Supporting material for *"Emission metrics for quantifying regional climate impacts of aviation"*

Marianne T. Lund, Borgar Aamaas, Terje Berntsen, Lisa Bock, Ulrike Burkhardt, Jan S. Fuglestvedt, Keith P. Shine

Table SI 1: Global and regional aviation emissions used in this study. Emissions are for year 2006 and from the AEDT inventory (Wilkerson et al., 2010). Also included is the accumulated flight distance in each region.

Source region	BC (kg yr^{-1})	NOx (kgN yr^{-1})	OC (kg yr^{-1})	SO2 (kg yr^{-1})	CO2 (kg yr^{-1})	Flight distance (km)
Global	5.9E+06	8.1E+08	6.4E+06	2.3E+08	5.9E+11	6.7E+10
SAF	4.0E+05	5.6E+07	3.6E+05	1.4E+07	3.8E+10	2.5E+09
NAM	2.2E+06	2.9E+08	2.0E+06	8.2E+07	2.2E+11	1.8E+10
EAS	9.8E+05	1.6E+08	1.1E+06	3.8E+07	1.0E+11	4.6E+09
EUR	1.5E+06	2.2E+08	2.1E+06	5.8E+07	1.5E+11	8.9E+09
SPO	4.6E+05	7.1E+07	4.8E+05	1.8E+07	4.6E+10	2.4E+09
SAS	2.5E+05	4.1E+07	2.3E+05	9.5E+06	2.5E+10	1.6E+09

Table SI 2: Radiative forcing (Wm^{-2}) by component, source region and latitude band for input to emission metric calculations.

Component	Source region	Radiative forcing (Wm^{-2})				
		Global	90-28S	28S-28N	28-60N	60-90N
Contrail-cirrus	Global	1.9E-02	2.3E-03	3.5E-02	2.1E-01	2.6E-02
	SAF	2.0E-03	5.9E-04	8.1E-03	1.2E-04	1.1E-09
	NAM	5.3E-03	-1.9E-10	9.7E-03	9.3E-02	6.9E-03
	EAS	4.0E-03	-6.0E-10	5.4E-03	1.3E-02	1.5E-03
	EUR	3.0E-03	2.5E-10	1.5E-04	6.1E-02	8.8E-03
	SPO	3.1E-03	9.1E-04	6.2E-03	-1.3E-06	3.2E-11
	SAS	1.6E-03	-2.5E-10	3.7E-03	7.6E-04	1.2E-08
Ozone	Global	1.9E-02	4.8E-03	2.0E-02	3.6E-02	2.3E-02
	SAF	2.0E-03	1.4E-03	2.9E-03	1.0E-03	2.5E-04
	NAM	5.3E-03	7.0E-05	4.0E-03	1.4E-02	8.4E-03
	EAS	4.0E-03	3.6E-04	4.8E-03	6.9E-03	3.8E-03
	EUR	3.0E-03	4.7E-05	1.3E-03	9.0E-03	8.2E-03
	SPO	3.1E-03	2.5E-03	4.8E-03	7.8E-04	-5.1E-05

