Supplemental Information

#1 Great Lakes			Annual		Spring		Summer		Autumn		Winter	
			Mean	Trend	Mean	Trend	Mean	Trend	Mean	Trend	Mean	Trend
TS1.1 surface (sampled)	2005-2020	AQS	38.2	-0.11	44.5	-0.13	48.6	-0.57	33.8	-0.24	26.2	0.45
		a priori	40.0	-0.04	43.2	-0.17	55.7	-0.45	37.1	0.09	24.1	0.35
		KF-AQS	37.7	-0.07	43.5	-0.13	49.0	-0.51	33.1	-0.03	25.4	0.39
TS1.2 surface	2005-2020	a priori	40.2	-0.06	43.4	-0.18	55.7	-0.47	37.4	0.09	24.8	0.27
		KF-AQS	37.9	-0.09	43.5	-0.14	49.1	-0.52	33.5	-0.04	25.7	0.30
TS1.3 trop. column (convolved)	2005-2020	OMI	39.3	-0.09	40.6	-0.16	46.9	0.12	36.7	-0.17	32.8	-0.15
		a priori	36.9	-0.11	37.5	-0.16	45.9	-0.13	35.0	-0.09	29.1	-0.03
		KF-OMI	38.8	-0.21	40.4	-0.31	47.7	-0.03	36.3	-0.23	30.4	-0.24
TS1.4 trop. Column	2005-2020	a priori	37.4	-0.03	38.1	-0.12	45.9	-0.13	35.8	0.03	30.1	0.12
		KF-AQS	36.8	-0.03	37.9	-0.10	44.3	-0.13	35.0	0.01	30.1	0.12
		KF-OMI	40.2	-0.29	42.5	-0.44	48.3	-0.09	37.8	-0.23	32.2	-0.39
	2005-2009	KF-AQS	36.6	-0.48	38.0	-0.32	44.1	-1.57	34.9	-0.37	29.3	-0.10
		KF-OMI	41.8	-0.42	44.5	-0.29	47.6	-1.30	39.4	-0.52	35.3	-0.47
	2010-2014	KF-AQS	37.1	-0.63	38.4	-1.15	45.5	-1.95	34.7	-0.11	30.1	-0.06
		KF-OMI	40.2	-0.97	43.1	-1.45	49.6	-1.77	37.0	-0.41	30.7	-0.49
	2015-2020	KF-AQS	36.7	0.05	37.4	-0.04	43.7	0.38	35.3	-0.19	30.8	0.11
		KF-OMI	38.9	-0.15	40.2	-0.41	47.7	0.16	37.1	-0.35	30.9	0.02

Table. S1. Averages (with units ppb or DU) and trends (with units ppb yr^{-1} or DU yr^{-1}) of surface and tropospheric column O_3 concentrations in 2005-2020 over Great Lakes (Region #1) from observations (AQS and OMI) and a priori and a posteriori (KF) simulations. Grids with low and medium anthropogenic NO_x emissions are excluded in Great Lakes.

