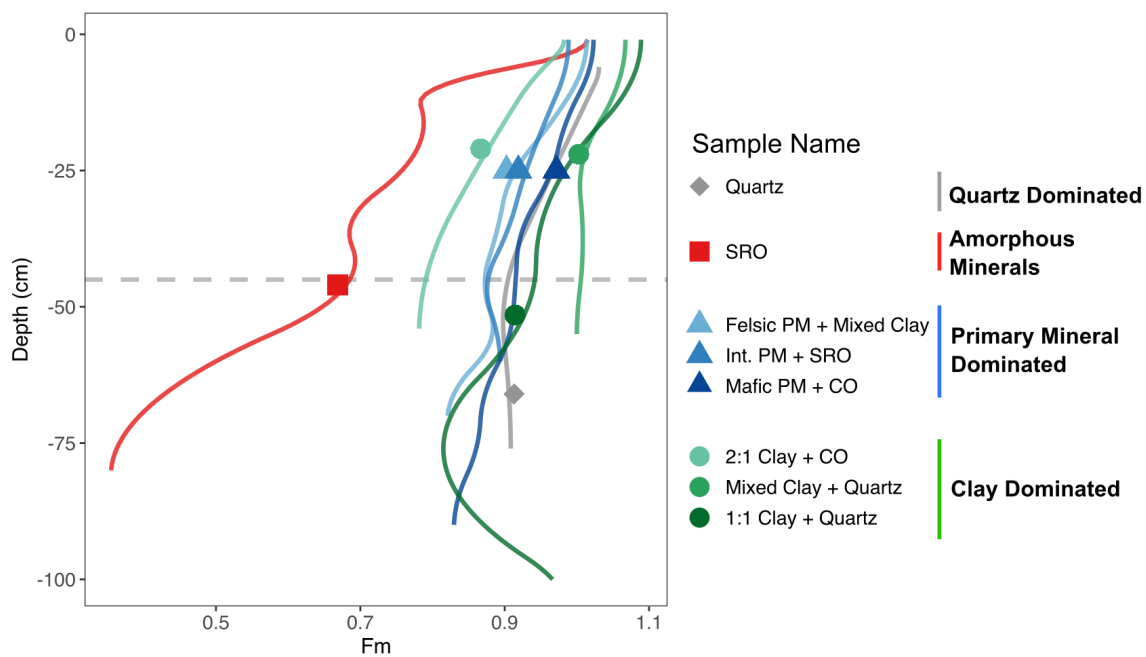
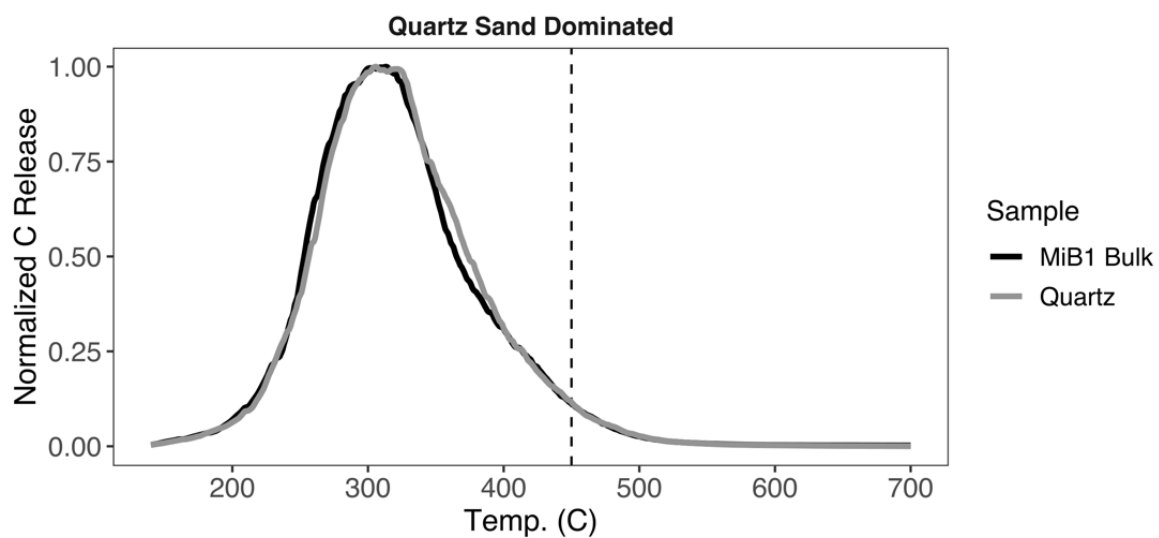


