Supplement of Atmos. Meas. Tech., 11, 2101–2118, 2018
https://doi.org/10.5194/amt-11-2101-2018-supplement

Atmospheric Measurement Techniques
Open Access

Supplement of

Increased aerosol content in the atmosphere over Ukraine during summer 2010

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Figure S1 shows the number of AOD observations per day at the Kyiv AERONET site during June 1 - August 31, 2010.

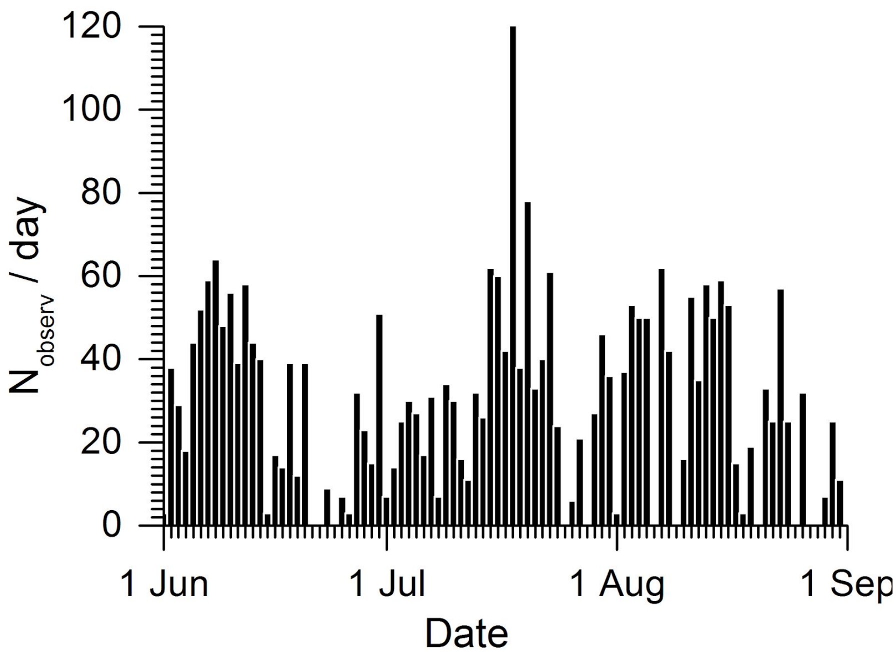


Figure S1. Number of AOD observations per day at the Kyiv AERONET site during summer 2010.

Figures S2–S34 represent HYSPLIT back trajectories of air parcels simulated for 168 hours (7 days) for the Kyiv site at 5 altitudes: 500 m, 1.5, 3, 4, and 5 km. We analyzed possible sources of aerosol from various regions from June 1 to August 31, 2010.

AOD changes in June were defined by both local sources and the transport with air masses mainly from the western areas. According to the weather conditions, at the beginning of June the air in the lower 5 km of the atmosphere was transported to Ukraine from the south, mainly from North Africa and the Mediterranean Sea through the Balkans and the Black Sea. Therefore, the relative maximum AOD during June 1–2 (Fig. **S2-S3**) was caused by local sources and, in addition, by particles transported from southern regions, as mixtures of continental soil dust and urban-industrial aerosol with the sea salt and possibly dust from Sahara. This is testified by both relatively low values of AE (in the Manuscript Fig. 5b), and prevailing coarse mode AOD over fine mode defined by spectral deconvolution algorithm (SDA, O’Neill et al., 2003).