#2 Northeast US			Annual		Spring		Summer		Autumn		Winter	
			Mean	Trend	Mean	Trend	Mean	Trend	Mean	Trend	Mean	Trend
TS2.1 surface (sampled)	2005-2020	AQS	37.4	-0.07	43.9	-0.11	47.1	-0.61	31.9	-0.05	27.2	0.42
		a priori	38.1	0.03	41.6	-0.02	52.2	-0.41	34.7	0.20	24.1	0.33
		KF-AQS	36.4	-0.04	42.4	-0.08	46.3	-0.52	31.0	0.05	26.2	0.36
TS2.2 surface	2005-2020	a priori	38.4	0.01	41.9	-0.05	52.4	-0.42	34.9	0.19	24.7	0.28
		KF-AQS	36.6	-0.06	42.5	-0.11	46.4	-0.53	31.2	0.03	26.5	0.32
TS2.3 trop. column (convolved)	2005-2020	OMI	39.3	-0.12	40.8	-0.21	47.3	0.02	37.2	-0.21	31.9	-0.08
		a priori	37.0	-0.11	37.1	-0.18	45.8	-0.13	35.3	-0.11	29.6	0.00
		KF-OMI	38.8	-0.22	40.1	-0.36	48.0	-0.06	36.7	-0.27	30.5	-0.17
TS2.4 trop. Column	2005-2020	a priori	37.4	-0.02	38.0	-0.07	45.3	-0.17	35.9	0.04	30.5	0.14
		KF-AQS	36.8	-0.02	37.9	-0.07	43.7	-0.18	35.1	0.02	30.6	0.14
		KF-OMI	40.3	-0.31	42.9	-0.48	47.9	-0.12	37.8	-0.21	32.7	-0.39
	2005-2009	KF-AQS	36.6	-0.33	37.7	0.00	43.9	-1.21	34.9	-0.67	30.0	-0.07
		KF-OMI	42.0	-0.33	45.1	-0.11	47.6	-0.89	39.1	-0.74	36.2	-0.63
	2010-2014	KF-AQS	37.1	-0.51	38.6	-0.91	44.7	-1.96	35.0	-0.15	30.2	-0.03
		KF-OMI	40.4	-0.86	43.9	-1.16	48.9	-1.92	37.3	-0.42	30.6	-0.46
	2015-2020	KF-AQS	36.6	0.10	37.4	-0.07	42.8	0.20	35.4	-0.13	31.4	0.28
		KF-OMI	38.9	-0.08	40.2	-0.46	47.2	0.03	37.2	-0.23	31.5	0.20

Table. S2. Averages (with units ppb or DU) and trends (with units ppb yr^{-1} or DU yr^{-1}) of surface and tropospheric column O_3 concentrations in 2005-2020 over Northeast US (Region #2) from observations (AQS and OMI) and a priori and a posteriori (KF) simulations. Grids with low and medium anthropogenic NO_x emissions are excluded in Northeast US.

#3 West Coast			Annual		Spring		Summer		Autumn		Winter	
			Mean	Trend	Mean	Trend	Mean	Trend	Mean	Trend	Mean	Trend
TS3.1 surface (sampled)	2005-2020	AQS	41.0	0.15	44.5	-0.07	50.8	-0.15	41.0	0.39	28.1	0.37
		a priori	41.6	-0.01	43.8	-0.18	49.2	-0.09	40.8	0.12	32.9	0.08
		KF-AQS	41.2	0.11	44.5	-0.10	50.6	-0.13	41.4	0.34	28.8	0.29
TS3.2 surface	2005-2020	a priori	41.6	-0.01	43.8	-0.18	49.2	-0.09	40.8	0.12	32.9	0.08
		KF-AQS	41.2	0.11	44.5	-0.10	50.6	-0.13	41.4	0.34	28.8	0.29
TS3.3 trop. column (convolved)	2005-2020	OMI	39.2	0.00	42.1	0.21	43.8	0.13	37.9	-0.15	32.7	-0.19
		a priori	37.5	-0.09	39.5	-0.06	42.7	-0.12	35.6	-0.09	31.9	-0.10
		KF-OMI	39.8	-0.14	43.2	-0.06	45.2	0.02	37.7	-0.23	32.7	-0.28
TS3.4 trop. Column	2005-2020	a priori	38.2	-0.02	38.9	-0.09	42.5	-0.15	36.5	0.00	34.9	0.07
		KF-AQS	38.1	-0.01	38.9	-0.09	42.6	-0.16	36.5	0.02	34.6	0.09
		KF-OMI	41.9	-0.26	44.9	-0.37	46.6	-0.08	39.5	-0.29	36.7	-0.38
	2005-2009	KF-AQS	38.0	0.07	38.9	-0.17	42.9	-0.48	36.6	-0.08	34.0	-0.01
		KF-OMI	43.2	0.19	45.9	-0.06	46.1	-0.17	41.6	-0.16	39.8	-0.20
	2010-2014	KF-AQS	38.3	-0.11	39.8	0.00	43.1	-1.21	36.5	0.17	34.5	0.60
		KF-OMI	42.3	-0.72	46.8	-1.04	47.8	-1.56	39.1	-0.11	35.3	0.18
	2015-2020	KF-AQS	38.0	-0.07	38.2	-0.29	41.8	-0.11	36.5	0.53	35.0	-0.31
		KF-OMI	40.6	-0.30	42.6	-0.72	46.0	-0.19	38.0	0.15	35.3	-0.44

Table. S3. Averages (with units ppb or DU) and trends (with units ppb yr^{-1} or DU yr^{-1}) of surface and tropospheric column O_3 concentrations in 2005-2020 over West Coast (Region #3) from observations (AQS and OMI) and a priori and a posteriori (KF) simulations. Grids with low and medium anthropogenic NO_x emissions are excluded in West Coast.

