

Table S1. Algorithm used to map Gunarso et al. (2013) land cover types to seven PFTs and bare land.

YIBs cover type	Gunarso et al. (2013) cover type(s)
Shrubland	Upland shrubland + swamp shrubland
Crops	Rice fields + dry cultivated land
C4-grassland	Upland grassland + swamp grassland
Dirt	Bare soil
Oil palm plantations	Oil palm plantations
Rubber plantations	Rubber plantations
Other tree plantations	Timber plantation + mixed tree crops / agroforest
Dipterocarp forest	Undisturbed upland forest + undisturbed mangrove + undisturbed swamp forest + disturbed upland forest + disturbed mangrove + disturbed swamp forest

Table S2. Physical, photosynthetic, and BVOC-emission parameters assigned to four new land cover types in the ModelE2-YIBs source code. Plts. = plantations.

Parameter	Dipterocarp forest ^a	Oil palm plts ^b	Rubber plts ^c	Other tree plts ^d
Vcmax25 ($\mu\text{mol CO}_2 \text{ m}^{-2} \text{ s}^{-1}$)	40	42	44	40
I _s ($\mu\text{gC g}^{-1}$ (leaf dry weight) h^{-1})	2	153	0.17	2
M _s ($\mu\text{gC g}^{-1}$ (leaf dry weight) h^{-1})	0.6	0	25	0.6
SLA (m^2 (leaf) kg^{-1} (leaf))	9.9	10.5	9.9	9.9
PAR absorptance	0.9	0.93	0.9	0.9
Height (m)	35	12	18	18
LAI	6	6	6	5.3

Parameters: (1) Vcmax25: maximum photosynthetic capacity at 25°C; (2) I_s: leaf-level isoprene basal emission rate (BER) at standard conditions of incident photosynthetically active radiation (PAR; 1000 $\mu\text{mol photons m}^{-2} \text{ s}^{-1}$) and leaf temperature (30°C); (3) M_s: leaf-level monoterpene BER at standard conditions of incident PAR (1000 $\mu\text{mol photons m}^{-2} \text{ s}^{-1}$) and leaf temperature (30°C); (4) SLA: specific leaf area; (5) PAR absorptance: the fraction of PAR photons incident on the leaf that are absorbed by the leaf; (6) vegetation height; and (7) leaf area index (LAI).

a) Vcmax25: Value assigned to the standard evergreen broadleaf forest PFT in YIBs. This value is supported by the average of measurements from five common tree species in the forest of Sulawesi, Indonesia (38.4 $\mu\text{mol m}^{-2} \text{ s}^{-1}$; Rakkibu, 2008). I_s: Upper limit of the BER ($< 2 \mu\text{gC g}^{-1} \text{ h}^{-1}$) reported for the species *Dipterocarpus obtusifolia* (Geron et al., 2006). Three additional tree species in the *Dipterocarpaceae* family are likewise reported to have low leaf-level isoprene emission rates, where low indicates an emission rate on the order of 0.1 $\mu\text{gC g}^{-1} \text{ h}^{-1}$ (actual numerical rates are not provided; Klinger et al., 2002). M_s: Calculated as the mean of the measured leaf-level emission rates for 11 dipterocarp species (Llusia et al., 2014). Height: Measurement from natural forest plot in Malaysian Borneo (Fowler et al., 2011). Within the range reported by Dietz et al. (2007) for natural forest plots. LAI: Measurement from natural forest plot in Malaysian Borneo (Fowler et al., 2011). Close to the LAI of 6.2 estimated for undisturbed forest stands by Dietz et al. (2007). SLA and PAR absorptance: Values assigned to the standard evergreen broadleaf forest PFT in YIBs.

b) Vcmax25: Corresponds to mature (12-year-old) plantations (Meijide et al., 2017). I_s: Cronn and Nutmagul, 1982; Kesselmeier and Staudt, 1999. M_s: Measured emissions for six different monoterpenes (Geron et al., 2006). SLA: Average of two measurements (Fan et al., 2015; Legros et al., 2009). PAR absorptance: For measurements of mature leaves (Ritchie and Runcie, 2014). Height and LAI: Measurements from 12-year-old commercial plantation in Malaysian Borneo (Misztal et al., 2011).