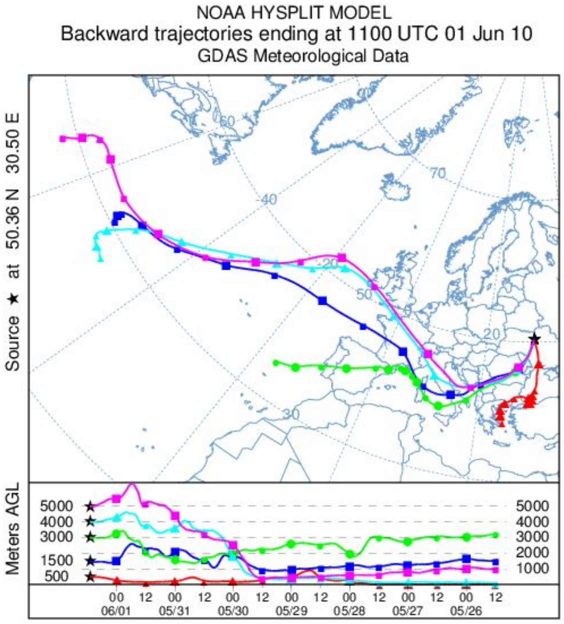


Figure S2. June 1, 2010

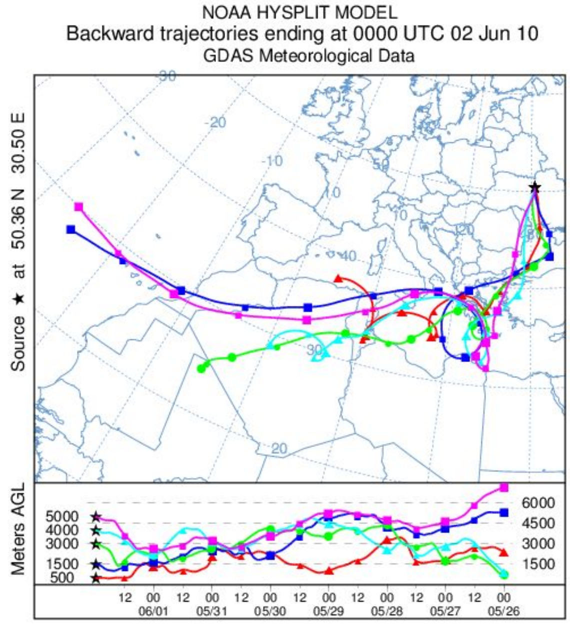


Figure S3. June 2, 2010

During June 8–14 air masses in the altitudes 500 m–5 km were transported to Kyiv from the Atlantic across Scandinavia, the Baltic Sea, circulating over the Western, Central and Eastern Europe (**Fig. S4-S10**). The increase of AOD was caused by aerosol of different types: according to AE and SDA, on June 8–11 fine mode of aerosol prevailed. Further increase of AOD during June 12–13 was caused by the arrival of coarse mode aerosol, which explains the rapid decrease of AE (Fig. 5b in the Manuscript). Coarse aerosol was mainly of local origin, such as city transport and heavy industry, while the fine mode particle likely was brought by air currents from Europe.

