Supplementary Information:

Title: Positive and negative C mineralization priming effects among a variety of biochar-amended soils

For Soil Biology & Biochemistry

Andrew R. Zimmerman
Department of Geological Sciences, University of Florida
241 Williamson Hall
PO Box 112120
Gainesville, FL 32611-2120
Office: (352) 392-0070
azimmer@ufl.edu
Fax: (352) 392-9294

Bin Gao, Department of Agricultural and Biological Engineering, University of Florida, Gainesville, FL 32611

Mi-youn Ahn, Soil and Water Science Department, University of Florida, PO Box 110290, Gainesville, FL 32611

Table S1. Pool sizes and decay rates of soil, biochar, and soil-biochar mixtures using double-exponential decay model

		Decay Model Parameters [1]			
Incubation		k_1	M_1	k_2	M_2
Soil Type	Biochar Type	(d^{-1})	(mgC/g)	(d^{-1})	(mgC/g)
-	Bubinga250	0.1100	1.4	0.0014	17.0
-	Bubinga400	0.0630	1.8	0.0021	8.9
-	Bubinga650	0.0530	1.8	0.0048	4.0
-	Grass250	0.0980	1.3	0.0018	9.2
-	Grass400	0.0510	4.6	0.0029	17.4
-	Grass525	0.0340	2.2	0.0003	6.1
-	Grass650	0.0090	1.0	0.0009	19.7
-	Oak250	0.0440	2.2	0.0028	17.9
-	Oak400	0.0540	3.4	0.0037	14.3
-	Oak525	0.0410	1.8	0.0033	6.2
-	Oak650	0.0310	2.4	0.0003	43.4
-	Pine250	2.4500	1.6	0.0099	17.0
-	Pine400	0.0200	1.9	0.0009	20.2
-	Pine400	0.0320	2.2	0.0006	18.3
-	Pine525	0.0600	1.1	0.0016	7.5
-	Pine650	1.8000	0.6	0.0028	10.5
-	SugCane250	0.5100	1.0	0.0052	8.5
-	SugCane400	0.0690	2.7	0.0040	11.0
-	SugCane525	0.1200	0.7	0.0040	9.1
-	SugCane650	0.0460	1.3	0.0027	4.8
SF2074	-	0.0052	2.2	0.0001	18.5
SF2074	Bubinga650	0.0710	0.3	0.0019	3.2
SF2074	Grass400	0.0460	1.2	0.0034	3.2
SF2074	Grass525	0.0330	1.5	0.0002	16.1
SF2074	Grass650	0.0420	1.8	0.0002	10.0
SF2074	Oak250	0.0180	1.7	0.0005	11.9
SF2074	Oak400	0.0230	1.3	0.0004	9.1
SF2074	Oak525	0.0210	1.5	0.0002	13.8
SF2074	Oak650	0.0480	0.9	0.0031	1.8
SF2074	Pine650	0.0690	2.0	0.0001	18.1
SF33	-	0.1500	0.1	0.0001	39.7
SF33	Bubinga250	0.0190	1.1	0.0001	25.1
SF33	Bubinga400	0.0340	0.3	0.0001	36.1
SF33	Bubinga525	0.0040	0.6	0.0007	7.0
SF33	Bubinga650	0.0015	0.2	0.0015	4.9
SF33	Grass250	0.0600	1.3	0.0021	2.2
SF33	Grass400	0.0300	1.9	0.0003	9.4
SF33	Grass525	0.0250	1.6	0.0001	20.6
SF33	Grass650	0.0670	0.8	0.0063	0.8
SF33	Oak250	0.0750	0.5	0.0047	1.7
SF33	Oak400	0.0280	1.2	0.0002	8.3
SF33	Oak525	0.0540	0.5	0.0027	2.0

SF33	Oak650	0.0290	0.9	0.0004	2.3
SF33	Pine250	0.0270	1.0	0.0009	5.1
SF33	Pine400	0.0035	0.0	0.0009	14.0
SF33	Pine525	0.0039	0.0	0.0001	88.4
SF33	Pine650	0.0023	0.0	0.0022	4.2
SF33	SugarCn400	0.0083	0.1	0.0008	13.2
SF33	SugarCn525	0.0860	0.3	0.0000	141.6
SF33	SugarCn650	0.0320	0.5	0.0002	5.0
SF1008	-	0.0190	0.5	0.0000	16.4
SF1008	Bubinga650	0.0120	0.7	0.0001	14.9
SF1008	Grass400	0.0450	1.1	0.0030	2.8
SF1008	Grass525	0.0420	1.2	0.0035	2.4
SF1008	Grass650	0.0370	1.3	0.0001	14.5
SF1008	Oak250	0.0370	1.2	0.0004	11.7
SF1008	Oak400	0.0230	1.3	0.0002	7.8
SF1008	Oak525	0.0230	1.2	0.0002	11.4
SF1008	Oak650	0.0280	1.1	0.0001	9.8
SF1008	Pine650	0.0390	0.3	0.0021	1.7
SF2049	-	0.0220	1.1	0.0001	16.6
SF2049	Bubinga250	0.0095	2.3	0.0002	14.2
SF2049	Bubinga400	0.0150	1.3	0.0002	16.2
SF2049	Bubinga525	0.0170	1.1	0.0001	18.4
SF2049	Bubinga650	0.0440	0.7	0.0031	1.8
SF2049	Grass250	0.0620	1.7	0.0032	3.4
SF2049	Grass400	0.0590	1.3	0.0013	9.7
SF2049	Grass525	0.0270	2.1	0.0005	8.8
SF2049	Grass650	0.0560	1.4	0.0033	2.0
SF2049	Oak250	0.0150	2.1	0.0002	29.8
SF2049	Oak400	0.0390	1.1	0.0027	3.0
SF2049	Oak525	0.0410	0.8	0.0035	2.5
SF2049	Oak650	0.0560	0.9	0.0044	2.1
SF2049	Pine250	0.0430	1.2	0.0009	9.7
SF2049	Pine400	0.0420	1.0	0.0009	4.7
SF2049	Pine525	0.0120	1.4	0.0001	13.4
SF2049	Pine650	0.0580	0.6	0.0030	2.6
SF2049	SugarCn400	0.0250	1.6	0.0003	8.3
SF2049	SugarCn525	0.0700	0.8	0.0018	3.9
SF2049	SugarCn650	0.0530	0.9	0.0001	15.1
SF922	-	0.0400	1.4	0.0028	7.8
SF922	Bubinga250	0.0530	2.2	0.0037	7.0
SF922	Bubinga400	0.0400	1.5	0.0025	12.0
SF922	Bubinga525	0.0520	1.3	0.0014	13.3
SF922	Bubinga650	0.1200	0.9	0.0034	7.7
SF922	Grass250	0.0640	2.1	0.0035	6.6
SF922	Grass400	0.0380	2.0	0.0016	17.7
SF922	Grass525	0.0510	1.6	0.0017	14.8
SF922	Grass650	0.3700	0.7	0.0033	9.2
SF922	Oak250	0.0410	2.0	0.0033	13.7
SF922	Oak400	0.0410	1.3	0.0030	8.5

SF922	Oak525	0.0790	0.9	0.0033	9.2
SF922	Oak650	0.1100	1.1	0.0032	8.8
SF922	Pine250	0.0440	2.8	0.0032	13.5
SF922	Pine400	0.0540	1.3	0.0030	10.7
SF922	Pine525	0.0470	1.4	0.0020	11.1
SF922	Pine650	0.1300	1.0	0.0047	5.6
SF922	SugarCn400	0.0410	2.1	0.0017	19.2
SF922	SugarCn525	0.0650	1.5	0.0013	17.9
SF922	SugarCn650	0.0640	1.3	0.0034	5.5

1. M_1 = amount of relatively labile mineralizable C, M_2 = amount of a relatively refractory mineralizable C, k_1 and k_2 = apparent first order mineralization rate constants for the labile and refractory pools (d^{-1}), respectively.
