Supplementary Information

Table S1. Location of the EMEP measurement sites used for the model evaluation.

Code	Name	Lon	Lat
AT02	Illmitz	16.77	47.77
AT05	Vorhegg	12.97	46.68
AT30	Pillersdorf bei Retz	15.94	48.72
AT32	Sulzberg	9.93	47.53
AT33	Stolzalpe bei Murau	14.20	47.13
AT34	Sonnblick	12.96	47.05
AT38	Gerlitzen	13.92	46.69
AT40	Masenberg	15.88	47.35
AT41	Haunsberg	13.02	47.97
AT42	Heidenreichstein	15.05	48.88
AT43	Forsthof	15.92	48.11
AT44	Graz Platte	15.47	47.11
AT45	Dunkelsteinerwald	15.55	48.37
AT46	Gänserndorf	16.73	48.33
AT47	Stixneusiedl	16.68	48.05
AT48	Zoebelboden	14.44	47.84
BG53	Rojen peak	24.74	41.70
CH01	Jungfraujoch	7.99	46.55
CH02	Payerne	6.94	46.81
CH03	Tänikon	8.90	47.48
CH04	Chaumont	6.98	47.05
CH05	Rigi	8.46	47.07
CY02	Ayia Marina	33.06	35.04
DE03	Schauinsland	7.91	47.91
DE43	Hohenpeissenberg	11.10	47.80
ES07	Víznar	−3.53	37.23
ES09	Campisabalos	−3.14	41.28
ES10	Cabo de Creus	3.32	42.32
ES11	Barcarrola	−6.92	38.48
ES12	Zarra	−1.10	39.09
ES13	Penausende	−5.87	41.28
ES14	Els Torms	0.72	41.40
ES15	Risco Llamo	−4.35	39.52
ES16	O Saviñao	−7.70	43.23
FR08	Donon	7.13	48.50
FR12	Iraty	−1.08	43.03
FR13	Peyrusse Vieille	0.18	43.62

Table S1. *Cont.*

Code	Name	Lon	Lat
FR14	Montandon	6.83	47.30
FR16	Le Casset	6.47	45.00
GR02	Finokalia	25.67	35.32
HU02	K-puszta	19.58	46.97
IT01	Montelibretti	12.63	42.10
IT04	Ispra	8.63	45.80
MK07	Lazaropole	20.42	41.32
MT01	Giordan lighthouse	14.22	36.07
SI08	Iskrba	14.87	45.57
SI31	Zarodnje	15.00	46.43
SI32	Krvavec	14.54	46.30
SI33	Kovk	15.11	46.13
SK02	Chopok	19.58	48.93
SK04	Stará Lesn	20.28	49.15
SK07	Topolniky	17.86	47.96

Table S2. Comparison of the daily mean and maximum model results and the ozone concentrations measured aboard the R. V. Urania.

Year	Daily Maxima				Daily Mean			
	MB (ppb)		R		MB (ppb)		R	
	low	hi	low	hi	low	hi	low	hi
2000	−0.80	1.44	0.78	0.83	4.50	0.39	0.81	0.91
2003	10.11	10.35	0.64	0.53	3.90	3.67	0.61	0.59
2005	3.29	5.87	0.45	0.55	4.30	5.67	0.64	0.68
2006	−9.98	−10.39	0.18	0.21	−5.89	−5.37	0.24	0.11
2009	8.88	8.14	0.64	0.62	8.20	8.23	0.33	0.28
2010	1.44	0.69	0.46	0.47	0.66	0.18	0.35	0.34

Table S3. Comparison of the model results and the ozone concentrations measured at the EMEP stations during the period of the oceanographic campaign (see Table 1). Values for mean normalized bias (MNB), normalized gross error (NGE) and for accuracy of the unpaired predicted to observed peak hourly O_3 concentration ratio (AUP) are in percent (%).

Period	Stat.	MNB	NGE	AUP
2000	IT01	−24.0	27.4	-19.8
	MT01	2.4	15.5	11.0
	SI08	−17.7	18.2	−14.6
	SI31	−9.1	13.1	−3.6
	SI32	−22.2	22.9	−16.5
	SI33	−17.5	18.7	−20.3
2003	BG53	−27.1	27.1	−27.6
	ES07	−13.4	19.9	−13.6
	ES09	−4.6	11.0	0.9
	ES10	−5.8	14.8	−0.1
	ES11	8.4	16.3	6.6
	ES12	−12.6	19.6	−2.7
	ES13	−6.4	14.7	−3.0
	ES14	−9.2	16.8	3.4
	ES15	−20.6	23.6	−9.0
	ES16	61.5	61.5	65.7
	FR12	−23.3	25.2	−21.0
	FR13	0.5	15.3	3.9
	GR02	−2.0	9.4	3.0
	IT01	−5.5	16.8	−7.3
	MT01	4.0	15.3	5.8
	SI08	−23.0	23.5	−22.9
2005	AT02	−10.5	13.9	−9.7
	AT05	−28.7	29.0	−24.9
	AT30	−16.8	20.8	−14.6
	AT32	−25.9	27.8	−18.8
	AT33	−27.9	27.9	−25.5
	AT34	−27.5	27.5	−27.5
	AT38	−29.6	29.6	−26.5
	AT40	−25.5	25.7	−21.6
	AT41	−17.1	22.8	−5.3
	AT42	−14.8	18.4	−14.9
	AT43	−26.5	27.4	−18.3
	AT44	−25.7	25.8	−19.9
	AT45	−17.1	18.1	−18.0
	AT46	−6.4	7.5	−4.4

Table S3. *Cont.*

Period	Stat.	MNB	NGE	AUP
2005	AT47	−9.4	12.3	−6.2
	AT48	−29.0	29.8	−21.9
	CH02	−10.5	13.0	−11.1
	CH03	−5.9	13.3	−5.4
	CH04	−18.1	22.2	−7.3
	CH05	−23.0	25.7	−12.0
	DE03	−22.1	24.1	−13.1
	DE43	−30.9	31.6	−23.0
	FR08	−8.5	15.9	−4.6
	FR14	−6.1	11.1	−5.1
	HU02	8.0	25.6	16.8
	IT01	−4.9	13.5	−8.1
	IT04	8.5	13.5	8.0
	MK07	−31.9	32.0	−26.5
	MT01	9.6	19.6	12.2
	SI08	−21.4	21.4	−19.7
	SI31	−21.3	21.4	−18.1
	SI32	−24.1	24.3	−22.9
	SI33	−25.2	25.2	−24.0
	SK02	−23.0	23.3	−19.6
	SK04	−11.1	11.4	−13.7
	SK07	−9.2	12.8	−11.5
2006	CY02	13.9	18.3	17.1
	IT01	1.7	9.1	−4.9
	MK07	−19.1	20.5	−16.3
	SI08	−0.2	10.5	2.4
2009	BG53	−29.0	29.2	−25.1
	IT01	−21.8	21.9	−24.8
	MK07	−35.4	36.9	−28.2
	SI08	−26.5	26.5	−21.0
2010	GR02	−19.4	20.0	−15.0
	IT01	−24.3	24.3	−25.4

Figure S1. Examples of shipping emissions used in the model runs [1]. The NOx emissions (shown in the left panel) and SOx (in the right panel) refer to the 2010 emission inventory (see Section 3.5), and show clearly the major shipping lanes.