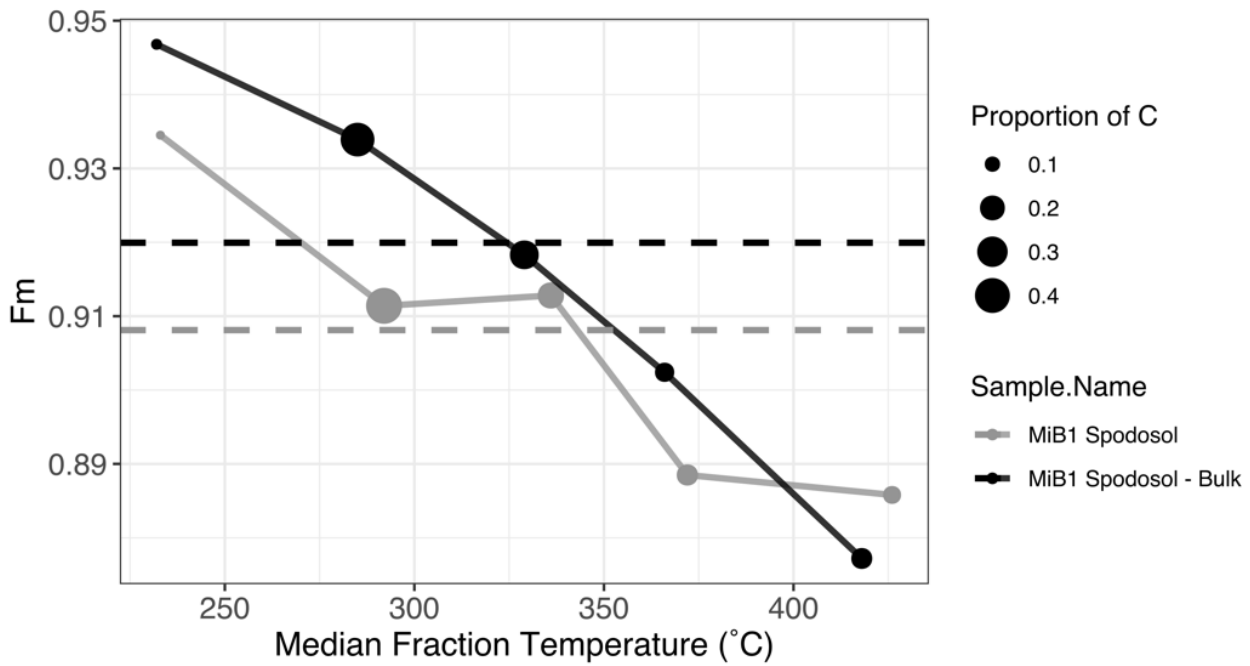
Supplement



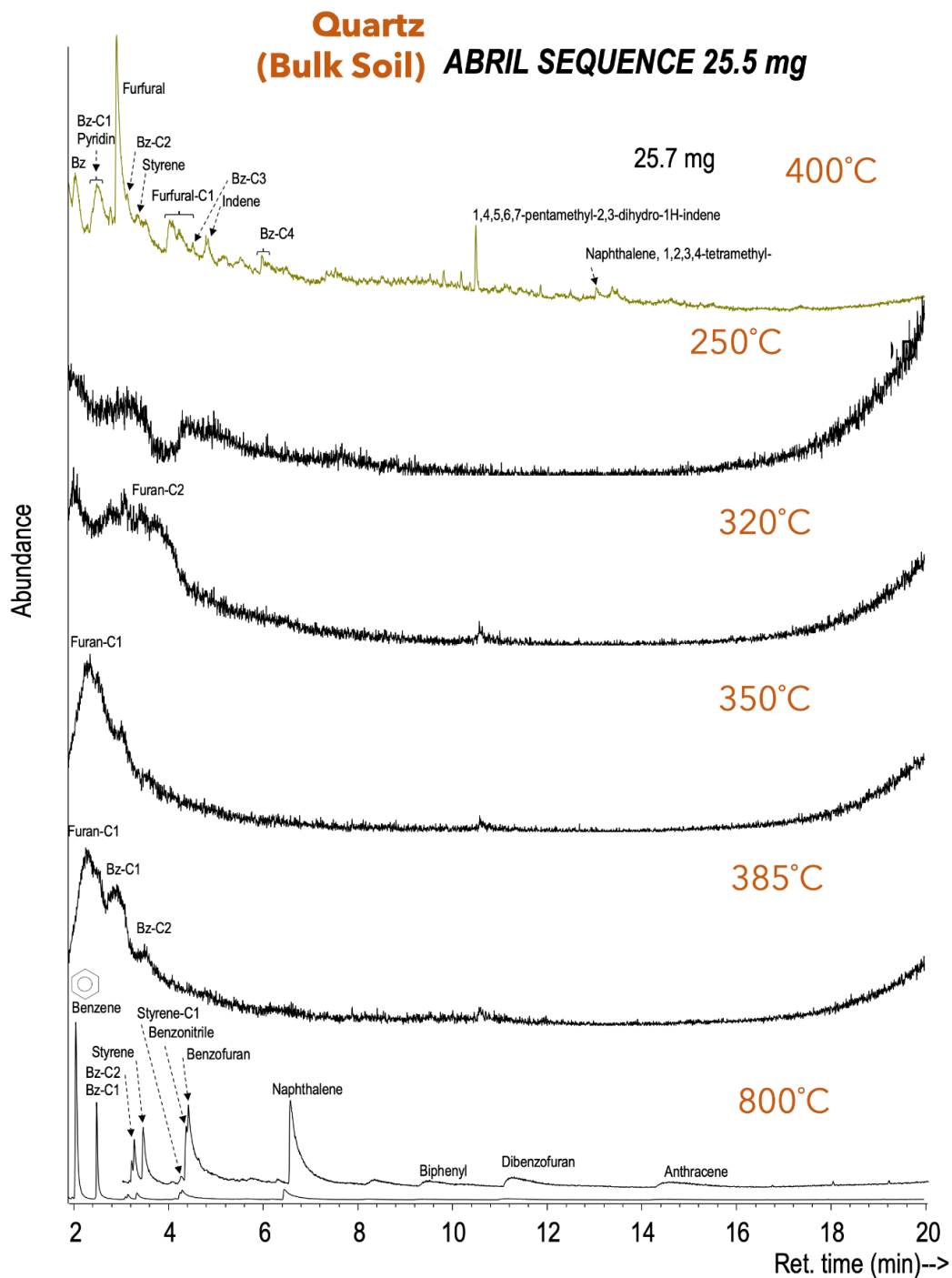
Supplemental figure S1: Mass-preserving depth splines (52) of soil ^{14}C . Dashed line represents 45 cm depth as reported in Table 1. For “CO + 1:1 Clay”, ^{14}C depth profile is from the same site, reported by Torn et al. (42), with the sample measured in this profile included.