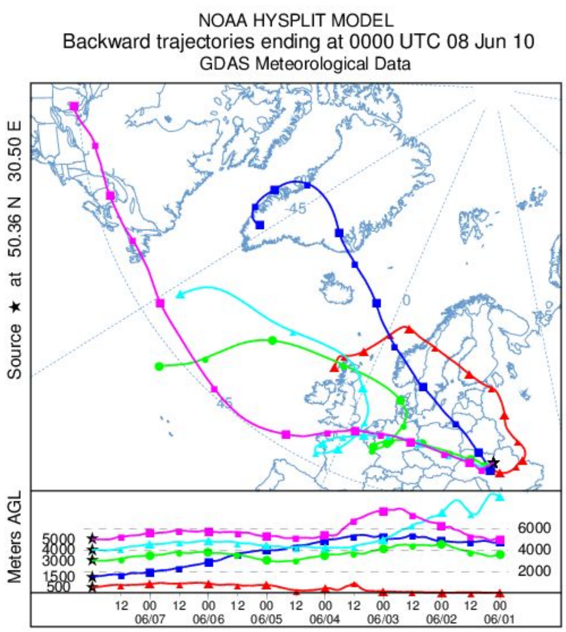


Figure S4. June 8, 2010

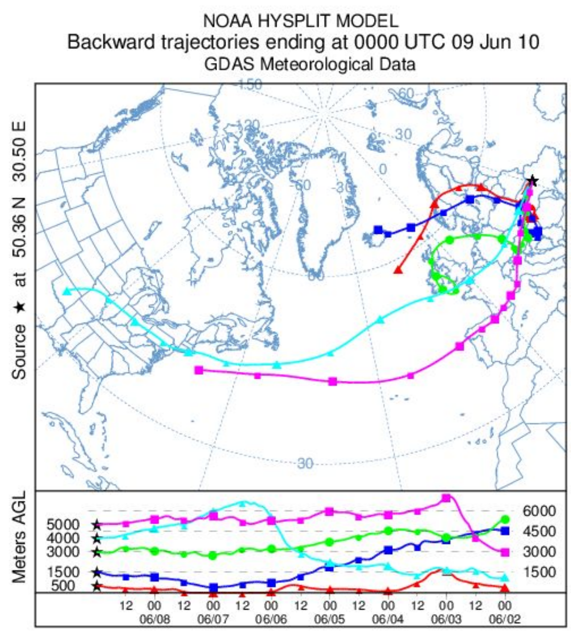


Figure S5. June 9, 2010

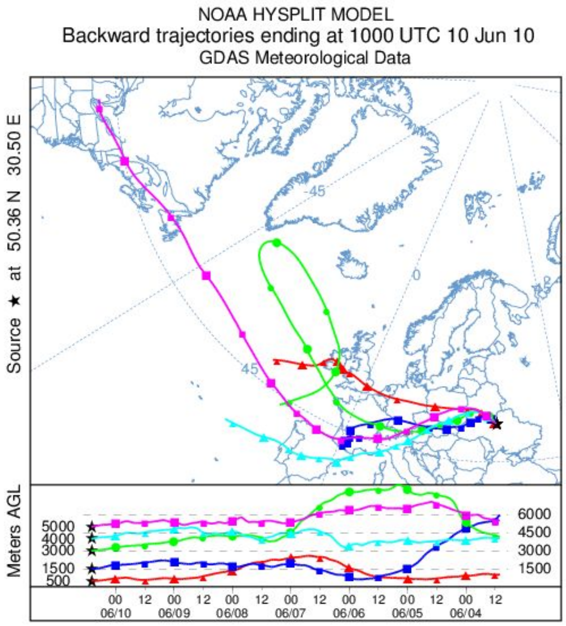


Figure S6. June 10, 2010

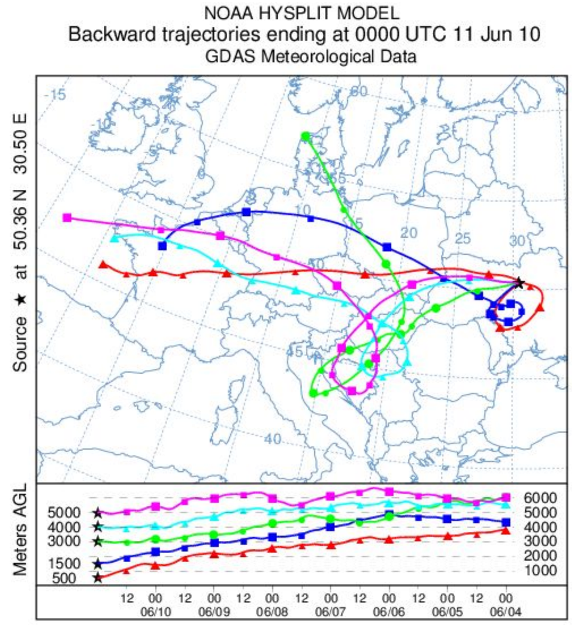


Figure S7. June 11, 2010

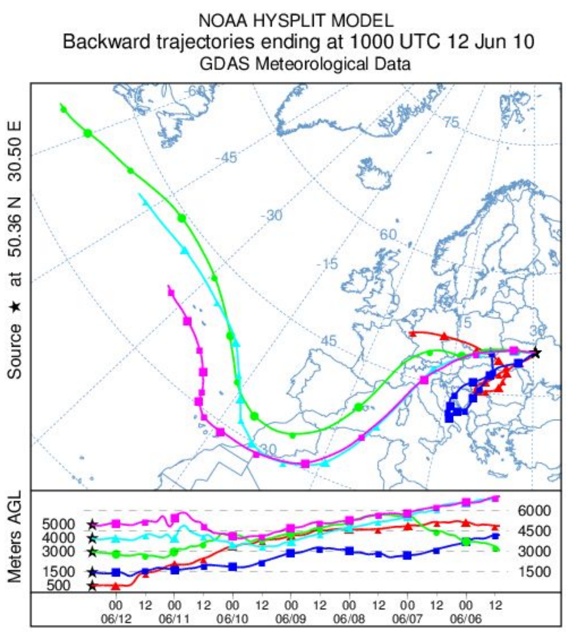


Figure S8. June 12, 2010

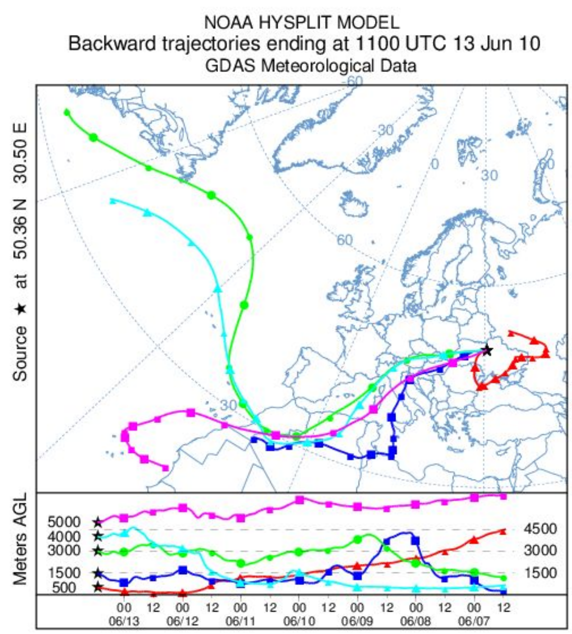


Figure 9. June 13, 2010

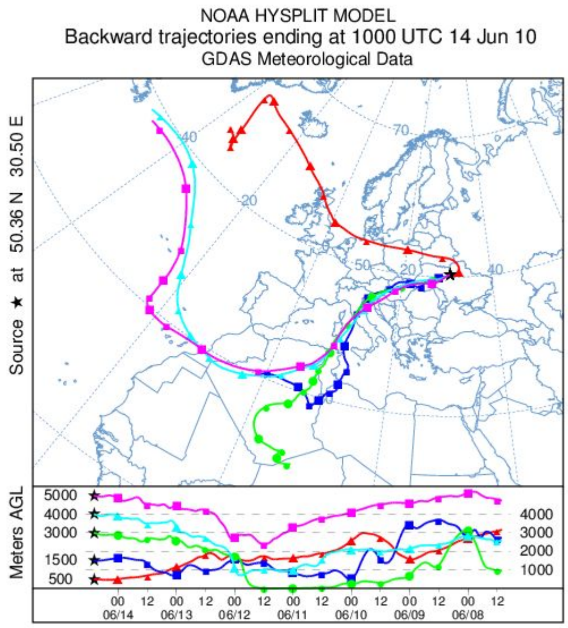


Figure S10. June 14, 2010

During June 23–26 AOD increase (Fig. 5a in the Manuscript) cannot be considered as reliable because of the small amount of data (9 measurements in the evening of June 23, 7 measurements on June 25 and 3 measurements on June 26, **Fig. S1**). Herewith, the dynamics of airflow during those days was more diverse (**Fig. S11-S13**). At 500 m air was transported to Kyiv mainly from Kazakhstan through the steppe zone of the ETR and eastern and south-eastern regions of Ukraine; at the altitudes of 1.5–5 km mainly from Turkey and the Caucasus through the Black and Azov seas, often changing direction and heights. In general, the accuracy of derived AOD values, obtained from a rather small number of individual measurements through short-term gaps in the clouds, can not be considered as sufficient. Because the algorithm of detection and elimination of the influence of clouds on measured AOD is not able to distinguish a thin uniform layer consisting of cloud water droplets from aerosol in the sunphotometer field of view. Therefore, we do not interpret relatively high AOD values for June 27–29 as a significant aerosol load over Kyiv. On June 30 the average AOD at 500 nm was equal approximately 0.35. It was computed for almost continuous dataset observed that day. This means that the aerosol content on June 30 increased comparing to the June 16–20.

