	3.3	152.5
983	GRE37	Thermal+AF	DirOKir	150-300	4	192.6	-35.8	3.7	151.0

Table S1: Paleomagnetic results (A and B for the Forezan and Grésy sections) with sample location in the section. sample name. demagnetization treatment. statistics of PCA or PCA acnored to the origin (Kirschvink, 1980), demagnetization field (in black for AF and grey for thermal) and steps used for statistical calculations, declination and inclination of the characteristic Remanent Magnetization, Maximal Angle Deviation and reversal angle.

Table S2: Chemostratigraphy

Zone// Locality	Z (m) ; e=elevation (m.a.s.l)	Lat.	Long.	$^{87}Sr/^{86}Sr$	±	Mean age	±	% $CaCO^3$	$\delta^{13}C_{V\text{-}PDB}$	±	$\delta^{18}O_{V\text{-}PDB}$	±
A// 1	20	46.044659	5.811738	0.708487	0.000040	**19.00**	**0.55**	64.68	-1.39	0.03	-5.69	0.04
	8	46.044688	5.811436	0.708421	0.000041	**20.00**	**0.75**	57.02	-2.08	0.02	-6.77	0.03
	7	46.044698	5.811331	0.708399	0.000043	**20.38**	**0.82**	84.68	-0.87	0.01	-1.53	0.02
	5	46.04516	5.811855	0.708356	0.000006	**21.15**	**0.15**	100.22	-3.16	0.01	-3.67	0.02
	3	46.045133	5.811817	0.708252	0.000005	23.03	0.17	97.19	-5.57	0.02	-4.46	0.02
	4	46.0497	5.814697	0.708345	0.000006	**21.35**	**0.15**	90.88	-3.64	0.03	-3.73	0.03
A// 2	38	45.934869	5.847306	0.708420	0.000020	**19.95**	**0.40**	98.95	-2.19	0.01	-0.38	0.02
	27	45.934671	5.847678	0.708473	0.000021	19.15	0.30	101.48	-2.09	0.01	-4.22	0.01
	Dupl.			0.708407	0.000016	**20.20**	**0.35**	94.65	-0.70	0.01	-3.51	0.02
A// 3	25	45.819964	6.028747	0.708418	0.000016	19.55	0.40	91.72	-1.32	0.00	-4.34	0.02
	Dupl.			0.708418	0.000016	**19.98**	**0.33**	97.36	-1.22	0.01	-4.85	0.02
	14	45.819948	6.028854	0.708388	0.000017	**20.55**	**0.40**	103.54	-0.27	0.02	-2.70	0.02
A// 4	937	45.740527	5.970701	0.708635	0.000011	**17.20**	**0.15**	98.13	0.46	0.02	-0.34	0.03
	925	45.738774	5.969089	0.708611	0.000016	**17.50**	**0.20**	93.06	-0.05	0.01	-0.21	0.01
	908	45.736996	5.967655	0.708618	0.000017	**17.43**	**0.23**	63.37	0.36	0.02	-0.66	0.02
	872	45.734728	5.965678	0.708627	0.000022	**17.33**	**0.28**	85.93	-0.40	0.01	-1.49	0.02
	5	45.725952	5.935587	0.708381	0.000029	**20.65**	**0.60**	99.02	-1.33	0.01	-4.24	0.03
	Dupl.			0.708467	0.000016	19.25	0.25	99.35	-2.20	0.01	-5.85	0.02
	1	45.725956	5.93541	0.708338	0.000017	**21.45**	**0.30**	91.75	0.79	0.02	-0.16	0.02
A// 5	990	45.555797	5.867708	0.708696	0.000021	**16.30**	**0.30**	93.94	-1.01	0.02	-1.21	0.02
	965	45.559248	5.871866	0.708705	0.000020	**16.25**	**0.30**	91.53	-2.32	0.01	-3.40	0.02

	Dupl.			0.708838	0.000016	11.95	0.90	99.38	-4.25	0.01	-4.79	0.02
	965	45.554873	5.863917	0.708641	0.000021	**17.13**	**0.27**	83.78	0.68	0.02	-2.01	0.03
	707	45.552427	5.858426	0.708633	0.000021	**17.23**	**0.28**	92.81	0.63	0.02	-1.05	0.03
	707	45.558547	5.87551	0.708648	0.000040	**17.03**	**0.53**	96.56	-3.66	0.02	-0.56	0.03
	175	45.557722	5.881748	0.708575	0.000029	**17.95**	**0.35**	71.81	0.39	0.01	-2.42	0.02
	173	45.557744	5.88207	0.708576	0.000020	**17.95**	**0.25**	81.07	0.32	0.01	-2.71	0.03
A// 5b	20	45.571086	5.837066	0.708419	0.000015	**19.98**	**0.33**	98.10	-4.28	0.02	-0.79	0.02
	18	45.583325	5.833628	0.708402	0.000018	**20.30**	**0.40**	99.81	-1.46	0.03	-2.18	0.03
A// 6	65	45.464902	5.821749	0.708545	0.000011	**18.30**	**0.15**	94.63	-0.48	0.02	-2.95	0.01
	39	45.464737	5.822243	0.708416	0.000013	**20.03**	**0.28**	101.27	-0.70	0.02	-1.47	0.02
	26	45.464665	5.822412	0.708361	0.000017	**21.05**	**0.35**	77.22	-0.18	0.01	-2.29	0.02
A// 7	34	45.435249	5.815086	0.708461	0.000040	19.40	0.60	99.37	-0.38	0.01	-4.25	0.03
	Dupl.			0.708459	0.000019	**19.35**	**0.30**	99.44	-0.26	0.01	-5.40	0.02
A// 15	10	45.546041	5.820634	0.708395	0.000021	**20.40**	**0.45**	148.16	-0.20	0.03	-1.87	0.01
	10	45.546041	5.820634	0.708347	0.000026	**21.28**	**0.53**	97.99	-0.01	0.02	-2.13	0.02
A// A1	~10	46.309153	5.949013	0.708379	0.000020	**20.70**	**0.45**	98.19	-0.19	0.01	-2.29	0.02
A// A5	~50 +/- 20	45.694009	5.898134	0.708417	0.000112	**20.25**	**1.80**	54.31	-0.43	0.05	-4.97	0.05
B// 8	~85	45.316045	5.736087	0.708577	0.000016	**17.95**	**0.20**	?	?	?	?	?
	75	45.326768	5.743066	0.708514	0.000024	**18.65**	**0.30**	88.96	0.18	0.01	-2.30	0.01
B// 9	9	45.27207	5.717649	0.708511	0.000020	**18.70**	**0.25**	91.98	-0.60	0.01	-3.37	0.02
B// 10	28	45.248726	5.686425	0.708519	0.000021	**18.60**	**0.25**	86.47	-0.12	0.01	-2.26	0.01
	12	45.248622	5.686038	0.708474	0.000017	**19.15**	**0.25**	86.79	0.44	0.01	-2.47	0.02
	8	45.244397	5.684753	0.708436	0.000025	**19.70**	**0.45**	94.90	-0.66	0.02	-3.36	0.02
B// 12	59	45.158352	5.619567	0.708395	0.000004	**20.25**	**0.15**	43.05	-1.22	0.03	-6.55	0.08
B// B2	e=1157	45.283554	5.727017	0.708425	0.000050	19.98	0.88	pollution?	pollution	268.29	pollution	1356.31
B// B3	e=689	45.276945	5.705126	0.708517	0.000041	**18.65**	**0.50**	48.11	0.04	0.02	-6.49	0.02

