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Magmatic pulse driven by sea-level changes associated with the Messinian salinity crisis

Pietro Sternai, Luca Caricchi, Daniel Garcia-Castellanos, Laurent Jolivet, Tom E. Sheldrake and Sébastien Castelltort

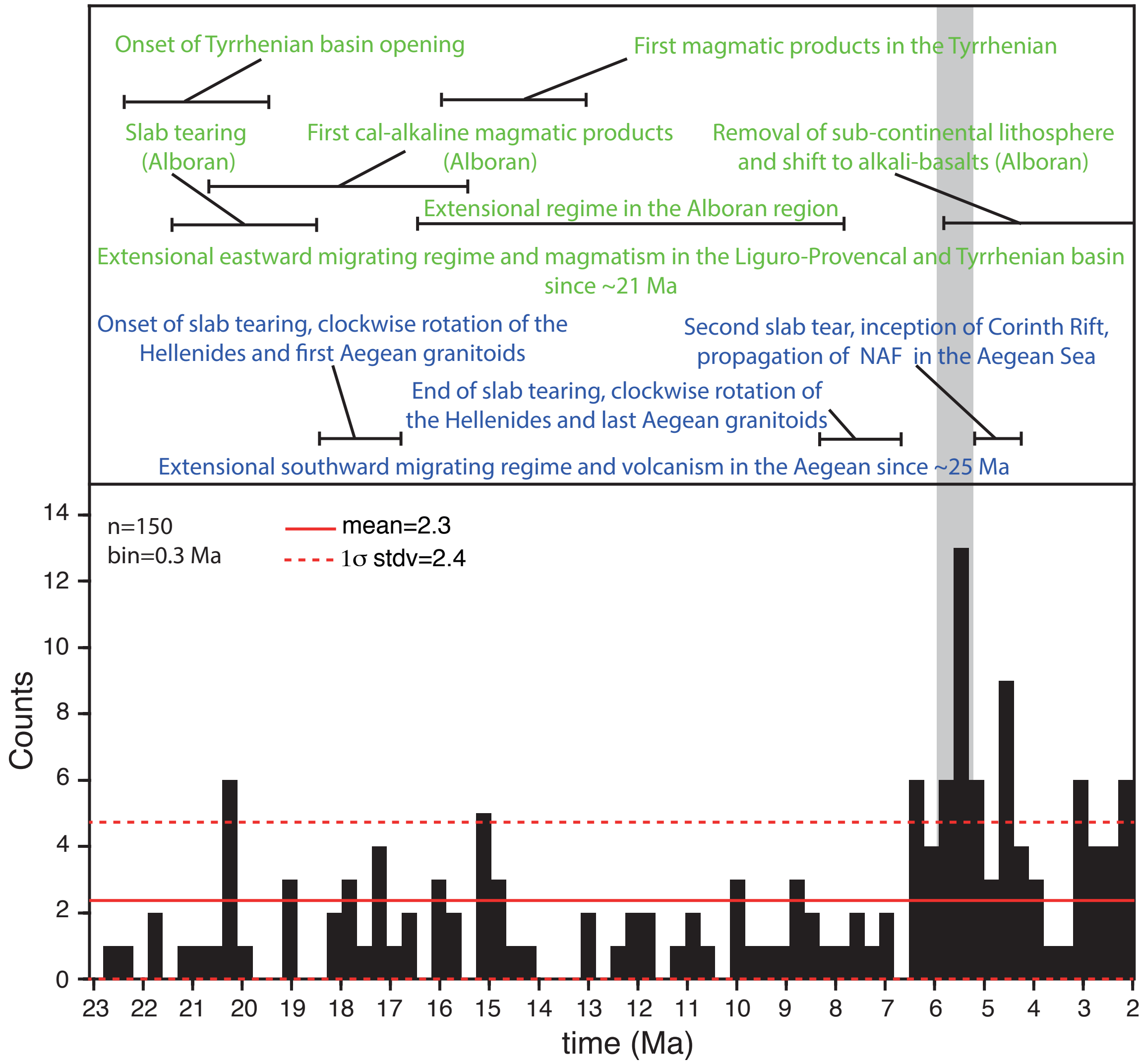

Figure S1: Synopsis of the Neogene Mediterranean geodynamics and mineral ages distribution.

