

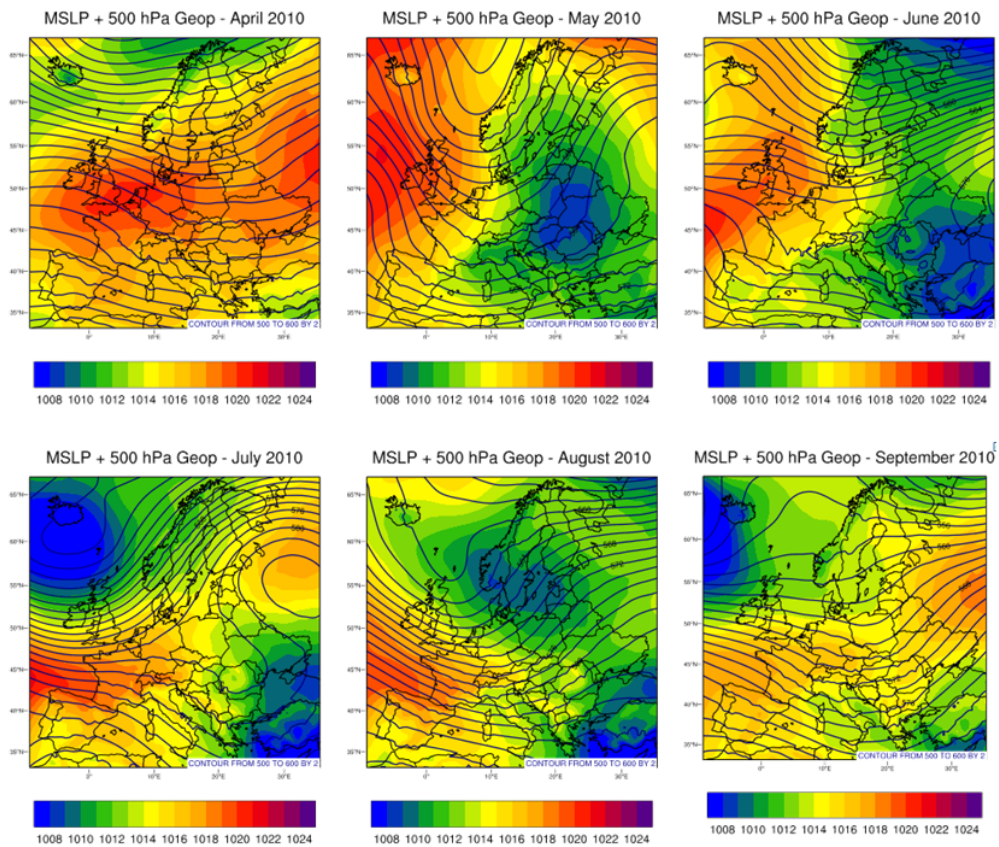
# **Supplementary material: Source attribution of European tropospheric ozone using a tagged ozone mechanism**

Aurelia Lupaşcu<sup>1</sup> and Tim Butler<sup>1,2</sup>

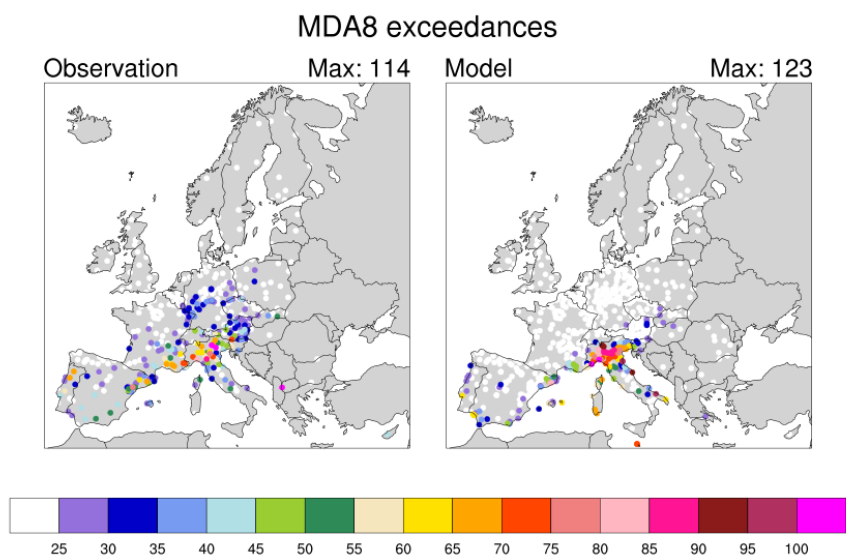
<sup>1</sup>Institute for Advanced Sustainability Studies (IASS), Potsdam, 14467, Germany