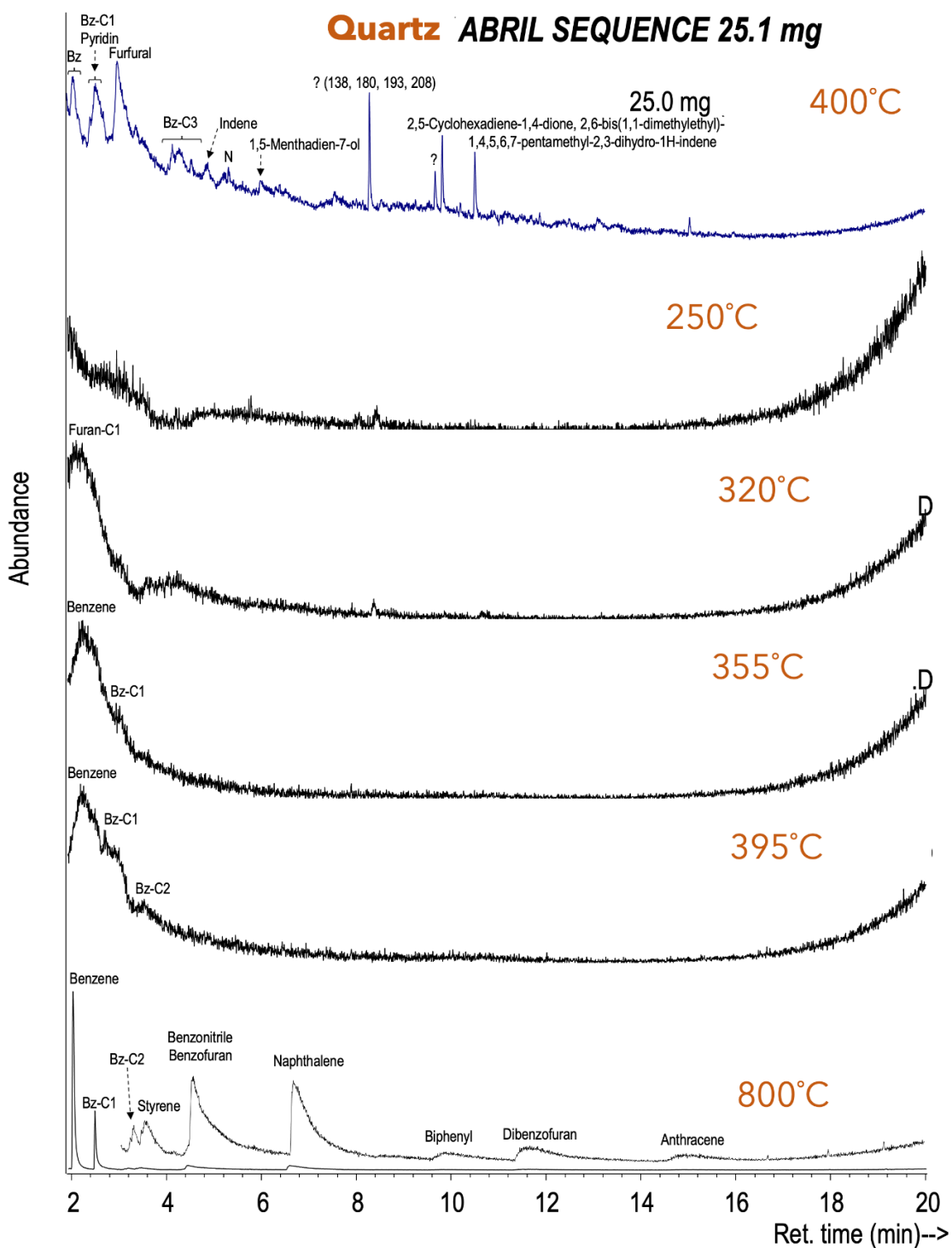
Supplemental figure S2: Thermogram comparison of sample "Quartz". "MiB1 Bulk" represents the bulk soil thermogram, and "Quartz" represents the density-fractionated MOM thermogram of the same sample. Thermograms show very little difference suggesting little change in the distribution of bond strengths as a result of density fractionation.