C// 13	228	45.649776	5.732652	0.708690	0.000023	16.45	0.35	82.71	-5.49	0.01	-3.33	0.01
	228	45.649776	5.732652	0.708712	0.000028	**16.15**	**0.40**	104.74	-3.77	0.02	-2.91	0.03
	218.5	45.64957	5.732135	0.708671	0.000005	**16.73**	**0.08**	98.74	-4.72	0.01	-5.63	0.02
	210	45.649492	5.732041	0.708692	0.000021	16.45	0.30	104.07	-6.28	0.02	-2.94	0.02
	208	45.649393	5.731447	0.708687	0.000025	16.50	0.35	98.99	-6.64	0.02	-3.07	0.02
	17	45.646419	5.725466	0.708586	0.000043	**17.83**	**0.53**	69.97	0.20	0.02	-1.34	0.02
	15	45.646396	5.725428	0.708610	0.000028	**17.53**	**0.38**	87.84	0.01	0.02	-3.75	0.03
	13	45.646393	5.725264	0.708615	0.000024	**17.45**	**0.30**	60.40	0.00	0.01	-1.01	0.02
C// 14	19	45.538171	5.739849	0.708573	0.000025	**17.98**	**0.28**	111.59	0.11	0.01	-1.18	0.03
C// 16	92	45.472272	5.740843	0.708653	0.000023	16.95	0.30	88.58	-15.38	0.01	-0.52	0.02
C// 17	0.1	45.436423	5.75495	0.708563	0.000025	**18.10**	**0.30**	95.09	-0.02	0.02	-3.09	0.02
	0.1	45.436423	5.75495	0.708536	0.000024	**18.40**	**0.30**	84.37	-0.19	0.02	-2.20	0.02
C// 19	264	45.380068	5.743982	0.708607	0.000029	**17.58**	**0.38**	88.01	-0.66	0.02	-1.36	0.02
	10	45.37647	5.746103	0.708541	0.000021	**18.35**	**0.25**	94.43	0.38	0.01	-4.11	0.02
C// 26	31	45.608863	5.693207	0.708601	0.000046	**17.63**	**0.57**	82.93	-0.74	0.02	-2.14	0.02
	18	45.608288	5.695065	0.708572	0.000036	**17.98**	**0.42**	86.91	-0.14	0.02	-1.96	0.02
C// 27	22	45.599657	5.719722	0.708592	0.000025	**17.73**	**0.33**	95.33	0.30	0.01	-1.12	0.02
	18.5	45.600529	5.715867	0.708591	0.000046	**17.73**	**0.58**	98.38	0.35	0.02	-6.44	0.02
	13	45.602036	5.713924	0.708585	0.000017	**17.85**	**0.20**	82.22	0.20	0.02	-3.01	0.02
	12	45.601012	5.719301	0.708549	0.000015	**18.28**	**0.17**	89.71	0.11	0.01	-2.50	0.01
C// 28	27	45.475578	5.715016	0.708635	0.000027	**17.20**	**0.35**	93.92	0.30	0.01	-1.61	0.01
	18	45.487805	5.721297	0.708611	0.000029	**17.53**	**0.38**	93.48	-1.31	0.02	-2.02	0.03
	8	45.487513	5.719013	0.708480	0.000017	**19.08**	**0.23**	93.00	-0.68	0.05	-2.59	0.05
	1	45.484589	5.71556	0.707538	0.000017	78.15		102.75	-0.82	0.01	-3.85	0.02
	1	45.486894	5.719315	0.707456	0.000018	82.70		56.17	0.63	0.03	-2.14	0.03
C// C3	e=314	45.779875	5.714786	0.708566	0.000027	**18.08**	**0.32**	98.80	-0.18	0.01	-1.69	0.01

C// C1	e=1246	46.280278	5.856558			74.90		93.98	-3.23	0.03	-5.99	0.03
	Dupl.	46.280278	5.856558			85.40		49.47	1.55	0.02	-3.07	0.03
C// C11	e=340	45.533262	5.748309	0.708514	0.000065	**18.70**	**0.80**	73.99	0.03	0.02	-4.99	0.04
	e=380	45.541711	5.758291	0.708528	0.000022	**18.50**	**0.25**	71.58	-0.23	0.02	-4.89	0.04
C// C12	e=636	45.480421	5.772074	0.708571	0.000020	**18.00**	**0.25**	129.59	-0.54	0.02	-4.59	0.03
C// C13	80+/-10m	45.460511	5.761243	0.708636	0.000021	**17.20**	**0.30**	93.40	-2.66	0.01	-3.54	0.02
C// C14	0-5m	45.43035	5.776594	0.708549	0.000017	**18.25**	**0.20**	64.01	0.08	0.01	-6.07	0.02
D// 22	308	45.306255	5.665337	0.708615	0.000017	17.48	0.23	96.25	-3.53	0.02	-4.94	0.03
	20	45.309528	5.641654	0.708628	0.000015	**17.30**	**0.20**	99.70	-4.36	0.02	-3.87	0.02
	20	45.309528	5.641654	0.708621	0.000017	**17.38**	**0.23**	99.27	-4.31	0.02	-4.11	0.02
	19	45.309499	5.641742	0.708577	0.000025	17.95	0.30	97.78	-5.34	0.02	-5.61	0.02
	9	45.309784	5.641278	0.708640	0.000009	**17.13**	**0.13**	87.37	-2.95	0.02	-2.08	0.02
	9	45.309784	5.641278	0.708635	0.000026	**17.25**	**0.35**	?	?	?	?	?
D// 23	15	45.292763	5.646007	0.708665	0.000015	16.80	0.20	99.24	-7.28	0.02	-1.42	0.02
	15	45.292763	5.646007	0.708626	0.000017	**17.33**	**0.23**	98.14	-4.19	0.02	-2.83	0.02
	8	45.29265	5.645351	0.708625	0.000020	**17.33**	**0.28**	99.62	-3.17	0.01	-2.47	0.02
D// D1	0-5	45.273458	5.553916	0.708630	0.000036	**17.28**	**0.48**	93.54	-0.17	0.02	-1.66	0.01
E// 24	15	45.17737	5.497853	0.708610	0.000020	**17.75**	**0.35**	?	?	?	?	?
	9	45.177441	5.49782	0.708575	0.000008	**18.19**	**0.15**	?	?	?	?	?
	5	45.17752	5.497818	0.708583	0.000007	**18.08**	**0.15**	?	?	?	?	?
E// 25	153	45.164006	5.494036	0.708685	0.000018	**16.50**	**0.25**	78.66	-0.34	0.02	-4.06	0.01
	14	45.163518	5.489769	0.708628	0.000031	**17.30**	**0.40**	100.15	0.49	0.02	-1.76	0.02
E// 11	10	45.155937	5.554002	0.708581	0.000025	**17.90**	**0.30**	93.08	-0.88	0.01	-4.14	0.02
	10	45.155937	5.554002	0.708566	0.000017	**18.05**	**0.20**					
E// E3	0-5m	45.171352	5.548853	0.708603	0.000018	**17.60**	**0.25**	97.38	0.02	0.01	-2.15	0.02
F// 30	e=532	45.270438	5.346267	0.708760	0.000016	**15.43**	**0.27**	88.88	-2.83	0.01	-8.76	0.02
F// F9	e=351	45.231009	5.455807	0.708777	0.000016	**15.10**	**0.35**	95.60	-0.91	0.01	-2.09	0.02

