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Plants or bacteria? 130 years of mixed imprints in Lake Baldegg sediments (Switzerland), as revealed by compound-specific isotope analysis (CSIA) and biomarker analysis

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Table S1: Soil samples names, land-use and FA $\delta^{13}C$ [‰] results. stdev: standard deviation of triplicate measurements.

Soil sample name	Land-use	C24:0 mean $\delta^{13}C$ [‰]	Stdev.	C26:0 mean $\delta^{13}C$ [‰]	Stdev.	C28:0 mean $\delta^{13}C$ [‰]	Stdev.
Aa	Arable land	-34.24	0.28	-34.73	0.02	-35.85	0.38
Ab	Arable land	-32.83	0.10	-34.30	0.23	-35.33	0.29
Ac	Arable land	-32.25	0.37	-34.22	0.46	-35.37	0.49
Ad	Arable land	-31.50	0.21	-33.85	0.08	-35.23	0.12
Fa	Forest (mixed)	-32.59	0.19	-34.26	0.19	-35.32	0.09
Fb	Forest (mixed)	-34.00	0.41	-34.45	0.31	-34.10	0.49
Fc	Forest (mixed)	-32.58	0.14	-33.43	0.04	-34.42	0.17
Fd	Forest (mixed)	-32.51	0.08	-33.10	0.36	-33.89	0.50
Fe	Forest (mixed)	-33.10	0.10	-33.87	0.06	-34.63	0.11
Oa	Orchard	-32.84	0.41	-34.14	0.15	-35.05	0.29
Ob	Orchard	-33.24	0.18	-34.43	0.12	-35.01	0.09
Oc	Orchard	-33.21	0.47	-34.55	0.35	-35.29	0.15
Od	Orchard	-32.43	0.47	-33.29	0.26	-34.52	0.29
Oe	Orchard	-33.51	0.16	-34.83	0.15	-35.16	0.33
PGa	Permanent grassland	-35.00	0.31	-35.71	0.29	-37.10	0.18
PGb	Permanent grassland	-34.51	0.49	-35.56	0.48	-36.15	0.17
PGc	Permanent grassland	-34.11	0.41	-35.23	0.16	-36.32	0.25
TGa	Temporary grassland	-34.34	0.18	-35.58	0.12	-36.73	0.27
TGb	Temporary grassland	-33.74	0.14	-35.06	0.21	-36.64	0.15
TGc	Temporary grassland	-34.83	0.16	-35.68	0.30	-36.33	0.45
TGd	Temporary grassland	-33.23	0.26	-34.90	0.37	-36.30	0.31

Table S2: Lake sediment core samples depth, age, and FA $\delta^{13}C$ [‰] results. stdev: standard deviation of triplicate measurements.

Depth (mm)	**Age CE**	C24:0 mean $\delta^{13}C$ [‰]	Stdev.	C26:0 mean $\delta^{13}C$ [‰]	Stdev.	C28:0 mean $\delta^{13}C$ [‰]	Stdev.
000-009	Post-1995	-36.27	0.38	-34.39	0.22	-34.75	0.08
018-027	Post-1995	-35.20	0.29	-34.20	0.29	-34.66	0.30
042-052	1989-1992	-33.90	0.49	-33.53	0.45	-34.83	0.39
061-077	1982-1985	-36.01	0.23	-34.65	0.50	-34.63	0.26
092-100	1976-1978	-37.74	0.50	-34.25	0.22	-34.36	0.38
111-128	1970-1972	-33.68	0.44	-33.69	0.32	-36.11	0.35
142-157	1964-1966	-33.34	0.34	-33.59	0.28	-37.81	0.12
164-173	1957-1960	-32.94	0.20	-33.76	0.28	-34.11	0.48
175-184	1956 (Turbidite)	-33.34	0.18	-33.14	0.42	-32.92	0.25
193-204	1950-1952	-36.71	0.50	-33.95	0.33	-34.34	0.16
211-225	1944-1946	-36.26	0.46	-33.96	0.29	-34.04	0.13
234-245	1938-1940	-37.83	0.50	-35.61	0.39	-35.86	0.14
259-270	1932-1934	-39.03	0.49	-36.05	0.44	-35.63	0.38
283-295	1926-1928	-38.94	0.45	-37.50	0.34	-35.91	0.13
305-315	1920-1922	-38.70	0.42	-35.64	0.14	-35.06	0.16
325-333	1914-1916	-40.10	0.48	-36.58	0.25	-36.34	0.42
345-353	1908-1910	-39.13	0.37	-37.76	0.23	-36.02	0.12
363-370	1902-1904	-36.05	0.28	-37.27	0.33	-35.83	0.47
381-389	1896-1898	-35.65	0.33	-35.77	0.16	-33.63	0.50
399-406	1890-1892	-35.16	0.40	-35.00	0.37	-33.55	0.28
415-418	1885-1886	-36.25	0.23	-35.85	0.39	-34.70	0.27
440-453	Pre-1885	-35.30	0.44	-35.23	0.19	-34.07	0.33

Table S3: Orchard composition and age, defined from aerial pictures.