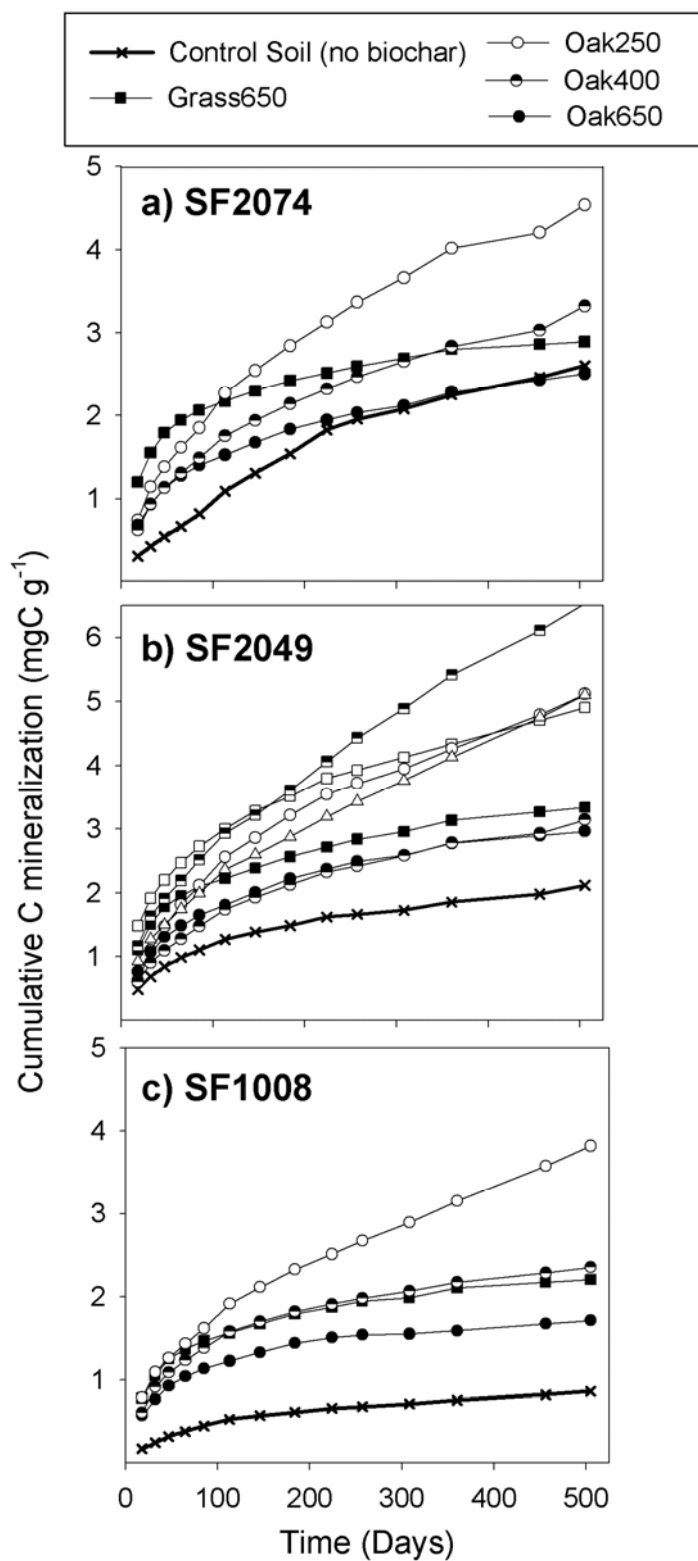
Figure S1. Cumulative C released (as CO_2) from incubations of a) SF2074, b) SF1008, and c) SF2049 soil and selected soil-biochar mixtures.