c) Vcmax25: Kositsup et al., 2009. I_s: Geron et al., 2006; Klinger et al., 2002. M_s: Baker et al., 2005; Klinger et al., 2002. SLA and PAR absorptance: Values assigned to the standard evergreen broadleaf forest PFT in YIBs. Height: Mean height of rubber trees measured in 49 stands in Peninsular Malaysia (Suratman et al., 2004). LAI: Rubber trees are evergreen trees in the humid

tropics (Li et al., 2016). Assigned LAI measured for a mature oil palm plantation in Malaysian Borneo (Misztal et al., 2011).

d) Description: This PFT is a combination of the timber plantation and mixed tree crop / agroforest cover types from the Gunarso et al. (2013) land cover classification scheme that is used to build the maritime Southeast Asian land cover distribution maps that are applied to the ModelE2-YIBs simulations. Typical species grown on timber plantations include *Gmelina sp.*, *Paraserianthes falcataria*, and *Acacia mangium* (Gunarso et al., 2013). Southeast Asian agroforest plots can contain a diverse array of vegetation, including oil palm, rubber trees, herbaceous crops, and many other tree species used as cash or subsistence crops (e.g., fruit and timber trees) (Scales and Marsden, 2008). Many agroforest plots in Southeast Asia maintain forest-like structural characteristics, despite the fact that they are cultivated, rather than natural, systems (Scales and Marsden, 2008). V_{cmax25} : Value assigned to both the evergreen broadleaf forest and crops classes in YIBs. I_s : Same as dipterocarp forest PFT. Low-isoprene-emitting rubber trees are prevalent in Indonesian agroforest systems (Scales and Marsden, 2008), warranting a low BER for this agroforest-containing PFT. The average I_s ($4.7 \mu\text{gC g}^{-1} \text{h}^{-1}$) based on two common timber species – *Acacia mangium* (Klinger et al., 2002) and *Gmelina arborea* (Singh et al., 2014) – is similar in magnitude to the I_s for the dipterocarp forest PFT, providing further justification for assignment of a low I_s . M_s : Same as dipterocarp forest PFT. Similar M_s is reported for *Acacia mangium* ($0.66 \mu\text{gC g}^{-1} \text{h}^{-1}$; Klinger et al., 2002). SLA and PAR absorptance: Values assigned to the standard evergreen broadleaf forest PFT in YIBs. Height: Reported height measured for plots of an agroforest (Dietz et al., 2007) and a timber plantation (Krisnawati et al., 2011). LAI: Mean LAI reported for three agroforest plots in Central Sulawesi, Indonesia (Dietz et al., 2007). Timber plantation class from Gunarso et al. (2013) has a partially open canopy, indicating a lower LAI than for the natural forest PFT.