G// 32	222	45.077025	5.302765	0.708828	0.000022	**12.68**	**1.48**	94.30	-0.91	0.02	-1.76	0.03
	76	45.062015	5.291672	0.708787	0.000005	**15.08**	**0.43**					
	15	45.061528	5.279986	0.708636	0.000017	**17.18**	**0.23**	97.54	1.22	0.01	-0.72	0.02
	15	45.061528	5.279986	0.708501	0.000040	**18.85**	**0.50**	65.45	0.02	0.03	-5.12	0.02
G// 34	61	45.036525	5.277152	0.708693	0.000044	**16.40**	**0.60**	97.27	0.51	0.02	-1.85	0.02
	22	45.032675	5.272878	0.708605	0.000020	**17.60**	**0.25**	70.33	0.25	0.01	-1.73	0.02
	15	45.032856	5.273061	0.708631	0.000043	**17.25**	**0.55**	68.32	0.41	0.01	-0.20	0.02
	1	45.033255	5.271637	0.708592	0.000022	17.75	0.30	85.70	0.18	0.02	-0.96	0.01
	Dupl.			0.708610	0.000018	**17.53**	**0.23**	88.27	0.44	0.02	-1.25	0.02
G// 34b	18	45.022723	5.289174	0.708723	0.000017	**15.98**	**0.23**	96.73	-1.02	0.03	0.22	0.03
	18	45.024022	5.289132	0.708686	0.000008	**16.57**	**0.25**	?	?	?	?	?
	10	45.024022	5.289132	0.708671	0.000017	**16.70**	**0.25**	97.52	-4.58	0.01	-1.93	0.03
G// 35	5	44.992483	5.270015	0.708608	0.000016	**17.55**	**0.20**	98.25	1.69	0.02	0.74	0.03
H// H3	E=243	45.542244	5.681604	0.708275	0.000026	22.60	0.55	93.49	-6.41	0.01	-1.91	0.02
	Dupl.			0.708290	0.000023	22.30	0.45					
I// I2	2.5	46.050342	5.406278	0.708872	0.000016	**10.40**	**0.65**	98.27	-1.58	0.01	-3.48	0.01
	2.5	46.0503333	5.4062778	0.708860	0.000016	**10.90**	**0.70**	141.16	2.15	0.02	0.32	0.02
I// BLYES-101 (well-log)	-185	45.839639	5.248694	0.708833	0.000017	**12.18**	**0.98**	99.64	-0.57	0.02	-0.77	0.02
	Dupl.							94.11	-0.52	0.02	-0.94	0.02
	-200	45.839639	5.248694	0.708847	0.000036	11.73	1.78	88.19	-0.27	0.02	-1.16	0.02
	Dupl.			0.708850	0.000029	**11.45**	**1.40**	93.39	-0.20	0.02	-0.96	0.03
	-230	45.839639	5.248694	0.708841	0.000015	**11.78**	**0.88**	97.13	0.11	0.01	-0.86	0.01
	Dupl.							96.12	0.24	0.01	-0.62	0.03
I// I14		45.70188	4.85472	0.708841	0.000016	**11.80**	**0.90**	192.04	-4.61	0.02	-5.10	0.02
	Dupl.							94.75	-4.72	0.02	-5.31	0.01
		45.70188	4.85472	0.708914	0.000040	8.58	1.78	120.78	-2.33	0.02	-5.05	0.01

	Dupl.			0.708901	0.000029	**9.10**	**1.30**					
I// I10	e= ~180	45.771105	4.836536	0.708883	0.000017	**10.03**	**0.63**	128.82	0.61	0.02	-2.12	0.02
	e= ~180	45.771105	4.836536	0.708845	0.000019	**11.63**	**1.03**	100.25	-0.27	0.02	-1.62	0.02
I// 13	e= ~180	45.765734	4.826936	0.708863	0.000021	**10.80**	**0.90**	101.64	0.16	0.01	-1.41	0.02
	e= ~180	45.765734	4.826936	0.708867	0.000022	**10.65**	**0.90**	91.36	-3.33	0.01	-3.27	0.02
I// I12	e= ~185	45.770011	4.829643	0.708877	0.000017	**10.25**	**0.65**	121.37	0.45	0.01	-0.99	0.02
	e= ~185	45.770011	4.829643	0.708913	0.000018	**8.70**	**0.95**	98.04	-0.39	0.01	-4.39	0.02
	e= ~185	45.770011	4.829643	0.708872	0.000019	**10.45**	**0.75**	96.23	0.21	0.01	-0.46	0.02
I// I18	e= 230	45.565257 ?	5.001824 ?	0.708892	0.000046	9.45	2.10	95.56	-2.41	0.01	-4.64	0.03
	Dupl.1			0.708903	0.000019	**9.13**	**0.88**	96.55	-2.36	0.01	-4.30	0.02
	Dupl.2							97.79	-2.34	0.01	-4.48	0.02
I// I19	e= ~233	45.536745	4.887846	0.708853	0.000020	**11.25**	**1.00**	81.88	-2.46	0.02	-3.62	0.03
I// I19b	e= ~250	45.539003	4.91077	0.708910	0.000013	8.93	0.68	88.68	-6.04	0.02	-6.54	0.02
J// J6 - niv 1	e= ~220-260	45.360033	4.864411	0.708815	0.000013	13.40	1.10	74.57	-6.05	0.01	-6.13	0.02
	Dupl.							69.98	-5.93	0.02	-6.35	0.01
J// J6 - niv 4	e= ~220-260	45.360033	4.864411	0.708843	0.000014	11.70	0.80	93.60	-5.65	0.01	-5.90	0.01
	Dupl.1							94.41	-5.69	0.02	-5.67	0.02
	Dupl.2							98.41	-5.63	0.01	-5.69	0.02
L// L4	e= 257	44.693664	5.006701	0.708673	0.000018	**16.70**	**0.25**	100.08	-2.05	0.01	-1.40	0.03
	e= 254	44.692545	5.005975	0.708668	0.000017	**16.75**	**0.25**	98.44	-2.15	0.02	-2.99	0.02
L// L5	e= 349	44.685163	4.989701	0.708610	0.000019	**17.53**	**0.23**	98.97	-0.27	0.01	-1.63	0.02

Table S2: $^{87}Sr/^{86}Sr$ dating and $\delta^{18}O$ and $\delta^{13}C$ analyses. The ages obtained and the associated uncertainties concern the 2 central columns: the ages that appear in bold red characters are the ages exploited during the study. The background coloured lines correspond to excluded samples: Pink for samples with high diagenetic effect ($\delta^{13}C$<-5‰), green for the reworked samples. The names of the samples framed in colour refer to the duplicated (blue) and bulk (beige) samples. See Fig. 3 for samples locations and appendix B for the stratigraphic context. Dupl.=Duplicate sample.