(a) Summary of the major events in the western (green) and eastern (blue) Mediterranean from the references cited in the text and Methods section. (b) Histogram of mineral ages. Solid and dashed red lines respectively show the average number of mineral ages throughout the considered time interval and the 1σ standard deviation. More details in the text and Methods.

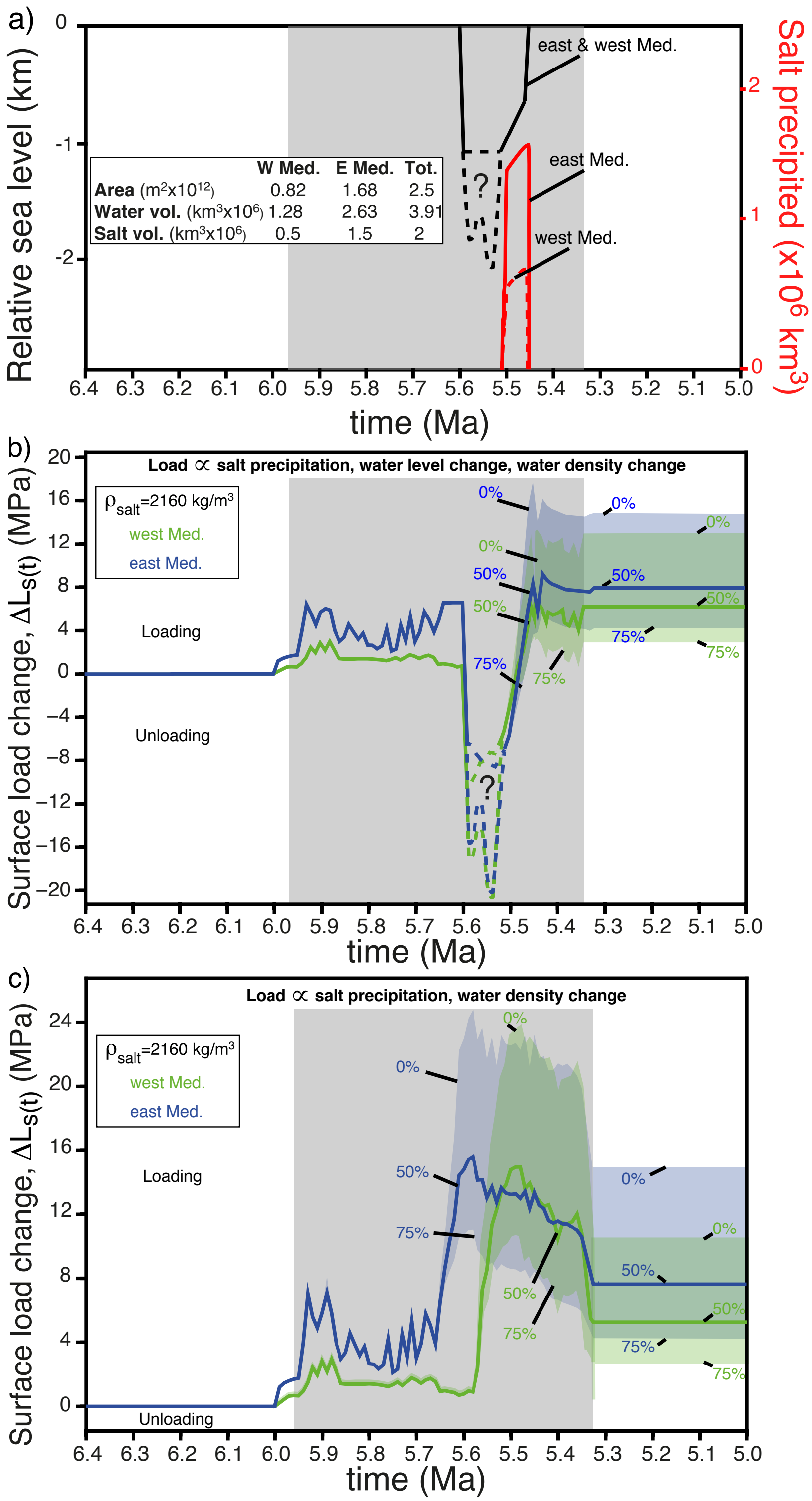

Figure S2: Surface load variation estimates form alternative MSC scenarios.

(a) Relative sea level and salt precipitation (ref. 1). Dashed lines highlight arbitrary paths where data is missing. The inset provides values to convert salt volumes into average thickness. (b) $\Delta L_{s(t)}$ (i.e., surface