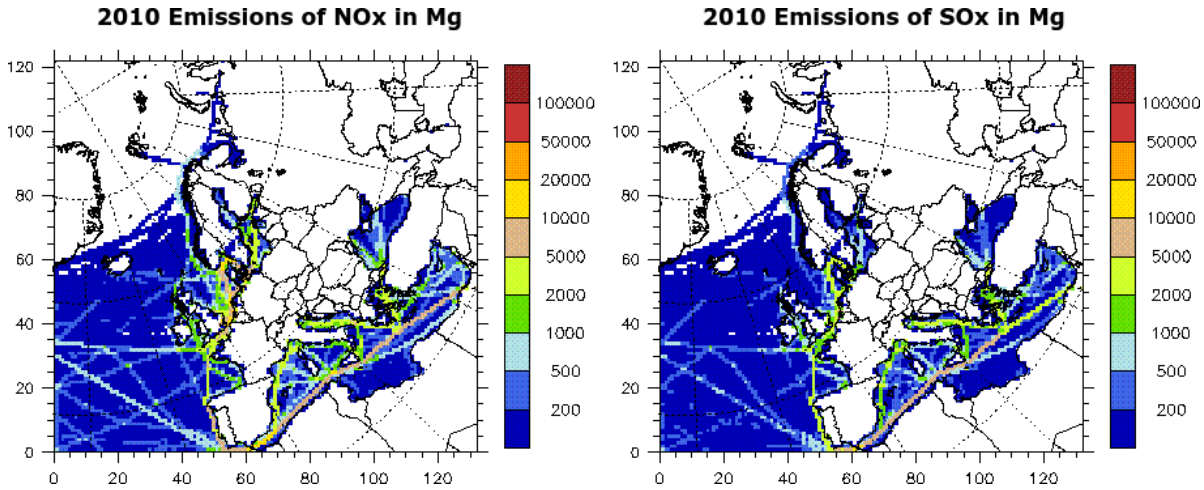


Figure S2. Model domains used for simulations of 2000 campaign, displayed in Google™ Earth.

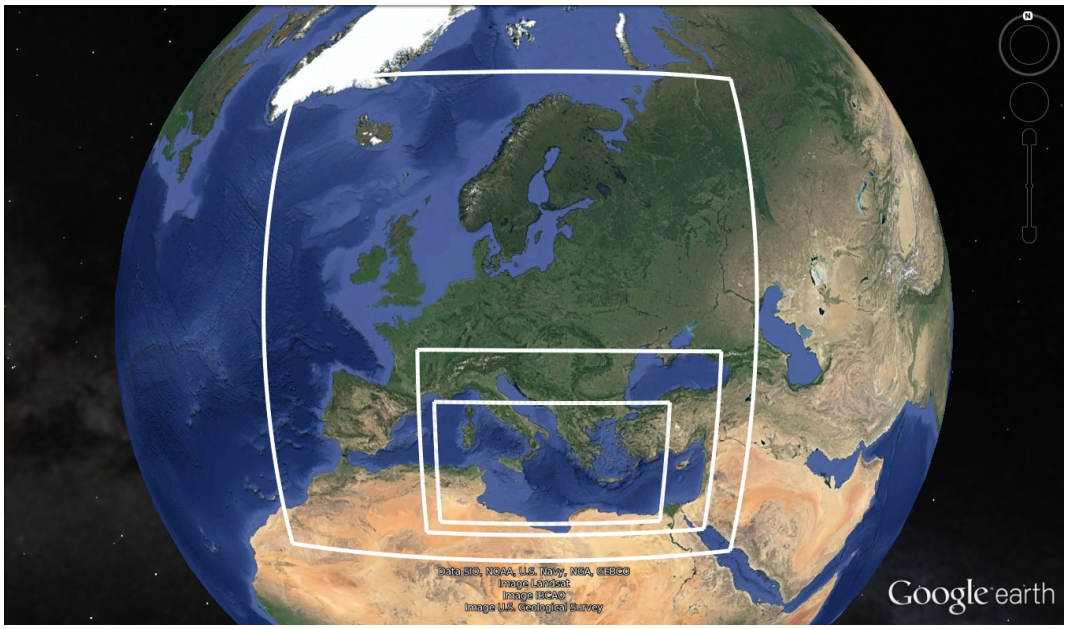


Figure S3. Model domains used for simulations of 2003 campaign, displayed in Google™ Earth.

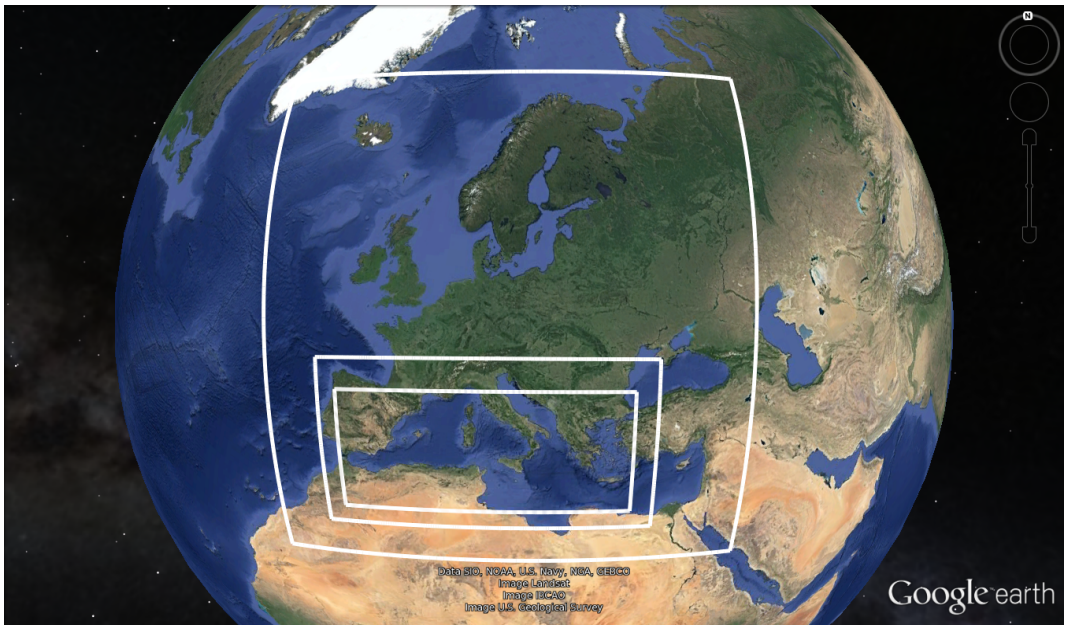


Figure S4. Model domains used for simulations of 2005 campaign, displayed in Google™ Earth.