Orchard name	Type of tree	Plot used as orchard since…
Oa	Pear trees	Less than 10 years
Ob	Vines	25 years
Oc	Apple trees	20 years
Od	Apple trees	20 years
Oe	Apple trees	40 years

Table S4: "Suess effect" corrected (back to 1840, pre-industrial era) CSIA $\delta^{13}C$ values, after Verburg (2007), for long-chain FAs of Lake Baldegg soil samples. CSIA results are mean values of at least triplicate analyses. T is the assumed turnover time of the FAs in the soil.

Soil samples	land use	C24:0 FA	Correction for Suess effect (1840)			C26:0 FA	Correction for Suess effect (1840)			C28:0 FA	Correction for Suess effect (1840)		
		$\delta^{13}C$ [‰]	T = 100y	T = 30y	T = 10y	$\delta^{13}C$ [‰]	T = 100y	T = 30y	T = 10y	$\delta^{13}C$ [‰]	T = 100y	T = 30y	T = 10y
A1a	arable land	-34.24	-33.58	-32.92	-32.41	-34.73	-34.08	-33.42	-32.91	-35.85	-35.19	-34.54	-34.02
A2a	arable land	-32.83	-32.17	-31.52	-31.00	-34.30	-33.64	-32.98	-32.47	-35.33	-34.68	-34.02	-33.51
A3a	arable land	-32.25	-31.59	-30.93	-30.42	-34.22	-33.56	-32.91	-32.39	-35.37	-34.72	-34.06	-33.55
A4a	arable land	-31.50	-30.85	-30.19	-29.68	-33.85	-33.19	-32.54	-32.02	-35.23	-34.57	-33.92	-33.40
F1a	forest	-32.59	-31.94	-31.28	-30.77	-34.26	-33.61	-32.95	-32.44	-35.32	-34.66	-34.01	-33.49
F2a	forest	-34.00	-33.34	-32.68	-32.17	-34.45	-33.80	-33.14	-32.63	-34.10	-33.44	-32.78	-32.27
F3a	forest	-32.58	-31.92	-31.27	-30.75	-33.43	-32.77	-32.11	-31.60	-34.42	-33.77	-33.11	-32.60
F5a	forest	-32.51	-31.86	-31.20	-30.69	-33.10	-32.45	-31.79	-31.28	-33.89	-33.23	-32.58	-32.06
F8a	forest	-33.10	-32.45	-31.79	-31.28	-33.87	-33.22	-32.56	-32.05	-34.63	-33.98	-33.32	-32.81
O2a	orchards	-32.84	-32.18	-31.52	-31.01	-34.14	-33.48	-32.83	-32.31	-35.05	-34.39	-33.74	-33.22
O3a	orchards	-33.24	-32.59	-31.93	-31.42	-34.43	-33.78	-33.12	-32.61	-35.01	-34.36	-33.70	-33.19
O4a	orchards	-33.21	-32.56	-31.90	-31.39	-34.55	-33.89	-33.24	-32.72	-35.29	-34.64	-33.98	-33.47
O4'a	orchards	-32.43	-31.78	-31.12	-30.61	-33.29	-32.64	-31.98	-31.47	-34.52	-33.86	-33.20	-32.69
O5a	orchards	-33.51	-32.86	-32.20	-31.69	-34.83	-34.18	-33.52	-33.01	-35.16	-34.51	-33.85	-33.34
PG1a	perm. grassl.	-35.00	-34.35	-33.69	-33.18	-35.71	-35.06	-34.40	-33.89	-37.10	-36.45	-35.79	-35.28
PG3a	perm. grassl.	-34.51	-33.85	-33.20	-32.68	-35.56	-34.91	-34.25	-33.74	-36.15	-35.49	-34.83	-34.32
PG2a (Ar2)	perm. grassl.	-34.11	-33.46	-32.80	-32.29	-35.23	-34.58	-33.92	-33.41	-36.32	-35.67	-35.01	-34.50
TG2a	temp grassl.	-34.34	-33.69	-33.03	-32.52	-35.58	-34.92	-34.26	-33.75	-36.73	-36.08	-35.42	-34.91
TG3a	temp grassl.	-33.74	-33.09	-32.43	-31.92	-35.06	-34.41	-33.75	-33.24	-36.64	-35.98	-35.33	-34.81
TG4a	temp grassl.	-34.83	-34.18	-33.52	-33.01	-35.68	-35.03	-34.37	-33.86	-36.33	-35.68	-35.02	-34.51
TG5a	temp grassl.	-33.23	-32.58	-31.92	-31.41	-34.90	-34.25	-33.59	-33.08	-36.30	-35.65	-34.99	-34.48

Table S5: "Suess effect" corrected (back to 1840, pre-industrial era) CSIA $\delta^{13}C$ values, after Verburg (2007), for long-chain FAs of Lake Baldegg lake sediment samples. CSIA results are mean values of at least triplicate analyses. T is the assumed turnover time of the FAs in the soil.