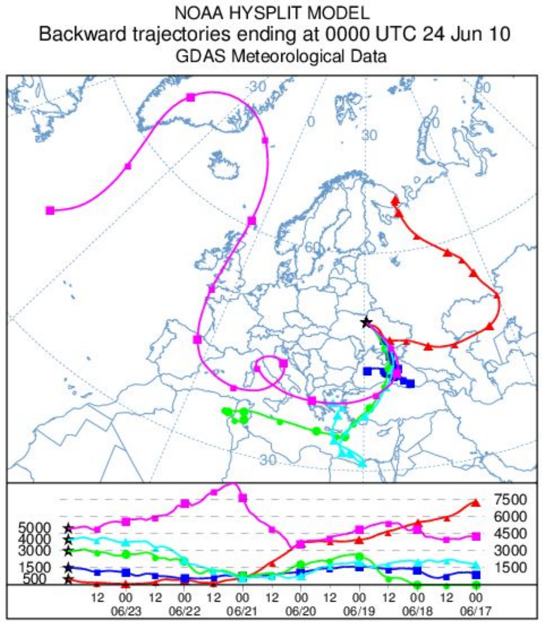


Figure S11. June 24, 2010

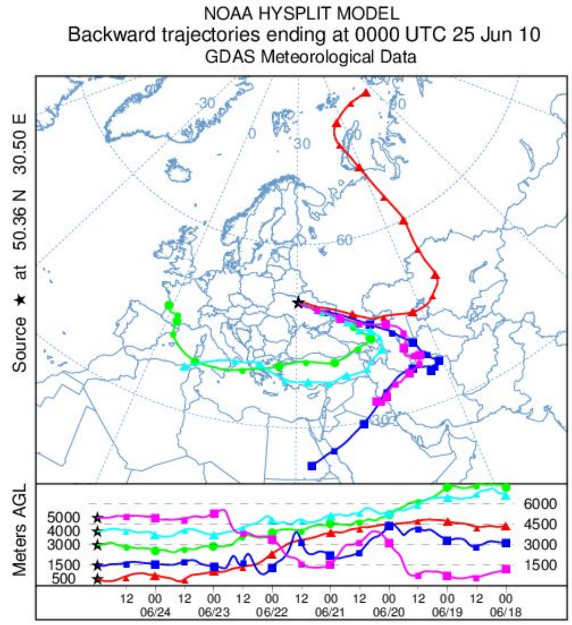


Figure S12. June 25, 2010

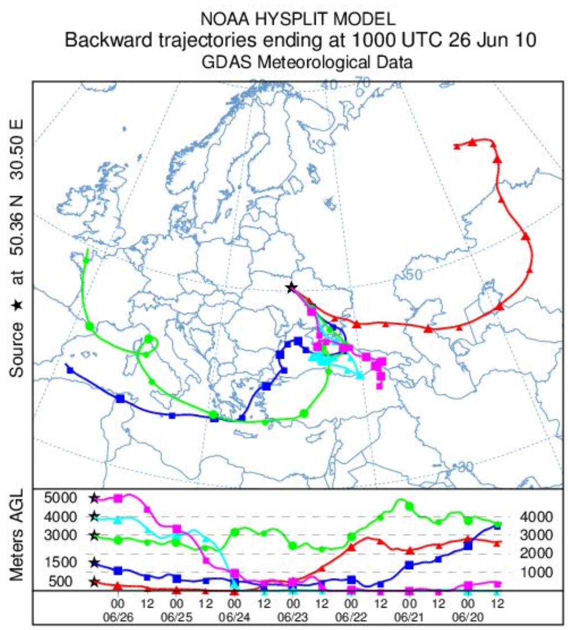


Figure S13. June 26, 2010

During June 27–29 the dynamics of tropospheric circulation and the transport of air masses through Kyiv significantly changed (**Fig. S14–S16**). Preceding this period, since the beginning of June, air masses predominantly travelled to Kyiv mainly from the Atlantic throughout the European continent. However, during June 27–29 the path of air mass transport changed as seen in our back trajectory calculations that moved first southward and finally eastward. So that finally from June 29 on, air in above-mentioned altitudes was transported to Kyiv from Kazakhstan and Central Asia, across the Caspian Sea, the steppe zone of the ETR, and eastern regions of Ukraine. In addition, the 500 m back trajectory indicated a rapid change of the air motion from the north-west. On 30 June air motion remained unchanged (**Fig. S17**).