	SAS	1.6E-03	7.0E-05	2.2E-03	2.4E-03	6.6E-04
BC	Global	5.7E-04	9.7E-05	5.2E-04	1.3E-03	6.6E-04
	SAF	5.4E-05	2.8E-05	8.2E-05	2.6E-05	9.9E-06
	NAM	1.9E-04	1.8E-06	1.3E-04	5.9E-04	2.7E-04
	EAS	1.0E-04	9.0E-06	1.1E-04	2.0E-04	1.0E-04
	EUR	1.1E-04	1.4E-06	4.7E-05	4.0E-04	2.2E-04
	SPO	5.6E-05	4.9E-05	8.5E-05	1.3E-05	7.3E-06
	SAS	5.0E-05	3.8E-06	6.4E-05	7.7E-05	3.3E-05
OC	Global	-4.6E-05	-4.7E-06	-4.9E-05	-9.9E-05	-2.1E-05
	SAF	-4.4E-06	-1.4E-06	-7.3E-06	-1.6E-06	-2.5E-07
	NAM	-1.5E-05	-6.4E-08	-1.3E-05	-4.1E-05	-7.8E-06
	EAS	-7.7E-06	-4.0E-07	-1.0E-05	-1.2E-05	-2.9E-06
	EUR	-1.0E-05	-5.3E-08	-5.3E-06	-3.8E-05	-8.8E-06
	SPO	-5.1E-06	-2.5E-06	-8.5E-06	-8.7E-07	-2.1E-07
	SAS	-3.6E-06	-1.4E-07	-5.4E-06	-4.2E-06	-8.3E-07
Sulfate	Global	-3.2E-03	-2.2E-04	-3.5E-03	-6.5E-03	-2.0E-03
	SAF	-3.0E-04	-9.9E-05	-5.0E-04	-1.1E-04	-1.8E-05
	NAM	-1.1E-03	3.6E-06	-1.0E-03	-3.0E-03	-8.5E-04
	EAS	-5.8E-04	-3.2E-06	-7.5E-04	-9.7E-04	-2.7E-04
	EUR	-5.5E-04	1.0E-06	-2.9E-04	-1.9E-03	-7.8E-04
	SPO	-3.3E-04	-1.1E-04	-5.8E-04	-4.1E-05	7.2E-06
	SAS	-2.7E-04	-2.9E-06	-3.8E-04	-3.5E-04	-7.8E-05
Nitrate	Global	-3.2E-04	-5.6E-07	-2.8E-04	-9.7E-04	-4.1E-05
	SAF	-1.2E-05	-1.9E-07	-1.7E-05	-1.9E-05	-4.8E-08
	NAM	-9.4E-05	5.8E-10	-8.0E-05	-2.8E-04	-1.3E-05
	EAS	-3.2E-05	6.0E-09	-2.4E-05	-1.1E-04	-6.1E-06
	EUR	-1.1E-04	-3.9E-09	-6.7E-05	-4.2E-04	-1.9E-05
	SPO	-5.9E-06	-3.5E-07	-8.3E-06	-8.5E-06	-1.8E-08
	SAS	-4.1E-05	1.7E-09	-5.7E-05	-6.4E-05	-3.2E-07
Methane	Global	-9.3E-03	-6.8E-03	-1.1E-02	-8.6E-03	-6.1E-03
	SAF	-1.1E-03	-8.3E-04	-1.4E-03	-1.0E-03	-7.4E-04
	NAM	-2.7E-03	-2.0E-03	-3.3E-03	-2.5E-03	-1.8E-03
	EAS	-1.7E-03	-1.2E-03	-2.0E-03	-1.5E-03	-1.1E-03
	EUR	-1.5E-03	-1.1E-03	-1.8E-03	-1.4E-03	-9.7E-04
	SPO	-1.2E-03	-9.0E-04	-1.5E-03	-1.1E-03	-8.1E-04
	SAS	-6.1E-04	-4.5E-04	-7.4E-04	-5.6E-04	-4.0E-04

Table SI 3: Global and regional GWP and GTP for time horizons 20 and 100 years of contrail-cirrus, calculated per km accumulated distance. The GTPs are calculated using the impulse response function by Boucher and Reddy (2008) and values are given relative to CO_2 using CO_2 parameters from Joos et al. (2013).

		GWP		GTP	
Component	**Source region**	**H=20**	**H=100**	**H=20**	**H=100**
Contrail-cirrus	Global	34	9	10	1.3
	SAF	69	19	21	2.7
	NAM	51	14	15	2.0
	EAS	45	12	14	1.8
	EUR	53	14	16	2.1
	SPO	55	15	17	2.1