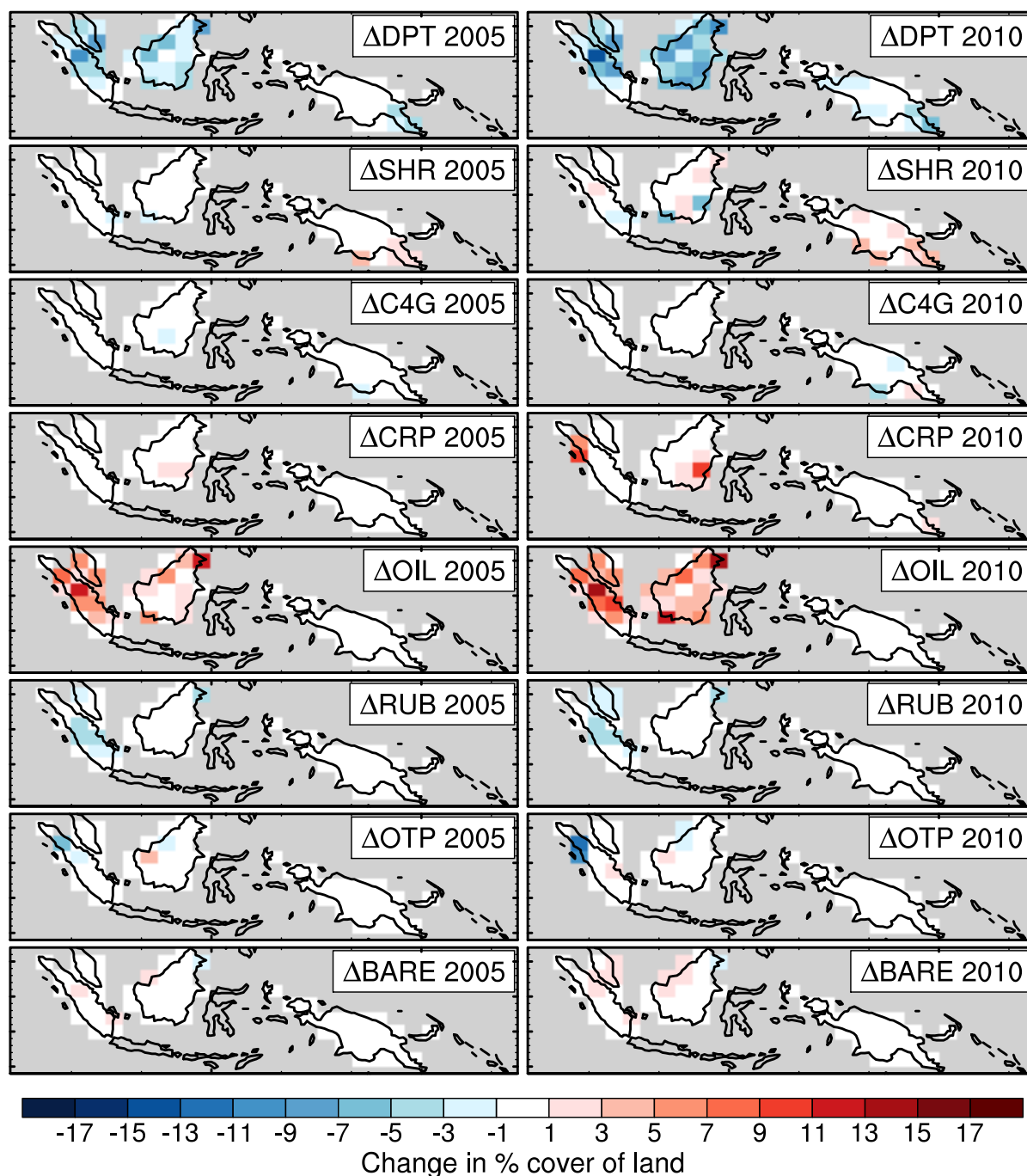


Figure S1. Regional land cover change for 2005 and 2010 relative to 1990. Cover types include dipterocarp evergreen broadleaf forest (DPT), shrubland (SHR), C4-grassland (C4G), crops (CRP), oil palm plantations (OIL), rubber plantations (RUB), other tree plantations (OTP), and bare land (BARE).