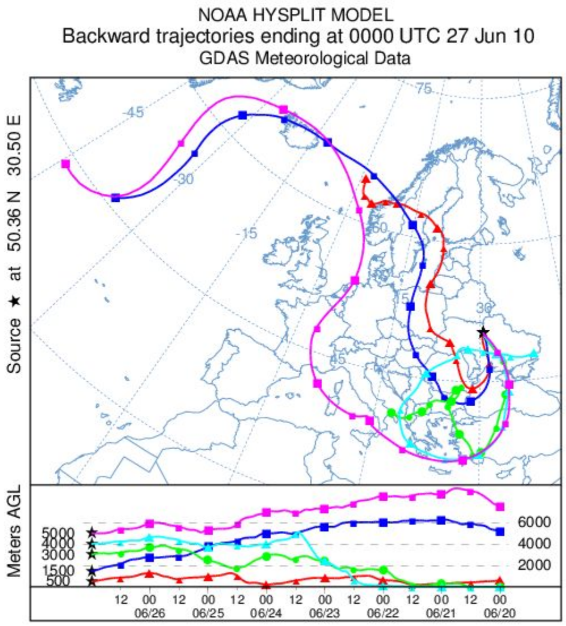


Figure S14. June 27, 2010

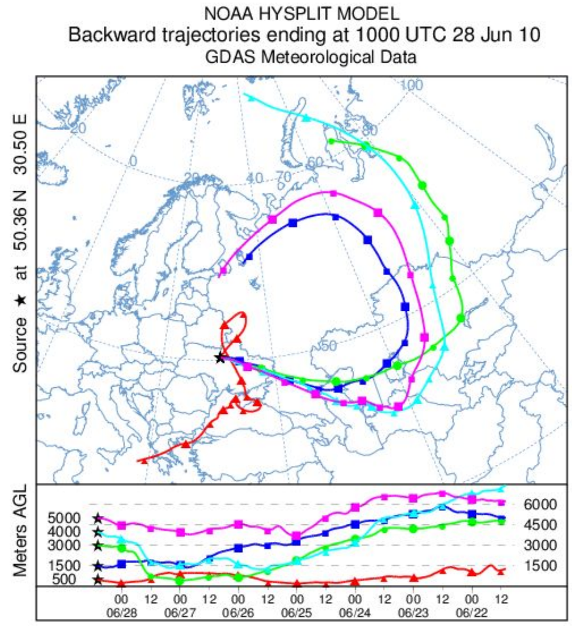


Figure S15. June 28, 2010

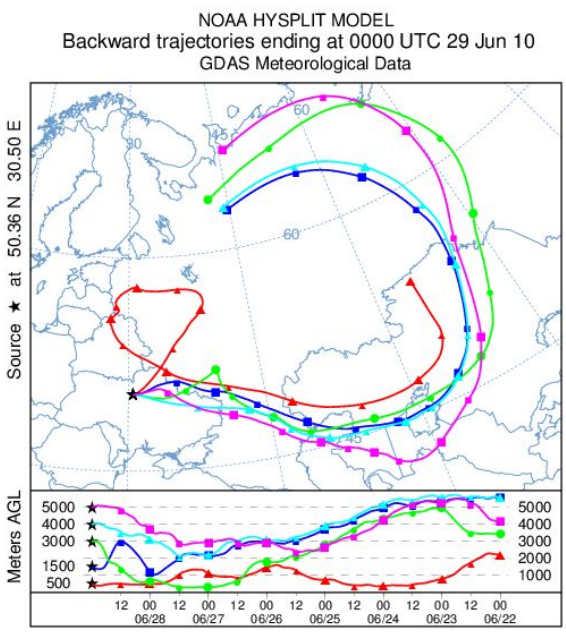


Figure S16. June 29, 2010

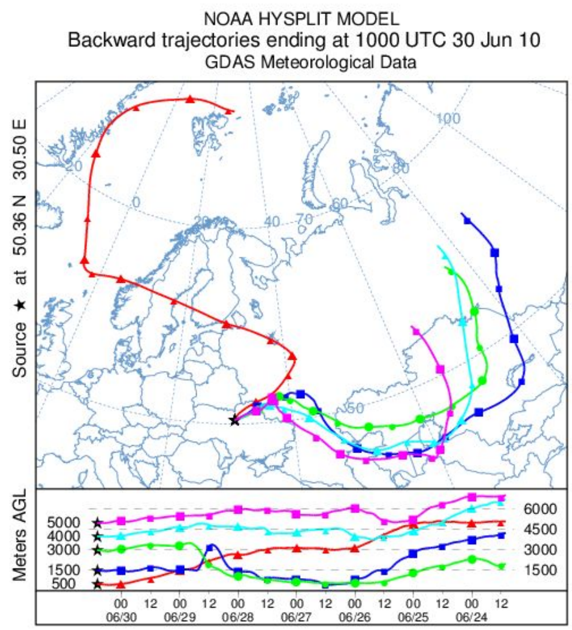


Figure S17. June 30, 2010

According to our analysis of air mass transport and spatio–temporal distribution of the brightness temperature of fires in Eastern Europe, it was seen that the wildfires were not the main source of increased concentrations of aerosol over Kyiv in June. The complex impact of continental particles and aerosol of marine origin was dominating. The relatively high AOD value on July 1 (see **Fig. S1**) was observed based on less than 10 measurements during that day. There were also no more measurements the day after, on July 2. During both days, wind directions at different altitudes varied much. Air entered Kyiv on July 1 at lower altitudes (500 m–1.5 km) passing central regions of the ETR on June 28–30. At 3–5 km altitude air came from the steppe area between the Caspian Sea and the eastern border of Ukraine. A large number of fires burned during those days (Fig. 2d in the Manuscript). Thus, combustion products in the form of aerosol likely influenced the atmosphere over Kyiv and increased the AOD.