load changes,) estimated from curves in panel a and Fig. S5. (c) $\Delta L_{s(t)}$ assuming that no sea level drawdown occurred[2,3] estimated from curves in Fig. 1a and S5. The 0%, 50% and 75% curves in panels b and c show $\Delta L_{s(t)}$ after reducing the salt volume by that amount to account for the sediments interleaved. The grey bar highlights the MSC.

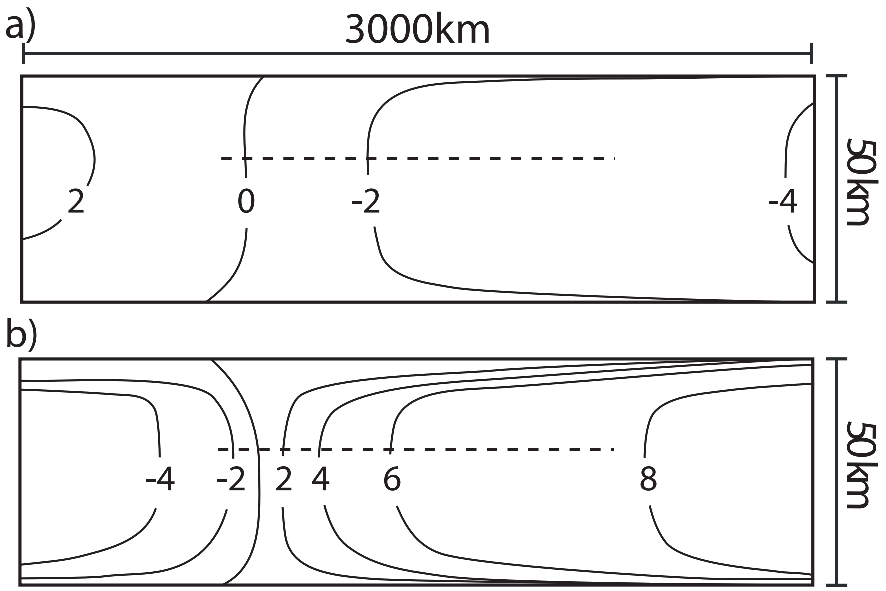

Figure S3: Deviatoric horizontal stress, σ'$_{xx}$, maps.

(a, b) Deviatoric horizontal stress, σ'$_{xx}$, within the upper layer (analogue to the crust) for the geodynamic model time-steps shown in Fig. 2b, c, respectively. The horizontal dashed lines show the location of the profiles in Fig. 4b, c.