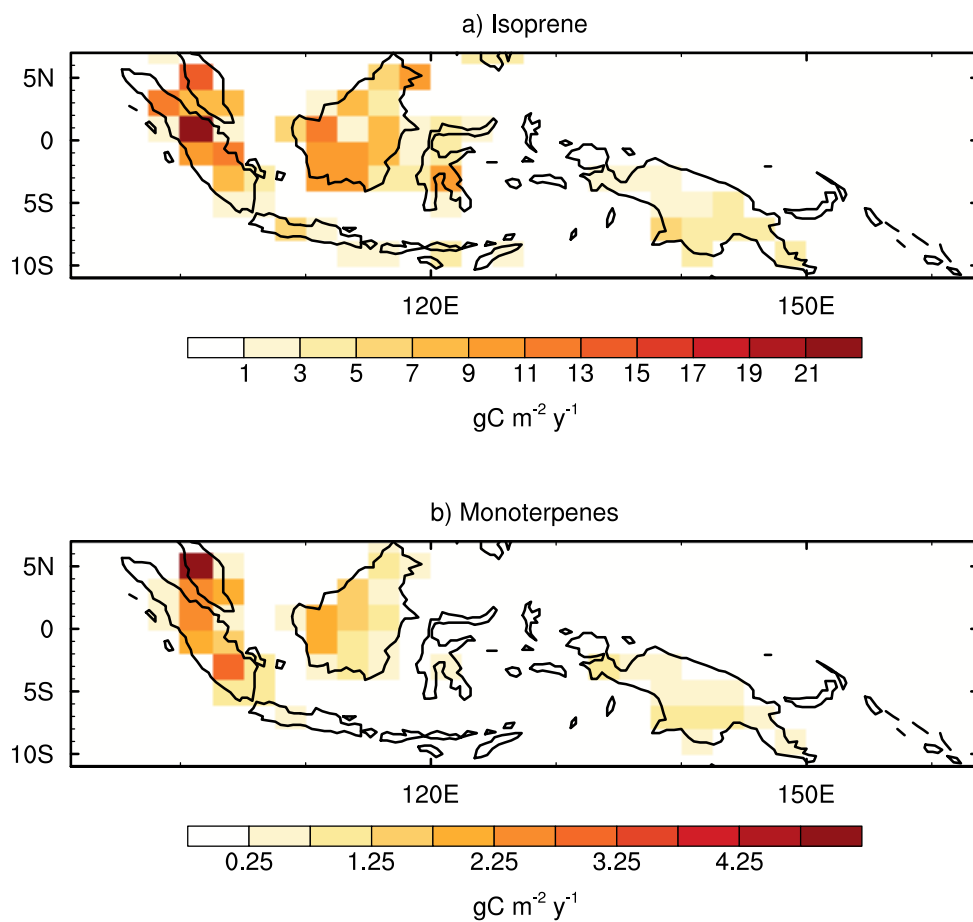


Figure S2. Annual emissions of a) isoprene and b) monoterpenes in 2010 in maritime Southeast Asia (simulation 2010land_base).

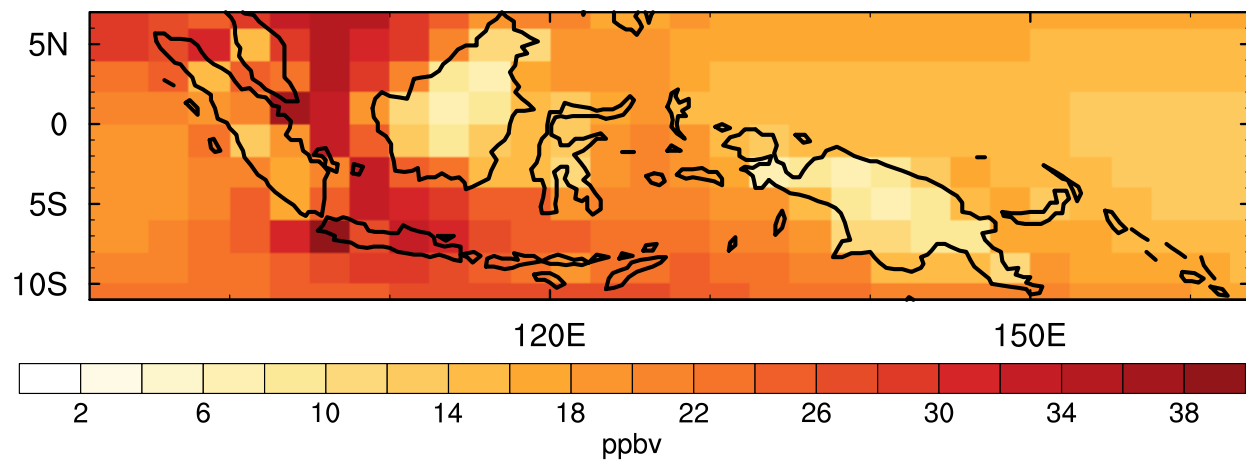


Figure S3. Annual-mean surface ozone mixing ratio for 2010 (simulation 2010land_base).