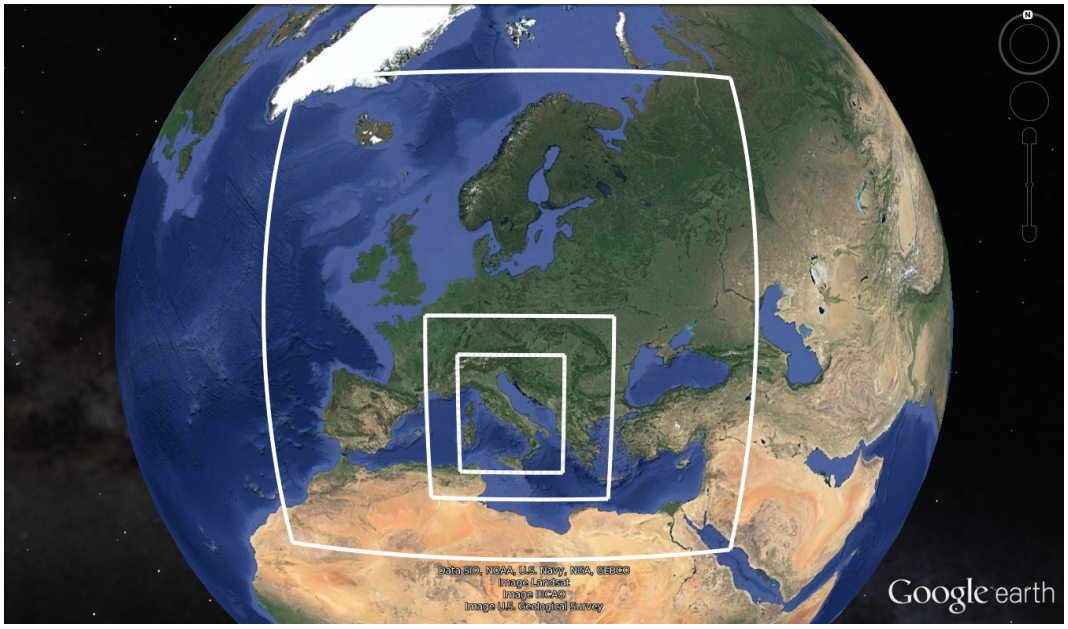


Figure S5. Model domains used for simulations of 2006 and 2010 campaigns, displayed in Google™ Earth.

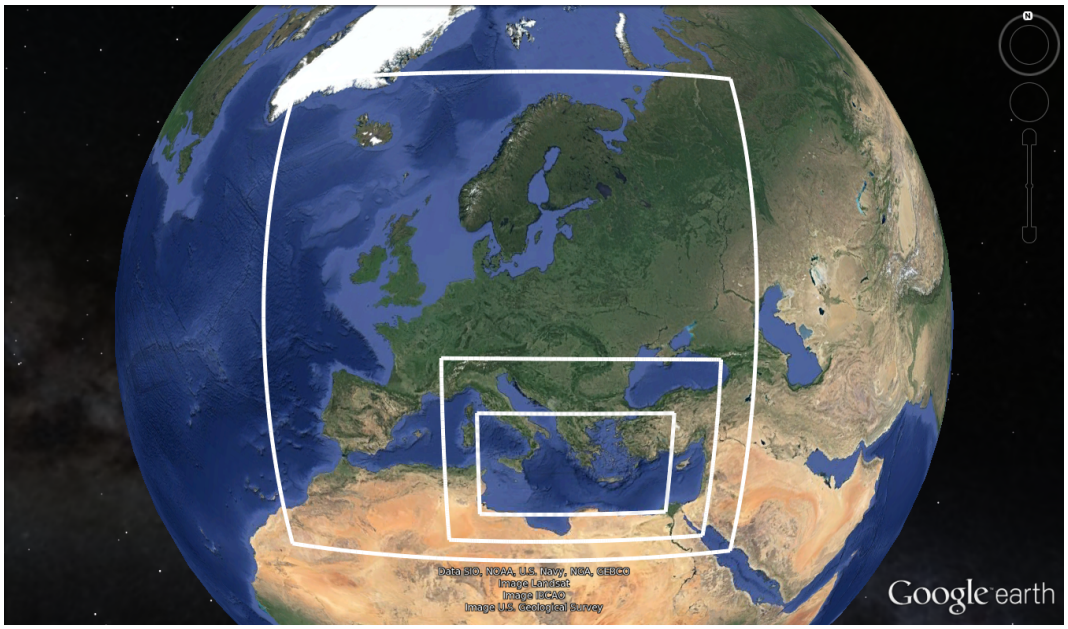


Figure S6. Model domains used for simulations of 2009 campaign, displayed in Google™ Earth.