Lake sediments	Sediment	C24:0 FA	Correction for Suess effect (1840)			C26:0 FA	Correction for Suess effect (1840)			C28:0 FA	Correction for Suess effect (1840)		
Depth (mm)	age CE	$\delta^{13}C$ [‰]	T = 100y	T = 30y	T = 10y	$\delta^{13}C$ [‰]	T = 100y	T = 30y	T = 10y	$\delta^{13}C$ [‰]	T = 100y	T = 30y	T = 10y
000-009	2010	-36.27	-35.70	-35.11	-34.65	-34.39	-33.81	-33.22	-32.76	-34.75	-34.17	-33.58	-33.12
018-027	2000	-35.20	-34.75	-34.28	-33.91	-34.20	-33.75	-33.28	-32.91	-34.66	-34.21	-33.74	-33.38
042-052	1990	-33.90	-33.55	-33.18	-32.89	-33.53	-33.17	-32.81	-32.52	-34.83	-34.48	-34.12	-33.83
061-077	1983	-36.01	-35.72	-35.41	-35.16	-34.65	-34.36	-34.05	-33.80	-34.63	-34.34	-34.04	-33.79
092-100	1977	-37.74	-37.49	-37.23	-37.02	-34.25	-34.00	-33.74	-33.53	-34.36	-34.11	-33.84	-33.63
111-128	1971	-33.68	-33.46	-33.24	-33.05	-33.69	-33.48	-33.25	-33.07	-36.11	-35.90	-35.67	-35.49
142-157	1965	-33.34	-33.15	-32.96	-32.80	-33.59	-33.41	-33.21	-33.06	-37.81	-37.63	-37.44	-37.28
164-173	1958	-32.94	-32.78	-32.62	-32.49	-33.76	-33.61	-33.45	-33.32	-34.11	-33.96	-33.80	-33.67
175-184	1956	-33.34	-33.20	-33.05	-32.92	-33.14	-32.99	-32.84	-32.72	-32.92	-32.78	-32.63	-32.50
193-204	1951	-36.71	-36.59	-36.45	-36.34	-33.95	-33.82	-33.69	-33.58	-34.34	-34.21	-34.08	-33.97
211-225	1945	-36.26	-36.15	-36.04	-35.94	-33.96	-33.86	-33.74	-33.65	-34.04	-33.94	-33.82	-33.73
234-245	1939	-37.83	-37.74	-37.64	-37.56	-35.61	-35.52	-35.42	-35.34	-35.86	-35.77	-35.67	-35.59
259-270	1933	-39.03	-38.95	-38.87	-38.80	-36.05	-35.98	-35.89	-35.82	-35.63	-35.55	-35.47	-35.40
283-295	1927	-38.94	-38.88	-38.80	-38.75	-37.50	-37.44	-37.36	-37.30	-35.91	-35.85	-35.77	-35.71
305-315	1921	-38.70	-38.65	-38.59	-38.53	-35.64	-35.59	-35.53	-35.48	-35.06	-35.00	-34.94	-34.89
325-333	1915	-40.10	-40.06	-40.00	-39.96	-36.58	-36.53	-36.48	-36.43	-36.34	-36.29	-36.24	-36.19
345-353	1909	-39.13	-39.09	-39.04	-39.00	-37.76	-37.72	-37.67	-37.63	-36.02	-35.98	-35.93	-35.89
363-370	1903	-36.05	-36.02	-35.97	-35.94	-37.27	-37.24	-37.19	-37.16	-35.83	-35.80	-35.76	-35.72
381-389	1899	-35.65	-35.62	-35.58	-35.55	-35.77	-35.75	-35.71	-35.68	-33.63	-33.61	-33.57	-33.54
399-406	1891	-35.16	-35.14	-35.11	-35.08	-35.00	-34.98	-34.95	-34.92	-33.55	-33.53	-33.50	-33.47
415-418	1885	-36.25	-36.24	-36.21	-36.19	-35.85	-35.83	-35.81	-35.78	-34.70	-34.69	-34.66	-34.64
440-453	1880	-35.30	-35.28	-35.26	-35.24	-35.23	-35.22	-35.20	-35.18	-34.07	-34.06	-34.04	-34.01