Table S3: Nannoplankton biostratigraphy

Zone// Log	Z (m); e= elevation (m.a.s.l)	NANNOPLANKTON BIOSTRATIGRAPHY	Interpretations
A// 3	620	Miocene taxa: *Sphenolithus belemnos, Coccolithus pelagicus, Sphenolitus moriformis, Cyclicargolithus floridanus, Helicosphaera* sp., *Helicosphaera euphratis* (reworked?), *Reticulofenestra minuta*. Reworked: Paleogene to Cretaceous nannoplankton (139/177)	**NN3** **Burdigalian** **18-19 Ma**
A// 4	1060	Miocene taxa: *Cy. floridanus, C. pelagicus, Sphenolithus* sp. Reworked: Paleogene to Cretaceous (70/94)	**NP15 (Eoc.) - Top NN6** **Eoc. - 11.9 Ma**
	1045	Miocene taxa: absent Reworked: One Cretaceous taxa	Undetermined
	8	Miocene taxa: *Cy. floridanus*, *C. pelagicus, Sphenolithus* sp. Reworked: Paleogene to Cretaceous nannoplankton (70/96)	**NP15 (Eoc.) - Top NN6** **Eoc. - 11.9 Ma**
A// 5	980	Miocene taxa: absent Reworked: *Quadrum gartneri, Micula decussata* (Cretaceous) and *Watznaueria britannica* (Jurassic) (4/4)	Undetermined
A// 7	141.5	Miocene taxa: *Helicosphaera ampliaperta*, *H. scissura* Reworked: *R. bisecta, R. umbilica, H. compacta* (Olig.-Eoc.) and *W. barnesiae, Micula decussata* (Cretaceous)	**NN2 - NN4** **Aquitanian to Langhian** **(20.1-14.91 Ma)**
	65	Miocene taxa: *Sphenolitus heteromorphus, H. ampliaperta* Reworked: *R. bisecta, Ericsonia. formosa* (Paleogene) to Upper Cretaceous (*Aspidolithus parcus parcus, A. parcus constrictus*)	**NN4** **Late Burd. - Langhian** **17.95-14.9Ma**
	6.5	Miocene taxa: *Helicosphaera ampliaperta* Reworked: *R. bisecta, R. umbilica* (Olig.-Eoc.) to *W. barnesiae, W. britannica* (Jurassic and Cretaceous)	**NN2 - NN4** **Aquitanian to Langhian** **20.1-14.91Ma**

B// 8	16.5	Miocene taxa: absent Reworked: *E. formosa*, *R. bisecta* (Olig.-Eoc.), *Fasciculithus tympaniformis* (Pal.), and *W. barnesiae, M. decussata, Nannoconus truittii truittii, A. parcus parcus* (Cret.)	Undetermined
B// B2		Miocene taxa: absent	Undetermined
B// B3	112	Miocene taxa: absent Reworked: *E. formosa*, *R. umbilica* (Olig.-Eoc.)	Undetermined
	5	Miocene taxa: absent Reworked: *E. formosa*, *R. bisecta* (Olig.-Eoc.), *W. barnesiae, M. decussata* (Cretaceous)	Undetermined
C// 13	620	Miocene taxa: absent Reworked: Paleogene and Cretacaceous nannoplankton (6/6)	Undetermined
	590	Miocene taxa: *Cy. floridanus, C. pelagicus, Discoaster* sp., Reworked: Eoc. and Upper Cretaceous nannoplankton (50/74)	**NP15 (Eoc.) - Top NN6** **Eoc. - 11.9 Ma**
	580	Miocene: *Cy. floridanus, C. pelagicus, Discoaster* sp., *H. carteri*. Reworked: Eoc. and Upper Cretaceous nannoplankton (69/110).	
C// 16	196	Miocene taxa: absent Reworked: *R. bisecta*, *R. umbilica* (Olig.-Eoc.) to *W. barnesiae, W. britannica* (Jur. to Cret.)	Undetermined
	86	Miocene taxa: absent Reworked: *R. hillae* (Olig.-Eoc.) and *W. barnesiae* (Jur. to Cret.)	Undetermined
C// 18	170	Miocene taxa: *Sphenolitus heteromorphus* Reworked: abundant *Reinhardtites levis, A. cymbiformis, Broinsonia. matalosa* (upper Cretaceous) and *R. umbilica*, *Ch. solitus* (Eoc.)	**NN4 - NN5** **Burd. to Serravalian** **18-13.5 Ma**
	129	Miocene taxa: absent	**Undetermined**
	125	Miocene taxa: *S. heteromorphus, Cy. floridanus, C. pelagicus*. Reworked: *R. bisecta, E. formosa* (Olig.-Eoc.) and *W. barnesiae, Ark. cymbiformis* (Cret.)	**NN4 - NN5** **Burd. to Serravalian** **18-13.5 Ma**

D// 22	255	Miocene taxa: *Cy. floridanus, D. deflandrei, H. stalis, C. pelagicus*. Reworked: Paleogene and Mesozoic nannoplankton (26/51)	**NN6** **13.6-11.9Ma**
	60	Miocene taxa: *C. pelagicus, Cy. floridanus, Helicosphaera sp., Sphenolithus sp., Reticulofenestra lockeri* (reworked?). Reworked: Paleogene and Cretaceous nannoplankton (19/31)	Undetermined
	14	Miocene taxa: absent Reworked: *S. obtusus*, *H. gartneri* (Olig.-Eoc.)	Undetermined
E// 11	20	Miocene taxa: *S. heteromorphus*, *H. scissura* Reworked: Paleogene, Cret. and Upper Jur. nannoplankton (98/159)	**NN4 - NN5** **Burd. to Serravalian** **18-13.5 Ma**
E// 24	212	Miocene taxa: *R. pseudoumbilica, Cy. floridanus, C. pelagicus, R. pseudoumbilica (small), Helicosphaera carteri.* Reworked: Paleogene and Cret. nannoplankton (15/25)	**NN4-NN6** **Late Burd. to Serrav.** **18-11.8 Ma**
	180	Miocene taxa: *R. pseudoumbilica, Cy. floridanus, C. pelagicus, R. pseudoumbilica (small), H. carteri, Sphenolithus* sp. Reworked: Paleogene and Cretaceous nannoplankton (35/92)	**NN4-NN6** **Late Burd. to Serrav.** **18-11.8 Ma**
	165	Miocene taxa: *R. pseudoumbilica, Cy. floridanus, C. pelagicus* Reworked: Paleogene and Cretaceous nannoplankton (6/11)	**NN4-NN6** **18-11.8 Ma**
	117	Miocene taxa: Absent	Undetermined
	102	Miocene taxa: Absent	Undetermined
	16.5	Miocene taxa: Absent Reworked: *R. bisecta* (Olig.-Eoc.) and *W. barnesiae* (Mesozoic)	Undetermined
	16.5	Miocene taxa: *H. obliqua* (?)*, H. carteri* (?) Reworked: *R. umbilica, E. formosa, Towieus* sp. (Eoc.) and *W. barnesiae, Micula decussata* (Cret.)	**NN1?- NN6?** **Aquitanian? to Serrav.?** **23.2-11,8Ma**
	9.5	Miocene taxa: *S. heteromorphus*, *R. pseudoumbilica*, *Cy. floridanus, C. pelagicus*. Reworked: *W. barnesiae, W. britannica* (Mesozoic)	**NN4 - NN5** **Burd. to Serravalian**