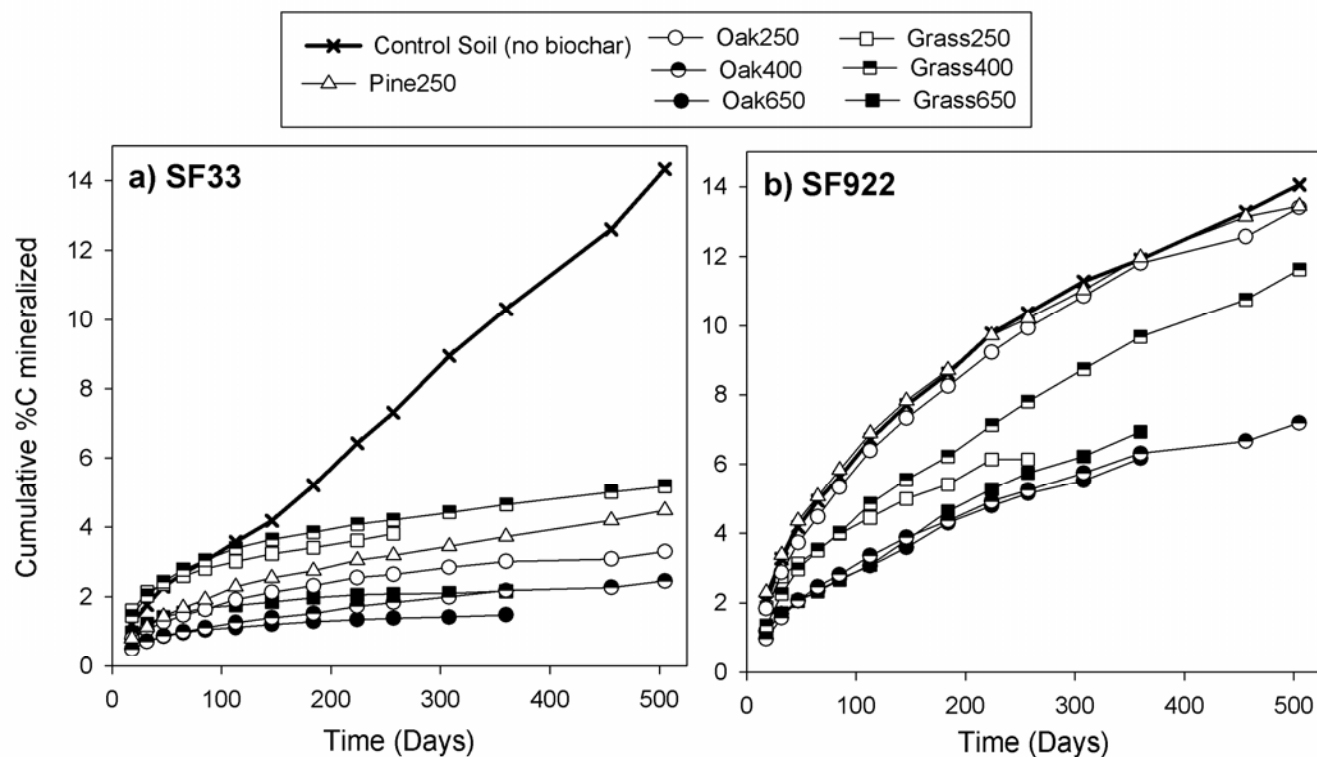
Figure S2. Cumulative C released (as CO_2) from incubations of a) SF33 and b) SF2922 soil and selected soil-biochar mixtures normalized to total organic carbon content.
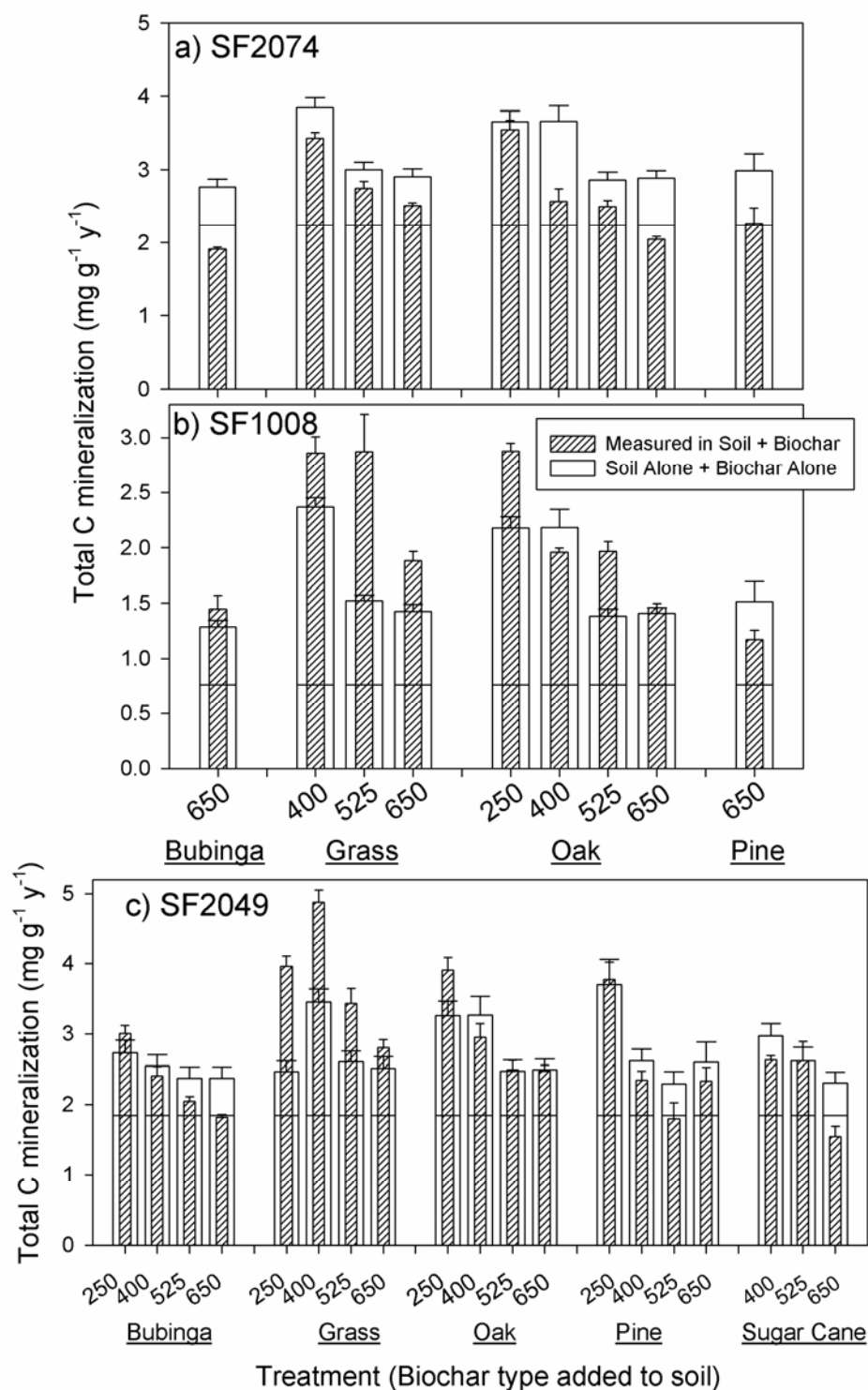
Figure S3. Cumulative C released (as CO_2) in 1 y incubations of biochar mixed with a) SF2074, b) SF1008, and c) SF2049 soil (striped bars) compared with that calculated had C mineralization from soil (bottom portion of open bars) and biochar (top portion of open bars) been additive (i.e., no priming).