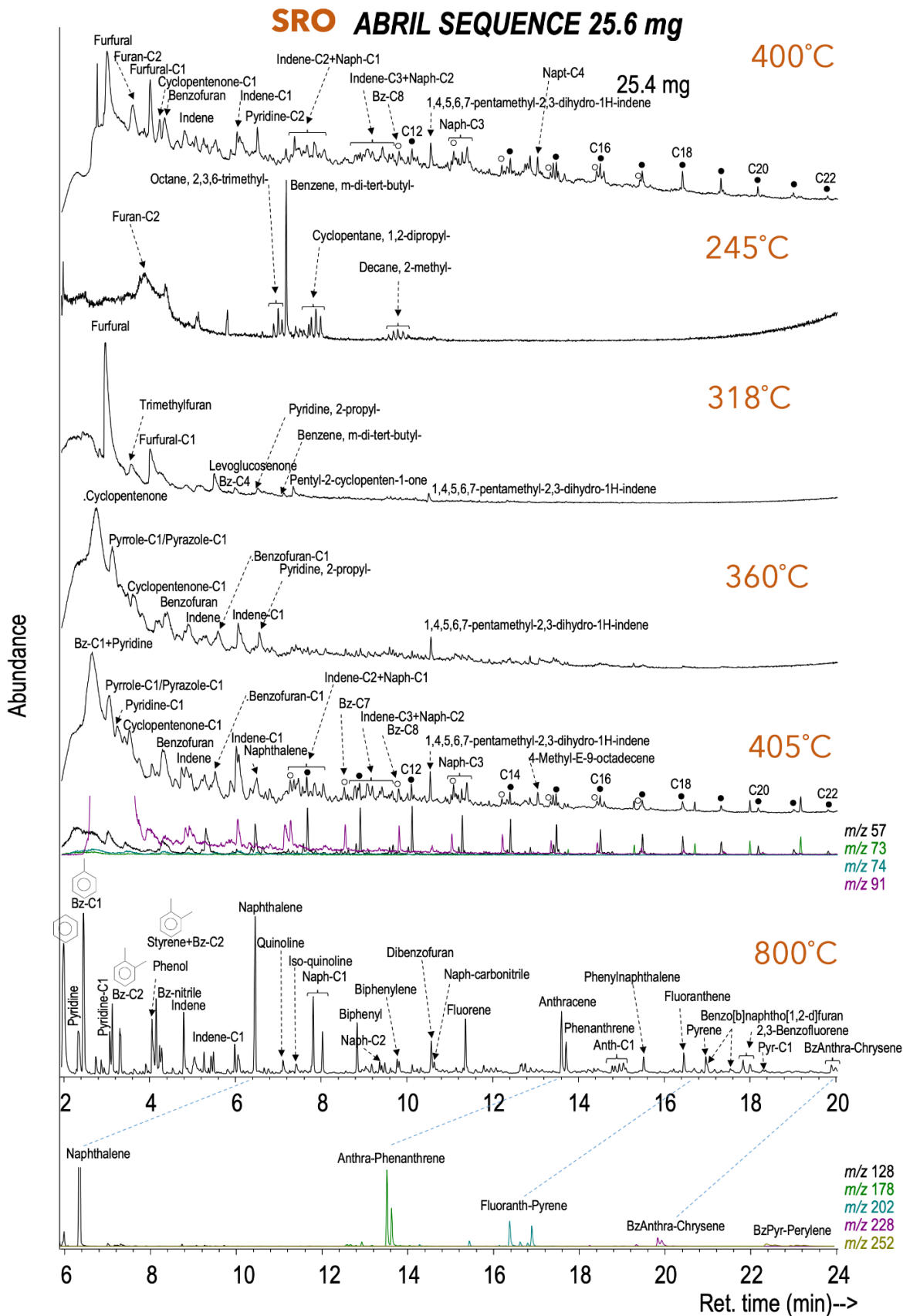
Supplemental figure S3: Thermal fractionation ¹⁴C data for sample “Quartz”. “MiB1 Spodosol” corresponds to sample “Quartz”, and “MiB1 Spodosol – Bulk” corresponds to the bulk soil from which “Quartz” was derived via density fractionation. Data suggest a loss of some younger C through density fractionation. Dashed lines represent mean ¹⁴C content for each sample.