#4 Middle US			Annual		Spring		Summer		Autumn		Winter	
			Mean	Trend	Mean	Trend	Mean	Trend	Mean	Trend	Mean	Trend
TS4.1 surface (sampled)	2005-2020	AQS	39.7	-0.30	44.3	-0.29	46.0	-0.62	37.8	-0.35	31.0	-0.06
		a priori	42.2	-0.28	44.8	-0.40	55.2	-0.61	40.6	-0.18	28.3	0.02
		KF-AQS	40.4	-0.29	44.8	-0.33	48.5	-0.61	38.4	-0.30	30.2	-0.01
TS4.2 surface	2005-2020	a priori	41.3	-0.23	44.1	-0.34	54.1	-0.48	39.3	-0.18	27.8	0.04
		KF-AQS	40.0	-0.21	44.1	-0.28	49.8	-0.46	37.6	-0.22	28.7	0.05
TS4.3 trop. column (convolved)	2005-2020	OMI	39.0	0.02	40.8	0.11	44.4	0.16	37.2	-0.06	33.8	-0.12
		a priori	38.2	-0.10	39.5	-0.11	46.3	-0.17	36.1	-0.06	31.0	-0.05
		KF-OMI	39.4	-0.13	41.8	-0.13	46.4	0.00	37.2	-0.14	32.1	-0.24
TS4.4 trop. Column	2005-2020	a priori	39.3	-0.08	40.8	-0.19	46.1	-0.18	36.6	-0.02	33.9	0.04
		KF-AQS	38.9	-0.07	40.8	-0.17	45.1	-0.17	36.2	-0.02	33.9	0.05
		KF-OMI	41.5	-0.24	44.4	-0.33	47.7	-0.09	38.5	-0.21	35.4	-0.34
	2005-2009	KF-AQS	39.0	-0.43	41.1	-0.62	45.3	-1.44	36.1	-0.15	33.3	-0.58
		KF-OMI	42.6	-0.30	45.4	-0.42	47.3	-1.26	39.8	-0.14	37.9	-0.59
	2010-2014	KF-AQS	39.4	-0.60	41.6	-1.20	45.9	-1.37	36.4	-0.31	34.0	-0.49
		KF-OMI	41.8	-0.88	45.7	-1.47	48.8	-1.25	38.3	-0.50	34.2	-0.81
	2015-2020	KF-AQS	38.5	0.07	39.7	0.11	44.2	0.28	36.1	0.00	34.3	-0.02
		KF-OMI	40.3	-0.12	42.4	-0.23	47.1	0.19	37.6	-0.25	34.2	-0.13

Table. S4. Averages (with units ppb or DU) and trends (with units ppb yr^{-1} or DU yr^{-1}) of surface and tropospheric column O_3 concentrations in 2005-2020 over Middle US (Region #4) from observations (AQS and OMI) and a priori and a posteriori (KF) simulations.