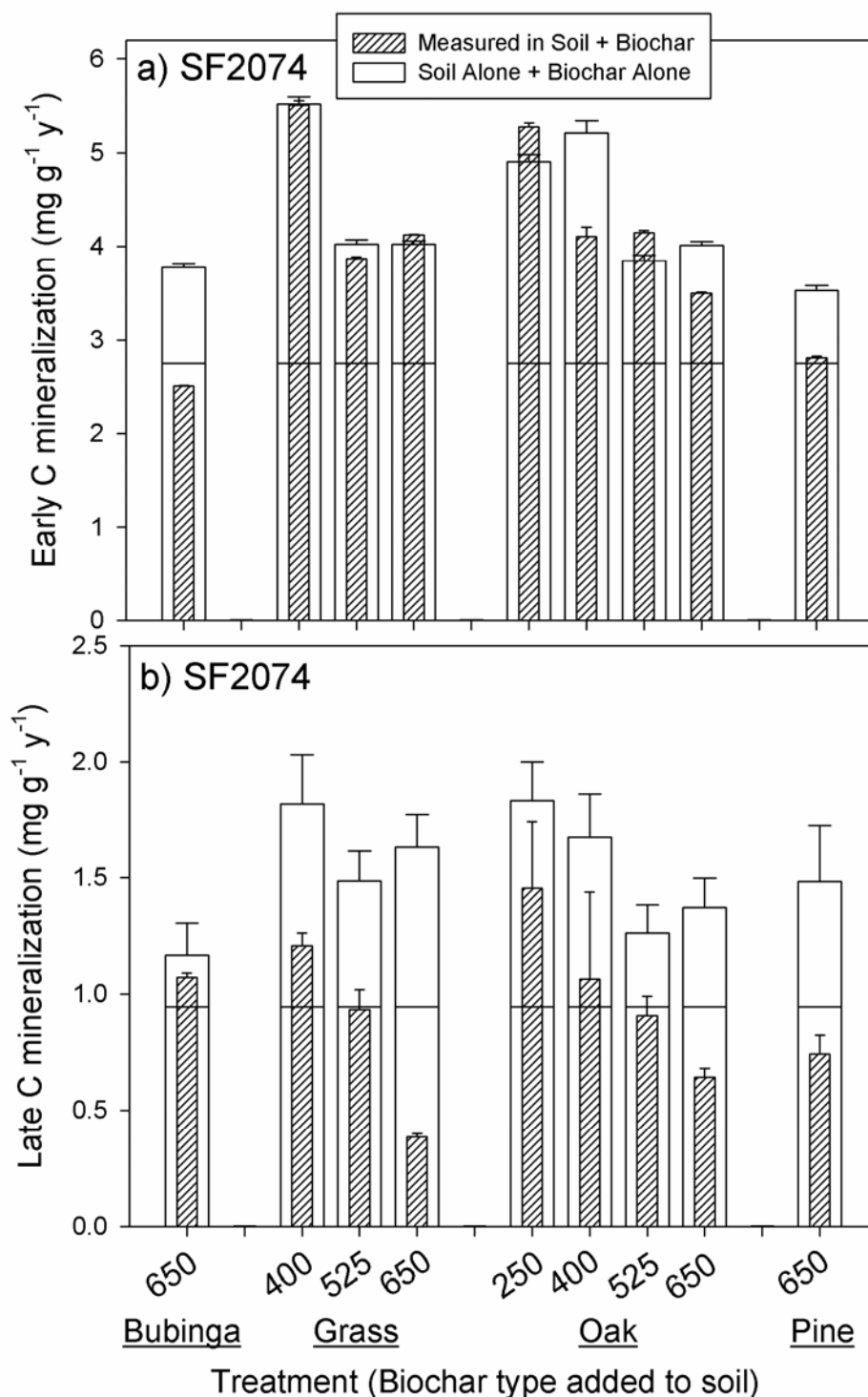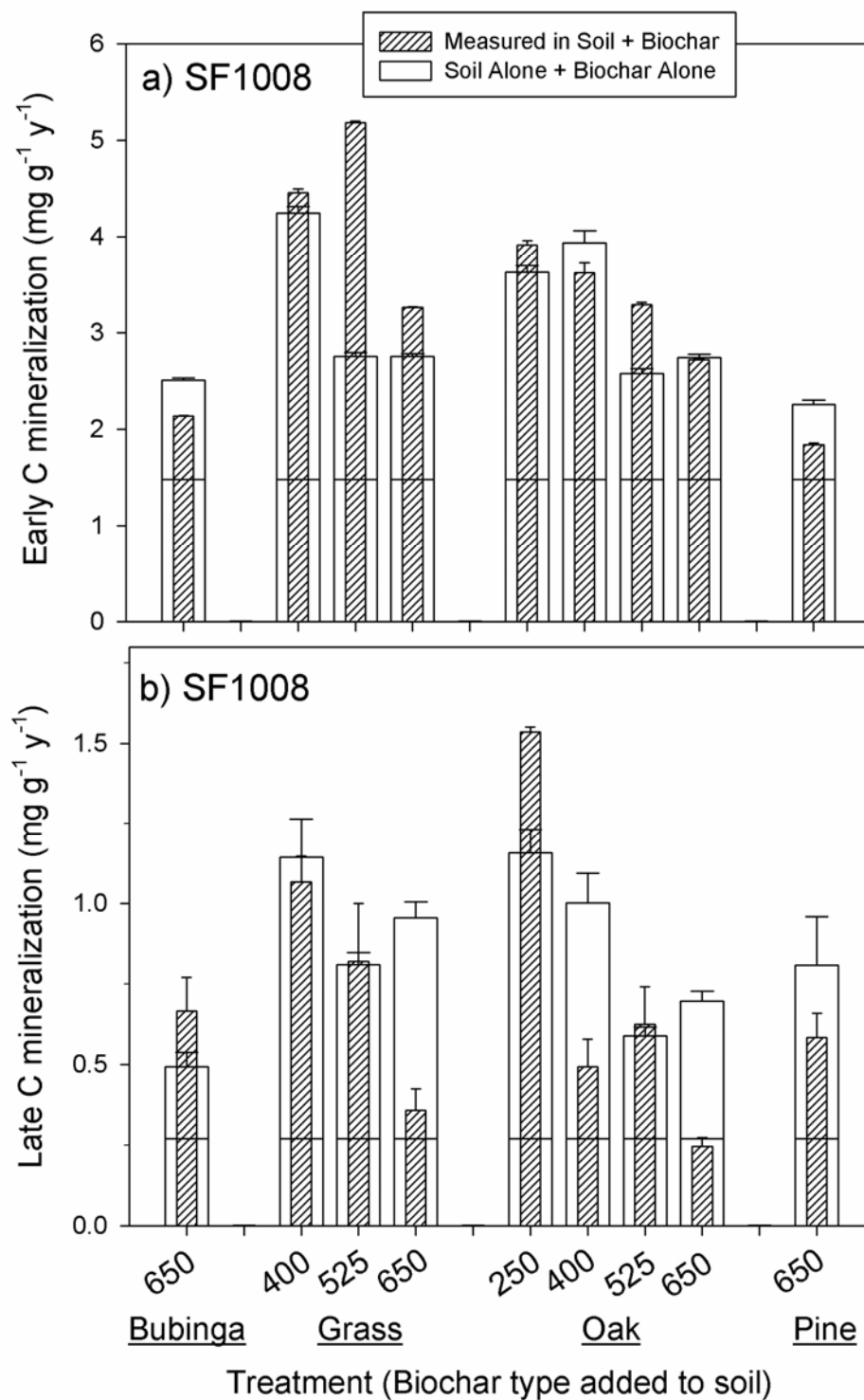
Figure S4. C mineralization rate from incubations of SF2047 soil mixed with biochars during a) the first 90 d ('early') and b) day 250-500 ('late') compared with that calculated had C mineralization rates from soil (bottom portion of open bars) and biochar (top portion of open bars) been additive (i.e., no priming).