<sup>2</sup>Freie Universität Berlin, Institut für Meteorologie, Berlin, Germany

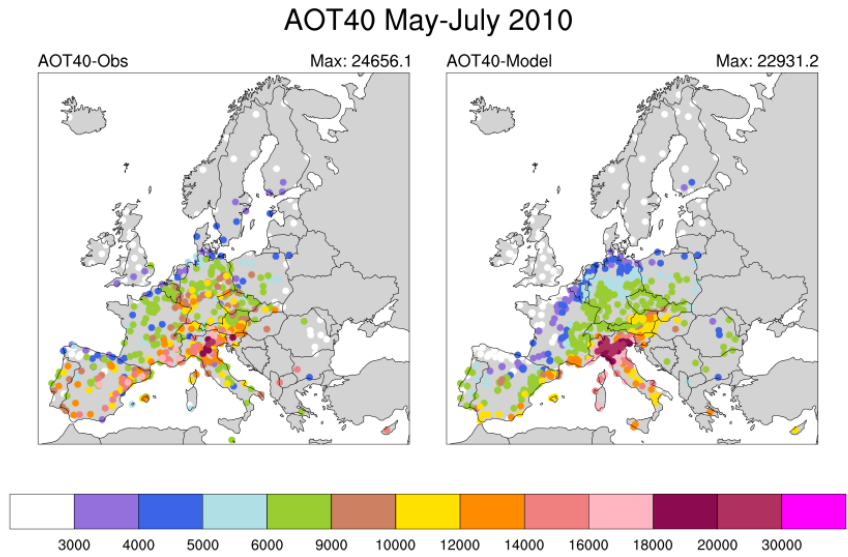
**Correspondence:** A.Lupascu (Aurelia.Lupascu@iass-potsdam.de)



**Figure 1.** Averaged mean sea level pressure (filled colors) and geopotential heights (contours) at 500 hPa for May-September 2010 period from the WRF-Chem simulation. The contour interval is 2 hPa



**Figure 2.** Distribution of observed (left) and modelled (right) MDA8 ozone air quality exceedance during April-September 2010 period. Model results are shown at the locations of the rural AirBase stations.



**Figure 3.** Distribution of observed (left) and modelled (right) AOT40 vegetation metrics during May-July 2010 period. Model results are shown at the locations of the rural AirBase stations

**Table 1.** Local, European, long range transported (LRT) and natural emissions sources contribution to MDA8 O<sub>3</sub> during late spring, summer and early autumn 2010

