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Homeostatic Response of Aptian Gymnosperms to Changes in Atmospheric CO₂ Concentrations

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Supplementary Table DR1. Average (μ) and standard deviation (σ) of carbon isotope results for bulk organic matter, C₂₉ *n*-alkane, C₂₇ *n*-alkane, and cuticles for the two studied sites (Muirkirk and El Neck). Time was estimated using chemostratigraphic correlations (see main text).

Depth (m)	Site	Time (Ma)	$\delta^{13}\text{C}_{\text{org}}(\text{‰})$		$\delta^{13}\text{C-}n\text{C}_{29}(\text{‰})$		$\delta^{13}\text{C-}n\text{C}_{27}(\text{‰})$		$\delta^{13}\text{C}_{\text{cuticle}}(\text{‰})$	
			μ	σ	μ	σ	μ	σ	μ	σ
8.01	Muirkirk	110.0	-23.5	0.34	-26.3	0.64	-25.9	0.66	-24.5	0.23
7.71	Muirkirk	110.5	-22.5	0.25						
7.46	Muirkirk	111.0	-23.0	0.42						
7.11	Muirkirk	111.6	-22.2	0.14						
6.91	Muirkirk	111.9	-22.2	0.23	-25.5	0.53	-25.1	0.38	-23.4	0.16
6.71	Muirkirk	112.3	-22.6	0.11						
6.31	Muirkirk	113.0	-21.7	0.34						
6.00	Muirkirk	113.5	-22.3	0.21						
5.52	Muirkirk	114.4	-22.7	0.30	-25.4	0.59	-26.0	0.71		
5.14	Muirkirk	115.1	-24.4	0.41						
4.80	Muirkirk	115.7	-22.8	0.32						
4.52	Muirkirk	116.1	-23.1	0.11	-27.6	0.63	-27.0	0.62	-24.6	0.11
4.19	Muirkirk	116.7	-21.7	0.23						
3.92	Muirkirk	117.2	-22.6	0.28	-24.5	0.59	-24.4	0.61		
3.73	Muirkirk	117.5	-22.8	0.14						
3.35	Muirkirk	118.2	-23.8	0.35						
2.97	Muirkirk	119.2	-23.3	0.23	-26.3	0.60	-26.8	0.49	-23.5	0.26
2.74	Muirkirk	119.8	-22.4	0.20						
2.41	Muirkirk	120.7	-22.8	0.18	-25.6	0.64	-24.6	0.54		
2.11	Muirkirk	121.5	-22.3	0.17						
1.75	Muirkirk	122.5	-22.5	0.09						
1.46	Muirkirk	123.3	-22.4	0.21						
1.20	Muirkirk	124.0	-22.3	0.25	-27.4	0.53	-26.8	0.62	-24.3	0.08
0.72	Muirkirk	124.9	-25.5	0.18						
0.57	Muirkirk	125.2	-25.6	0.17	-29.8	0.61	-28.4	0.59	-27.7	0.31
0.14	Muirkirk	126.0	-24.2	0.32						
0.04	Muirkirk	126.2	-23.6	0.14						
4.60	El Neck	111.8	-23.6	0.19						
4.34	El Neck	112.5	-23.2	0.34						
4.13	El Neck	113.0	-22.8	0.42	-26.7	0.85	-26.6	0.72	-24.3	0.38
3.82	El Neck	113.8	-22.8	0.29						
3.62	El Neck	114.3	-23.7	0.26	-26.1	0.32	-25.3	0.63	-23.7	0.18
3.37	El Neck	114.9	-23.3	0.26						
3.20	El Neck	115.4	-23.7	0.30						
2.96	El Neck	116.0	-22.8	0.19	-26.7	0.71	-26.1	0.55		
2.81	El Neck	116.4	-23.1	0.51						
2.62	El Neck	116.9	-22.8	0.24	-25.1	0.68	-25.9	0.47	-23.1	0.21
2.40	El Neck	117.4	-22.3	0.31						
2.27	El Neck	117.8	-23.0	0.32						
2.10	El Neck	118.2	-23.9	0.28	-26.9	0.81	-26.4	0.33	-24.5	0.05
1.98	El Neck	119.0	-22.7	0.26						
1.45	El Neck	122.6	-23.1	0.21	-26.2	0.49	-27.5	0.58	-24.0	0.11
1.25	El Neck	124.0	-22.8	0.18						
0.91	El Neck	125.2	-25.8	0.23	-29.7	0.68	-29.1	0.32		
0.50	El Neck	126.6	-23.7	0.26						
0.03	El Neck	128.2	-22.2	0.37	-27.4	0.77	-28.7	0.68		

Supplementary Table DR2. Average (μ) and standard deviation (σ) of leaf carbon isotope composition ($\delta^{13}\text{C}_{\text{leaf}}$) and discrimination against ^{13}C during photosynthesis ($^{13}\Delta_{\text{leaf}}$), both obtained from $n\text{-C}_{29}$ and $n\text{-C}_{27}$ alkane $\delta^{13}\text{C}$ values (Table DR1) that were adjusted by their $^{13}\epsilon_{\text{biomarker}}$ values of 2.3‰ and 2.2‰, respectively. C_i/C_a and iWUE values were obtained from: $n\text{-C}_{27}$ $\delta^{13}\text{C}_{\text{leaf}}$; $\delta^{13}\text{C}$ values of atmospheric CO_2 ($\delta^{13}\text{C}_a$), as calculated by Barral et al. (2017); and atmospheric CO_2 estimates (C_a) from paleosols compiled by Foster et al. (2017). C_a values were selected if they were within the uncertainty (0.4 Myr) of the estimated ages for each of the Arundel Clay horizons. When that option was unavailable, C_a was linearly interpolated.