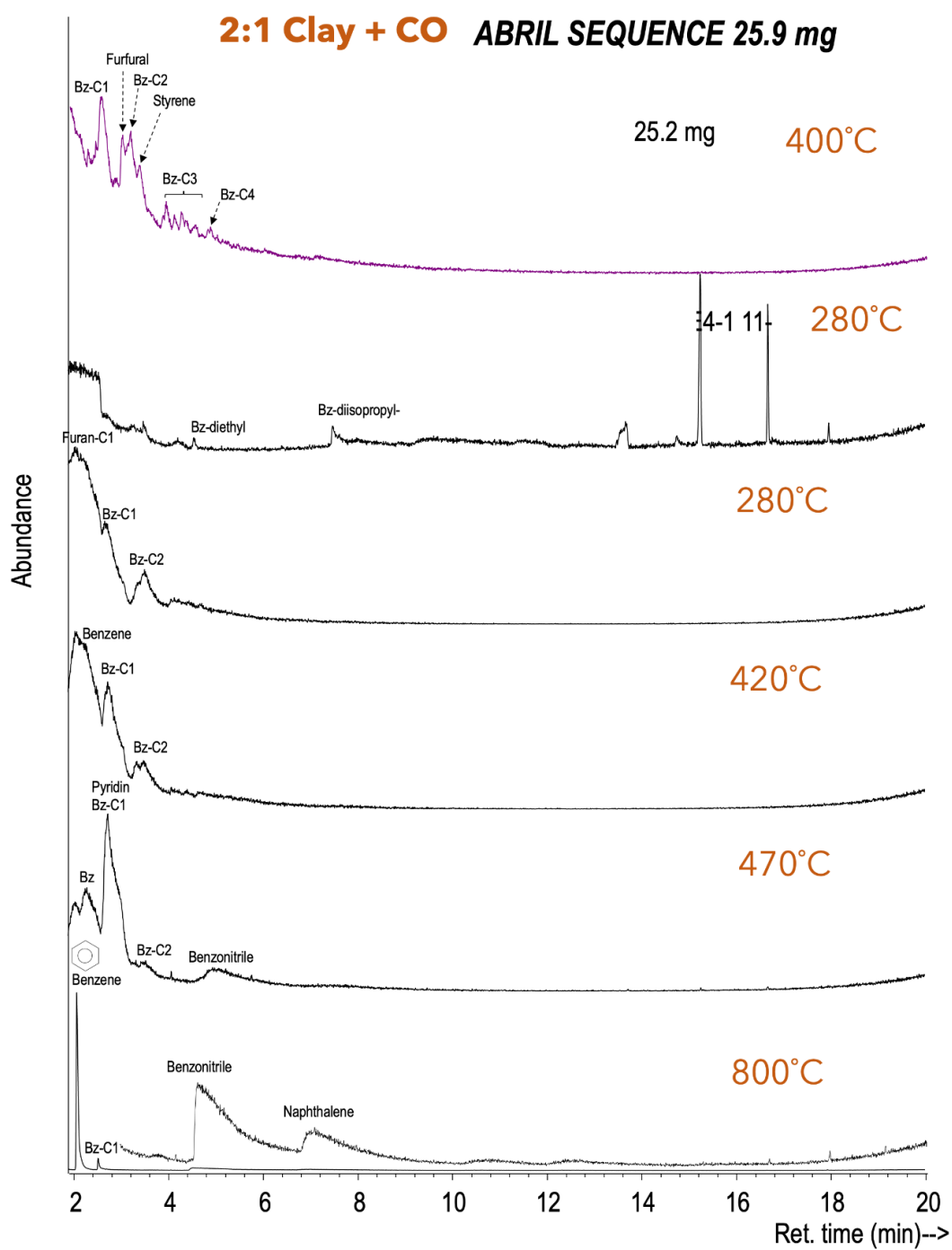
Supplemental figure S4: Multi-shot py-GC/MS profiles for MiB1, the bulk soil from which sample “Quartz” (Supplemental figure S6) was derived. Numbers at the end of each profile label denote the temperature of pyrolysis in degrees C.



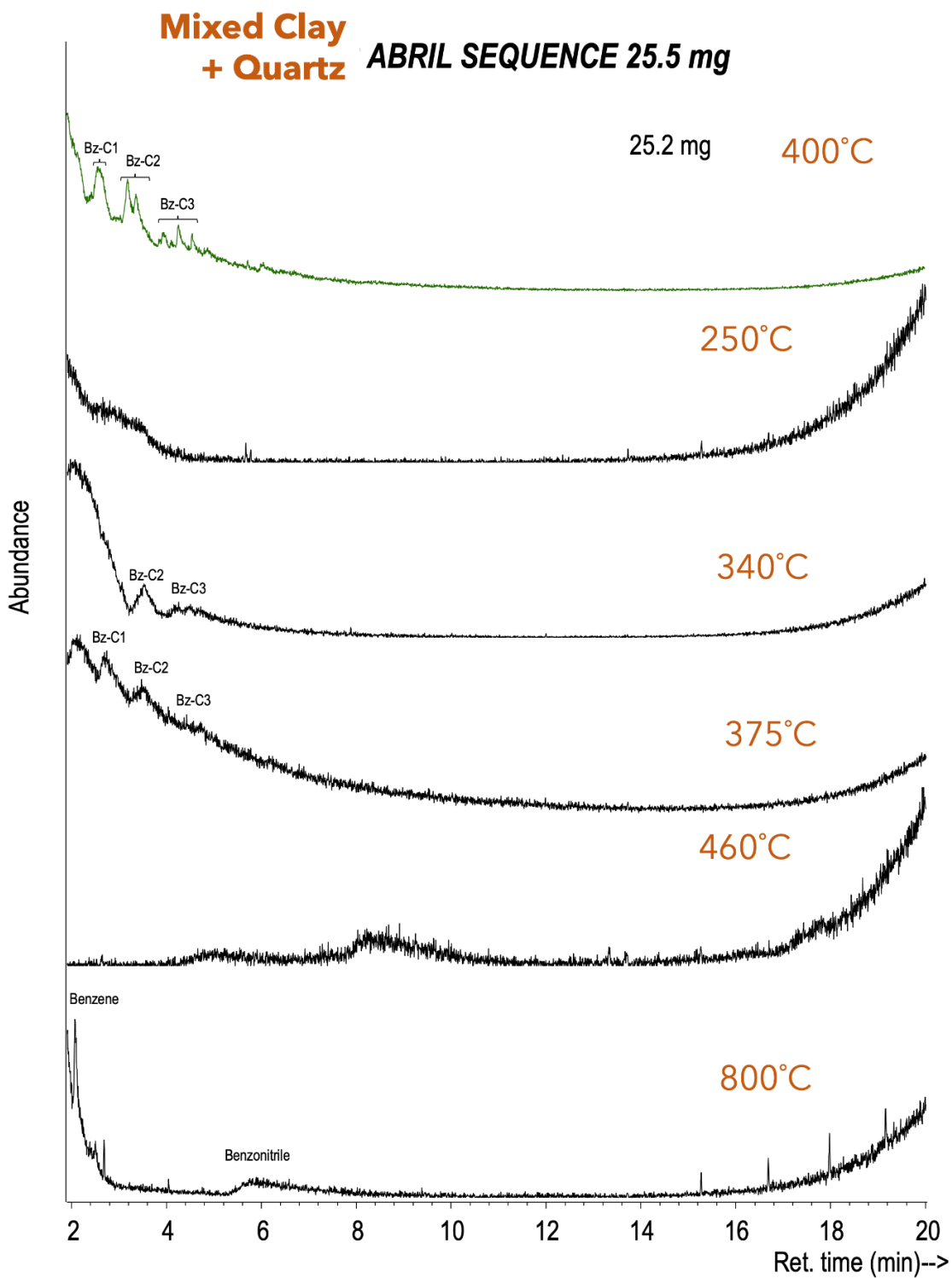
Supplemental figure S5: Multi-shot py-GC/MS profiles for sample “Quartz”. Numbers at the end of each profile label denote the temperature of pyrolysis in degrees C.