#5 Southeast US			Annual		Spring		Summer		Autumn		Winter	
			Mean	Trend	Mean	Trend	Mean	Trend	Mean	Trend	Mean	Trend
TS5.1 surface (sampled)	2005-2020	AQS	39.9	-0.47	46.9	-0.54	42.6	-0.92	37.6	-0.44	32.7	-0.03
		a priori	44.4	-0.38	46.6	-0.47	54.8	-0.86	43.3	-0.24	33.2	0.00
		KF-AQS	40.3	-0.43	46.3	-0.52	44.7	-0.87	37.8	-0.37	32.6	-0.02
TS5.2 surface	2005-2020	a priori	43.7	-0.39	46.0	-0.47	53.1	-0.84	42.9	-0.26	33.0	-0.02
		KF-AQS	40.6	-0.39	45.3	-0.48	45.3	-0.78	38.9	-0.33	32.8	0.00
TS5.3 trop. column (convolved)	2005-2020	OMI	42.7	0.06	44.5	0.06	48.9	0.09	40.4	0.00	36.9	0.07
		a priori	42.8	-0.11	45.3	-0.13	49.3	-0.21	40.1	-0.08	36.6	-0.02
		KF-OMI	43.6	-0.10	46.8	-0.13	49.8	-0.02	41.0	-0.13	36.9	-0.14
TS5.4 trop. Column	2005-2020	a priori	44.3	-0.19	47.4	-0.34	48.1	-0.26	40.0	-0.07	42.2	-0.09
		KF-AQS	43.5	-0.18	47.1	-0.34	46.1	-0.23	39.2	-0.08	42.1	-0.09
		KF-OMI	45.8	-0.28	49.8	-0.42	49.4	-0.17	41.6	-0.20	42.7	-0.34
	2005-2009	KF-AQS	44.1	-0.23	48.0	-1.06	46.5	-0.61	38.9	-0.40	43.3	-0.32
		KF-OMI	46.9	-0.22	51.0	-0.98	49.3	-0.64	42.1	-0.39	45.9	-0.15
	2010-2014	KF-AQS	44.3	-1.05	48.7	-1.53	47.3	-1.83	40.1	-0.97	40.9	-0.94
		KF-OMI	46.6	-1.24	51.8	-1.69	50.8	-1.74	42.4	-1.03	40.5	-1.07
	2015-2020	KF-AQS	42.4	0.14	45.1	0.14	44.7	0.19	38.6	-0.15	42.2	0.44
		KF-OMI	44.2	-0.06	47.2	-0.13	48.3	0.04	40.6	-0.39	41.8	0.24

Table. S5. Averages (with units ppb or DU) and trends (with units ppb yr^{-1} or DU yr^{-1}) of surface and tropospheric column O_3 concentrations in 2005-2020 over Southeast US (Region #5) from observations (AQS and OMI) and a priori and a posteriori (KF) simulations.

#1 Britain			Annual		Spring		Summer		Autumn		Winter	
			Mean	Trend	Mean	Trend	Mean	Trend	Mean	Trend	Mean	Trend
TS6.1 surface (sampled)	2005-2020	AirBase	24.4	0.14	31.8	0.17	27.5	-0.01	19.7	0.12	18.8	0.35
		a priori	29.9	0.10	36.0	0.11	38.7	-0.10	25.2	0.08	19.9	0.31
		KF-AirBase	26.0	0.09	32.9	0.11	30.7	-0.07	21.3	0.07	19.1	0.28
TS6.2 surface	2005-2020	a priori	30.0	0.09	35.9	0.10	38.5	-0.10	25.4	0.07	20.2	0.30
		KF-AirBase	26.7	0.07	33.4	0.09	31.9	-0.09	22.0	0.06	19.5	0.28
TS6.3 trop. column (convolved)	2005-2020	OMI	35.9	-0.05	37.8	-0.31	37.2	-0.17	34.1	0.04	34.5	0.30
		a priori	30.9	-0.07	32.3	-0.16	32.2	-0.24	29.8	0.03	29.3	0.12
		KF-OMI	33.7	-0.25	36.2	-0.43	35.9	-0.29	31.7	-0.19	30.8	-0.03
TS6.4 trop. Column	2005-2020	a priori	30.1	0.00	32.9	0.01	31.8	0.02	27.9	-0.02	27.8	0.01
		KF-AirBase	29.7	0.00	32.6	0.01	31.0	0.02	27.5	-0.02	27.7	0.01
		KF-OMI	34.7	-0.49	39.8	-0.60	36.9	-0.07	30.9	-0.52	30.6	-0.71
	2005-2009	KF-AirBase	29.7	-0.29	32.4	0.18	31.1	-0.85	27.7	-0.27	27.6	-0.27
		KF-OMI	37.7	-0.52	42.8	0.03	37.0	-0.42	34.4	-0.92	35.9	-1.35
	2010-2014	KF-AirBase	29.5	-0.16	32.8	-0.67	30.3	-0.04	27.3	0.29	27.5	-0.40
		KF-OMI	34.2	-0.88	40.7	-1.52	37.0	-0.41	29.9	-0.25	28.3	-1.00
	2015-2020	KF-AirBase	29.9	0.07	32.6	0.18	31.4	0.17	27.5	-0.15	28.1	-0.12
		KF-OMI	32.5	-0.35	36.6	-0.52	36.7	-0.45	28.7	-0.42	28.2	-0.18

