Supplement of Atmos. Chem. Phys. Discuss., 15, 32413–32468, 2015
http://www.atmos-chem-phys-discuss.net/15/32413/2015/
doi:10.5194/acpd-15-32413-2015-supplement
© Author(s) 2015. CC Attribution 3.0 License.

Supplement of

Rethinking the global secondary organic aerosol (SOA) budget: stronger production, faster removal, shorter lifetime

A. Hodzic et al.

Correspondence to: A. Hodzic (alma@ucar.edu)

The copyright of individual parts of the supplement might differ from the CC-BY 3.0 licence.

Supplementary material

Annex 1: Comparison of the default [*Jo et al.,* 2013] and the updated VBS for toluene and α-pinene oxidation.

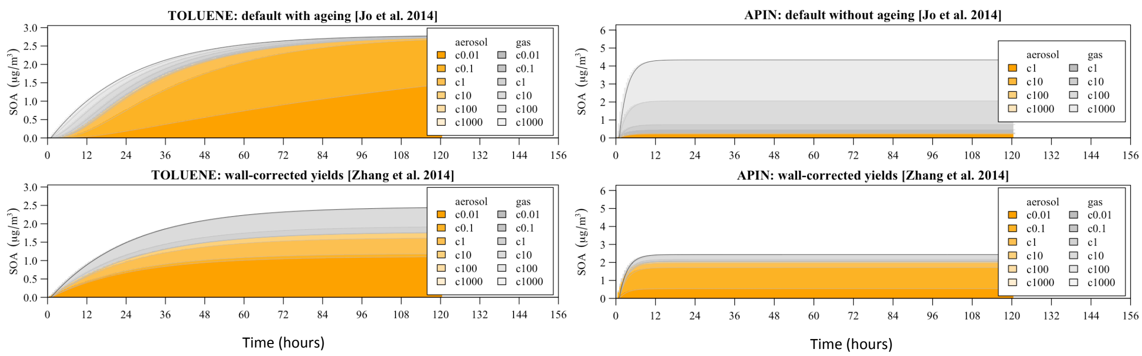
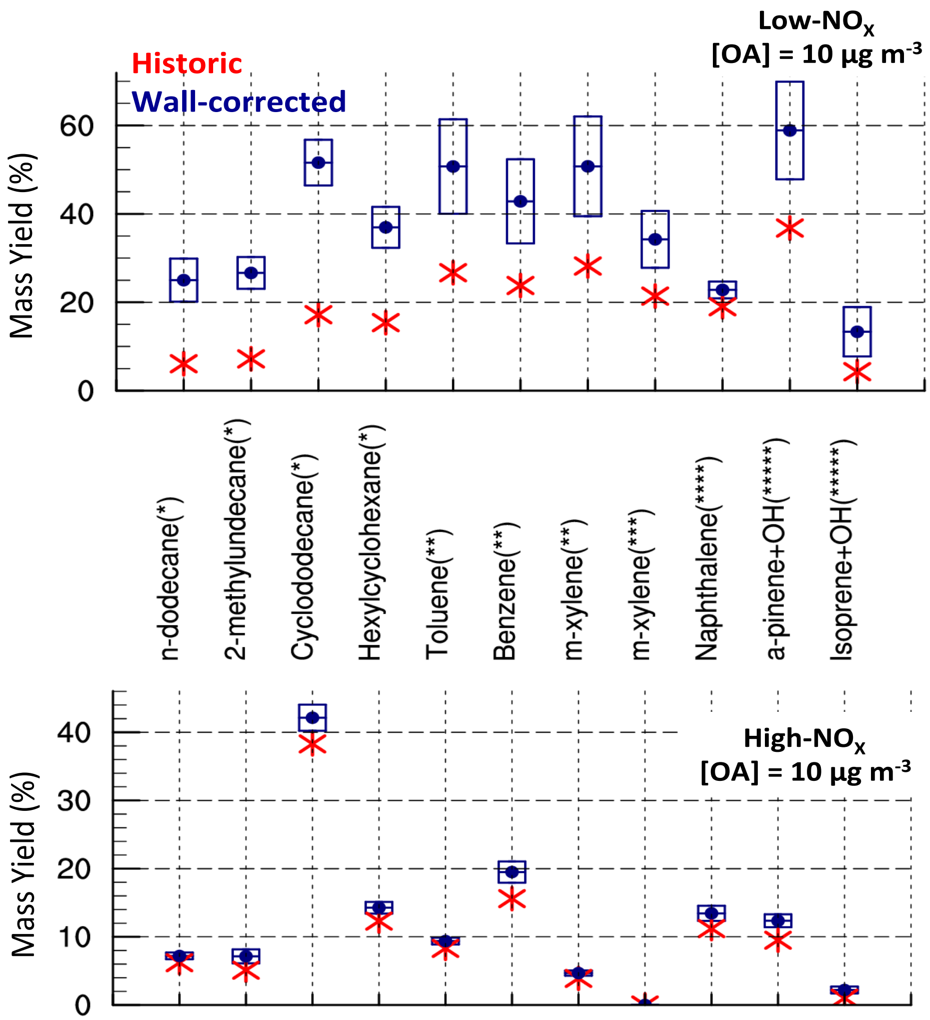