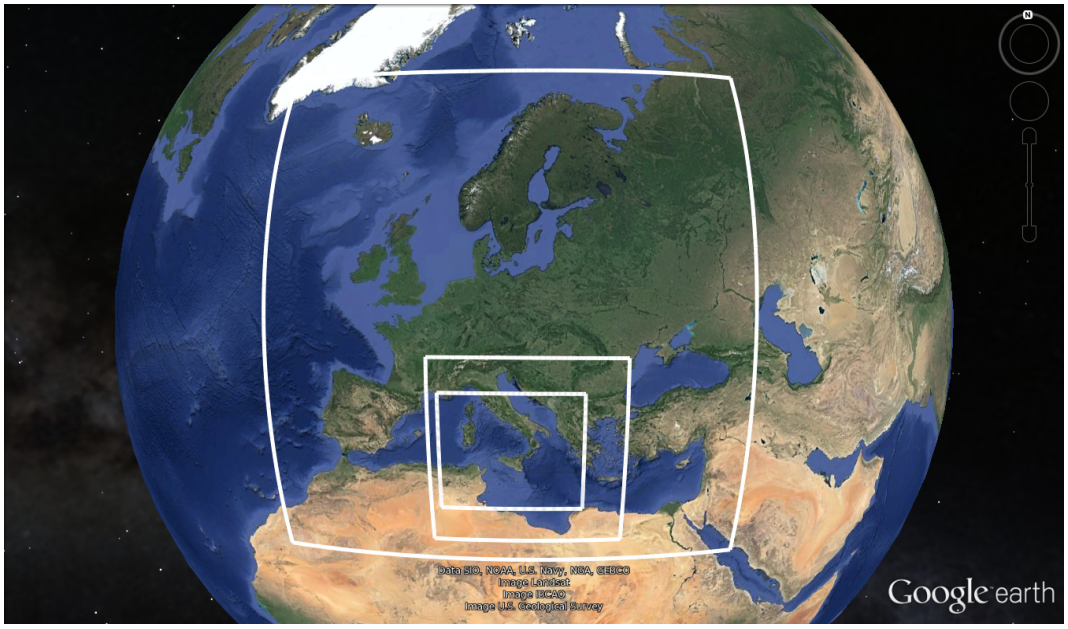


Figure S7. Model comparison with land-based observations during the period of the oceanographic campaign in 2000 (see Table 1). Values for mean normalized bias (MNB), normalized gross error (NGE) and for accuracy of the unpaired predicted to observed peak hourly O_3 concentration ratio (AUP) are in percent (%).

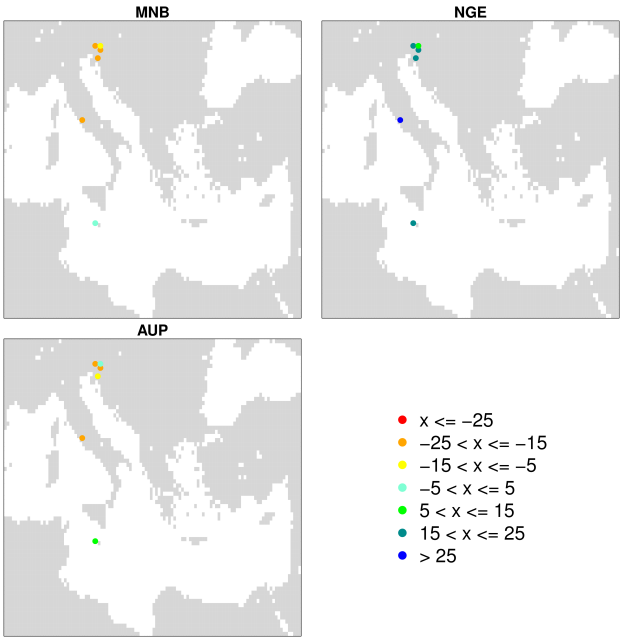


Figure S8. Model comparison with land-based observations during the period of the oceanographic campaign in 2003 (see Table 1). Values for mean normalized bias (MNB), normalized gross error (NGE) and for accuracy of the unpaired predicted to observed peak hourly O_3 concentration ratio (AUP) are in percent (%).

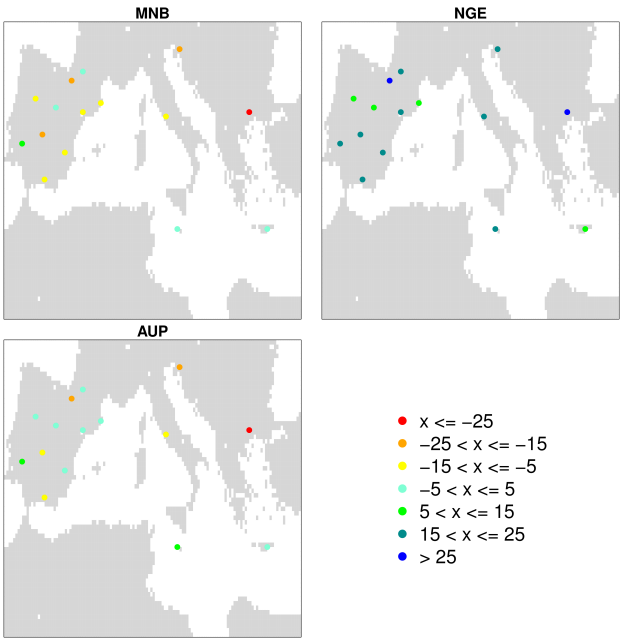


Figure S9. Model comparison with land-based observations during the period of the oceanographic campaign in 2005 (see Table 1). Values for mean normalized bias (MNB), normalized gross error (NGE) and for accuracy of the unpaired predicted to observed peak hourly O_3 concentration ratio (AUP) are in percent (%).

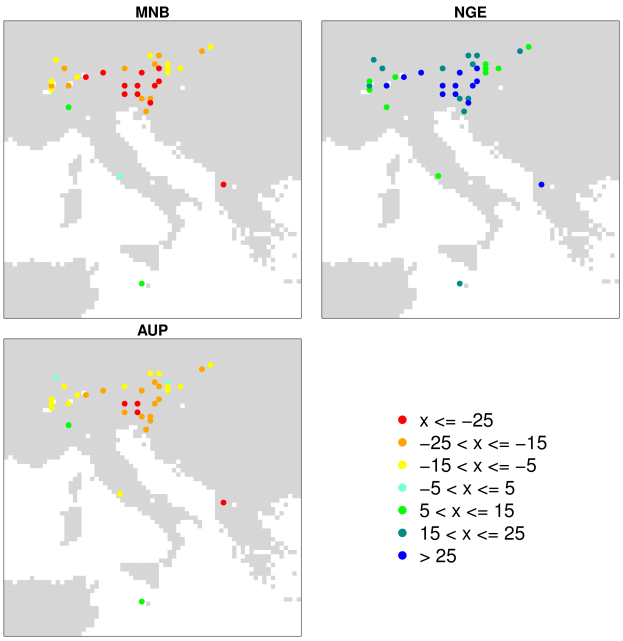


Figure S10. Model comparison with land-based observations during the period of the oceanographic campaign in 2006 (see Table 1). Values for mean normalized bias (MNB), normalized gross error (NGE) and for accuracy of the unpaired predicted to observed peak hourly O_3 concentration ratio (AUP) are in percent (%).