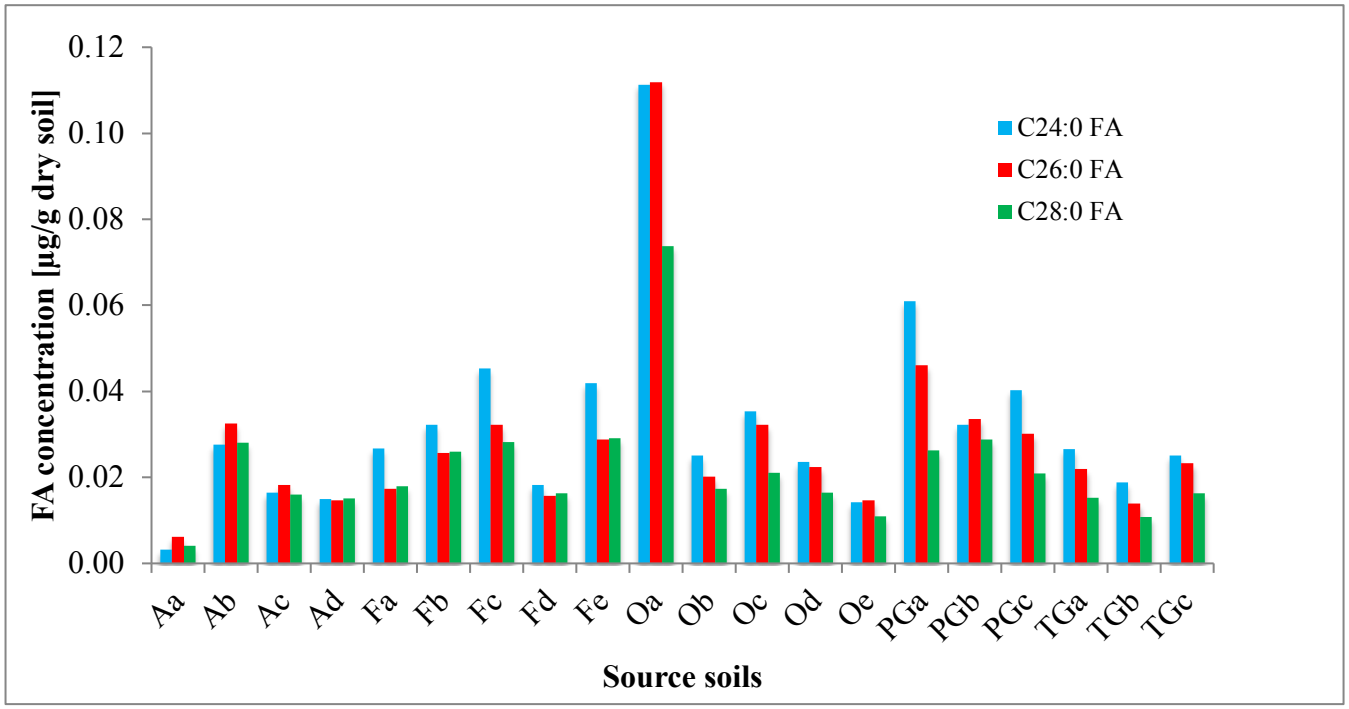

Fig.S1: FAs concentration for C24:0, C26:0 and C28:0 in source soils.