SR region	Late Spring				Summer				Early Autumn			
	Local	rest of Europe	LRT	natural sources	Local	rest of Europe	LRT	natural sources	Local	rest of Europe	LRT	natural sources
IBE	19.96	20.37	41.09	18.57	31.10	21.84	27.69	19.36	31.15	15.35	33.74	19.75
ITA	11.43	45.76	29.46	13.34	16.75	53.63	15.53	14.08	12.17	46.66	24.6	16.56
SEE	15.96	38.22	28.84	16.97	22.27	40.35	14.18	23.19	17.41	37.11	21.84	23.64
TCA	20.19	24.68	33.96	21.16	24.57	26.62	22.69	26.1	22.99	23.16	26.92	26.92
UKI	10.35	13.52	53.65	22.46	17.38	15.28	44.84	22.48	7.80	19.83	44.96	27.41
FRA	14.37	33.91	34.22	17.48	25.45	35.09	23.66	15.78	21.81	28.26	29.63	20.29
ALP	19.63	40.39	25.06	14.91	33.60	40.09	12.85	13.44	26.09	35.30	21.72	16.87
GEN	14.23	28.66	37.8	19.29	32.01	33.89	19.26	14.82	15.00	31.89	30.45	22.63
CEN	15.42	36.12	30.33	18.11	26.14	41.01	15.27	17.56	17.10	34.22	25.70	22.97
SCA	8.50	17.81	49.25	24.35	14.67	29.00	31.38	24.94	7.88	23.31	38.40	30.42
RBU	21.15	14.21	38.61	26.02	27.12	14.73	21.01	37.14	25.31	17.75	27.38	29.55