			18-13.5 Ma
E// 25	175	Miocene taxa: absent	Undetermined
	158	Miocene taxa: absent	
	108	Miocene taxa: absent Reworked: *M. decussata, Watznaueria* sp. (Paleogene and Cret.)	
	48	Miocene taxa: absent	
	40	Miocene taxa: absent	
F// 29	230	Miocene taxa: *Cy. floridanus* Reworked: Cretaceous nannoplankton (8/9)	**NP15 (Eoc.) - Top NN6** **Eoc. - 11.9 Ma**
F// 30	95	Miocene taxa: *Cy. floridanus, C. pelagicus* Reworked: Paleogene and Cretaceous (520/529) nannoplankton	**NP15 (Eoc.) - Top NN6** **Eoc. - 11.9 Ma**
F// PA-1 (well-log)	e= +363	Miocene taxa : absent Reworked: *W. britannica, W. barnesiae*, *W. fossacincta, Zygodiscus embergeri* (Jur. to Cret.)	Undetermined
	e= +253	Miocene taxa : absent Reworked: *W. britannica* (Jur. to Cret.)	Undetermined
	e= -57	Miocene taxa : absent Reworked: *W. britannica* (Jur. to Cret.)	Undetermined
	e= -158	Miocene taxa : *C. pelagicus* Reworked: *Toweius callosus* (Eoc.) and *W. britannica, W. barnesiae* (Jur. to Cret.)	Undetermined
	e= -168	Miocene taxa : *Cy. floridanus*, *C. pelagicus* Reworked: *T. occulatus* (Eoc.) and *W. britannica, W. barnesiae* (Jur. to Cret.)	**NP15 (Eoc.) - Top NN6** **Eoc. - 11.9 Ma**
	e= -173	Miocene taxa : *Cy. floridanus* Reworked: *W. britannica, W. barnesiae, A. cymbiformis* (Jur. to Cret.)	**NP15 (Eoc.) - Top NN6** **Eoc. - 11.9 Ma**
	e= -290	Miocene taxa : *C. pelagicus* Reworked: *W. barnesiae* (Jur. to Cret.)	Undetermined

	e= -312	Miocene taxa : absent Reworked: *R. bisecta* (Eoc.) and *W. fossacincta, W. barnesiae* (Jur. to Cret.)	Undetermined
G// 31	27	Miocene taxa: absent	Undetermined
	9.5	Miocene taxa: absent	Undetermined
G// 32	80	Miocene taxa: *S. heteromorphus, Cy. Floridanus, C. pelagicus* Reworked: *H. compacta, R. bisecta, E. formosa* (Paleogene) and *W. barnesiae, Eiffellithus eximius* (Cret.) (520/529)	**NN4 - NN5** **Burd. to Serrav.** **18-13.5 Ma**
	52.5	Miocene taxa: *H. ampliaperta, H. scissura* Reworked: *E. formosa, R. bisecta* (Eoc.) and *W. barnesiae, W. fossacincta* (Jur. to Cret.)	**NN2 - NN4** **Aquitanian to Langhian** **20.1-14.91Ma**
	15	Miocene taxa : *H. ampliaperta, H. scissura* Reworked: *E. formosa, R. hillae* (Eoc.) and *W. barnesae, M. decussata, A. cymbiformis* (Jur. to Cret.)	**NN4 - NN2** **Langhian to Aquitanian** **(14.91-20.1Ma)**
G// 33	294	Miocene taxa: absent	Undetermined
G// 34b	17	Miocene taxa: absent Reworked: *R. bisecta* (Eoc.) and *W. barnesiae* (Mesozoic)	Undetermined
H// BI-1 (well-log)	e= +392.8	Miocene taxa : absent Reworked: *R. dictyoda* (Eoc.) and *Watznaueria sp., W. barnesiae, W. fossacincta* (Jur. to Cret.)	Undetermined
	e= +287.8	Miocene taxa : absent Reworked: *W. Britannica, W. barnesiae, W. fossacincta* (Jur. to Cret.)	Undetermined
	e= +19.8	Miocene taxa : absent Reworked: *W. Britannica, W. barnesiae, W. fossacincta* (Jur. to Cret.)	Undetermined
	e= -0.2	Miocene taxa : *Cy. floridanus* Reworked: *W. britannica, W. barnesiae* (Jur. to Cret.)	**NP15 (Eoc.) - Top NN6** **Eoc. - 11.9 Ma**
	e= -60.2	Miocene taxa : absent Reworked: *R. bisecta, E. formosa* (Eoc.) and *Eiffellithus eximius*, *W. barnesiae, W.*	Undetermined

		fossacincta (Jur. to Cret.)	
J// FA-1 (well-log)	e= +35	Miocene taxa: absent Reworked: *R. bisecta* (Eoc.) and *W. barnesiae*, *Eprolithus moratus* (Jur. to Cret.)	Undetermined
	e= -7	Miocene taxa : *Cy. floridanus, H. mediterranea* Reworked: *R. bisecta* (Eoc.) and *W. barnesiae*, *W. britannica, W. fossacincta* (Jur. to Cret.)	**NP15 (Eoc.) - Top NN6 Eoc. - 11.9 Ma**
	e= -60	Miocene taxa : *Cyclicargolithus floridanus, Coccolithus pelagicus, Reticulofenestra pseudoumbilica (small)* Reworked: *R. bisecta, Toweius cf. serotinus* (Eoc.) and *Watznaueria barnesiae*, *W. britannica, W. fossacincta, Arkhangelskiella cymbiformis, Eiffellithus turriseiffelii, Prediscosphaera sp.* (Jur. to Cret.)	**NP15 (Eoc.) - Top NN6 Eoc. - 11.9 Ma (Top Serravalian)**
	e= -101	Miocene taxa : *Cy. floridanus, C. pelagicus* Reworked: *R. bisecta, Ericonia. formosa, Nannotetrina fulgens, R. umbilica, Tribrachiatus orthostylus* (Eoc.) and *W. barnesiae*, *W. fossacincta, A. cymbiformis, Eprolithus sp., Nannoconus sp.* (Jur. to Cret.)	**NP15 (Eoc.) - Top NN6 Eoc. - 11.9 Ma (Top Serravalian)**
	e= -116	Miocene taxa : *S. heteromorphus, Cy. floridanus, C. pelagicus, H. mediterranea, H. carteri, R. pseudoumbilica (small)* Reworked: *R. bisecta, Chiasmolithus oamaruensis, C. eopelagicus, Cribrocentrum reticulatum, S. radians* (Eoc.) and *W. britannica, W. barnesiae*, *W. fossacincta, A. cymbiformis, Eprolithus sp., Nannoconus sp., Eiffelithus gorkae, Microrhabdulus decorus, Rhagodiscus asper, Stradneria crenulata, Tranolithus phacelosus* (Jur. to Cret.)	**NN4 - NN5 Burdigalian to Serravalian (18-13.5 Ma)**
J// CHF-1 (well-	e= +511	Miocene taxa : absent Reworked: *W. barnesiae*, *W. britannica, W. fossacincta, A. cymbiformis, Cyclagelosphaera margelii* (Jurassic to Paleocene)	Undetermined
	e= +154	Miocene taxa : *Reticulofenestra pseudoumbilica (small)* Reworked: *W. barnesiae*, *Cyclicargolithus sp.* (Jur. to Cret.)	Undetermined