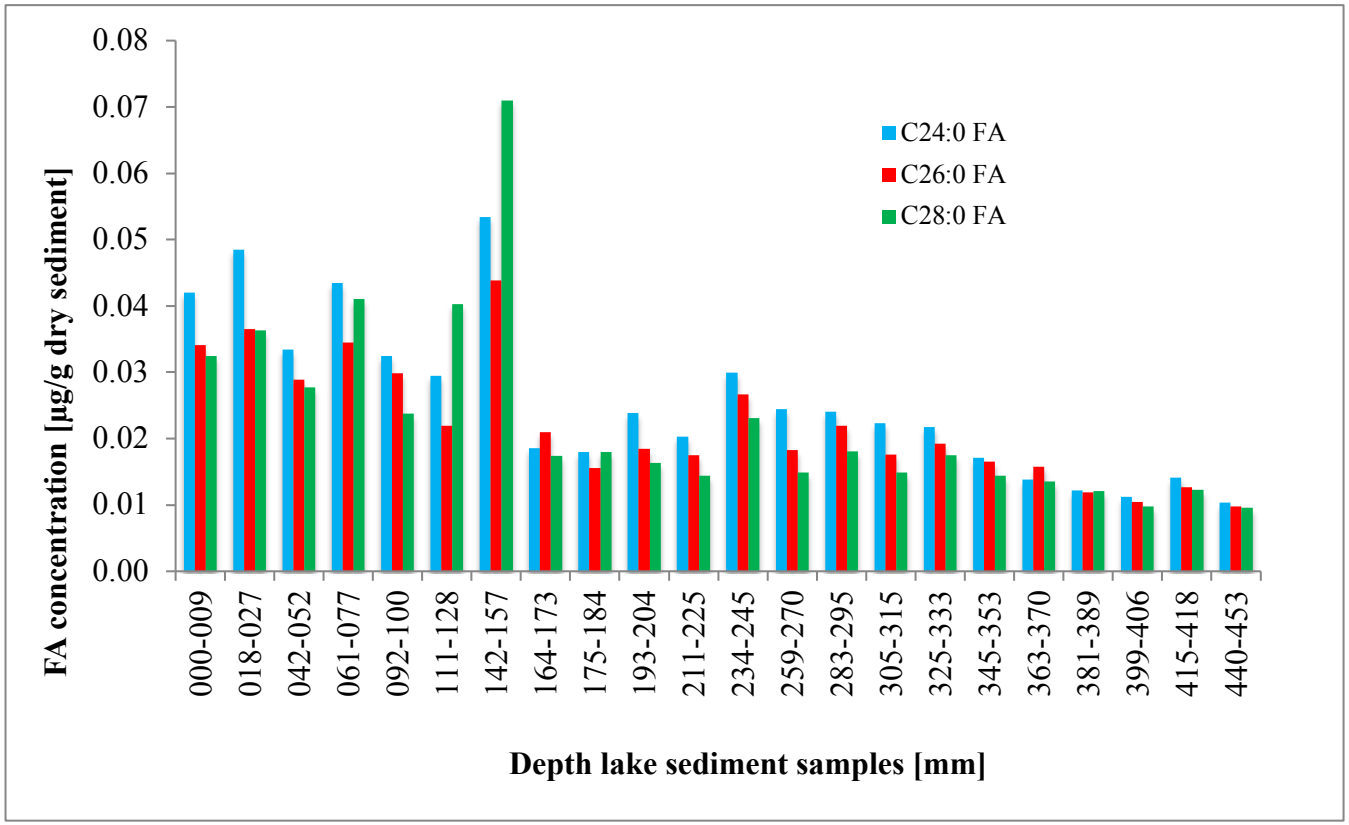

Fig. S2: Lake sediment FAs concentrations for C24:0, C26:0 and C28:0. No obvious enrichment of C24:0 and C26:0 compared to C28:0 and compared to soil FAs concentrations.

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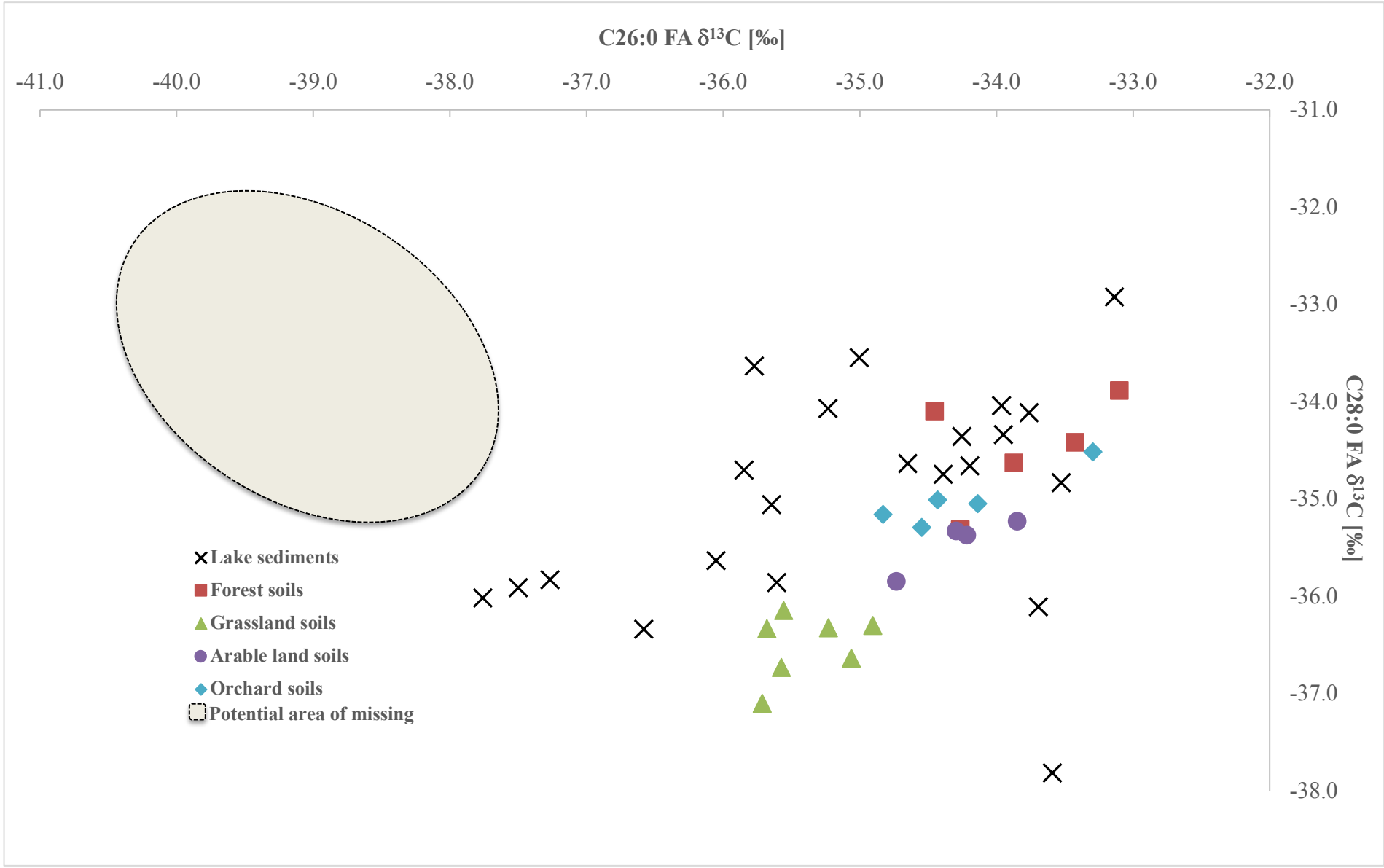

Fig. S3: The grey area, $\delta^{13}C$ of C26:0 and C28:0 FA, marks possible margins of the "missing source".