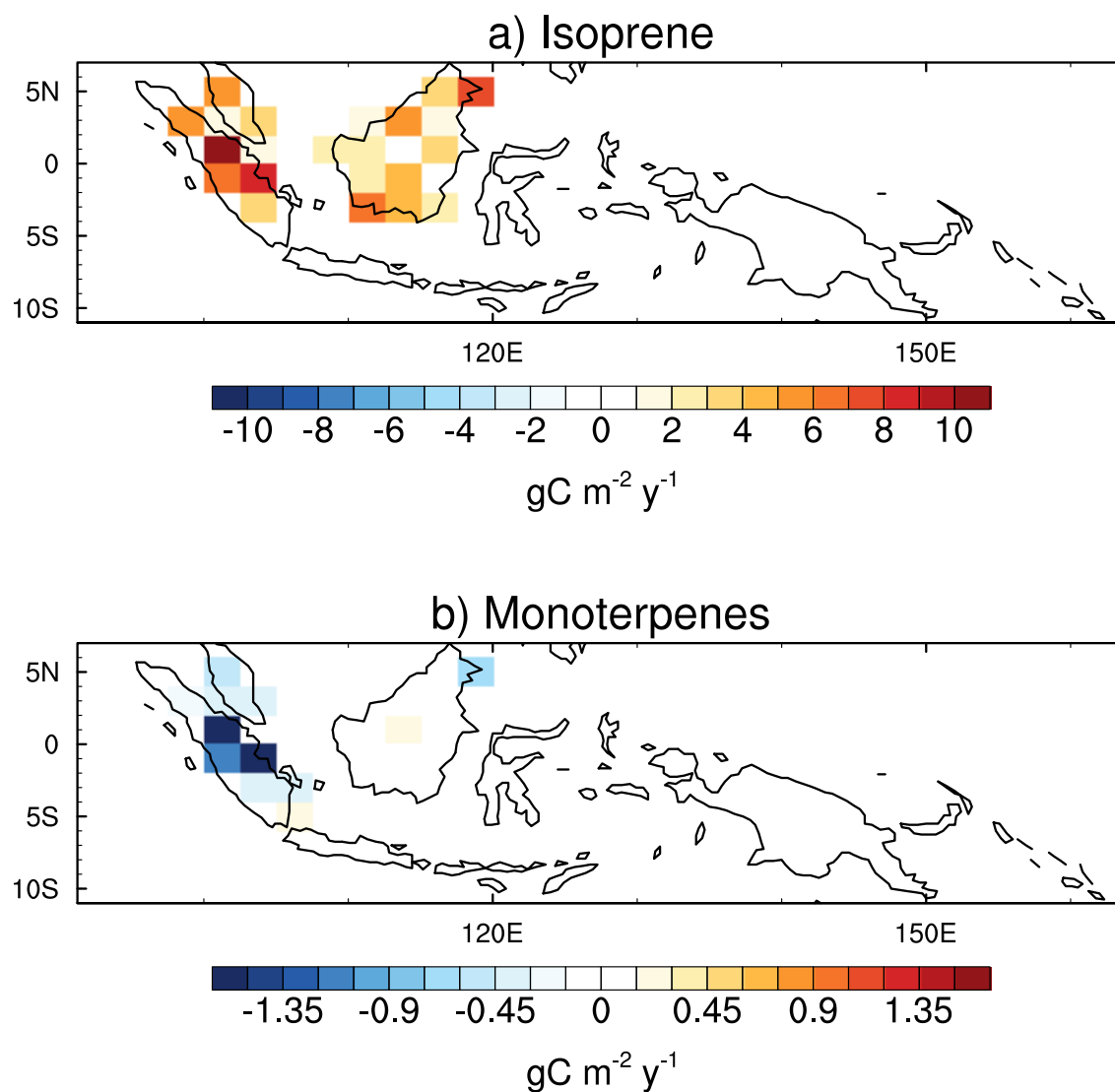


Figure S4. Change in annual emissions of a) isoprene and b) monoterpenes due to 1990–2010 maritime Southeast Asian land cover change (2010land_base – 1990land_base).

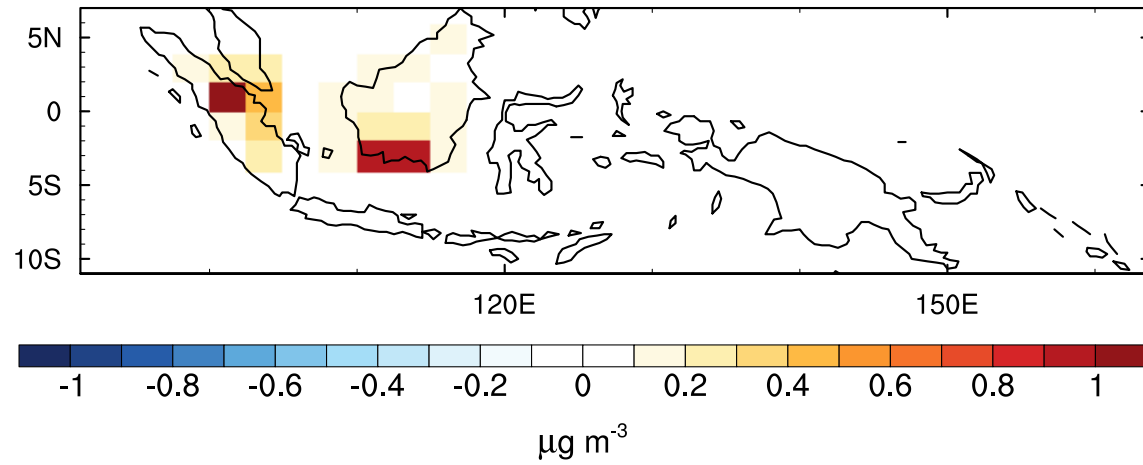


Figure S5. Change in annual-mean surface SOA concentration ($\mu\text{g m}^{-3}$) due to 1990–2010 maritime Southeast Asian land cover change (2010land_base minus 1990land_base).