In the morning of July 2 air masses entered Kyiv from the North Atlantic at altitudes of 500 m–3 km; at the end of day also at altitude of 5 km (**Fig. S18**). In the following three days, July 3–5, when washout by rain cleaned the atmosphere in the evening of July 2nd, AERONET-measured AODs were temporarily low, with values below 0.3 at 440 nm. On these days cloudiness decreased significantly and more measurements could be taken into account, thus, decreasing the uncertainty of the derived time-series. Between July 3–5 air masses entered Kyiv from the North Atlantic and Arctic through various parts of Europe, particularly at lower altitudes (500 m–1.5 km) through the ETR (**Fig. S19-S21**).

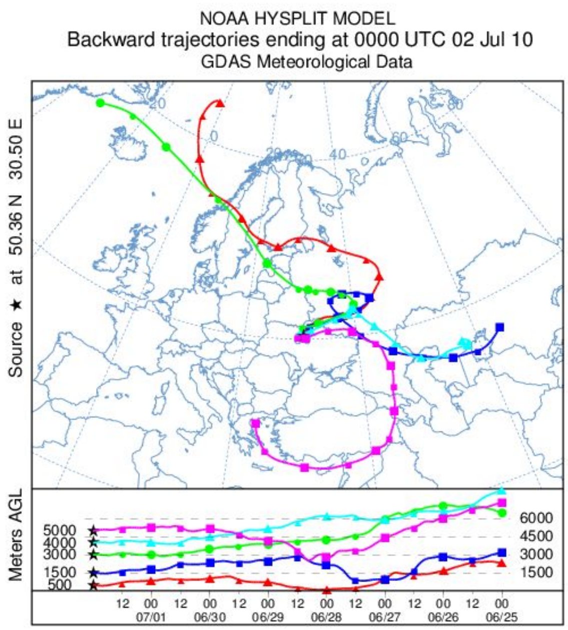


Figure S18. July 2, 2010

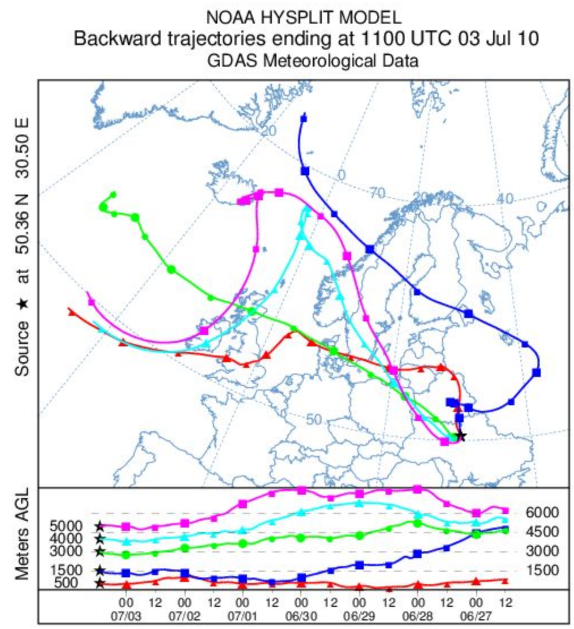


Figure S19. July 3, 2010

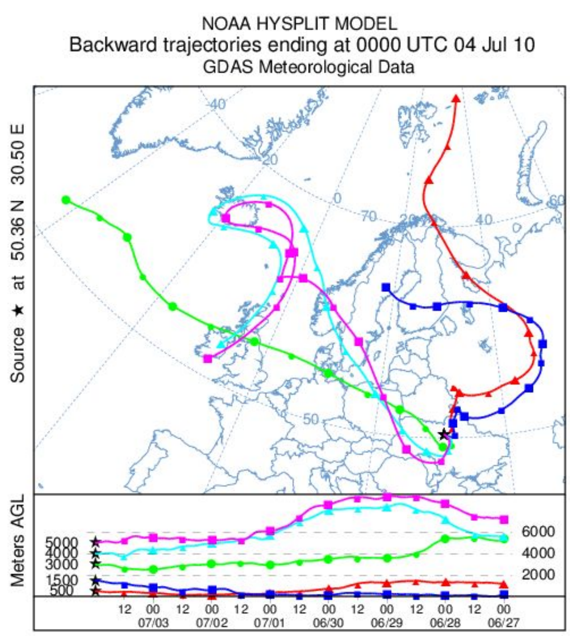