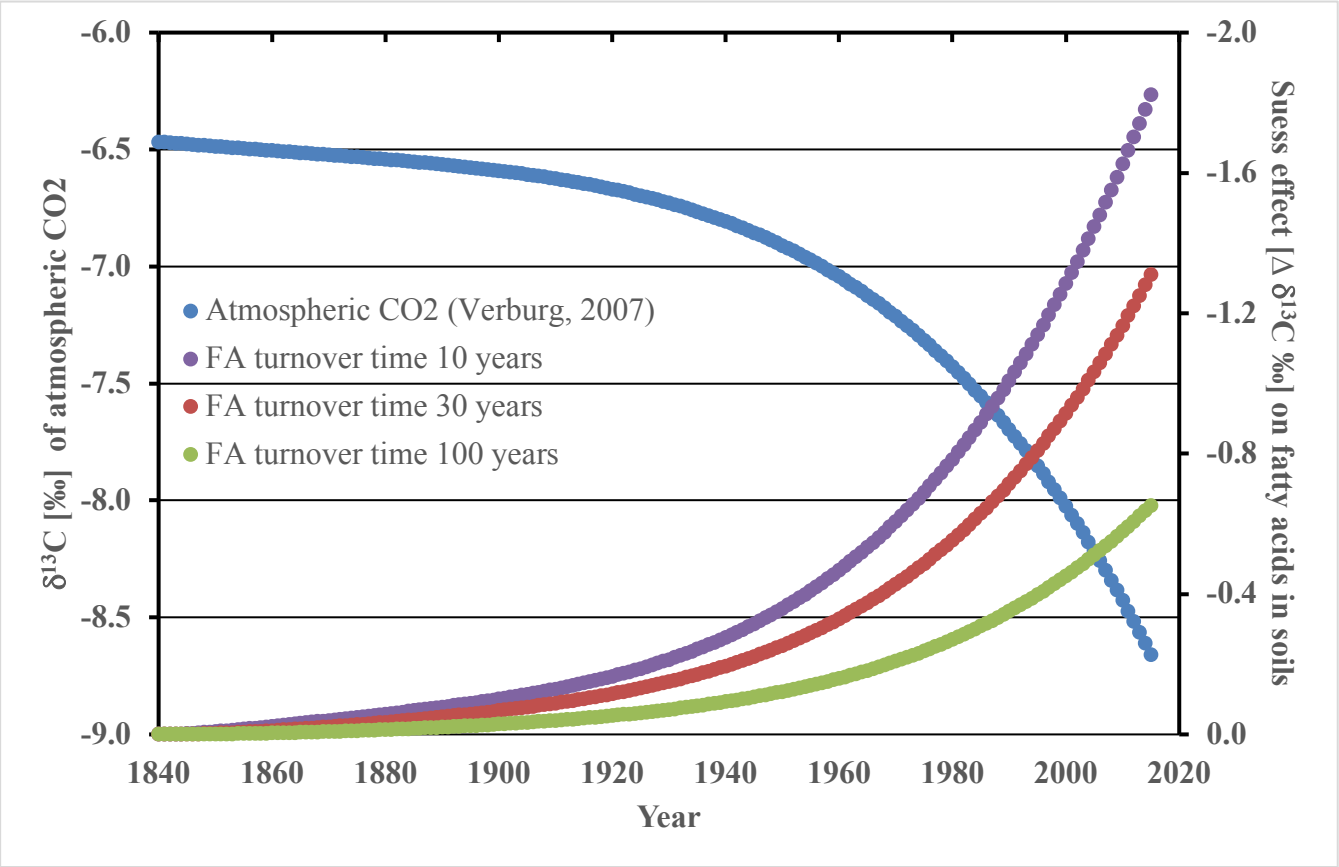

Fig. S4: Actual effect of the atmospheric "Suess effect" (Verburg, 2007) on the FAs in soils, assuming three different turnover times, 10, 30 and 100 years (Equation 1).