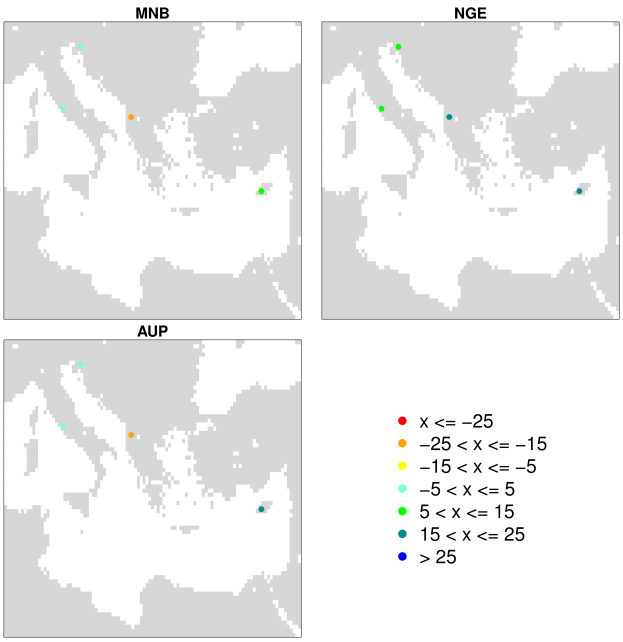


Figure S11. Model comparison with land-based observations during the period of the oceanographic campaign in 2009 (see Table 1). Values for mean normalized bias (MNB), normalized gross error (NGE) and for accuracy of the unpaired predicted to observed peak hourly O_3 concentration ratio (AUP) are in percent (%).

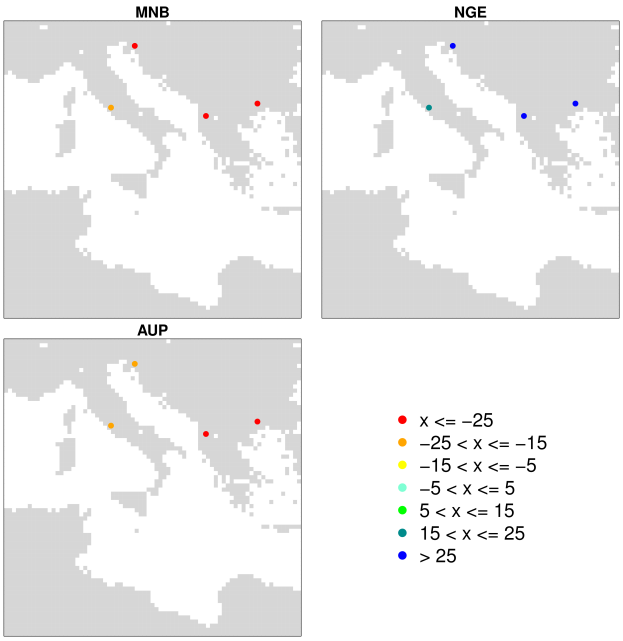


Figure S12. Model comparison with land-based observations during the period of the oceanographic campaign in 2010 (see Table 1). Values for mean normalized bias (MNB), normalized gross error (NGE) and for accuracy of the unpaired predicted to observed peak hourly O_3 concentration ratio (AUP) are in percent (%).

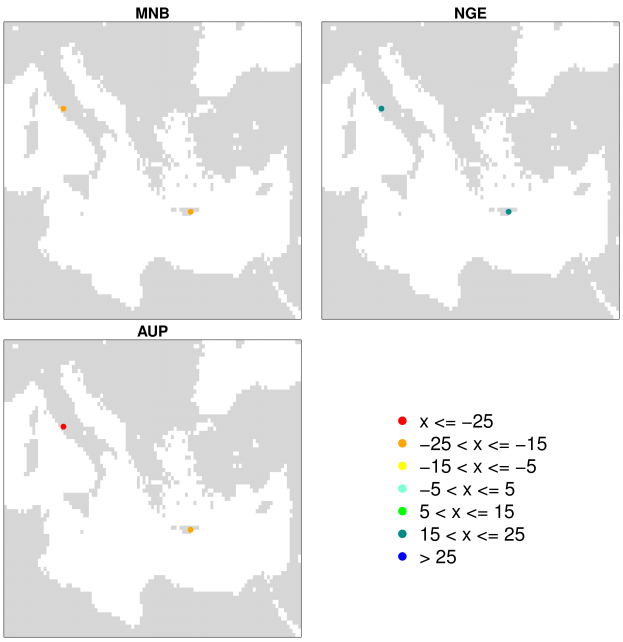


Figure S13. Concentration difference (calculated as Equation (1)) for O_3, NO and NO_2 in the first model layer and in the MBL.

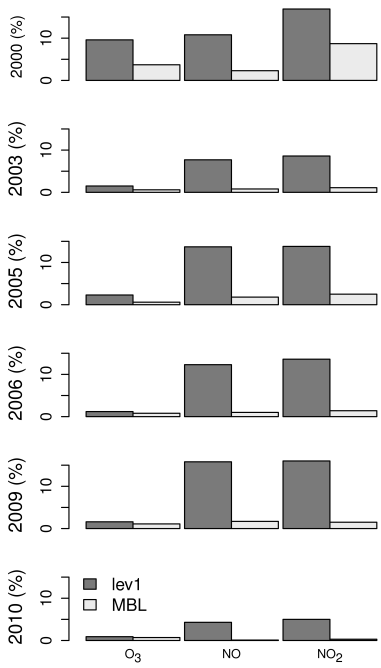


Figure S14. The average O_3 concentration difference in the first model layer for 2000. Absolute difference (ppb) in lower panel, and percentage in upper panel.