Table. S6. Averages (with units ppb or DU) and trends (with units ppb yr^{-1} or DU yr^{-1}) of surface and tropospheric column O_3 concentrations in 2005-2020 over Britain (Region #1) from observations (AirBase and OMI) and a priori and a posteriori (KF) simulations. Grids with low and medium anthropogenic NO_x emissions are excluded in Britain.

#2 Central EU			Annual		Spring		Summer		Autumn		Winter	
			Mean	Trend	Mean	Trend	Mean	Trend	Mean	Trend	Mean	Trend
TS7.1 surface (sampled)	2005-2020	AirBase	28.0	0.21	35.5	0.14	38.3	0.17	20.5	0.22	17.7	0.33
		a priori	30.5	0.14	36.5	0.12	44.7	0.03	25.2	0.14	15.9	0.27
		KF-AirBase	28.2	0.16	35.4	0.13	39.0	0.12	21.3	0.17	17.4	0.26
TS7.2 surface	2005-2020	a priori	30.6	0.14	36.5	0.12	44.8	0.03	25.2	0.14	15.9	0.27
		KF-AirBase	28.3	0.16	35.4	0.12	39.1	0.12	21.3	0.17	17.3	0.25
TS7.3 trop. column (convolved)	2005-2020	OMI	35.5	-0.22	36.6	-0.51	37.8	-0.25	33.4	-0.14	34.2	-0.02
		a priori	31.6	-0.13	32.9	-0.26	34.4	-0.23	30.2	-0.02	28.9	-0.02
		KF-OMI	34.0	-0.31	36.2	-0.52	37.5	-0.29	31.9	-0.22	30.5	-0.20
TS7.4 trop. Column	2005-2020	a priori	31.0	0.04	33.4	0.02	34.7	0.09	28.5	-0.01	27.3	0.06
		KF-AirBase	30.4	0.04	33.0	0.02	33.5	0.10	27.8	-0.01	27.4	0.06
		KF-OMI	34.9	-0.38	39.3	-0.50	38.9	0.03	31.1	-0.44	30.0	-0.62
	2005-2009	KF-AirBase	30.2	-0.24	32.7	0.07	33.2	-0.50	27.9	-0.48	27.0	-0.28
		KF-OMI	37.4	-0.36	41.6	-0.12	38.5	-0.13	34.1	-0.83	34.8	-1.25
	2010-2014	KF-AirBase	30.2	-0.11	33.3	-0.61	32.8	-0.06	27.7	0.24	27.0	-0.17
		KF-OMI	34.4	-0.72	40.3	-1.49	38.8	-0.30	30.3	-0.12	27.8	-0.71
	2015-2020	KF-AirBase	30.8	0.11	33.0	0.19	34.5	0.07	27.8	0.13	27.9	-0.12
		KF-OMI	33.3	-0.23	36.7	-0.45	39.3	-0.31	29.2	-0.11	28.0	-0.18

Table. S7. Averages (with units ppb or DU) and trends (with units ppb yr^{-1} or DU yr^{-1}) of surface and tropospheric column O_3 concentrations in 2005-2020 over Central EU (Region #2) from observations (AirBase and OMI) and a priori and a posteriori (KF) simulations. Grids with low and medium anthropogenic NO_x emissions are excluded in Central EU.

