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Supplement of

**Modelling the role of fires in the terrestrial carbon balance by
incorporating SPITFIRE into the global vegetation model
ORCHIDEE – Part 2: Carbon emissions and the role of fires
in the global carbon balance**

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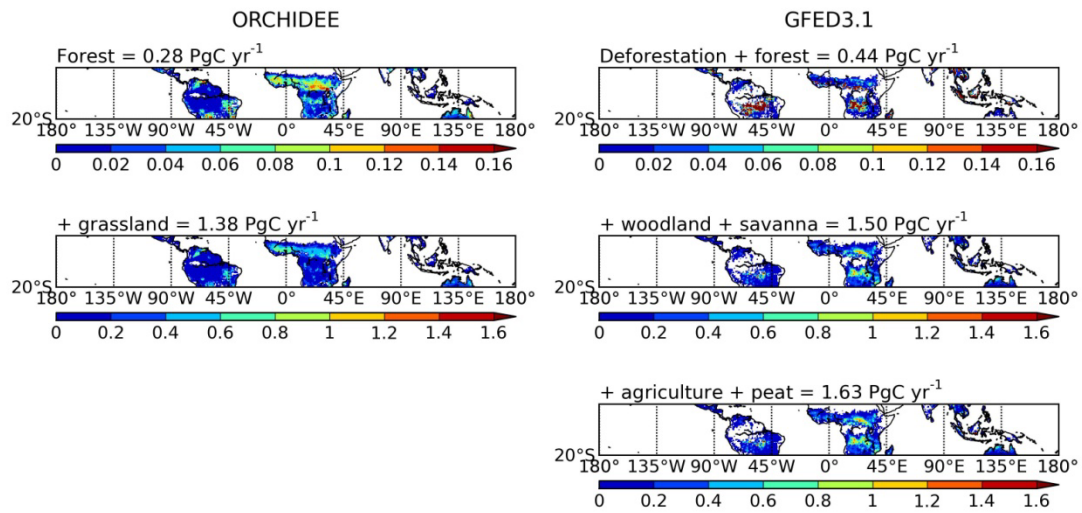


Fig. S1 Simulated and GFED3.1 fire carbon emissions for the tropical region (20°S–20°N) from different sources averaged over 1997–2009.

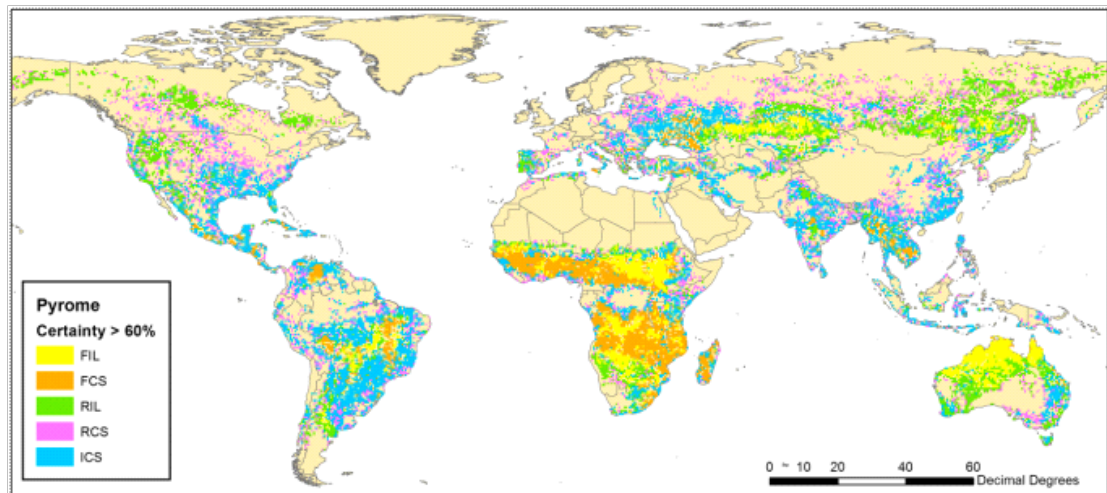


Fig. S2 The distribution of fire pyromes by Archibald et al. (2013). The five pyromes are: FIL (Frequent–Intense–Large); FCS (Frequent–Cool–Small); RIL (Rare–Intense–Large); RCS (Rare–Cool–Small) and ICS (Intermediate–Cool–Small).