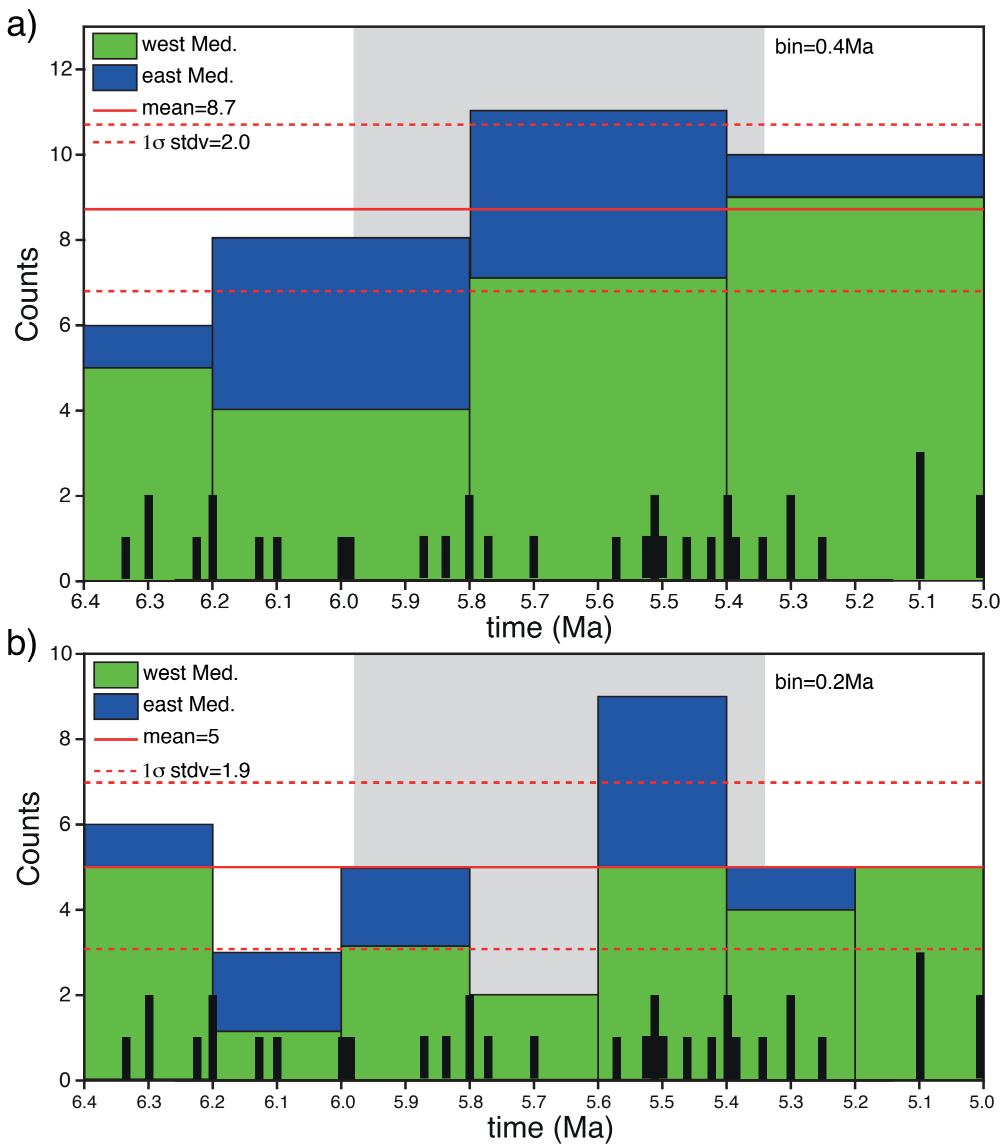

Figure S4: Effect of the bin size on the histograms of mineral ages between 5-6.4 Ma.

(a, b) Same as Fig. 1c, but with different bin size. More details are provided in the text and Methods.

