Anthropogenic emissions enhance biogenic SOA formation and its radiative cooling effect

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Model set up

- a fully explicit SOA model
- 1, SOA formation from organic nitrates and hydroperoxides through traditional gas-particle partitioning, followed by further aerosol phase reactions to form oligomers .
- 2, Formation of non-evaporative SOA from uptake of glyoxal and methylglyoxal on sulfate aerosols and cloud droplets as proposed by *Fu et al.* [2008].
- 3, Formation of non-evaporative SOA from uptake of epoxides on sulfate [*Paulot et al*., 2009]

An offline radiative transfer model to calculate the forcing

	Size distributions	**Refractive index**
Case 1	median radius, r_g=0.08 µm; geometric standard deviation, σ_g=1.4.	Light absorbing: (1.53–0.03i) at 550 nm *Kirchstetter et al.* [2004].
Case 2	43% of SOA: r_g=0.005 µm and σ_g=1.5 57% of SOA: r_g=0.08 µm and σ_g=1.7.	50% of SOA is light absorbing 50% of SOA is pure scattering

PD SOA and Change in SOA between PD and PI

		Load (mg/m^2)	Burden (Tg)	Total source (Tg/yr)	Total biogenic source (Tg/yr)
PD	This work	2.91	1.47	111.2	98.6
	Other global models [a]			18-69	
	AMS constraint[b]			50-230	
PD-PI	This work	0.97 (50%)	0.49 (50%)	31.2(39%)	18.6(23%)
	Other models from AeroCom phase II [c]	0.09~0.3			
	AMS constraint [b]		0.5~2.1	40~160	

Forcing due to the change in SOA

	Case 1	Case 2	Other models reported in AeroCom phase II [c]	AMS constraint [b]
Direct forcing (W/m^2)	-0.06	-0.21	-0.01~-0.07	-0.41~-0.11
First indirect forcing (W/m^2)	-0.32	-0.24		-0.74~-0.36

[a]: Lin et al.(2012); [b]: Spracklen et al. (2011); [c]: Myhre et al. (2012)