

Supplementary Table 2. Isotopic composition of ASI paleosol carbonates.									
SIMA02 #	Site	Level	Material	Carb MAW#	Material	Carb 13C	18Opdb	18Osmow	%C4
19	Asa Issie Upper tr	3	Silty clay	260	Root cast 10.5x5 cm	-6.039	-5.927	24.800	35.4
20a	Asa Issie Upper tr	3	Silty clay	261	Root cast 1.5x2 cm	-6.147	-5.334	25.411	34.7
20b	Asa Issie Upper tr	3	Silty clay	262	Root cast 4x1.4 w xtals	-6.895	-6.532	24.176	29.3
21	Asa Issie Upper tr	5	Clayey silt crumb	263	Nodule 5.5x3.5 cm	-7.635	-5.806	24.924	24.0
22	Asa Issie Upper tr	5	Clayey silt crumb	264	Nodule 5.5x3.5 cm	-7.092	-6.397	24.315	27.9
23	Asa Issie Upper tr	5	Clayey silt crumb	265	Nodule 9.5x5.5 cm	-7.032	-7.837	22.780	28.3
24	Asa Issie Upper tr	5	Clayey silt crumb	266	Root cast 5x2 cm	-7.092	-6.532	24.176	27.9
25	Asa Issie Upper tr	7	Silt	267	Nodule 8x3 cm	-7.047	-6.048	24.675	28.2
26	Asa Issie Upper tr	7	Silt	268	Nodule w. xtals 6x3.5 cm	-7.503	-9.027	21.604	25.0
27	Asa Issie Upper tr	8	Siltstone	269	Nodule crumbly 7x4 cm	-7.310	-6.840	23.859	26.4
28	Asa Issie Lower tr	5	Clayey silt crumb	270	Root cast 4x2 cm	-6.307	-5.134	25.617	33.5
29	Asa Issie Lower tr	5	Clayey silt crumb	271	Root cast 2.5x1 cm	-5.788	-4.659	26.200	37.2
30a	Asa Issie Lower tr	5	Clayey silt crumb	272	Root cast 1.5x2.5 cm	-6.546	-5.534	25.205	31.8
30b	Asa Issie Lower tr	5	Clayey silt crumb	273	Root cast 1.5x2.5 cm	-6.360	-4.683	26.082	33.1
31a	Asa Issie Lower tr	5	Clayey silt crumb	274	Root cast 3x2 cm	-6.551	-4.971	25.785	31.8
31b	Asa Issie Lower tr	5	Clayey silt crumb	275	Root cast 3x2 cm	-6.602	-4.920	25.838	31.4
32a	Asa Issie Lower tr	5	Clayey silt crumb	276	Root cast 3.5x2 cm	-6.653	-4.585	26.183	31.1
32b	Asa Issie Lower tr	5	Clayey silt crumb	277	Root cast 3.5x2 cm	-6.531	-3.395	27.410	31.9
33	Asa Issie Lower tr	5	Clayey silt crumb	278	Root cast 6x2.5 cm	-6.204	-4.324	26.452	34.3
34	Asa Issie North tr	4	Silt/claystone	279	Nodule w. xtals 1.5x2 cm	-7.456	-7.857	22.801	25.3
					<i>Mean upper</i>	<b>-6.921</b>	<b>-6.361</b>	<b>24.346</b>	<b>29.1</b>
					<i>Mean lower</i>	<b>-6.394</b>	<b>-4.689</b>	<b>26.086</b>	<b>32.9</b>
					<i>SD upper</i>	<b>0.515</b>	<b>0.717</b>	<b>0.753</b>	
					<i>SD lower</i>	<b>0.271</b>	<b>0.598</b>	<b>0.618</b>	

Interiors of carbonate nodules and rootcasts were drilled with a diamond burr rotary tool. Powdered samples weighing 30-130 mg were roasted under vacuum at 400°C for 4 hours. Samples weighing 45-220 µg were reacted at 70°C under vacuum with 100% phosphoric acid and CO<sub>2</sub> was cryogenically distilled in a Kiel 3 device interfaced with a Finnegan MAT252 isotope ratio mass spectrometer. Precision of analysis is ± 0.06‰ for d<sup>13</sup>C and ± 0.10‰ for d<sup>18</sup>O. Estimates of %C<sub>4</sub> biomass are predicated on the assumption that the end member d<sup>13</sup>C values for pure C<sub>3</sub> and C<sub>4</sub> environments are approximately -26.5 and -12.5‰, respectively, and carbonate d<sup>13</sup>C values are enriched by an average of 15.5‰ relative to those of the flora (Cerling 1984). Therefore the end member d<sup>13</sup>C values for carbonates formed in pure C<sub>3</sub> and C<sub>4</sub> environments are approximately -11.0 and +3.0‰, respectively. Recrystallized specimens are diagenetically altered, and have not been used for calculation of means and standard deviations.