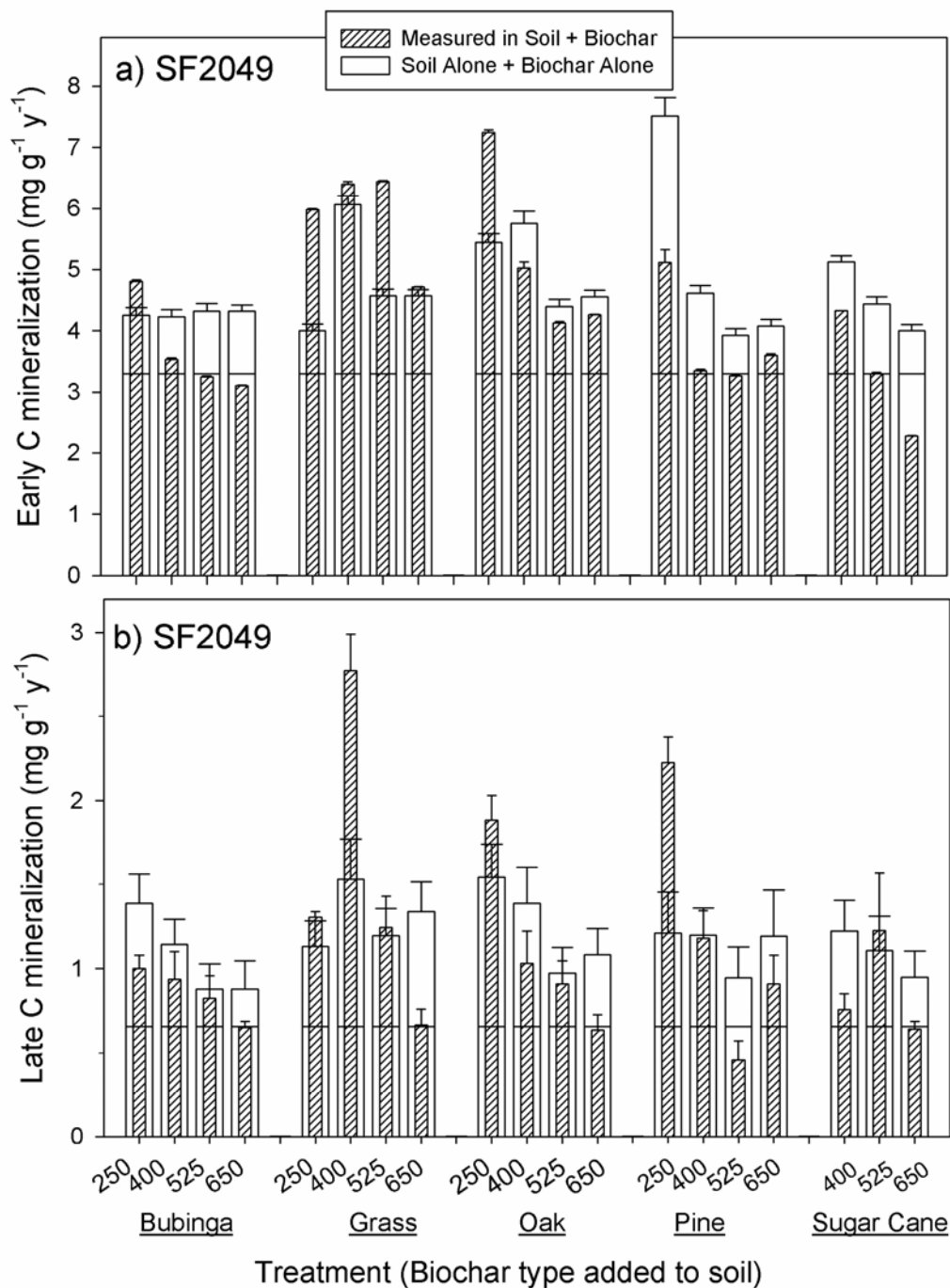
Figure S5. C mineralization rate from incubations of SF1008 soil mixed with biochars during a) the first 90 d ('early') and b) day 250-500 ('late') compared with that calculated had C mineralization rates from soil (bottom portion of open bars) and biochar (top portion of open bars) been additive (i.e., no priming).

Figure S6. C mineralization rate from incubations of SF2049 soil mixed with biochars during a) the first 90 d ('early') and b) day 250-500 ('late') compared with that calculated had C mineralization rates from soil (bottom portion of open bars) and biochar (top portion of open bars) been additive (i.e., no priming).