log)	e= +29	Miocene taxa : *Cy. floridanus* Reworked: *W. barnesiae* (Jur. to Cret.)	**NP15 (Eoc.) - Top NN6** **Eoc. - 11.9 Ma**
J// BEF-1 (well-log)	e= +182-183	Miocene taxa : *C. pelagicus, Helicopsphaera sp.* Reworked: *R. bisecta, T. callosus* (Eoc.) and *W. britannica, W. barnesiae* (Jur. to Cret.)	Undetermined
	e= +94	Miocene taxa : *Cy. floridanus, Discoaster deflandrei, C. pelagicus, R. pseudoumbilica (small), H. carteri* Reworked: *R. bisecta, E. formosa* (Eoc.) and *M. decussata, H. trabeculatus*, *W. britannica, W. barnesiae, W. fossacincta, R. asper* (Jur. to Cret.)	**NN1 - Top NN6** **Top Chattien - Top Serrav.** **23.1 – 11.9 Ma**
	e= -47-48	Miocene taxa : absent Reworked: *W. britannica, W. barnesiae, W. fossacincta, Cy. margelii* (Jur. to Cret.)	Undetermined
	e= -50	Miocene taxa : *C. pelagicus* Reworked: *W. barnesiae, Cy. margelii* (Jur. to Cret.)	Undetermined
	e= -100-101	Miocene taxa : *Discoaster deflandrei* Reworked: *Eprolithus sp., W. britannica, W. barnesiae* (Jur. to Cret.)	**NP17 (Eoc.) - Top NN7** **Eoc. – 10.8 Ma**
	e= -111-112	Miocene taxa : *Discoaster deflandrei* Reworked: *W. barnesiae, W. fossacincta, Cy. margelii, Zeugrhabdotus diplogrammus* (Jur. to Cret.)	**NP17 (Eoc.) - Top NN7** **Eoc. – 10.8 Ma**
	e= -180	Miocene taxa : *Cy. floridanus, C. pelagicus, Reticulofenestra pseudoumbilica* Reworked: *Chiasmolithus grandis, Ch. solitus, C. eopelagicus, Criobrocentrum reticulatum, Discoaster sp., R. umbilica, T. callosus, Toweius sp.* (Eoc.) and *E. turriseiffelii, M. decussata, Prediscophaera sp., Rhagodiscus achlyostaurion, Stradneria crenulata, Tranolithus phacelosus, W. britannica, W. barnesiae, W. fossacincta, Z. diplogrammus* (Jur. to Cret.)	**NP15 (Eoc.) - Top NN6** **Eoc. - 11.9 Ma (Top Serravalian)**

Table S3: Calcareous nannoplankton biostratigraphic data. Biozonation from Young et al. (2017). In red, the taxa or assembling taxa used for datings. The ages that appear in bold black characters are the ages exploited during the study. See Fig. 3 for locations. Burd.= Burdigalian, Cret.= Cretaceous, Eoc.= Eocene, Jur.= Jurassic, Serrav.= Serravalian.

Table S4: Dinoflagellate cysts biostratigraphy

Zone// Log	Z (m)	DINOFLAGELLATE CYSTS BIOSTRATIGRAPHY	Interpretations
A// 3	620	Miocene taxa: *Systematophora placacantha, Cribroperidinium tenuitabulatum* Reworked: *Deflandrea phosphoritica* (Eocene-Oligocene)	**Eocene - middle D18** **Eocene - 13 Ma**
A// 4	1060	Miocene taxa: *Systematophora placacantha, Classopollis* Reworked: *Cribroperidinium, Cyclonephelium distinctum* (Cretaceous)	**Eocene - middle D18** **Eocene - 13 Ma**
	1045	Reworked: *Classopollis* (Cretaceous)	Undetermined
	8	Miocene taxa: *Systematophora placacantha*, *Cribroperidinium tenuitabulatum* Reworked: *Wetzeliella sp.* (Eocene), *Meiourogonyaulax* (Cretaceous), *G. jurassica* (Jurassic)	**Eocene - middle D18** **Eocene - 13 Ma**
A// 5	980	Reworked: *Enneadocysta* sp. (Early Oligocene-Eocene)*, Classopollis, Quadrum gartneri, Micula decussata* (Cretaceous)	Undetermined
C// 13	580	Miocene taxa: *Systematophora placacantha*, *Cousteaudinium* Reworked: *Apectodinium* sp. (Eocene), *Classopollis* sp.*, Odontochitina* sp.*, Muderongia* sp.*, Kleithriasphaeridium simplicispinum* (Cretaceous), *Gonyaulacysta jurassica* (Jurassic)	**Top D17 - Upper D16** **20,55-14,8Ma**
	590	Miocene taxa: *Reticulatasphaera actinocoronota*, *Cribroperidinium tenuitabulatum* Reworked: *Apectodinium homomorphum* (Eocene)	**Eocene - top D18** **Eocene – 11.7 Ma**
	620		Undetermined
D// 20	76	Miocene taxa: *Spiniferites pseudofurcatus*, *Pentadinium laticinctum* Reworked: *Enneadocysta arcuata* (middle Eocene-early Rupelian), *Meiourogonyaulax* sp. (Jurassic to Cretaceous), *Classopollis* (upper Trias to Cretac.), *Phoberocysta neocomica* (Berriasian to Aptian)	**Eocene - middle D19** **Eocene – 8.6 Ma**
	120	Miocene taxa: *Ectosphaeropsis burdigalensis*, *Homotryblium* Reworked: *Areoligera* cf. *gippingensis* (Paleocene), *Apectodinium* sp. (upper Paleocene to	**D16- D18** **Lower Aquitanian -**