Figure S1: Distribution of the organic mass in particle (orange) and vapor (gray) phases generated from the oxidation of 1 ppbv of toluene (left) and α-pinene (right). Calculations are performed with 1 μg m^{-3} of organic aerosol seed that is used for gas-particle partitioning.

Annex 2: Historic and wall-corrected SOA yields



(*)Values based on the Statistical Oxidation Model (SOM) estimates [*Cappa et al.,* 2013]; (**)Yields based on *Ng et al.* [2007]; (***)Yields from *Loza et al.* [2012]; (****)Yields from *Chan et al.* [2009]; (*****)Yields based on *Chhabra et al.* [2011].

Figure S2: Comparison of historic (red) and wall corrected SOA yields (blue) reported by *Zhang et al.* [2014, Table 1] under low- and high-NO_X conditions. The average biases in SOA yields due to vapor wall losses for various VOCs are also given around the mean value (blue boxes).

Cappa, C.D., et al., Application of the Statistical Oxidation Model (SOM) to sec- ondary organic aerosol formation from photooxidation of C12 alkanes. Atmos. Chem. Phys. 13:1591–1606, 2013.

Chan AWH, et al., Secondary organic aerosol formation from photooxidation of naphthalene and alkylnaphthalenes: Implications for oxidation of intermediate volatility organic compounds (IVOCs) Atmos. Chem. Phys. 9(9):3049–3060, 2009.

Chhabra PS, et al., Elemental composition and oxidation of chamber organic aerosol. Atmos. Chem. Phys. 11(17):8827–8845, 2011.

Loza CL, et al., Chemical aging of m-xylene secondary organic aerosol: Laboratory chamber study. Atmos. Chem. Phys. 12(1):151–167, 2012.

Ng NL, et al., Secondary organic aerosol formation from m-xylene, toluene, and benzene. Atmos Chem Phys 7(14):3909–3922, 2007.

Annex 3: Contribution of various sources to SOA production in the lower troposphere.