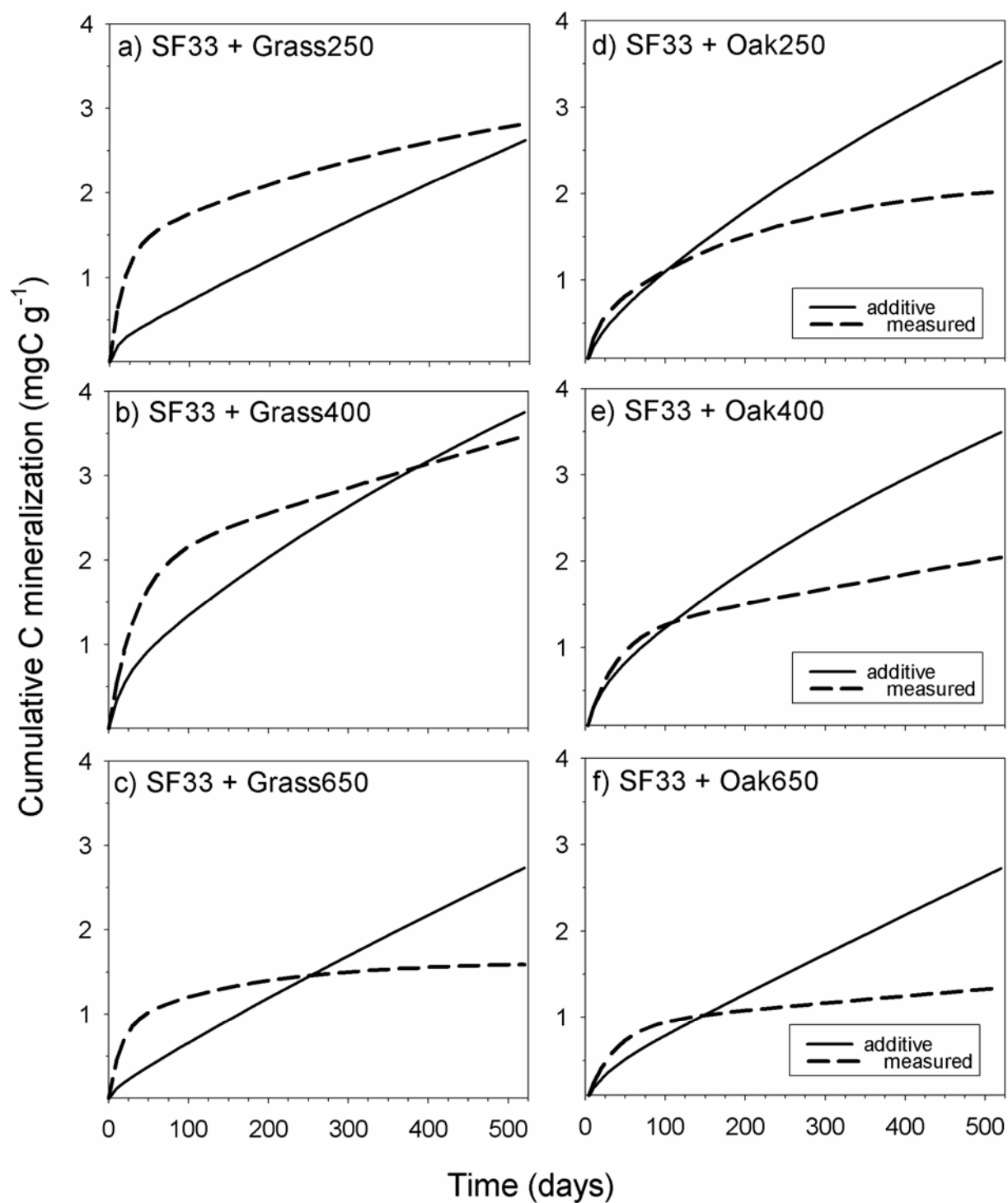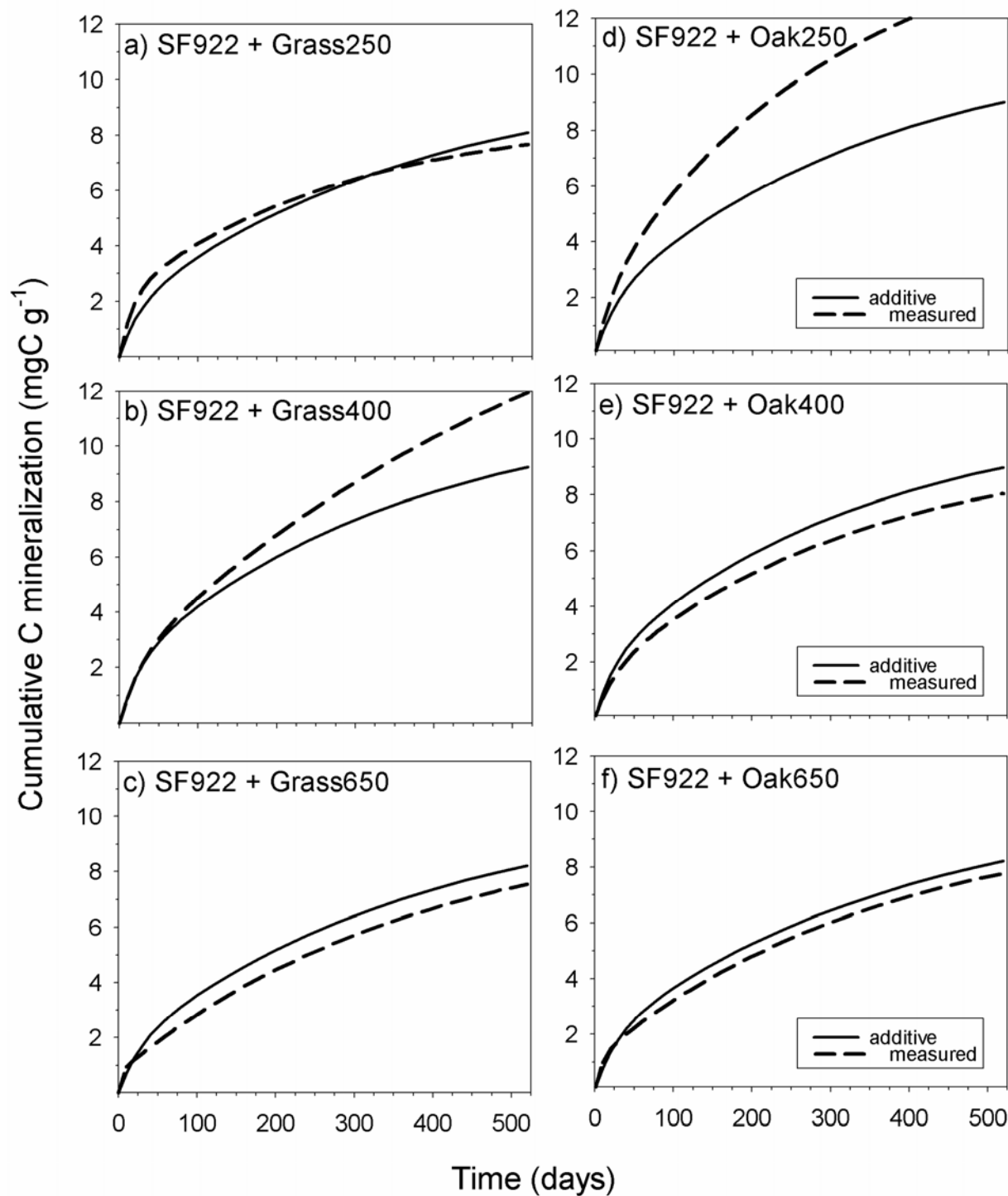
Figure S7. Dual-exponential model of measured C mineralized (as CO_2) and that calculated had C mineralization from soil and biochar been additive (i.e. no priming) from mixtures of SF33 soil with a) Grass 250, b) Grass 400, c) Grass 650, d) Oak 250, e) Oak 400 and f) Oak 650 biochar.
