Supplement

Table S1. Dry extinction efficiencies and single-scattering albedos at 350 nm used in CAMx (Takemura et al., 2002; RAMBOLL-ENVIRON, 2016).

Species	Dry extinction efficiency $(m^2 \mu g^{-1})$	Single-Scattering Albedo (SSA)
SO_4^{2-} , NH_4^+ , NO_3^-	$7 \cdot 10^{-6}$	0.99
POA, SOA	7.10-6	0.80
EC	18.10-6	0.25
FPRM, CPRM, FCRS, CCRS	$0.4 \cdot 10^{-6}$	0.70
NaCl	1.5.10-6	0.99

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Table S2: Overview of solar radiation measurement stations from the BSRN network used for model evaluation.

Site	Longitude (deg)	Latitude (deg)	Elevation (m asl)
Cabauw	4.93 E	51.97 N	0
Carpentras	5.06 E	44.08 N	100
Cener	1.60 W	42.82 N	471
Lindenberg	14.12 E	52.21 N	125
Palaiseau	2.21 E	48.71 N	156
Payerne	6.94 E	46.82 N	491
Toravere	26.46 E	58.25 N	70

Table S3: Overview of measurement stations used in PM trend analysis.

Sito	Туре	Longitude	Latitude	Elevation (m
		(deg)	(deg)	asl)
Basel-Binningen (CH)	Background suburban	7.58 E	47.54 N	316
Payerne (CH)	Background rural	6.94 E	46.81 N	489
Zürich-Kaserne (CH)	Background urban	8.53 E	47.38 N	409
Den Haag-Rebecquestraat (NL)	Background urban	4.29 E	52.08 N	2
Vredepeel-Vredeweg (NL)	Background rural	5.85 E	51.54 N	28
Wieringerwerf-Medemblikkerweg (NL)	Background rural	5.05 E	52.80 N	-4



Figure S1. Seasonal daytime (10:00-18:00 LMT) mean concentrations (μ g m⁻³) of (a) biogenic secondary organic aerosol (BSOA), (b) sodium (Na⁺), (c) chloride (Cl⁻), (d) fine crustal aerosols (FCRS), (e) coarse crustal aerosol (CCRS), (f) coarse other primary aerosols (CPRM), (g) PM_{2.5} and (h) PM₁₀, for the BASE scenario in summer 2010.



Figure S2. Seasonal daytime (10:00-18:00 LMT) mean $J(O_3 \rightarrow O^1D)$ for the BASE scenario (a) and $J(O_3 \rightarrow O^1D)$ differences between the BASE scenario and PHOT1, PHOT2 and PHOT3 scenarios (b-d), respectively, in summer 2010. Note the different color scale between panel (a) and panels (b-d).



Figure S3. Seasonal daytime (10:00-18:00 LMT) mean differences for all secondary aerosol (SA) species between the BASE scenario and PHOT1 scenario in summer 2010. The PM species that are illustrated are: sulfate (SO_4^{2-}) , ammonium (NH_4^+) , nitrate (NO_3^-) and anthropogenic and biogenic secondary organic aerosols (ASOA and BSOA respectively), as well as the total secondary aerosol (all SA).



Figure S4. Seasonal daytime (10:00-18:00 LMT) mean differences for all secondary aerosol (SA) species between the BASE scenario and PHOT2 scenario in summer 2010. The PM species that are illustrated are: sulfate $(SO_4^{2^-})$, ammonium (NH_4^+) , nitrate (NO_3^-) and anthropogenic and biogenic secondary organic aerosols (ASOA and BSOA respectively), as well as the total secondary aerosol (all SA).



Figure S5. Largest hourly difference in O_3 mixing ratios between the BASE and PHOT1, PHOT2, PHOT3 scenarios (left panels) as well as between the BASE_NO_x and PHOT1_NO_x, PHOT2_NO_x, PHOT3_NO_x scenarios (right panels), in summer 2010.



Figure S6. Largest hourly difference in O_3 mixing ratios between the BASE and BIO, COMBO scenarios (left panels) as well as between the BASE_NO_x and BIO_NO_x, COMBO_NO_x scenarios (right panels), in summer 2010.