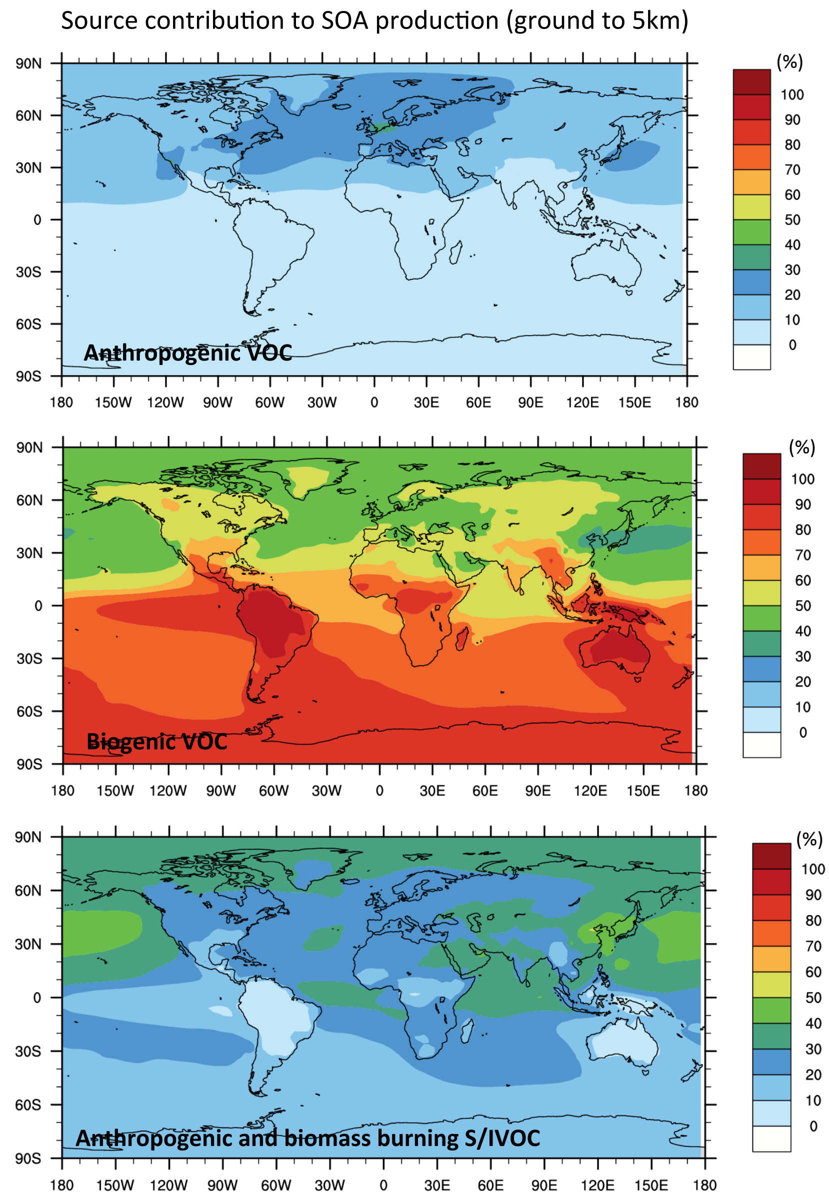


Figure S3: Relative contribution (%) of various sources to predicted SOA concentrations in the lower troposphere (ground to 5km).

Annex 4: Description of EMEP stations and aircraft campaigns

Table S1: Sampling sites of the EMEP OC campaign in Europe used in this study. All sites are representative of the urban background locations.

Site	Country	Latitude (°N)	Longitude (°E)	Height (m, asl)
Illmitz	Austria	47.77	16.77	117
Univ. of Gent	Belgium	51.05	3.72	0
Kosetice	Czech Rep.	49.58	15.08	534
Waldhof	Germany	52.80	10.76	74
Virolahti	Finland	60.53	27.69	4
Edingburgh	Scotland	55.95	3.22	0
Mace Head	Ireland	53.17	9.5	15
Belogna	Italy	44.48	11.33	0
Kollumerwaard	Netherlands	53.33	6.28	1
Braganca	Portugal	41.82	6.77	690
Aspvreten	Sweeden	58.80	17.38	20

Table S2: Aircraft measurements of organic aerosols used in this study. Data and their detailed description can be found at https://sites.google.com/site/amsglobaldatabase/ and in *Heald et al.* [2011]. SEAC4RS data are accessible at http://www-air.larc.nasa.gov.

Campaign	Location	Period	Region
ITOP	Azores (mid-latitudes)	12 Jul. - 3 Aug. 2004	Remote
IMPEX	N. America / E. Pacific (mid-latitudes)	17 Apr. - 15 May 2006	Remote+aged
VOCALS-UK	Eastern S. Pacific (tropical)	27 Oct. - 13 Nov. 2008	Remote
ADRIEX	N. Italy / Adriatic (mid-latitudes)	27 Aug. – 6 Sep. 2004	Pollution

TexAQ	Texas region (mid-latitudes)	11 Sep. – 13 Oct. 2006	Pollution
EUCAARI	N. Europe (mid-latitudes)	6 - 22 May 2008	Pollution
SEAC4RS	SE. US (mid-latitudes)	6 Aug. – 23 Sep. 2013	Pollution/Fires
ARCTAS	Artic / N. Europe (high latitudes)	1-20 Apr. 2008; 18 Jun.-13 Jul. 2008	Fires