#3 Western EU			Annual		Spring		Summer		Autumn		Winter	
			Mean	Trend	Mean	Trend	Mean	Trend	Mean	Trend	Mean	Trend
TS8.1 surface (sampled)	2005-2020	AirBase	32.3	0.11	38.9	0.05	40.1	-0.06	27.6	0.15	22.6	0.30
		a priori	35.9	0.02	40.6	-0.12	44.9	-0.10	32.9	0.03	25.2	0.23
		KF-AirBase	32.5	0.05	38.6	-0.02	40.2	-0.10	28.4	0.07	23.0	0.25
TS8.2 surface	2005-2020	a priori	36.0	0.00	40.6	-0.13	44.8	-0.12	33.2	0.01	25.6	0.22
		KF-AirBase	32.8	0.03	38.6	-0.05	40.2	-0.12	28.8	0.05	23.5	0.23
TS8.3 trop. column (convolved)	2005-2020	OMI	36.3	-0.16	37.8	-0.29	41.6	-0.10	34.7	-0.07	31.0	-0.21
		a priori	33.3	-0.10	34.0	-0.19	37.8	-0.17	32.0	-0.01	29.5	-0.04
		KF-OMI	35.7	-0.26	37.5	-0.40	41.3	-0.20	33.7	-0.20	30.5	-0.24
TS8.4 trop. Column	2005-2020	a priori	32.5	0.02	34.1	-0.02	37.0	0.03	30.0	-0.01	28.7	0.09
		KF-AirBase	31.8	0.03	33.6	0.00	35.9	0.03	29.3	0.00	28.5	0.09
		KF-OMI	36.4	-0.36	40.0	-0.44	41.4	-0.02	32.7	-0.41	31.2	-0.53
	2005-2009	KF-AirBase	31.6	-0.23	33.3	-0.15	35.7	-0.64	29.3	-0.21	27.9	-0.06
		KF-OMI	38.5	-0.40	41.8	-0.53	41.1	-0.25	35.4	-0.55	35.4	-0.81
	2010-2014	KF-AirBase	31.7	-0.25	33.8	-0.60	35.5	-0.38	29.2	-0.14	28.4	-0.14
		KF-OMI	36.2	-0.79	41.1	-1.19	41.6	-0.54	32.1	-0.47	29.2	-0.67
	2015-2020	KF-AirBase	32.1	-0.03	33.6	-0.04	36.5	-0.20	29.4	-0.03	29.1	0.02
		KF-OMI	34.8	-0.32	37.6	-0.57	41.4	-0.45	31.1	-0.35	29.3	-0.09

Table. S8. Averages (with units ppb or DU) and trends (with units ppb yr^{-1} or DU yr^{-1}) of surface and tropospheric column O_3 concentrations in 2005-2020 over Western EU (Region #3) from observations (AirBase and OMI) and a priori and a posteriori (KF) simulations.

#4 Iberian Peninsula			Annual		Spring		Summer		Autumn		Winter	
			Mean	Trend	Mean	Trend	Mean	Trend	Mean	Trend	Mean	Trend
TS9.1 surface (sampled)	2005-2020	AirBase	34.2	0.06	39.5	0.02	41.1	-0.15	31.2	0.12	25.3	0.23
		a priori	40.3	-0.06	43.9	-0.21	48.4	-0.18	38.1	-0.01	30.6	0.13
		KF-AirBase	35.2	-0.02	40.0	-0.08	42.1	-0.20	32.5	0.02	26.2	0.17
TS9.2 surface	2005-2020	a priori	40.4	-0.07	43.9	-0.22	48.7	-0.17	38.4	-0.02	30.9	0.10
		KF-AirBase	36.2	-0.05	40.6	-0.13	43.4	-0.22	33.4	0.00	27.2	0.13
TS9.3 trop. column (convolved)	2005-2020	OMI	37.8	-0.12	39.1	-0.20	45.4	0.05	35.7	-0.22	30.9	-0.12
		a priori	35.3	-0.08	36.0	-0.16	41.5	-0.06	33.3	-0.07	30.5	-0.05
		KF-OMI	37.8	-0.21	39.2	-0.30	45.3	-0.03	35.2	-0.28	31.2	-0.24
TS9..4 trop. Column	2005-2020	a priori	34.2	0.02	35.0	-0.06	40.7	0.03	31.3	0.00	29.9	0.09
		KF-AirBase	33.6	0.02	34.5	-0.04	39.7	0.02	30.6	0.00	29.5	0.10
		KF-OMI	38.1	-0.30	40.8	-0.39	45.3	0.01	34.2	-0.36	32.0	-0.46
	2005-2009	KF-AirBase	33.3	-0.26	34.4	-0.20	39.5	-0.69	30.4	-0.31	29.0	0.02
		KF-OMI	39.7	-0.41	42.1	-0.33	44.9	-0.43	36.3	-0.55	35.6	-0.50
	2010-2014	KF-AirBase	33.6	-0.38	34.7	-0.63	39.4	-0.42	30.7	-0.68	29.7	0.10
		KF-OMI	38.2	-0.86	42.0	-1.18	45.6	-0.44	34.0	-0.97	30.4	-0.37
	2015-2020	KF-AirBase	33.8	0.03	34.4	-0.28	40.1	0.05	30.7	0.10	29.9	0.34
		KF-OMI	36.7	-0.23	38.6	-0.74	45.4	-0.07	32.7	-0.29	30.2	0.20