		lower Eocene)	**Top Langhian; 23.2 - 13.8 Ma**
D// 21	50	Miocene taxa: *Spiniferites pseudofurcatus*, *Homotryblium*, *Systematophora placacantha*	**Eocene - middle D18 Eocene - 13 Ma**
	22	Miocene taxa: *Spiniferites pseudofurcatus*, *Systematophora placacantha*	
D// 22	255	Reworked: *Classopollis* (upper Trias to Cretaceous)	Undetermined
	225	Miocene taxa: *Holotryblium floripes* Reworked: *Homotryblium pallidum, Ericsonia formosa* (Eocene), *Classopollis, Micula decussata, Arkhangelskiella cymbiformis* (Cretaceous)	**Tortonian or ante-Tortonian**
	70	Miocene taxa: *Palaeocystodinium golzowenze* Reworked: *Wetzeliella sp., Homotryblium pallidum*, *Classopollis* (Cretaceous)	**Eocene - middle D19 Eocene – 8.6 Ma**
E// 11	20	Miocene taxa: *Reticulatasphaera actinocoronota*, *Cribroperidinium tenuitabulatum* Reworked: *Apectodinium homomorphum* (Eocene)	**Eocene - top D18 Eocene – 11.7 Ma**
E// 24	212		Undetermined
	175	Miocene taxa: *Systematophora placacantha*, *Spiniferites pseudofurcatus* Reworked: *Deflandrea phosphoritica* (Eocene-Oligocene), *Achomosphaera alcicornu* (lower Eocene - Oligocene)	**Eocene - middle D18 Eocene - 13 Ma**
	158	Miocene taxa: *Cribroperidinium tenuitabulatum*, *Spiniferites pseudofurcatus* Reworked: *Deflandrea phosphoritica* (Eocene-Oligocene), *Achomosphaera alcicornu* (lower Eocene - Oligocene), *Homotryblium pallidum* (Eocene), *Wetzeliella varielongituda* (Eocene), *Florentinia* sp. (Cretaceous)	**Eocene - top D18 Eocene – 11.7 Ma**
	180	Miocene taxa: *Spiniferites pseudofurcatus*, *Melitasphaeridium choanophorum* Reworked: *Wetzeliella articulata* (Eocene), *Muderongia* sp., *Cribroperidinium* sp. (Cretaceous)	**Eocene - lower D20 Eocene - 6.8 Ma**
	165	Reworked: *Wetzeliella articulata* (Eocene), *Chatangiella* sp. (Cretaceous)	Undetermined
	102	Miocene taxa: *Cribroperidinium tenuitabulatum* Reworked: *Deflandrea phosphoritica* (Eocene-Oligocène), *Homotryblium pallidum* (Eocene), *Cribroperidinium* sp. (Cretaceous)	**Eocene - top D18 Eocene – 11.7 Ma**

E// 25	108	Miocene taxa: *Cordosphaeridium cantharellum*, *Cribroperidinium tenuitabulatum* Reworked: *Wetzeliella sp.* (Eocene)*, Classopollis* (Cretaceous)	**Eocene - lower D17** **Eocene -17.6 Ma**
	48	Reworked: *Classopollis* (Cretaceous)	Undetermined
	40	Miocene taxa: *Hystrichosphaeropsis obscura*, *Cribroperidinium tenuitabulatum*, *Systematophora placacantha* Reworked: *Charlesdwoniea* sp. (lower Oligocene to Eocene), *Classopollis* (Cretaceous)	**Lower D17 – middle D18 18.65 – 13 Ma**
F// 29	230		Undetermined
F// 30			Undetermined
I// I2	7	Miocene taxa: *Homotryblium* Reworked: *Wetzeliella* sp. ou *Apectodinium* sp. (upper Paleocene to Oligocene)	**Miocene**
	1,8	Miocene taxa: *Glaphyrocysta* sp**.** Reworked: *Deflandrea phosphoritica (*Eocene-Oligocene)	**Ante-Tortonian**
	0,6	Miocene taxa: *Homotryblium floripes* Reworked: *Cyclonephelium distinctum* (Cretaceous)	**Ante-Tortonian**
	0,2	Reworked: *Cyclonephelium distinctum* (Cretaceous)	Undetermined
I// I3	6,8		Undetermined
	2,6		Undetermined
	2,2		Undetermined

Table S4: Dinoflagellate cysts biostratigraphic data. Ages based on Hardenbol et al. (SEPM Chart. 1998). calibrated in Ogg et al. (2016) geochronology using TimeScale Creator 7.4. In red, the taxa (or assembling taxa) used for dinoglagellate cysts datings. The ages that appear in bold black characters are the ages exploited during the study. See Fig. 3 for location of the analyzed samples.

Table S5: Foraminiferal biostratigraphy

Zone// Log	Z (m); e= elevation (m.a.s.l.)	FORAMINIFERAL BIOSTRATIGRAPHY	Interpretation:
A// 3	620		Undetermined
A// 4	635		Undetermined
	650		Undetermined
A// 5	375		Undetermined
	710		Undetermined
A// 5	720		Undetermined
	755		Undetermined
	820		Undetermined
A// 5 (Lamiraux, 1977)	710-760	*Globorotalia acrostoma*, *Trilobatus trilobus*	**Oligocene - N12a** **Oligocene - 13.6 Ma**
C// 13	180		Undetermined
	215		Undetermined
	220		Undetermined
	280	Rare benthic foraminifera (Milliolidae, *Elphidium* sp., Nodosariidae, *Lenticulina* sp.) –Very poor preservation	Undetermined
C// 16	20		Undetermined
C// 19	245		Undetermined
	270		Undetermined
	295		Undetermined
C// 27 (Latreille, 1969)	0-10	*Globorotalia* cf. *mayeri, Globigerina* cf. *concinna, Trilobatus trilobus*	**N7-N13 ?** **17.2– 11.6 Ma**
D// 22	68		Undetermined

D// 23	10		Undetermined
	15		Undetermined
E// 24	5	Benthic forams: Rotaliida (e.g., *Elphidium* spp., *Lenticulina* spp.), Textulariidae (e.g., *Triplasia* sp.) –Very poor preservation	Undetermined
	5	Rare benthic foraminifera (Textulariidae, *Lenticulina* spp.)	Undetermined
	9	Rare benthic foraminifera	Undetermined
	20		Undetermined
	20		Undetermined
	165		Undetermined
	180		Undetermined
G// 33 (Latreille, 1969)	5	*Globorotaloïdes* cf. *suteri*, *Globocassidulina oblonga*, *Globigerina* sp.	**P12 ? - N7- Middle Eocene - 17 Ma**
G// 34	20		Undetermined
F// VAF-2 (well-log)	e= +184		Undetermined
F// PA-1 (well-log)	e= -290	*Paragloborotalia bella, Globoturborotalia decoraperta*, *Globorotalia praescitula*, *Trilobatus trilobus*, *Globigerinoides subquadratus*, *Globigerinita glutinata*, *Globoturborotalia woodi* – Poor to moderate preservation	**N9 ? Langhian 15.0- 14.0 Ma**
	e= -312	*Globigerinita glutinata*, *Globigerinoides* sp.	Undetermined
H// H4-H5 (Latreille, 1969)	e= 265	*Globorotalia* cf. *Mayeri, Globigerina microstoma*, *Globigerina woodi*, *Trilobatus trilobus*	**N7- N13 ? 17.2 – 11.6 Ma**
H// H3 (Latreille, 1969)	e= 255	*Globigerina foliata, Orbulina suturalis,* *Globorotalia pseudopachyderma, Globigerina* ex. gr.*bulloïdes*	**N9-N18 15.0 – 5.33 Ma**
H// LTP-1 (well-log)	e= -160	*Praeorbulina circularis,* *Globorotalia siakensis*, *Sphaeroidinella seminulina*, *Sphaeroidinella disjuncta*, *Trilobatus trilobus*, *Globoturborotalia woodi* – Poor to moderate preservation	**M6 – M5b 16.29 – 14.23 Ma** (biozonation from Lirer et