**Table 3.** Table S2. continuation

	Metric	UKI	FRA	GEN	ITA	CEN	ALP	IBE	RBU	SEE	SCA	TCA	BNS	MBS	BIO	BMB	LGT	STR	OCN	NAM	NAF	ASI	RST
IBE	MeanF	2.3	5.2	2.5	0.4	0.8	0.9	19.8	1.8	0.3	0.5	0.1	1.8	6.4	4.2	1.9	4.0	7.6	11.5	9.0	2.4	6.0	10.6
	MeanS	1.5	5.0	0.6	0.2	0.1	0.4	28.2	0.9	0.0	0.2	0.0	1.0	9.6	7.3	5.3	5.1	3.2	10.0	8.8	2.8	3.7	6.0
	MDA8F	2.1	4.8	2.4	0.4	0.7	0.9	22.8	1.7	0.3	0.5	0.1	1.7	6.7	4.3	1.9	3.9	7.5	10.5	8.6	2.4	5.8	10.1
	MDA8S	1.3	4.2	0.5	0.2	0.1	0.3	31.9	0.9	0.0	0.2	0.0	0.9	9.7	7.2	5.4	5.0	3.1	8.8	8.2	2.8	3.6	5.6
	95th F	1.1	6.8	3.0	0.7	1.3	1.7	28.4	2.3	0.5	0.7	0.2	1.3	9.3	4.7	2.0	3.3	6.1	5.6	6.4	3.2	4.3	6.8
	95th S	1.1	3.9	0.8	0.3	0.1	0.4	37.6	0.6	0.0	0.2	0.0	0.8	12.5	7.1	6.3	4.1	2.6	5.0	5.6	3.8	2.9	4.3
	W126	0.8	4.0	1.4	0.3	0.4	0.6	36.1	0.9	0.1	0.2	0.0	0.7	10.1	7.0	5.8	3.9	3.9	4.9	6.6	3.1	3.6	5.4
	SOMO35	1.4	4.9	1.6	0.4	0.5	0.8	29.3	1.2	0.2	0.3	0.0	1.2	10.8	5.6	3.7	4.1	5.0	7.2	7.0	3.2	4.3	7.1
	AOT40	1.2	5.4	1.8	0.5	0.7	1.1	29.4	1.2	0.3	0.4	0.1	1.0	12.4	5.5	3.5	3.9	4.8	6.2	6.5	3.4	4.0	6.7
RBU	MeanF	0.9	0.6	1.5	0.2	3.4	0.3	0.3	22.2	1.6	3.0	0.5	1.5	0.6	7.3	5.4	4.5	8.8	6.6	8.3	0.7	8.2	13.7
	MeanS	1.7	0.7	2.3	0.1	4.0	0.2	0.1	25.6	0.9	3.3	0.2	2.1	0.2	13.4	16.3	4.7	3.4	2.9	5.7	0.1	3.9	8.4
	MDA8F	0.9	0.7	1.6	0.2	3.6	0.3	0.3	23.0	1.7	2.8	0.5	1.5	0.6	7.3	5.8	4.4	8.6	6.3	8.0	0.7	7.9	13.2
	MDA8S	1.6	0.7	2.3	0.1	4.0	0.2	0.1	26.6	1.0	3.1	0.2	2.0	0.2	12.9	17.6	4.5	3.3	2.7	5.4	0.1	3.7	7.9
	95th F	0.9	1.0	2.3	0.3	3.8	0.5	0.4	24.4	2.2	1.5	0.5	1.1	0.7	6.3	10.9	4.1	8.3	5.3	6.6	0.7	6.9	11.3
	95th S	0.8	0.5	1.6	0.1	3.0	0.2	0.1	29.3	1.1	1.4	0.2	1.0	0.2	12.1	28.8	3.5	2.6	1.4	3.7	0.1	2.8	5.6
	W126	0.3	0.3	0.9	0.1	2.1	0.1	0.1	29.3	0.8	0.7	0.1	0.5	0.1	12.4	33.8	3.2	2.8	0.9	3.2	0.1	2.8	5.1
	SOMO35	0.7	0.6	1.7	0.2	3.7	0.3	0.3	28.6	1.6	1.3	0.4	1.0	0.5	10.2	20.3	3.7	4.8	2.6	4.8	0.4	4.4	7.9
	AOT40	0.5	0.6	1.4	0.2	3.3	0.3	0.2	29.6	1.6	0.9	0.4	0.7	0.5	11.0	24.1	3.5	4.1	1.9	4.1	0.3	3.8	7.0
SEE	MeanF	0.9	1.9	3.7	3.5	7.4	1.7	1.2	6.9	16.4	0.9	3.2	1.2	6.7	5.2	2.3	3.4	6.4	4.3	5.9	2.1	4.9	9.9
	MeanS	1.2	1.5	3.4	2.4	7.5	1.8	0.6	9.7	19.0	1.2	3.7	1.5	4.8	9.3	9.9	3.8	2.8	2.0	4.6	0.8	2.9	5.6
	MDA8F	0.9	1.9	3.6	3.5	7.2	1.9	1.2	6.5	18.2	0.9	3.4	1.1	7.1	5.1	2.2	3.3	6.2	4.0	5.6	2.0	4.7	9.4
	MDA8S	1.2	1.5	3.2	2.4	7.1	2.0	0.6	9.3	20.6	1.1	4.1	1.4	5.2	9.1	10.0	3.6	2.7	1.8	4.4	0.8	2.8	5.3