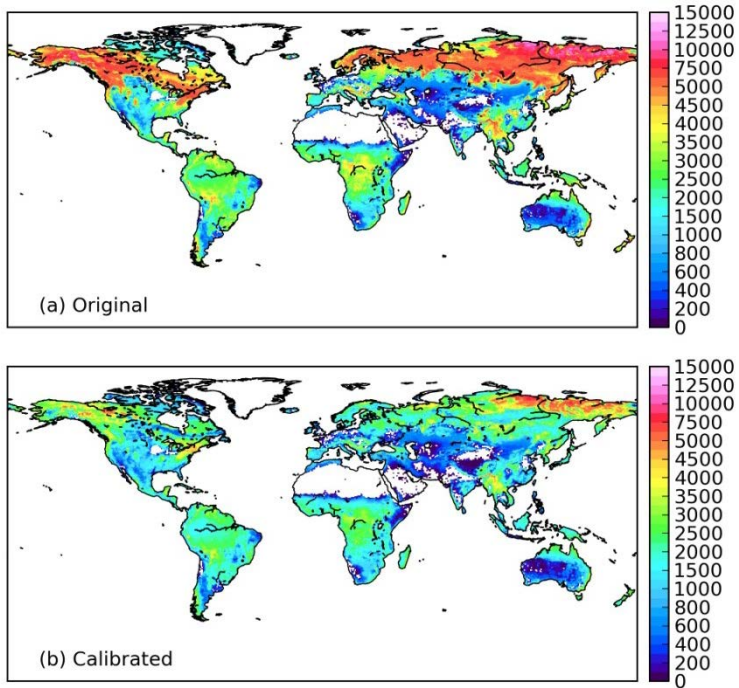


Fig. S3 Simulated surface dead fuel (g C m^{-2}) (a) before and (b) after productivity calibration.

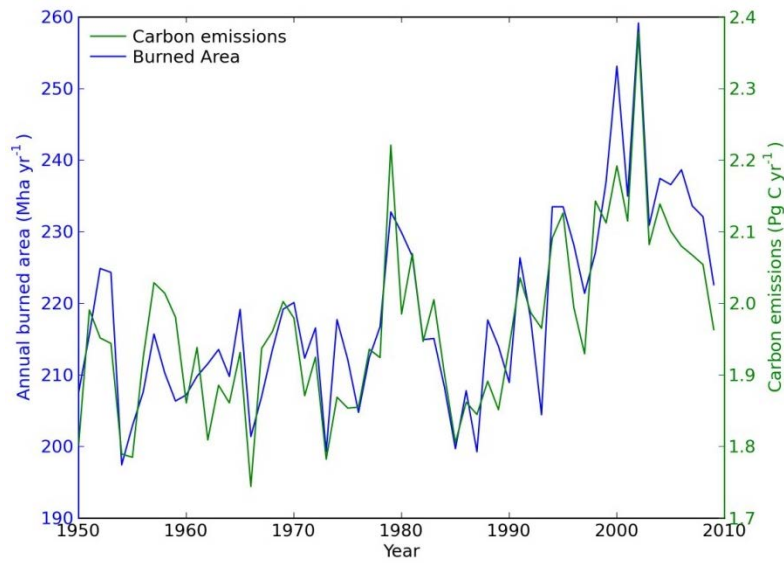


Fig. S4 Simulated annual global burned area (blue, left vertical axis) and carbon emissions (green, right vertical axis) for 1950–2009.