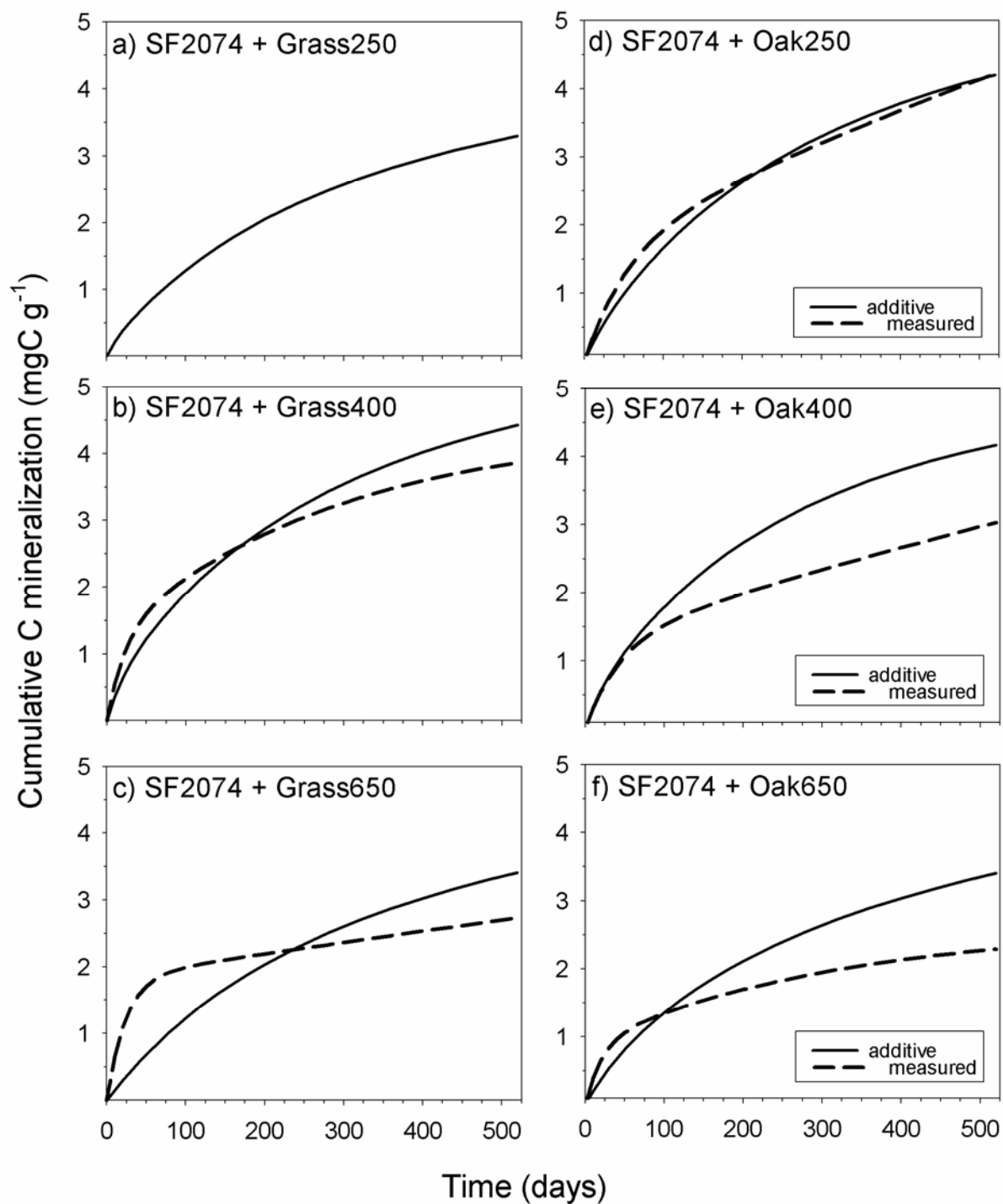
Figure S8. Dual-exponential model of measured C mineralized (as CO_2) and that calculated had C mineralization from soil and biochar been additive (i.e. no priming) from mixtures of SF922 soil with a) Grass 250, b) Grass 400, c) Grass 650, d) Oak 250, e) Oak 400 and f) Oak 650 biochar.

Figure S9. Dual-exponential model of measured C mineralized (as CO_2) and that calculated had C mineralization from soil and biochar been additive (i.e. no priming) from mixtures of SF2074 soil with a) Grass 250, b) Grass 400, c) Grass 650, d) Oak 250, e) Oak 400 and f) Oak 650 biochar. Grass250 + SF2074 incubation was not carried out.