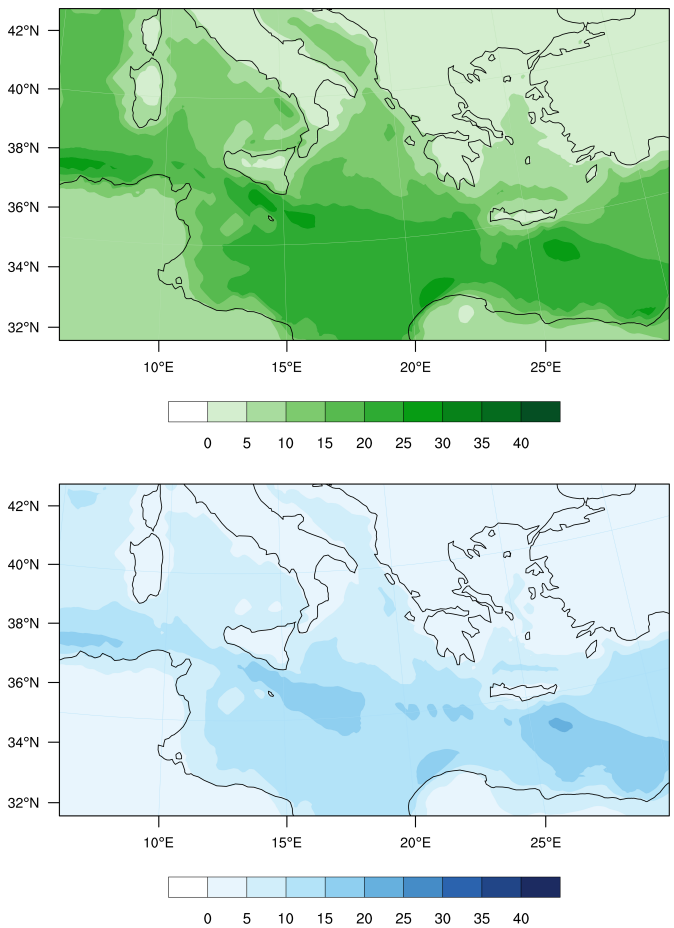


Figure S15. The average O_3 concentration difference in the first model layer for 2003. Absolute difference (ppb) in lower panel, and percentage in upper panel.

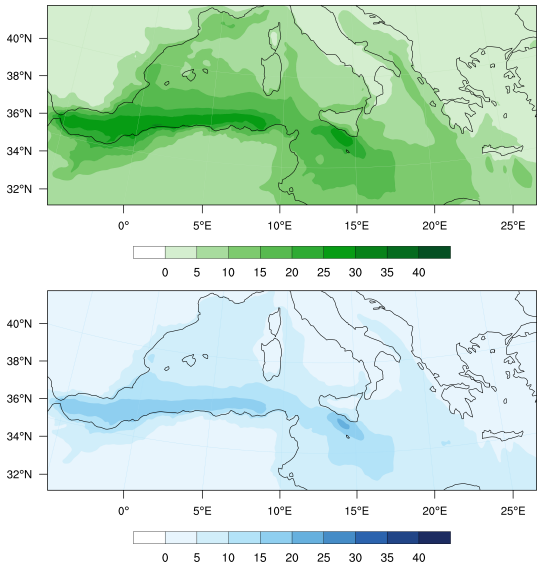


Figure S16. The average O_3 concentration difference in the first model layer for 2005. Absolute difference (ppb) in lower panel, and percentage in upper panel.

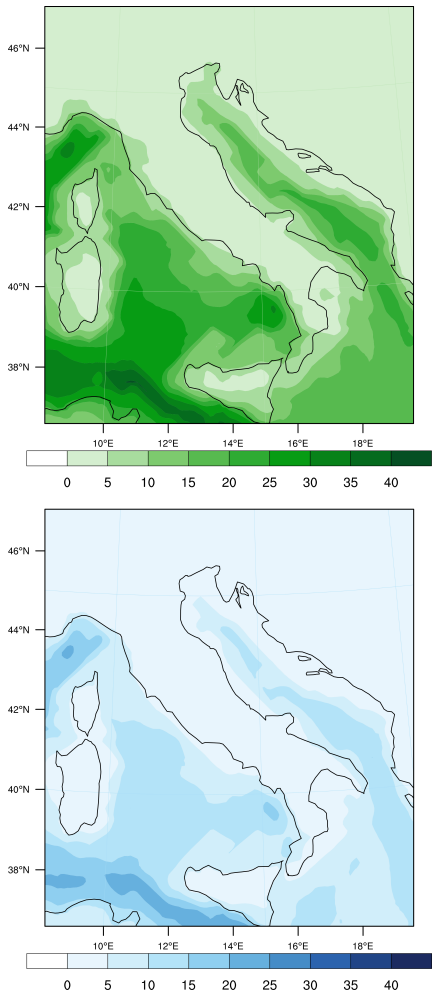


Figure S17. The average O_3 concentration difference in the first model layer for 2006. Absolute difference (ppb) in lower panel, and percentage in upper panel.

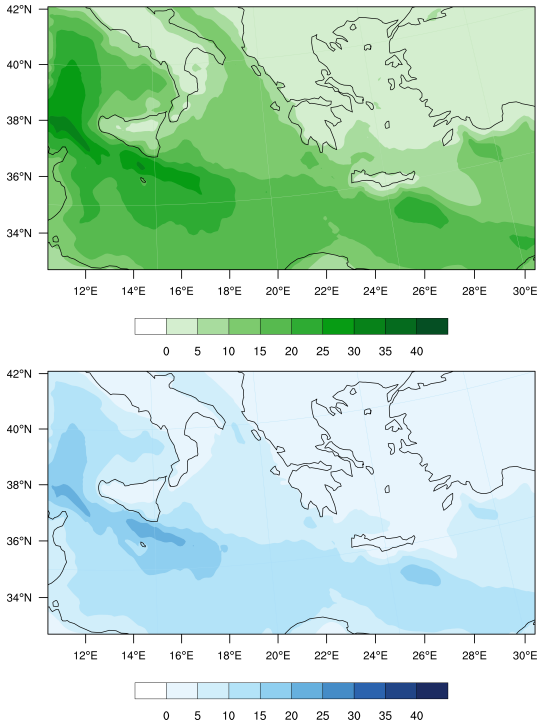


Figure S18. The average O_3 concentration difference in the first model layer for 2009. Absolute difference (ppb) in lower panel, and percentage in upper panel.

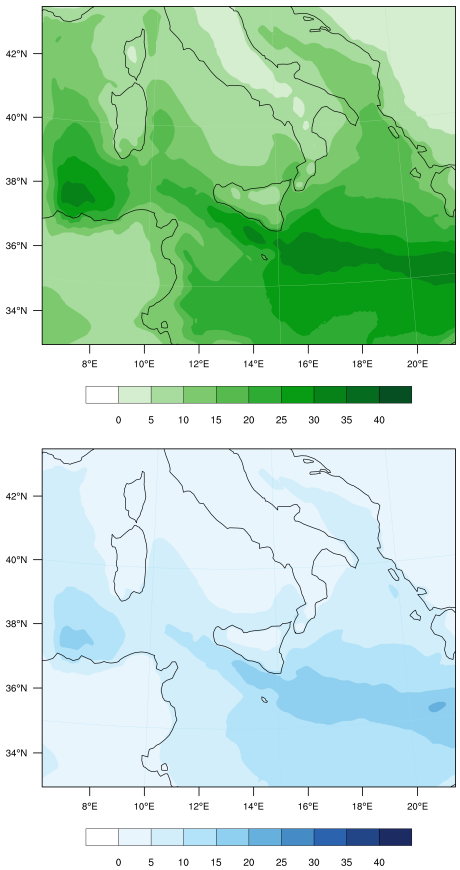


Figure S19. The average O_3 concentration difference in the first model layer for 2010. Absolute difference (ppb) in lower panel, and percentage in upper panel.