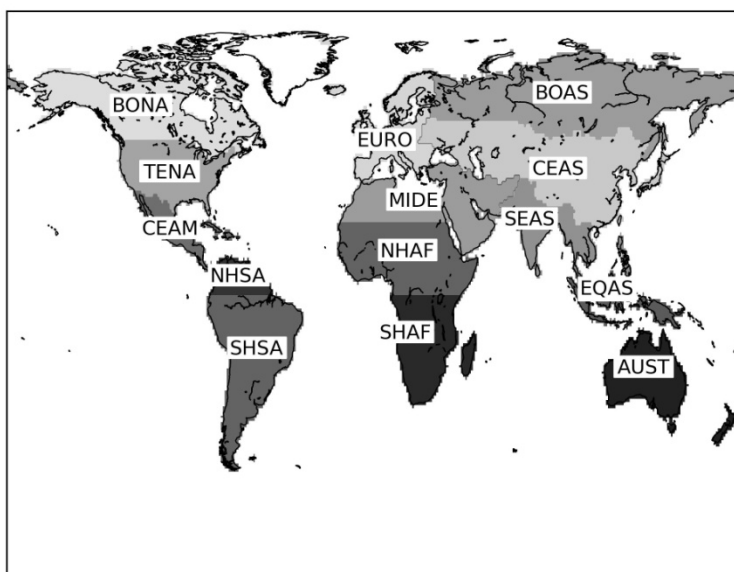


Fig. S5 The 14 GFED regions are, BONA: Boreal North America; TENA: Temperate North America; CEAM: Central America; NHSA: Northern Hemisphere South America; SHSA: Southern Hemisphere South America; EURO: Europe; MIDE: Middle East; NHAF: Northern Hemisphere Africa; SHAF: Southern Hemisphere Africa; BOAS: Boreal Asia; CEAS: Central Asia; SEAS: Southeast Asia; EQAS: Equatorial Asia; AUST: Australia and New Zealand.

Table S1 Original and modified values for the carboxylation rates (V_{cmax} , $\mu\text{mol m}^{-2} \text{s}^{-1}$) used in the model and the ratio used for GPP calibration.

Biome/Plant functional type (PFT)	Original	Modified	Ratio
Bare soil	-	-	-
Tropical forest			
Tropical broad-leaved evergreen	65	51	1.3
Tropical broad-leaved raingreen	65	51	1.3
Temperate forest			
Temperate needleleaf evergreen	35	24	1.4
Temperate broad-leaved evergreen	45	31	1.4
Temperate broad-leaved summergreen	55	38	1.4
Boreal forest			

Boreal needleleaf evergreen	35	20	1.7
Boreal broad-leaved summergreen	45	26	1.7
Boreal needleleaf summergreen	35	20	1.7
Grassland			
C3 grass	70	45	1.5
C4 grass	70	45	1.5
Agriculture			
C3 agriculture	70	27	2.6
C4 agriculture	70	27	2.6

Table S2 1997–2009 area-averaged NPP, combustion completeness for litter, and combustion completeness for the litter and aboveground live biomass combined by ORCHIDEE simulation and reported by van der Werf et al. (2010) for different regions. The combustion completeness for litter for GFED3.1 was taken from the last column of Table 4 in van der Werf et al. (2010), and the combustion for the litter and aboveground live biomass combined for GFED3.1 data was taken from the second to last right column of Table 4 in van der Werf et al. (2010). See caption to Fig. S4 for location of GFED regions and expansion of abbreviations.

Region	NPP (g C m ⁻² yr ⁻¹)		Combustion completeness for litter and aboveground biomass combined		Combustion completeness for litter	
	GFED3.1	ORCHIDEE	GFED3.1	ORCHIDEE	GFED3.1	ORCHIDEE
BONA	235	290	0.23	0.58	0.69	0.78
TENA	388	377	0.17	0.34	0.75	0.75
CEAM	674	583	0.22	0.29	0.79	0.8
NHSA	1001	1138	0.2	0.19	0.81	0.75
SHSA	796	806	0.29	0.24	0.82	0.77
EURO	400	304	0.21	0.22	0.8	0.73
MIDE	35	46	0.16	0.4	0.93	0.7
NHAF	366	511	0.09	0.33	0.86	0.8

SHAF	627	696	0.07	0.28	0.83	0.8
BOAS	257	345	0.21	0.52	0.7	0.78
SEAS	205	616	0.3	0.22	0.84	0.75
CEAS	545	243	0.29	0.45	0.8	0.75
EQAS	1213	1159	0.47	0.2	0.77	0.76
AUST	238	320	0.09	0.42	0.88	0.83