Table. S9. Averages (with units ppb or DU) and trends (with units ppb yr^{-1} or DU yr^{-1}) of surface and tropospheric column O_3 concentrations in 2005-2020 over Iberian Peninsula (Region #4) from observations (AirBase and OMI) and a priori and a posteriori (KF) simulations.

#5 Apennine Peninsula			Annual		Spring		Summer		Autumn		Winter	
			Mean	Trend	Mean	Trend	Mean	Trend	Mean	Trend	Mean	Trend
TS10.1 surface (sampled)	2005-2020	AirBase	34.0	0.08	39.2	-0.06	45.5	-0.03	29.2	0.17	22.0	0.22
		a priori	41.8	-0.05	45.3	-0.30	53.9	-0.10	39.0	0.00	29.1	0.20
		KF-AirBase	35.3	0.04	40.1	-0.09	46.4	-0.04	31.0	0.11	23.7	0.18
TS10.2 surface	2005-2020	a priori	41.8	-0.06	45.2	-0.30	52.8	-0.10	39.2	-0.01	30.1	0.17
		KF-AirBase	36.6	-0.02	41.0	-0.16	46.1	-0.11	33.0	0.03	26.5	0.16
TS10.3 trop. column (convolved)	2005-2020	OMI	38.7	-0.13	39.5	-0.25	46.7	0.02	36.5	-0.20	31.9	-0.15
		a priori	35.4	-0.08	35.6	-0.17	43.0	-0.02	33.4	-0.07	29.6	-0.06
		KF-OMI	37.7	-0.21	38.7	-0.33	46.0	-0.02	35.2	-0.25	30.7	-0.25
TS10.4 trop. Column	2005-2020	a priori	34.9	0.04	35.3	-0.10	44.1	0.12	31.8	0.02	28.5	0.09
		KF-AirBase	34.0	0.04	34.5	-0.08	42.7	0.11	30.8	0.03	28.1	0.10
		KF-OMI	38.2	-0.26	40.3	-0.42	47.6	0.11	34.2	-0.29	30.8	-0.46
	2005-2009	KF-AirBase	33.5	-0.24	34.6	-0.68	41.8	0.17	30.4	-0.57	27.6	-0.39
		KF-OMI	39.6	-0.29	41.7	-0.80	46.5	0.43	36.0	-0.74	34.5	-1.06
	2010-2014	KF-AirBase	34.1	-0.28	34.9	-0.58	42.8	-0.51	31.0	-0.02	27.6	-0.28
		KF-OMI	38.3	-0.81	41.5	-1.19	48.2	-0.67	34.0	-0.45	28.7	-0.79
	2015-2020	KF-AirBase	34.2	0.03	34.2	-0.24	43.3	-0.07	30.8	0.25	28.9	0.01
		KF-OMI	37.0	-0.19	38.0	-0.70	48.0	-0.16	32.9	-0.01	29.5	-0.11

Table. S10. Averages (with units ppb or DU) and trends (with units ppb yr^{-1} or DU yr^{-1}) of surface and tropospheric column O_3 concentrations in 2005-2020 over Apennine Peninsula (Region #5) from observations (AirBase and OMI) and a priori and a posteriori (KF) simulations.