	95th F	0.5	2.2	4.3	4.9	7.6	3.1	0.9	4.9	21.4	0.5	4.1	0.8	7.7	5.5	2.5	3.0	5.3	2.6	4.8	1.6	3.9	7.9
	95th S	0.4	0.8	2.1	2.3	5.4	2.2	0.4	9.1	25.3	0.3	4.3	0.5	4.9	10.2	14.2	3.2	2.3	1.0	3.4	0.7	2.5	4.6
	W126	0.7	1.3	2.9	2.1	7.2	2.8	0.6	9.6	23.6	0.6	1.1	0.8	2.6	10.8	13.9	3.3	2.7	1.3	3.9	0.6	2.7	4.7
	SOMO35	0.8	1.7	3.2	3.1	6.5	2.2	0.8	7.5	20.5	0.7	4.4	1.0	7.0	7.3	6.9	3.3	4.1	2.6	4.6	1.3	3.5	7.0
	AOT40	0.7	1.6	3.1	3.1	6.2	2.2	0.8	7.5	20.7	0.6	4.9	0.9	7.4	7.5	7.1	3.2	4.0	2.4	4.4	1.3	3.4	7.0
SCA	MeanF	2.2	0.6	1.6	0.0	1.5	0.1	0.1	7.1	0.1	9.3	0.0	4.3	0.1	5.5	2.8	5.0	10.8	12.4	11.0	0.7	10.1	14.6
	MeanS	5.5	1.4	4.5	0.0	3.1	0.1	0.1	5.8	0.1	11.6	0.0	7.5	0.0	10.4	8.3	5.7	3.9	7.9	9.3	0.1	4.3	10.2
	MDA8F	2.3	0.6	1.7	0.0	1.5	0.1	0.1	7.1	0.1	10.3	0.0	4.7	0.1	5.4	2.9	5.0	10.7	11.8	10.7	0.7	9.9	14.2
	MDA8S	5.5	1.5	5.3	0.0	3.5	0.1	0.1	6.0	0.2	12.6	0.0	7.9	0.0	10.1	8.0	5.5	3.8	7.3	8.9	0.1	4.1	9.6
	95th F	3.1	0.8	2.5	0.1	2.4	0.2	0.2	7.6	0.2	11.2	0.1	5.6	0.1	4.1	2.5	4.9	11.4	10.7	9.1	0.7	9.9	12.8
	95th S	5.0	2.6	10.2	0.0	7.3	0.2	0.2	7.6	0.4	12.4	0.0	9.1	0.1	8.6	6.6	4.4	3.1	5.1	7.1	0.1	3.3	6.8
	W126	2.6	1.7	6.8	0.0	4.8	0.2	0.2	12.5	0.2	10.9	0.0	5.3	0.1	7.2	8.2	3.7	6.8	6.7	6.9	0.4	6.1	8.6
	SOMO35	3.8	1.9	7.8	0.1	5.8	0.2	0.2	8.1	0.3	12.2	0.0	8.5	0.1	5.3	4.3	3.9	7.6	7.3	7.0	0.5	6.5	8.7
	AOT40	3.5	2.4	10.6	0.1	8.3	0.3	0.2	9.9	0.4	12.5	0.0	9.4	0.1	6.1	5.4	3.1	5.5	5.2	5.7	0.4	4.7	6.4
TCA	MeanF	0.4	1.0	1.7	0.7	2.4	0.7	0.7	8.0	6.8	0.4	19.7	0.6	4.5	6.0	2.1	4.4	7.7	3.7	6.0	2.4	5.4	14.8
	MeanS	0.4	0.4	0.7	0.3	1.8	0.4	0.3	13.6	4.6	0.4	20.6	0.4	4.1	10.7	8.2	5.6	4.3	1.5	5.1	1.1	4.4	11.3
	MDA8F	0.4	1.0	1.7	0.7	2.3	0.7	0.7	7.1	6.6	0.4	22.0	0.5	4.4	5.8	2.2	4.4	7.8	3.5	6.0	2.3	5.4	14.2
	MDA8S	0.3	0.3	0.7	0.3	1.6	0.3	0.3	11.8	4.4	0.4	23.6	0.4	3.7	10.4	7.9	5.8	4.5	1.4	5.2	1.0	4.5	11.1
	95th F	0.4	1.3	2.2	0.9	3.0	1.0	0.9	4.1	8.3	0.3	25.7	0.5	4.5	5.6	2.3	4.1	7.3	2.8	5.6	1.8	4.9	12.6
	95th S	0.2	0.2	0.4	0.2	1.3	0.2	0.2	10.4	4.2	0.3	27.6	0.2	3.0	10.4	9.4	5.7	4.8	1.1	5.0	0.6	4.4	10.4
	W126	0.2	0.3	0.6	0.3	1.2	0.3	0.3	8.4	4.0	0.2	28.0	0.2	2.5	10.4	7.5	6.0	5.5	1.3	5.3	0.9	4.7	11.7
	SOMO35	0.3	0.7	1.2	0.5	1.9	0.6	0.5	8.8	5.8	0.4	24.4	0.4	4.2	8.2	5.4	5.0	6.0	2.3	5.5	1.4	4.7	12.0
	AOT40	0.3	0.7	1.2	0.5	2.0	0.6	0.5	8.6	6.0	0.4	24.8	0.4	4.3	8.2	5.5	4.9	5.9	2.2	5.4	1.3	4.6	11.7