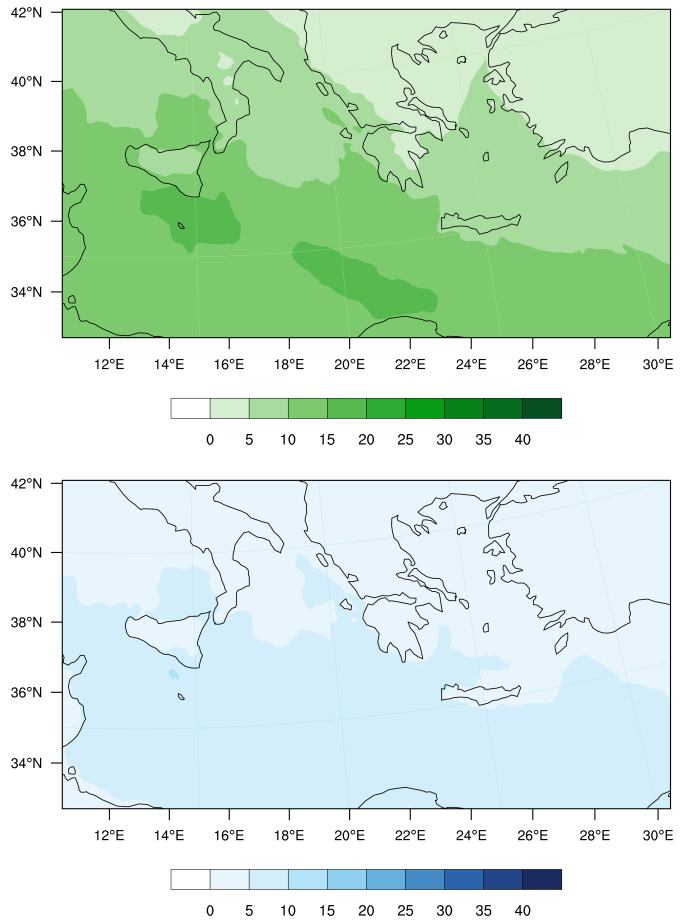


Figure S20. The difference (ppb) in the maximum O_3 concentrations between the Tot_emiss and No_ships simulations for the 2000 measurement campaign.

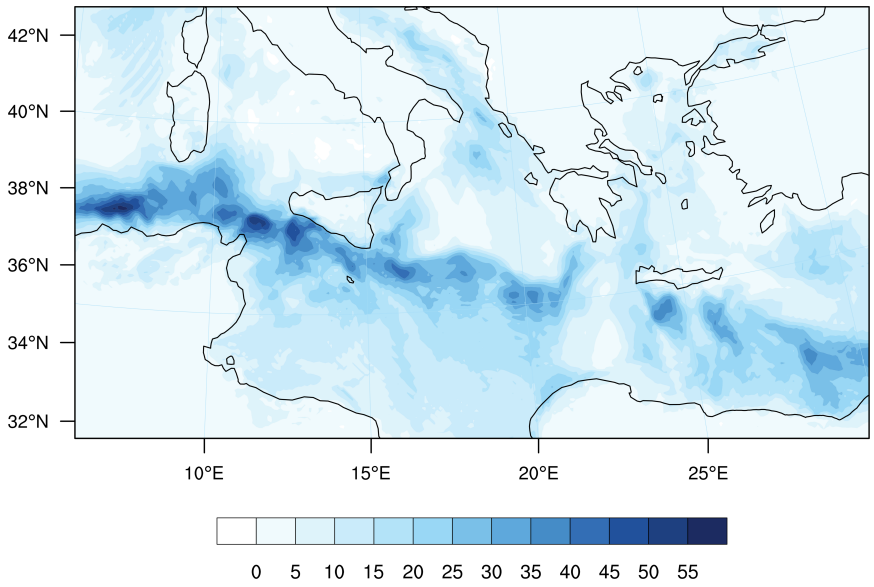


Figure S21. The difference (ppb) in the maximum O_3 concentrations between the Tot_emiss and No_ships simulations for the 2005 measurement campaign.

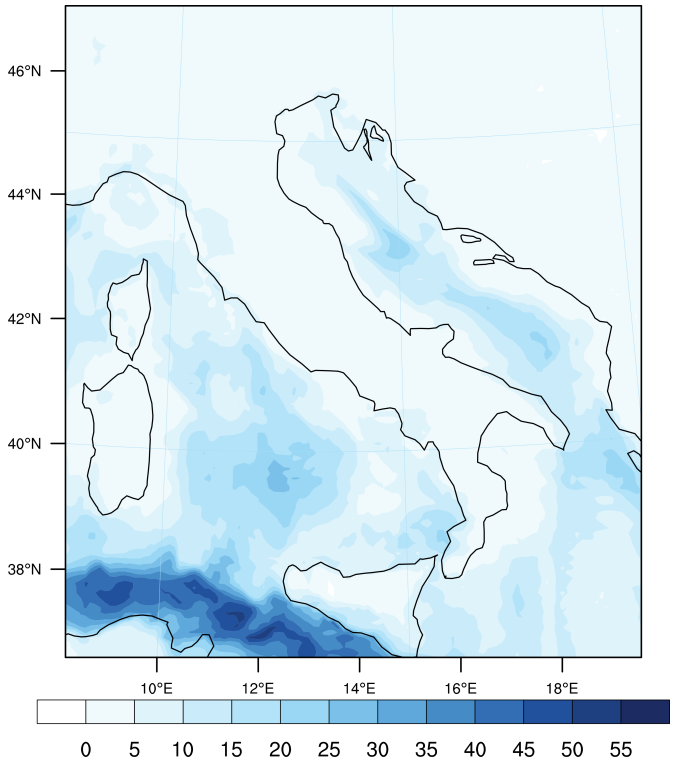


Figure S22. The difference (ppb) in the maximum O_3 concentrations between the Tot_emiss and No_ships simulations for the 2006 measurement campaign.