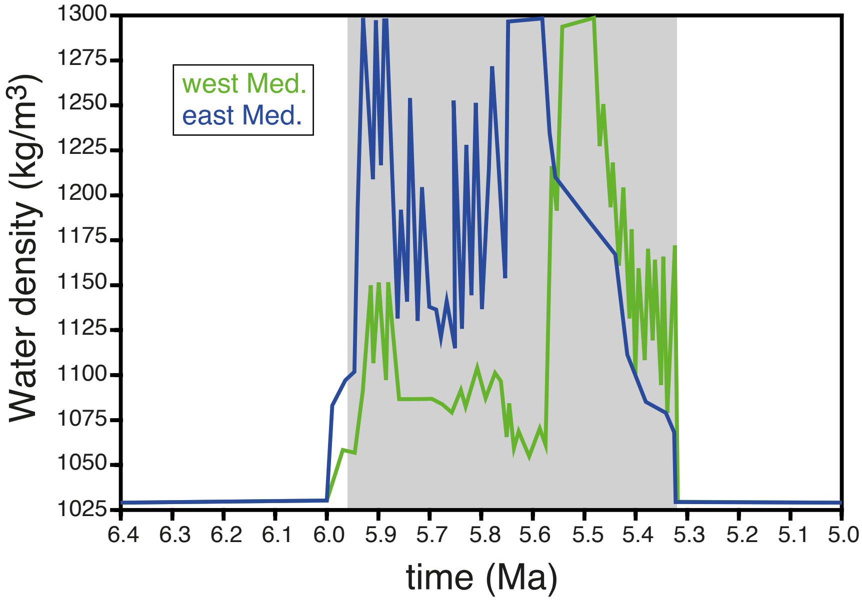

Figure S5: Mediterranean water density changes between 5-6.4 Ma.

Mediterranean water density curve between 5-6.4 Ma, $\rho_{w(t)}$, as constrained by the salinity changes estimated by ref. 4 and the equation of state for seawater by ref. 5. More details are provided in the text and Methods.

Table S1: Database of igneous mineral ages.

Igneous mineral ages from the pan-Mediterranean area during the 6.4-5 Ma time window. The database was generated based on a careful literature screening. For additional information, the reader is referred to the list of references below and to the works cited in these references.

Sample/ location	Reference	Lat.	Lon.	Min age (Ma)	Age (Ma)	Max age (Ma)	Method	Material	Rock	Type
HO-54, Spain	Acosta-Vigil et al., 2010	37	-2.4	6.18	6.33	6.48	K/Ar	Zircon	Dacite	Effusive
GG080400-3, Morocco	Duggen et al., 2005	35.22	-3.03	6	6.3	6.6	$^{40}Ar/^{39}Ar$	Matrix	Alkali-basalt	Effusive
GZ170699-3, Morocco	Duggen et al., 2005	34.44	-3.32	6.2	6.3	6.4	$^{40}Ar/^{39}Ar$	Matrix	Alkali-basalt	Effusive
3-124, Turkey	Lepetit et al., 2014	38.53	34.98	6.18	6.22	6.26	$^{40}Ar/^{39}Ar$	Glass	Ignimbrite	Effusive
Elba, Italy	Saupé et al., 1982	42.78	10.16	6.0	6.2	6.4	Rb-Sr	Whole rock	Granite	Intrusive
B321, Spain	Turner et al., 1999	36.96	-2.16	5.8	6.2	6.6	$^{40}Ar/^{39}Ar$	Biotite	Dacite	Effusive
GG280599-9, Morocco	Duggen et al., 2005	35.22	-3.1	6.11	6.12	6.13	$^{40}Ar/^{39}Ar$	Feldspar	Trachyandesite	Effusive