			al., 2019)
I// I2 (Mein, 1985)	Unknown exact stratigraphic position	*Cassigerinella chipolensis, Globorotalia* cf. *archaeomenardi* (reworked?), *Globigerina* gr. *pseudociperoensis, Globigerina* sp., *Turborotalia* cf. *quinqueloba,*	**P18 - N13** **Rupelian - Serravalian** **Oligocene -11.61 Ma**
I// I2 (Aguilar et al., 2004)	2,3-10,6	*Neogloboquadrina siakensis*, *Neogloboquadrina acostaensis*, *Globrotalia menardii*	**MMi8 ?** (biozonation from Lirer et al., 2019) **11.78 Ma-11.19 Ma**
	0-2,3	*Cassigerinella chipolensis, Paragloborotalia mayeri, Globorotalia lenguaensis*	**N13** **12– 11.6Ma**
I// I15 (Sample 13, Latreille, 1969)	e= 160	*Globrotalia menardii, Globigerina bulloides, Globigerina quinqueloba*, *Globigerina globorotaloidea*, *Globigerina parabulloides*, *Globorotalia menardii, Orbulina universa*, *Orbulina suturalis*	**N12b- actual** **Upper Serravalian – actual** **12.8 -0 Ma**
I// I14 (Latreille, 1969)	e= 155-175	*Globigerinoides bulloides, Globigerinoides Parabulloides*, *Trilobatus trilobus*	**Unusable**
I// BLYES-101 (well-log)	e= +57.7		Undetermined
	e= +12.7		Undetermined
	e= -42.3		Undetermined
	e= -42.3	Rare benthic foraminifera	Undetermined
	e= -47	Rare benthic foraminifera	Undetermined
K// K5b (Latreille, 1969)	e= 280-340	*Globigerina* cf. *bulbosa*, *Globigerina* cf. *diplostoma, Globigerina bulloides, Globoturborotalia woodi, Globorotalia hirsuta* (?), *Trilobatus trilobus, Globorotalia scitula scitula*	**N11 to N16 ?** **Langhian to Tortonian** **13.7– 8.6Ma**
K// K6 (Latreille, 1969)	e= 250	*Globigerina diplostoma*, *Globigerinoides* ex. gr. *bulloides*, *Globorotalia incompta* (?)	**N7 ? to N17** **Burdigalian to Tortonian** **17.2– 5.8 Ma**

K// K10 (Latreille, 1969)	e= 215-225	*Orbulina bilobata*	**N9 to N23 14.56 – 0 Ma**
K// MO-2 (well-log)	e= -245 +/- 10	Rare benthic forams (*Lenticulina* sp., Textulariidae, Miliolidae, *Ammonia* sp.)	Undetermined
K// SL-2 (well-log)	e= -98 +/- 10		Undetermined
K// SLF-1 (well-log)	e= -354	Rares reworked Eocene planktonic foraminifera	Undetermined
L// GVA-1 (well-log)	e= -127 +/- 10		Undetermined

Table S5: Planktonic foraminiferal biostratigraphic data. Grey colored lines correspond to data from the literature. Biozonation from Boudagher-Fadel (2015). In red, the key taxa (or assembling taxa) used for datings. The ages that appear in bold black characters are the ages exploited during the study. See Fig. 3 for location of the analyzed samples.

Table S6: Shortening and offset amounts deduced from the cross-sections equilibration

Cross-section	**B**										
Phase	**Phase 2**							**Phase 1**			
Fault zone	**FZ4**	**FZ3**	**FZ2**	FZ2-2c	FZ2-2b	FZ2-2a	**GF**	**FZ1 total**	FZ1	FZ1-b	**Total**
True displacement along the fault [m]	508	1049	4195	1293	1728	1174	860	10206	9400	806	16818
Offset [m]	249	366	2660	850	1050	760	660	2160		2160	6095
Folding [m]	140	686	1197	179	496	522	887	4978		4978	7888
Heave [m]	435	983	3229	970	1363	896	550	9154	8654	500	14351
Total horizontal shortening = folding+heave [m]	575	1669	4426	1149	1859	1418	1437	14132	8654		**22239**
Total horizontal shortening by phase	**6670**							**14132**			
Onset (Ma)	15	16.3	16.3	16.3	16.3	16.3	17.35	29	29	29	
Incertitude (Ma)	0.15	0.4	0.4	0.4	0.4	0.4	0.15	2	2	2	
End (Ma)	12	15	15	15	15	15	16.3	17.35	17.35	17.35	
Incertitude (Ma)	?	?	?	?	?	?	?	0.15	0.15	0.15	
Period of activity [Ma]	3	1.3	1.3	1.3	1.3	1.3	1.05	11.65	11.65	11.65	
Displacement rate [mm/yr]	0.169	0.807	3.227	0.995	1.329	0.903	0.819	0.876	0.807	0.069	
Shortening rate [mm/yr]	0.192	1.284	3.405	0.884	1.430	1.091	1.369	1.213	0.000	0.000	

Cross-section	**C**										
Phase	**Phase 2**							**Phase 1**			
Fault zone	**FZ4**	**FZ3**	**FZ2**	FZ2-2a	FZ2-2a1	FZ2-2a2	**GF**	**FZ1**	bkt2	bkt1	Total
True displacement along the fault [m]	200	493	4281	2879	897	505	181	4758	165	150	10047
Offset [m]	134	312	2853	1723	677	453	148	?	?		3299
Folding [m]	140	1050	1250	700	0	550	650	2326	1031	326	6123
Heave [m]	347	381	3147	2302	589	256	104	3475	150	101	7601
Total horizontal shortening = folding+heave [m]	487	1431	4397	3002	589	806	754	5801	1181	427	**13724**
Total horizontal shortening by phase [m]	**6315**							**5801**			
Onset (Ma)	15	16.3	16.3	16.3	16.3	16.3	17.35	29	?	?	
Incertitude (Ma)	0.15	0.4	0.4	0.4	0.4	0.4	0.15	2	?	?	
End (Ma)	12	15	15	15	15	15	16.3	17.35	?	?	
Incertitude (Ma)	?	?	?	?	?	?	?	0.15	?	?	
Period of activity [Ma]	3	1.3	1.3	1.3	1.3	1.3	1.05	11.65	?	?	
Displacement rate [mm/yr]	0.067	0.379	3.432	2.215	0.690	0.388	0.172	0.408	?	?	
Shortening rate [mm/yr]	0.116	0.293	2.501	1.771	0.453	0.197	0.099	0.298	?	?	

Table S6: Table of shortening and offset amounts deduced from the cross-sections equilibration. The grey background coloured columns correspond to the branches constituting the major fault zone (FZ).