Time (Ma)	$n\text{-C}_{29}$ $\delta^{13}\text{C}_{\text{leaf}}$ (‰)		$n\text{-C}_{27}$ $\delta^{13}\text{C}_{\text{leaf}}$ (‰)		$\delta^{13}\text{C}_a$ (‰)		C_a (ppmv)			$n\text{-C}_{29}$ $^{13}\Delta_{\text{leaf}}$ (‰)		$n\text{-C}_{27}$ $^{13}\Delta_{\text{leaf}}$ (‰)		C_i/C_a (ppmv/ppmv)		iWUE ($\mu\text{mol/mol}$)	
	μ	σ	μ	σ	μ	σ	μ	low	high	μ	σ	μ	σ	μ	σ	μ	σ
110.0	-24.1	1.6	-23.6	1.1	-5.15	0.90	1065.0	532.0	2130.0	19.4	1.9	18.9	1.5	0.613	0.054	257.7	134.9
111.9	-23.3	1.6	-22.8	1.0	-4.95	0.90	1829.0	914.0	3658.0	18.8	1.9	18.3	1.4	0.589	0.054	470.0	245.8
113.0	-24.5	1.7	-24.3	1.2	-3.95	0.90	1005.0	503.0	2010.0	21.1	2.0	20.8	1.5	0.696	0.065	191.2	60.1
114.3	-23.9	1.5	-23.0	1.1	-4.28	0.90	1405.0	702.0	2810.0	20.1	1.8	19.2	1.5	0.627	0.062	327.7	158.2
114.4	-23.2	1.6	-23.7	1.2	-4.28	0.90	1405.0	702.0	2810.0	19.4	1.9	19.9	1.5	0.658	0.064	300.5	171.8
116.0	-24.5	1.7	-23.8	1.1	-5.05	0.90	1071.0	536.0	2142.0	19.9	2.0	19.3	1.4	0.629	0.061	248.2	130.2
116.1	-25.4	1.6	-24.7	1.1	-5.05	0.90	1666.0	833.0	3331.0	20.8	1.9	20.1	1.5	0.666	0.062	348.3	184.8
116.9	-22.9	1.7	-23.6	1.0	-5.38	0.90	1190.0	595.0	2380.0	17.9	1.9	18.6	1.4	0.603	0.059	295.3	154.5
117.2	-22.3	1.6	-22.1	1.1	-5.23	0.90	1277.0	639.0	2554.0	17.4	1.9	17.2	1.5	0.544	0.062	364.2	200.6
118.2	-24.7	1.7	-24.1	1.0	-5.08	0.90	1272.0	636.0	2543.0	20.1	2.0	19.5	1.4	0.641	0.058	289.1	141.8
119.2	-24.1	1.6	-24.5	1.0	-4.74	0.90	1179.0	590.0	2358.0	19.8	1.9	20.2	1.4	0.670	0.060	243.1	129.8
120.7	-23.4	1.6	-22.3	1.1	-3.64	0.90	634.6	317.3	1269.2	20.2	1.9	19.1	1.4	0.623	0.061	149.5	87.5
122.6	-24.0	1.6	-25.2	1.1	-5.54	0.90	709.6	354.8	1419.1	18.9	1.9	20.1	1.5	0.667	0.062	147.8	104.4
124.0	-25.2	1.6	-24.5	1.1	-5.54	0.90	1018.0	509.0	2035.0	20.2	1.9	19.5	1.5	0.639	0.062	229.8	67.1
125.2	-27.6	1.6	-26.2	1.1	-5.49	0.90	1042.7	521.3	2085.3	22.7	1.9	21.2	1.5	0.712	0.062	187.4	99.1
128.2	-25.2	1.7	-26.4	1.1	-6.22	0.90	393.0	234.0	551.0	19.5	2.0	20.7	1.5	0.690	0.064	76.0	37.3

Figure DR1. Time series for the carbon isotope composition of bulk organic matter ($\delta^{13}\text{C}_{\text{org}}$) for the two studied sequences of the Arundel Clay: El Neck (left panel) and Muirkirk (right panel).

Figure DR2. Reconstructed ion chromatograms showing the distribution of underivatized aromatic sesqui- and di-terpenoids. Compound names and structures are shown in Figure DR3.

Figure DR3. Aromatic sesqui- and di-terpenoids names and structures recognized in the studied Aptian sequences.