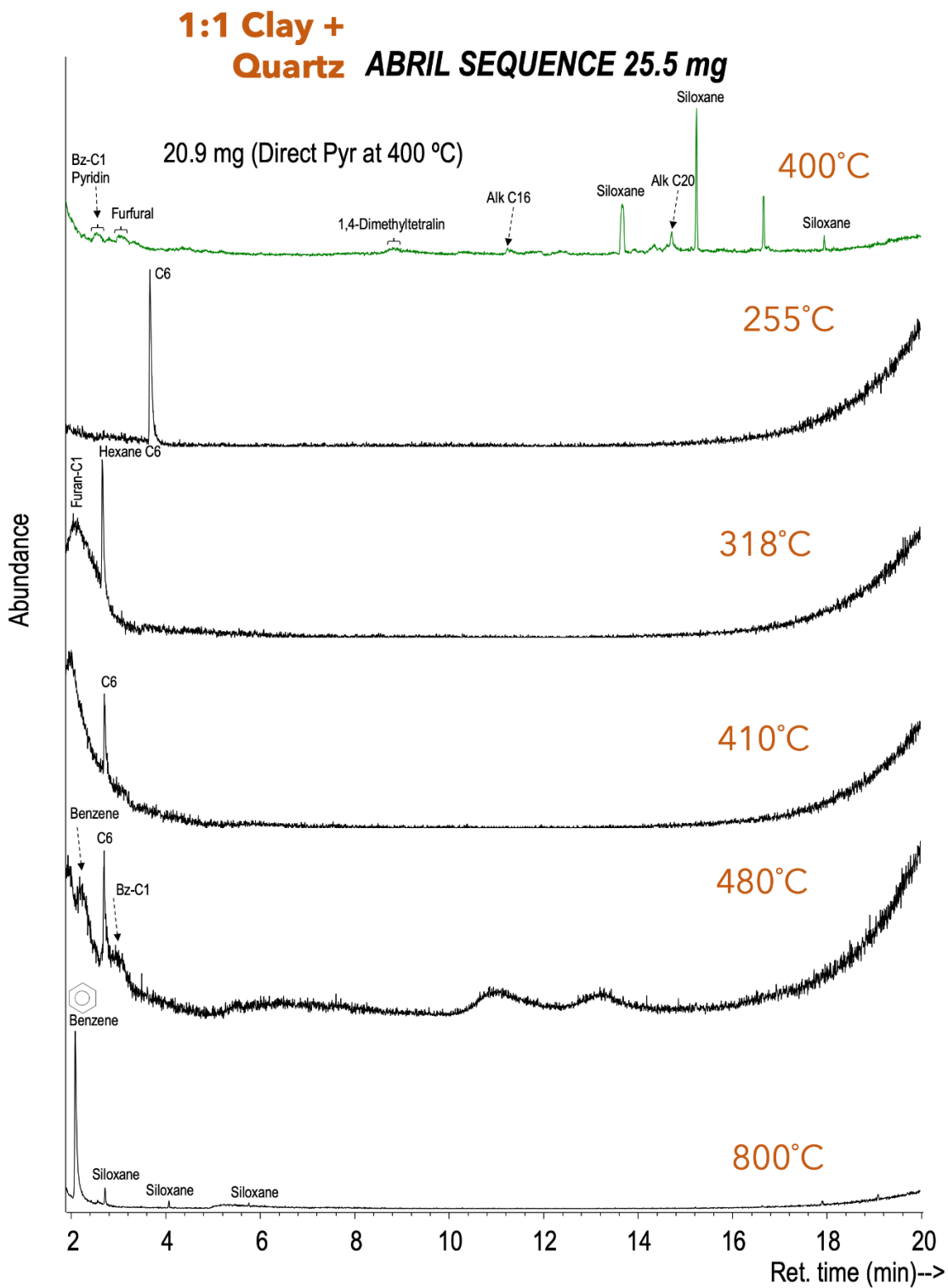
Supplemental figure S6: Multi-shot py-GC/MS profiles for sample “SRO”. Numbers at the end of each profile label denote the temperature of pyrolysis in degrees C.



Supplemental figure S7: Multi-shot py-GC/MS profiles for sample "2:1 Clay + CO". Numbers at the end of each profile label denote the temperature of pyrolysis in degrees C.