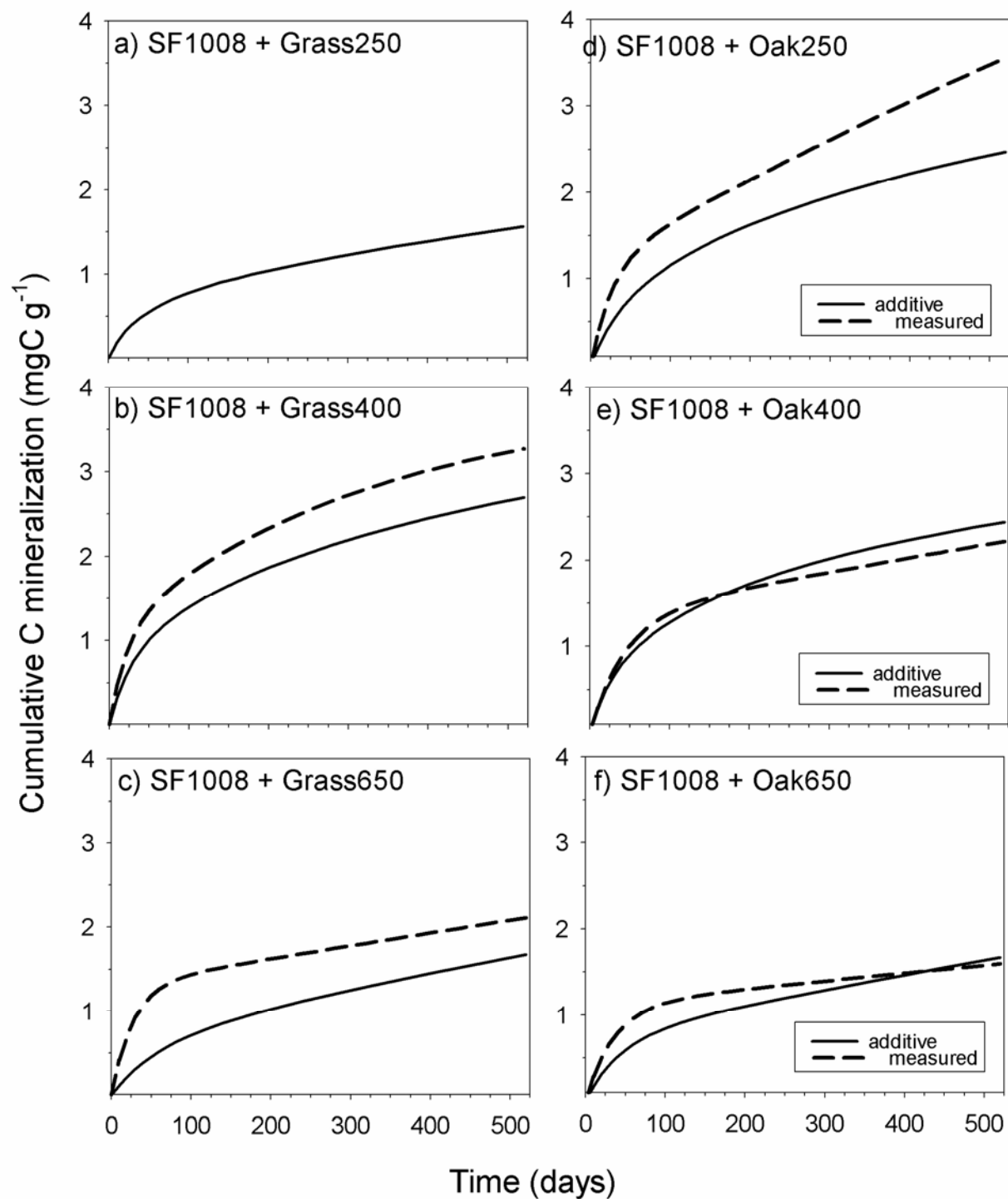
13

Figure S10. Dual-exponential model of measured C mineralized (as CO_2) and that calculated had C mineralization from soil and biochar been additive (i.e. no priming) from mixtures of SF1008 soil with a) Grass 250, b) Grass 400, c) Grass 650, d) Oak 250, e) Oak 400 and f) Oak 650 biochar. Grass250 + SF1008 incubation was not carried out.
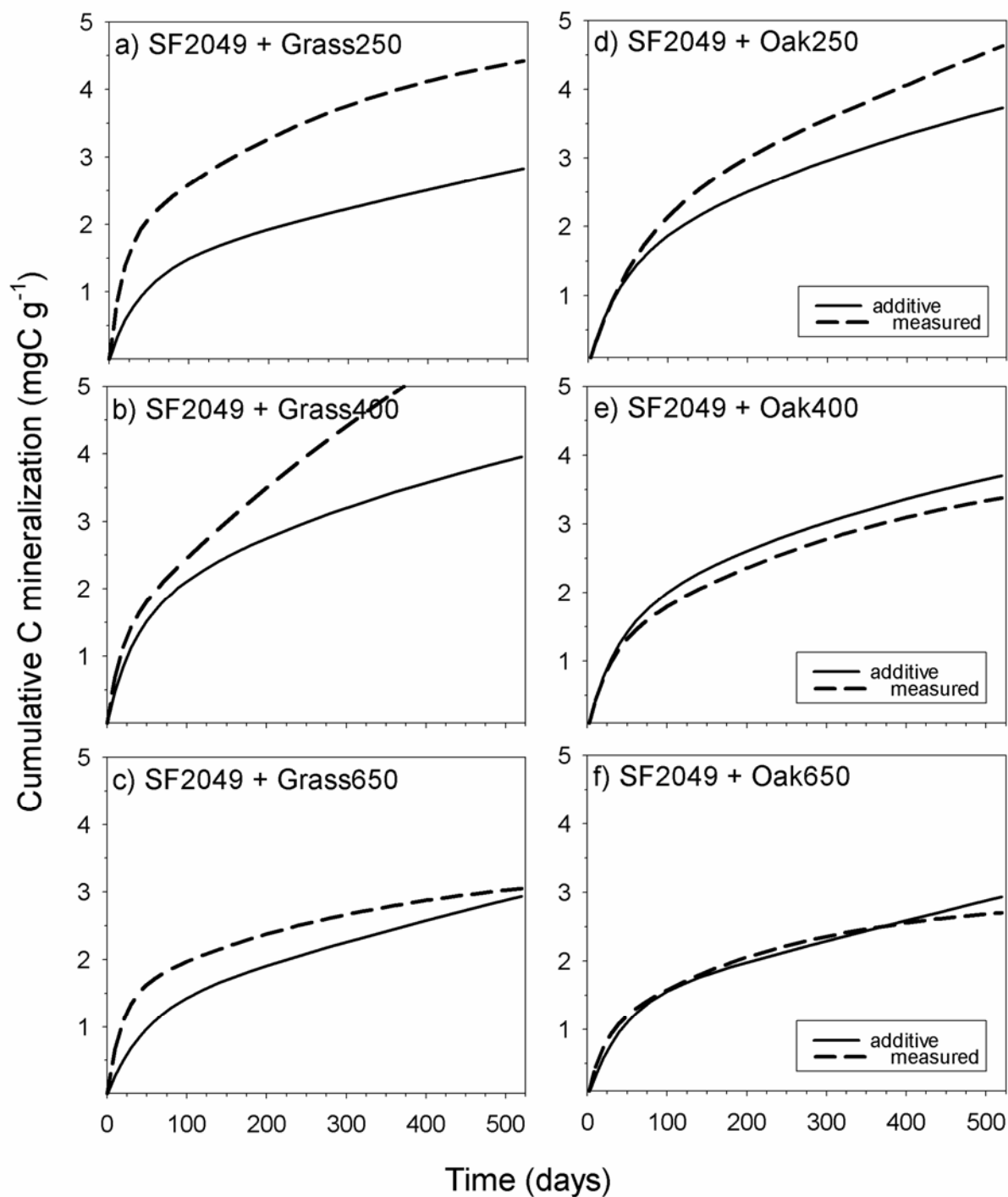
14

Figure S11. Dual-exponential model of measured C mineralized (as CO_2) and that calculated had C mineralization from soil and biochar been additive (i.e. no priming) from mixtures of SF2049 soil with a) Grass 250, b) Grass 400, c) Grass 650, d) Oak 250, e) Oak 400 and f) Oak 650 biochar.