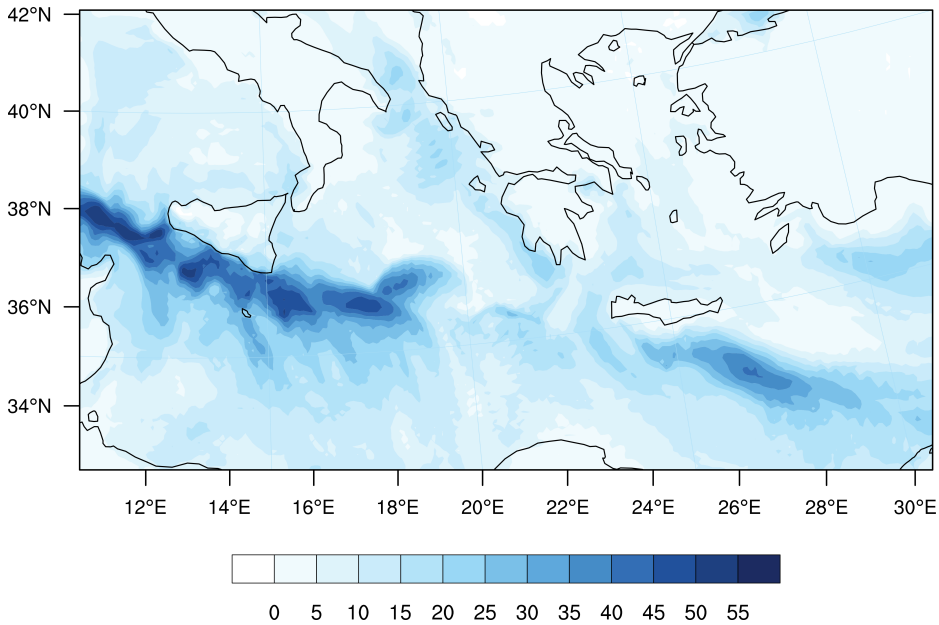


Figure S23. The difference (ppb) in the maximum O_3 concentrations between the Tot_emiss and No_ships simulations for the 2009 measurement campaign.

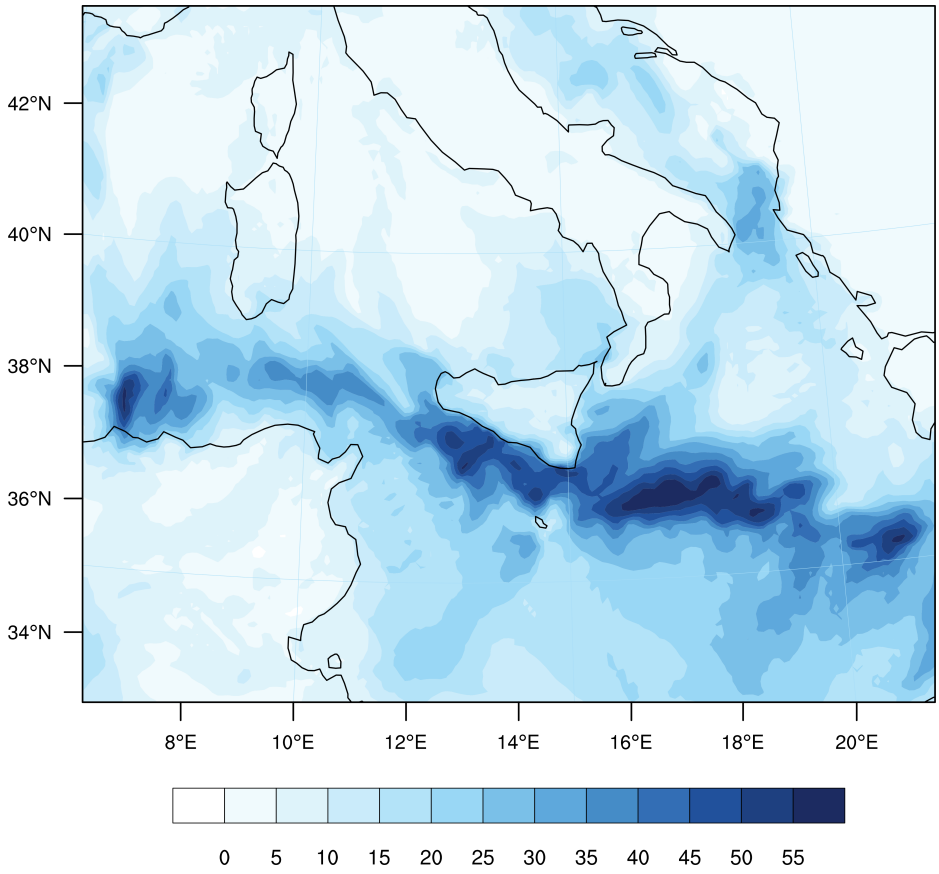
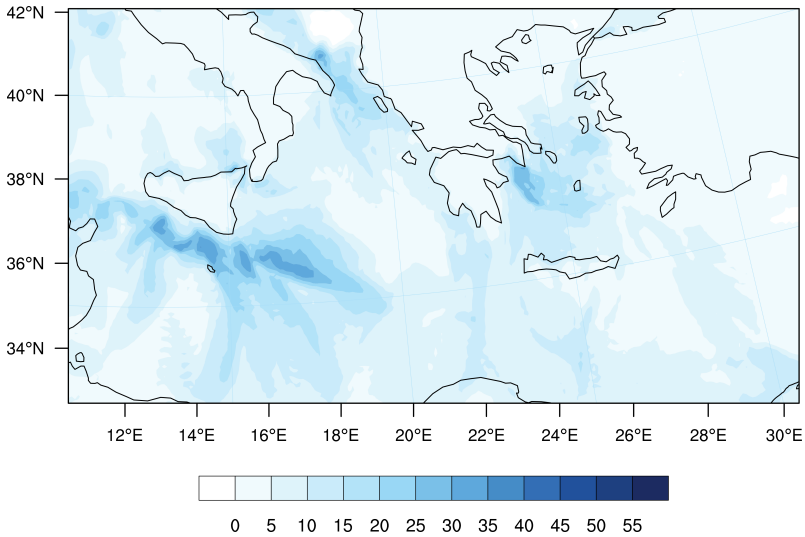


Figure S24. The difference (ppb) in the maximum O_3 concentrations between the Tot_emiss and No_ships simulations for the 2010 measurement campaign.



References

1. EMEP/CEIP. Present State of Emissions as Used in EMEP Models. Available online: http://www.ceip.at/webdab_emepdatabase/emissions_emepmodels/ (accessed on 20 November 2014).