Tahar, Turkey	Aydar et al., 2012	38.8	35.09	5.4	6.1	6.8	U-Pb	Zircon, Plagioclase	Ignimbrite	Effusive
KA 6, Aegean	Innocenti et al., 1982	36.63	25.04	5.7	6	6.3	K/Ar	Matrix	Alkali-basalt	Effusive
04JB02, Croatia	Prelevic et al., 2010	42.79	18.17	5.8	6	6.2	$^{40}Ar/^{39}Ar$	Whole rock	Lamproite	Effusive
KS2, Hungary	Balogh et al., 1986	47.04	17.64	5.63	5.87	6.11	K/Ar	Matrix	Basanite	Effusive
ST135/10, Italy	Conticelli et al., 2001	42.8	10.38	5.69	5.83	5.97	$^{40}Ar/^{39}Ar$	Feldspar, matrix	Mafic dike	Dike
Elba, Italy	Juteau et al., 1984	42.77	10.26	5.7	5.8	5.9	Rb-Sr	Biotite	Shoshonitic dike	Dike
GZ150699-1, Morocco	Duggen et al., 2005	34.65	-3.38	5.6	5.8	6	$^{40}Ar/^{39}Ar$	Matrix	Alkali-basalt	Effusive
Furnace syst., Morocco	Cornée et al., 2002	35.33	-2.96	5.73	5.77	5.81	$^{40}Ar/^{39}Ar$	Sanidine, plagioclase	Absarokite	Effusive
Elba, Italy	Ferrara et al., 1961	42.76	10.39	-	5.7	-	Rb-Sr	Biotite	Monzogranite	Intrusive
GG140699-8, Morocco	Duggen et al., 2005	35.27	-2.96	5.54	5.57	5.6	$^{40}Ar/^{39}Ar$	Feldspar	Trachyandesite	Effusive
Maccarone, Italy	Cosentino et al., 2013	43.38	13.12	5.528	5.532	5.536	CA-TIMS U-Pb	Zircon	Ash	Effusive
GG290599-1, Morocco	Duggen et al., 2005	35.19	-2.93	5.48	5.51	5.54	$^{40}Ar/^{39}Ar$	Matrix	Trachyandesite	Effusive
Mogod, Tunisia	Halloul, 1989	36.7	9.76	-	5.5	-	K/Ar	Whole rock	Alkali-basalt	Effusive
9206/1, Syria	Sharkov et al., 1994	34.77	36.42	5.32	5.5	5.68	K/Ar	Whole rock	Hawaite	Effusive
BM-Val, Turkey	Lepetit et al., 2014	38.8	35.09	5.4	5.46	5.52	$^{40}Ar/^{39}Ar$	Glass	Ignimbrite	Effusive
KS1/28, Hungary	Balogh et al., 1986	47.15	17.1	5.18	5.42	5.66	K/Ar	Matrix	Basanite	Effusive
GG090400-1b, Morocco	Duggen et al., 2005	35.26	-2.93	5.2	5.4	5.6	$^{40}Ar/^{39}Ar$	Feldspar, matrix	Trachybasalts	Effusive
9208/1, Syria	Sharkov et al., 1994	34.8	36.1	5.2	5.4	5.6	K/Ar	Whole rock	Hawaite	Effusive
RM-L, Italy	Lippolt et al., 1995	42.81	10.42	4.93	5.39	5.85	U-Th-He	Specularite	Basalt	Effusive
GG140699-6, Morocco	Duggen et al., 2005	35.26	-2.95	5.33	5.35	5.37	40Ar/39Ar	Biotite	Trachyandesite	Effusive
GZ180699-4, Morocco	Duggen et al., 2005	34.61	-3.05	5	5.3	5.6	40Ar/39Ar	Matrix	Alkali-basalts	Effusive
128-3, Syria	Sharkov et al., 1994	34.7	36.7	5.23	5.3	5.47	K/Ar	Whole rock	Alkali-basalt	Effusive
Anchise Seamount	Savelli, 1988	38.65	12.81	5.06	5.25	5.44	K/Ar	Whole rock	Trachybasalt	Effusive
CF10, Italy	Beccaluva et al.,1976	40.13	8.6	4.9	5.1	5.3	K/Ar	Whole rock	Alkali and transition basalts	Effusive
Elba, Italy	Saupé et al., 1982	42.76	10.39	5	5.1	5.2	Rb-Sr	Whole rock	Monzogranite	Intrusive
Giglio, Italy	Westerman et al., 1993	42.35	10.9	4.94	5.01	5.08	Rb-Sr	Biotite, whole rock	Monzogranite	Intrusive
71-220, Morocco	El Azzouzi et al., 1999	35.25	-3.05	-	5	-	K/Ar	Whole rock	Calco-alkaline basalts	Effusive
156, Italy	Barberi et al., 1967	40.91	12.94	-	5	-	K/Ar	-	Alkali-basalts	Effusive

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