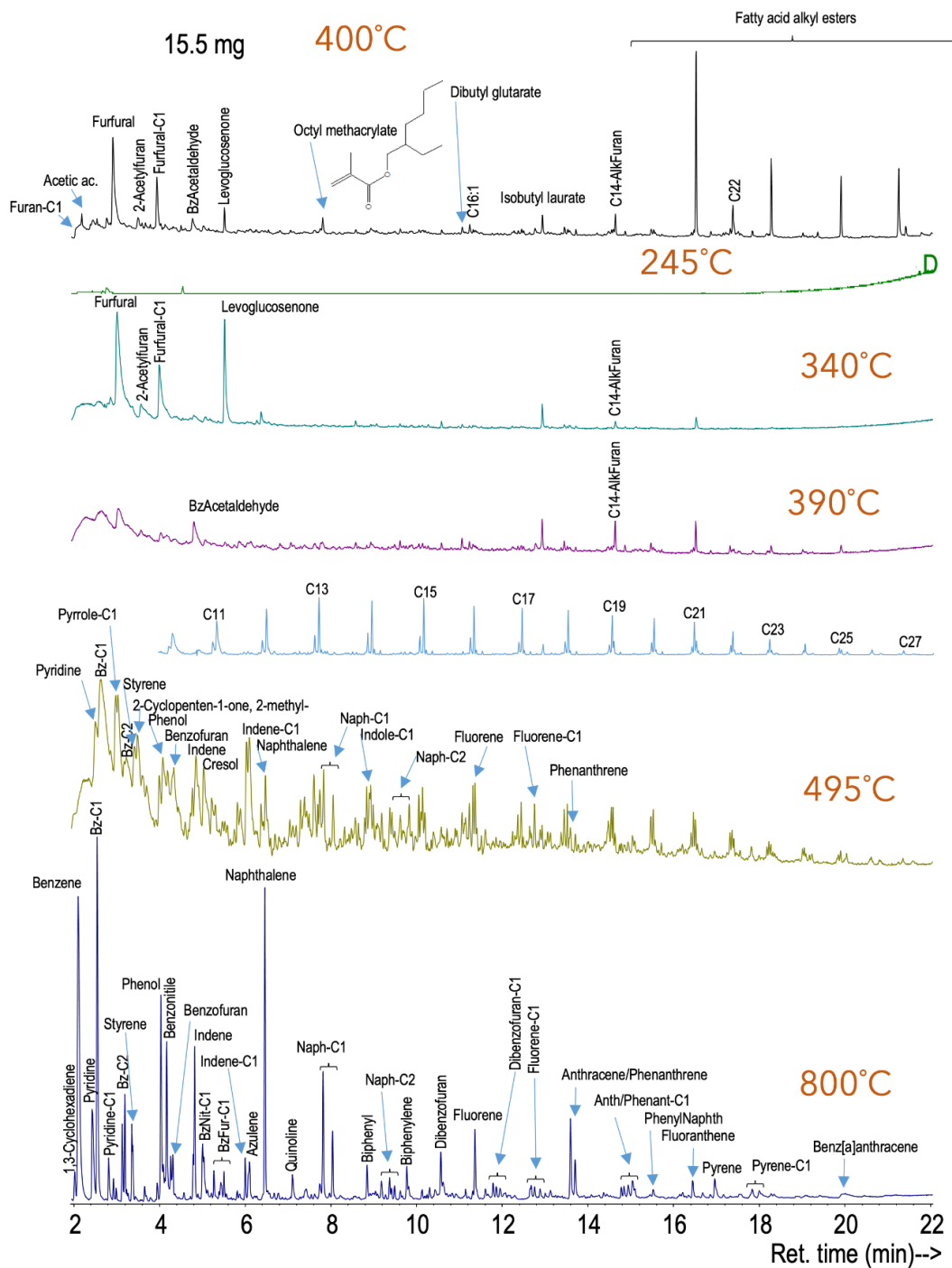
Supplemental figure S8: Multi-shot py-GC/MS profiles for sample “Mixed Clay + Quartz”. Numbers at the end of each profile label denote the temperature of pyrolysis in degrees C.



Supplemental figure S9: Multi-shot py-GC/MS profiles for sample “1:1 Clay + Quartz”. Numbers at the end of each profile label denote the temperature of pyrolysis in degrees C.