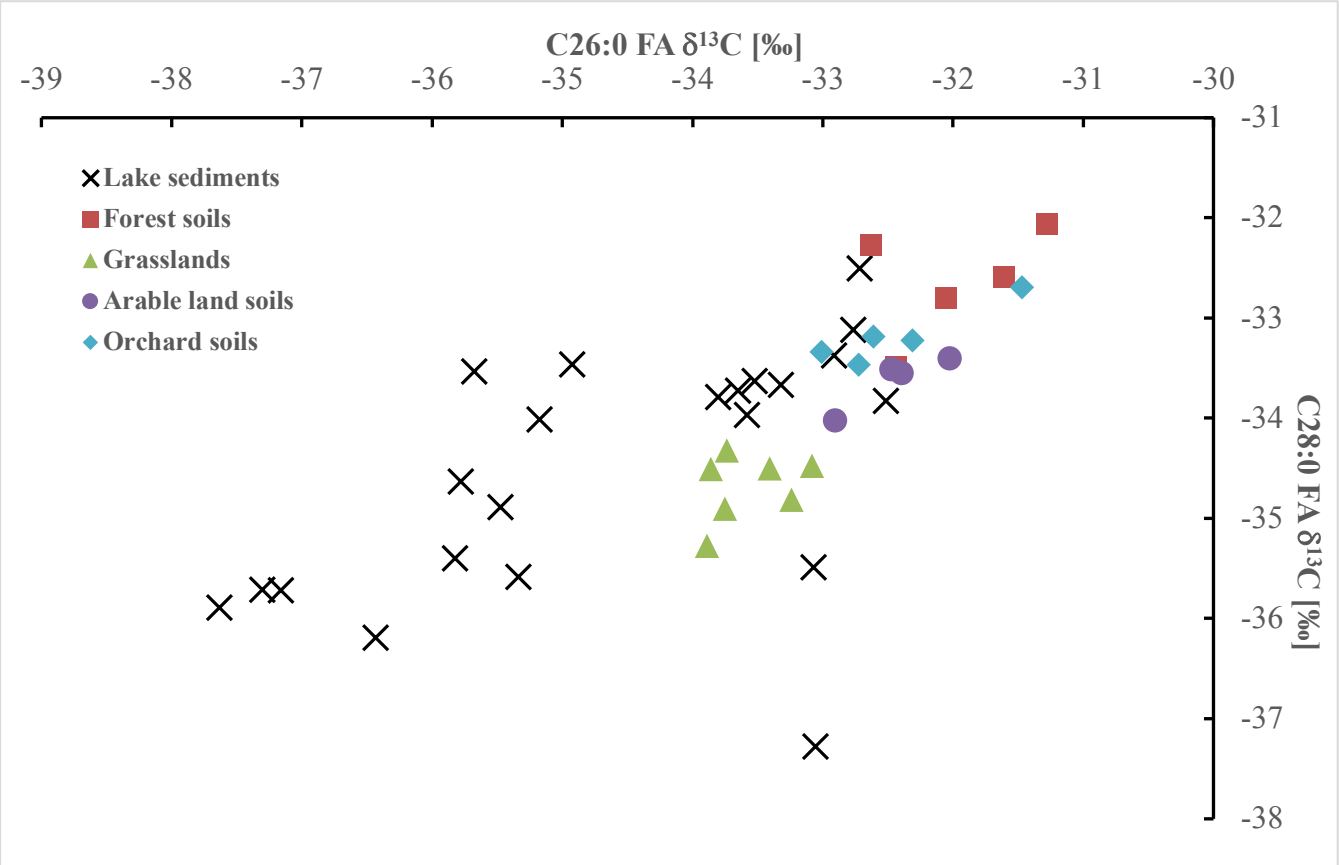

Fig. S5: "Suess effect" corrected sediments and soils (back to 1840) for 10y turnover time of FAs in soils, after Verburg (2007).