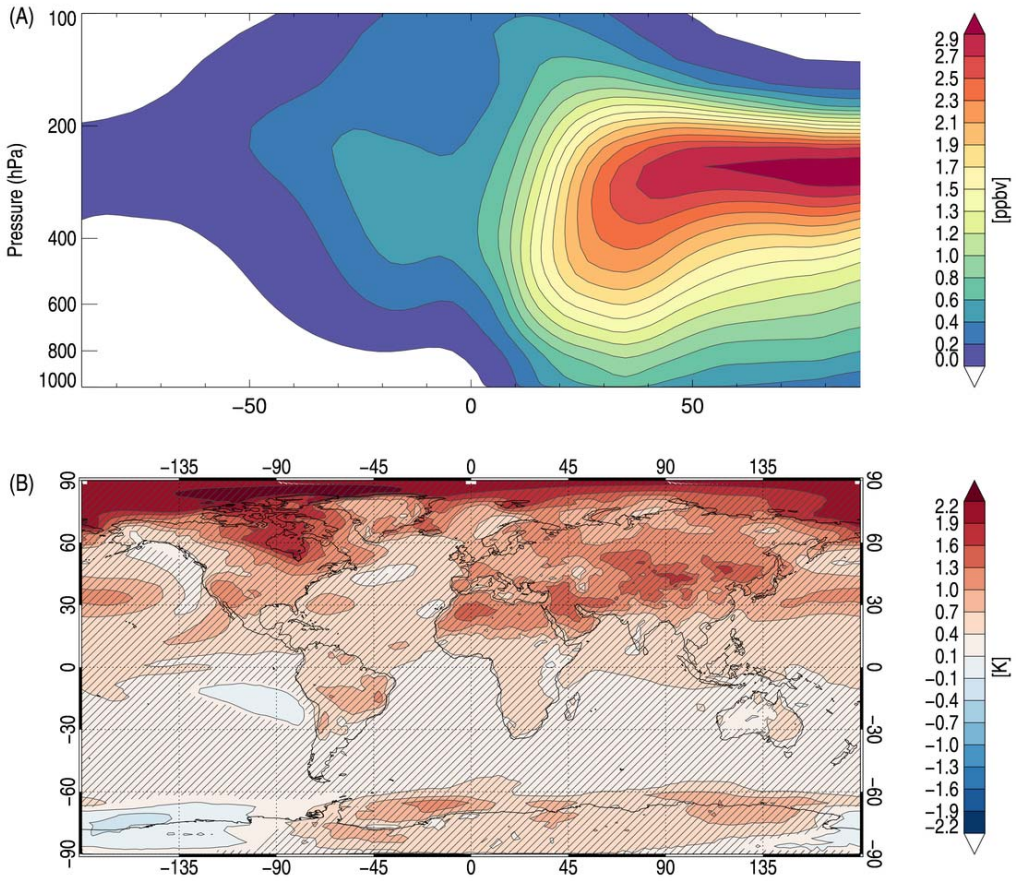

Figure SI 1: (A) Annual mean global aviation-induced ozone concentration from OsloCTM3 and (B) annual mean surface temperature response to the aviation ozone perturbation from CESM1.2. Hatching indicates statistical significance at the 0.05 level.

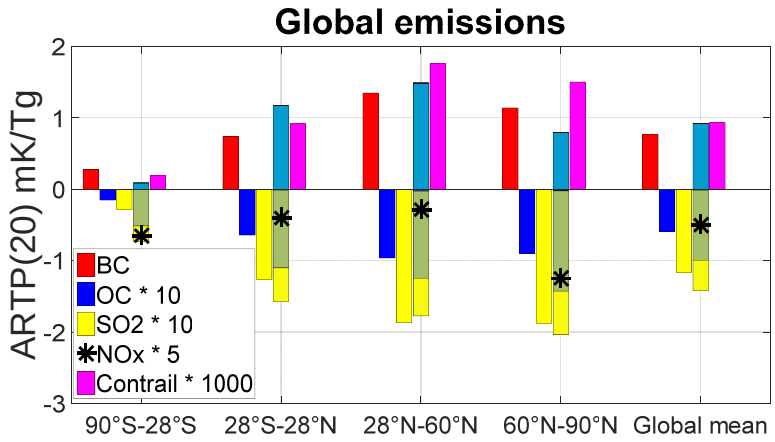

Figure SI 2: ARTP(20) for BC, OC, SO_2, NOx and contrail-cirrus for global aviation emissions. The NOx ARTP(20) is comprised of contributions from ozone (blue), methane (green) and methane-induced ozone (yellow) changes.

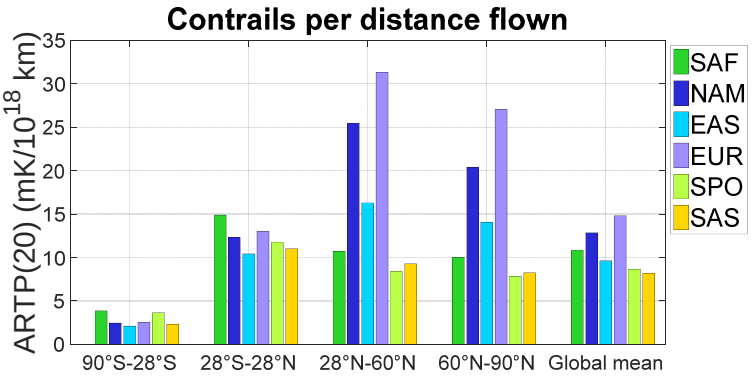

Figure SI 3: ARTP(20) of aviation-induced contrail-cirrus calculated per accumulated km distance.

References

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