Int. PM + SRO SEQUENCE 22.8 mg

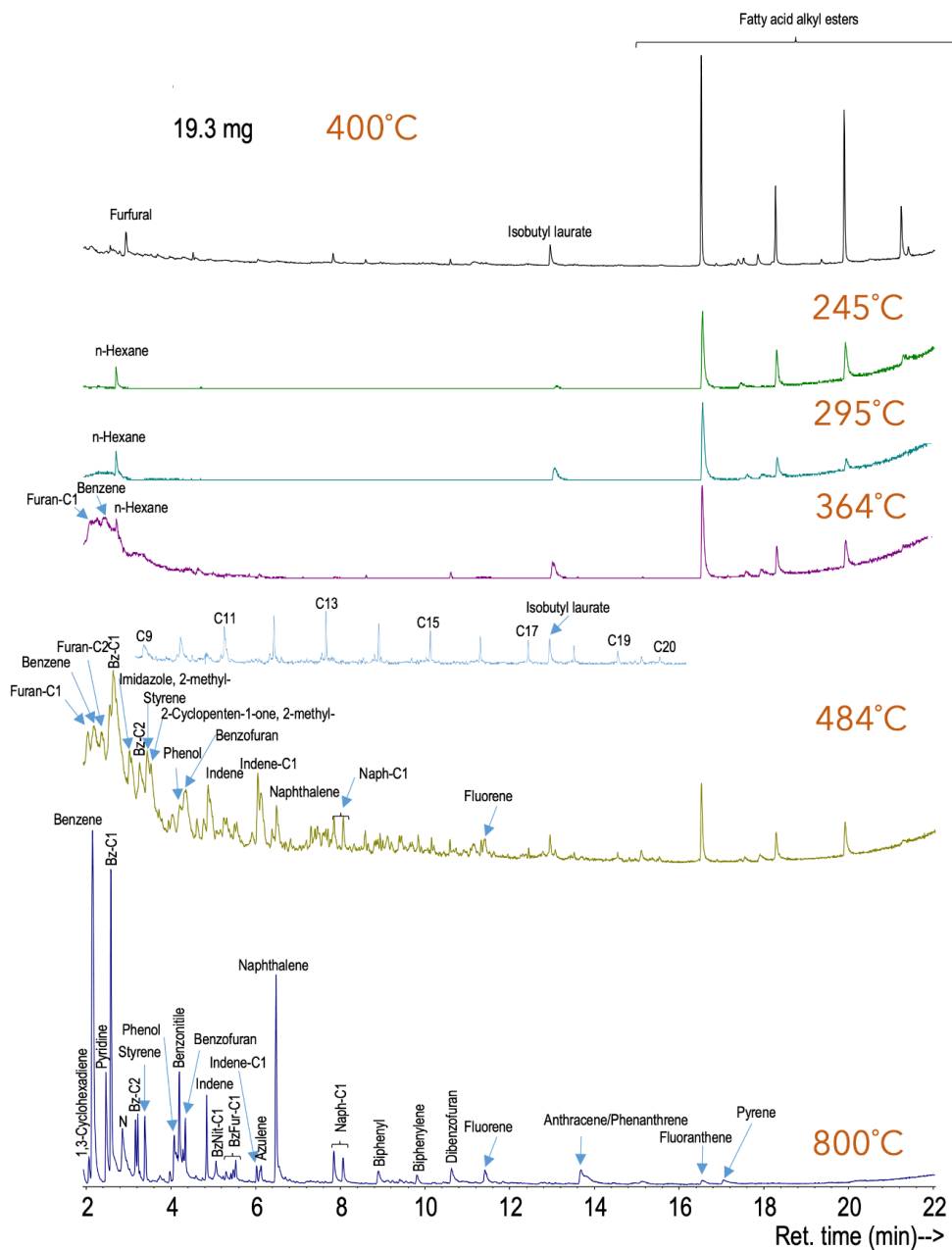
TIC: 15 MOM.D



Supplemental figure S10: Multi-shot py-GC/MS profiles for sample “Int. PM + SRO”. Numbers at the end of each profile label denote the temperature of pyrolysis in degrees C.

Mafic PM + CO SEQUENCE 22.7 mg

TIC: 6 MOM REP.D



Supplemental figure S12: Multi-shot py-GC/MS profiles for sample “Mafic PM + CO”. Numbers at the end of each profile label denote the temperature of pyrolysis in degrees C.

Supplemental Table S1

Sample	Bulk Fm	Bulk TT (yrs)	Fr. no.	Fr. Prop.	Fr. Fm	Fr. TT
Quartz	0.907	1135	1	0.10	0.935	845
			2	0.46	0.911	1046
			3	0.20	0.913	1025
			4	0.14	0.889	1244
			5	0.11	0.886	1268
SRO	0.674	3491	1	0.07	0.666	3582
			2	0.52	0.679	3423
			3	0.18	0.665	3606
			4	0.13	0.660	3659
			5	0.10	0.631	4046
1:1 Clay + Quartz	0.921	946	1	0.09	0.970	584
			2	0.40	0.974	553
			3	0.31	0.927	905
			4	0.12	0.898	1140
			5	0.09	0.845	1623
Mixed Clay + Quartz	1.009	335	1	0.10	1.042	211
			2	0.49	1.044	202
			3	0.13	1.000	392
			4	0.20	0.976	543
			5	0.08	0.926	919

			1	0.11	0.976	522
			2	0.52	0.934	841
2:1 Clay + CO	0.873	1353	3	0.15	0.862	1469
			4	0.13	0.857	1515
			5	0.09	0.836	1713
<hr/>						
			1	0.02	0.946	766
			2	0.48	0.939	805
Int. PM + SRO	0.892	1212	3	0.15	0.894	1183
			4	0.28	0.843	1664
			5	0.07	0.840	1676
<hr/>						
			1	0.04	1.006	368
			2	0.12	1.024	286
Mafic PM + CO	0.987	478	3	0.41	1.028	270
			4	0.36	0.981	520
			5	0.07	0.870	1404
<hr/>						
			1	0.14	0.945	773
			2	0.17	0.954	704
Felsic PM + Mixed Clay	0.938	830	3	0.51	0.943	773
			4	0.11	0.915	998
			5	0.08	0.863	1478

Supplementary table S1: Thermal fraction ^{14}C , proportional sizes, and one-pool model turnover times

Sample ID	R Index	I Index	Hydrogen Index (HI)	Oxygen Index (OI)
			mg HC / g TOC	mg CO ₂ / g TOC
Quartz	0.7974	-0.1398	67	314
Int. PM + SRO	0.8459	-0.2703	210	304
Felsic PM + Mixed Clay	0.8540	-0.2493	89	243
Mafic PM + CO	0.8550	-0.2214	93	278
SRO	0.8691	-0.3507	160	813
2:1 Clay + CO	0.7367	-0.0812	42	175
Mixed Clay + Quartz	0.6742	0.0358	52	117
1:1 Clay + Quartz	0.6766	0.0356	56	181

Supplemental table S2: Rock-Eval indices developed for soil organic matter studies (R and I indices, (62)) and traditional Rock Eval indices (HI and OI). “HC” = hydrocarbons, “TOC” = total organic carbon.