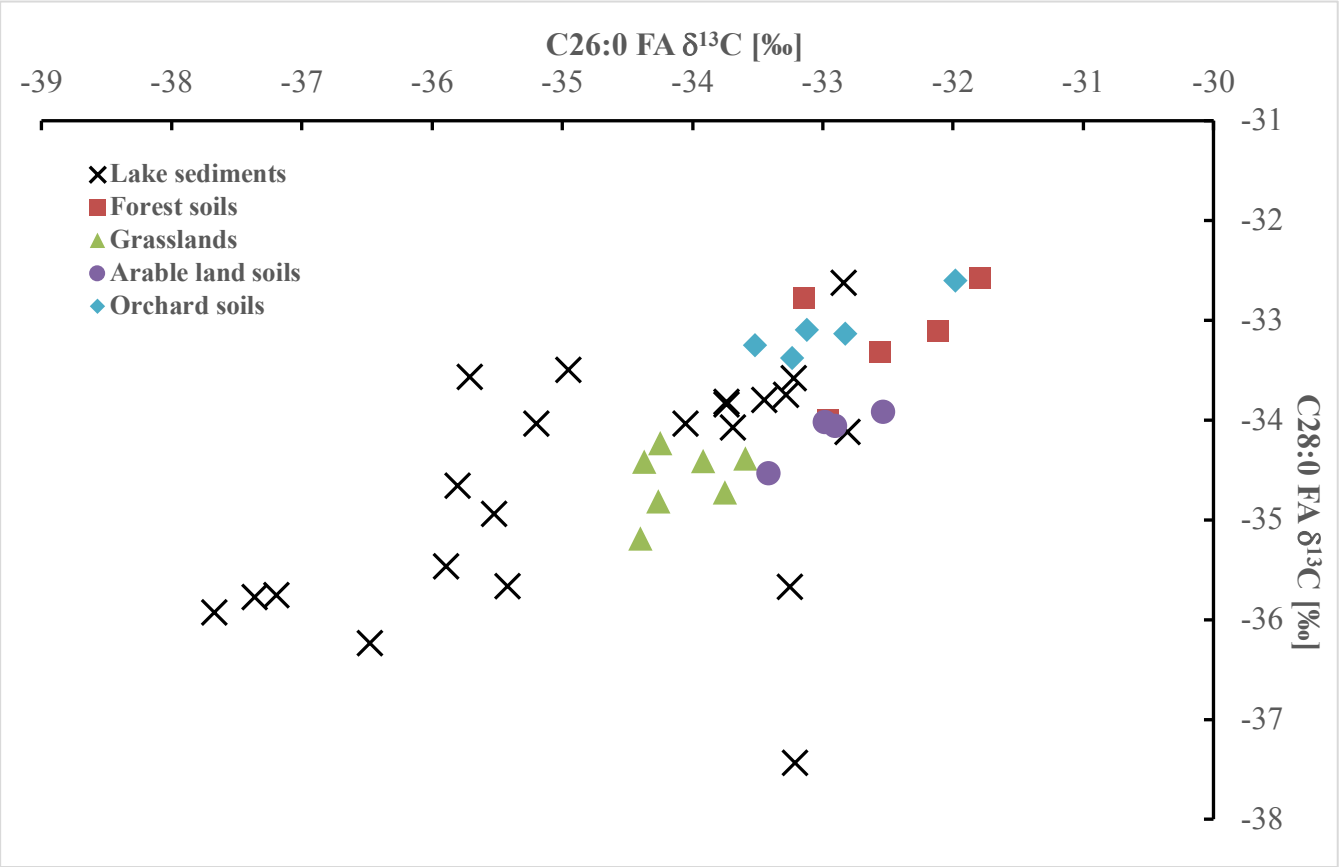

Fig. S6: "Suess effect" corrected sediments and soils (back to 1840) for 30y turnover time of FAs in soils, after Verburg (2007).

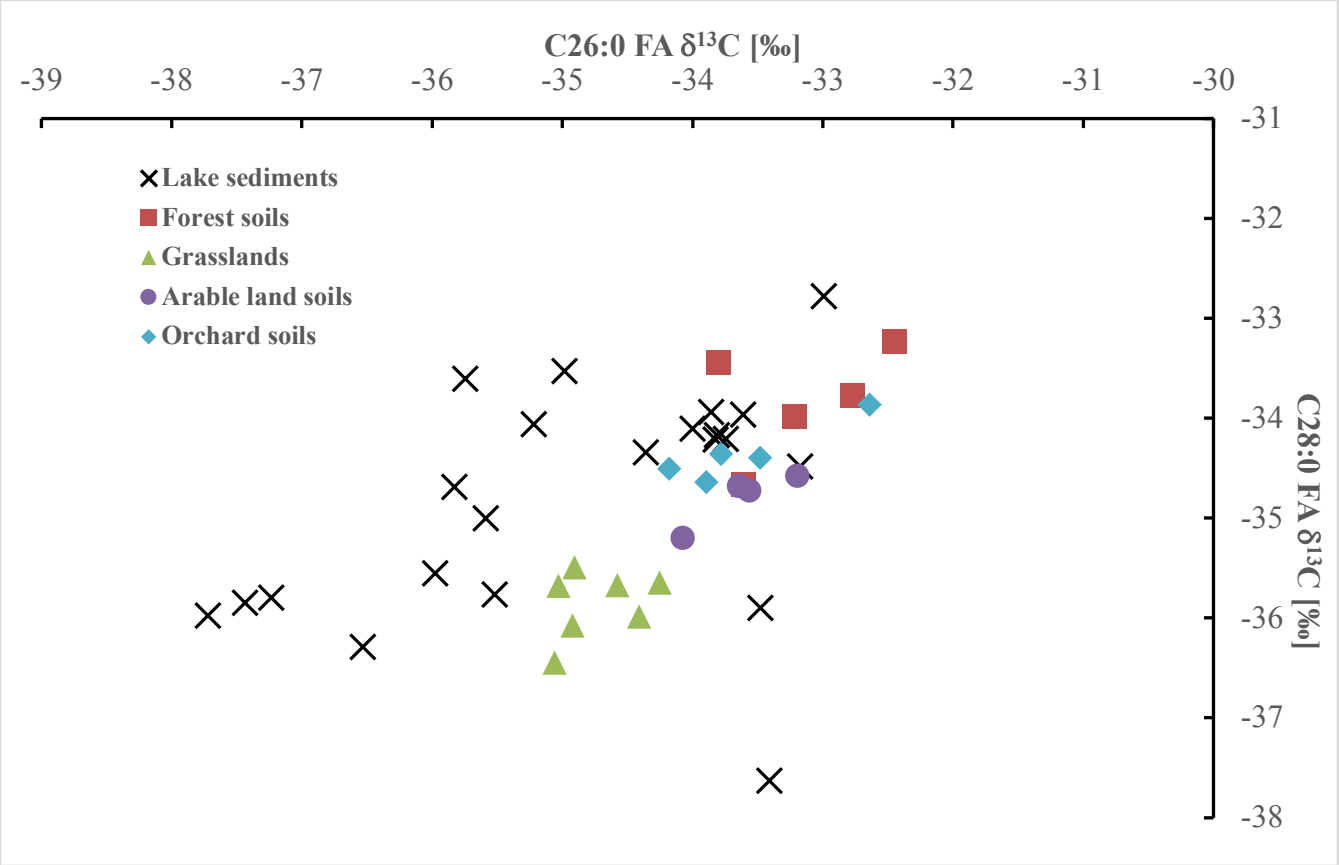

Fig. S7: "Suess effect" corrected sediments and soils (back to 1840) for 100y turnover time of FAs in soils, after Verburg (2007).