Figure S20. July 4, 2010

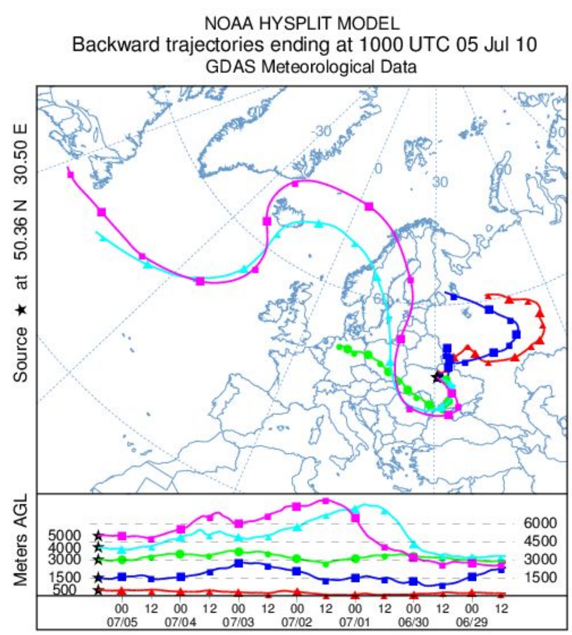


Figure S21. July 5, 2010

During July 6–7 weather conditions changed (**Fig. S22-S23**). Air masses now travelled westward at altitudes 0.5–4 km, originating mainly from central Kazakhstan and the ETR. Those air masses crossed the steppe zone of the ETR and south-east Ukraine, where active fires were observed (Fig. 2d in the Manuscript) and caused the relatively high AODs over Kyiv (Fig. 5a in the Manuscript). Another rapid change in weather conditions and transport pathways occurred again on July 8–9: air masses came from the Atlantic coast of Western Europe, travelled eastward causing an AOD decrease over Kyiv (Fig.5a in the manuscript, Fig. **S24-S25**).

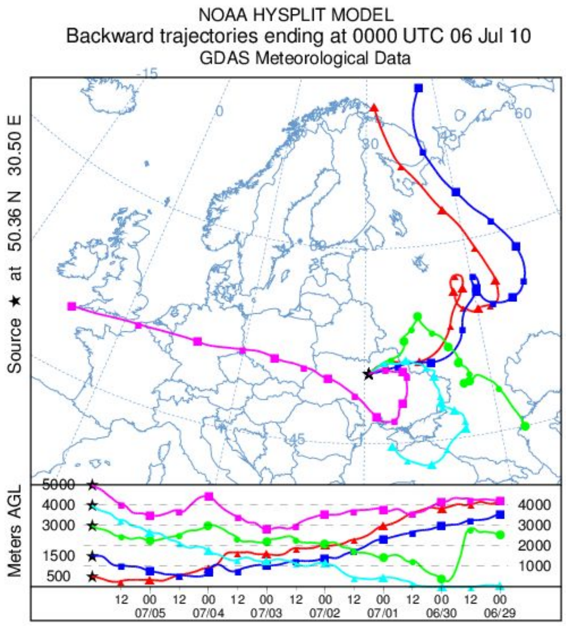


Figure S22. July 6, 2010

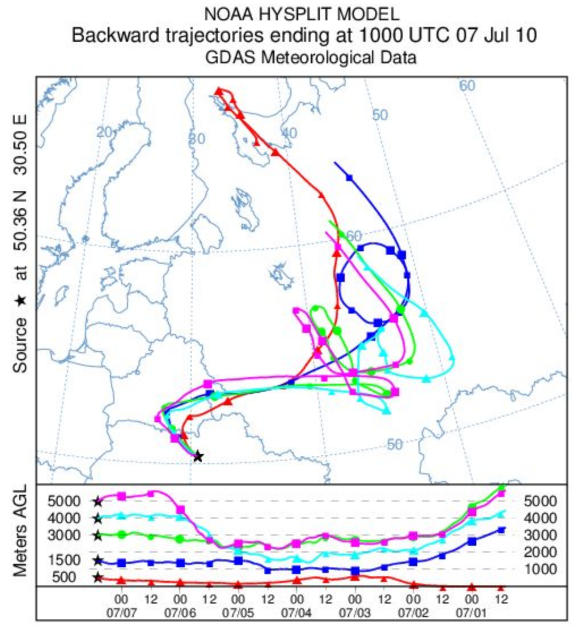


Figure S23. July 7, 2010

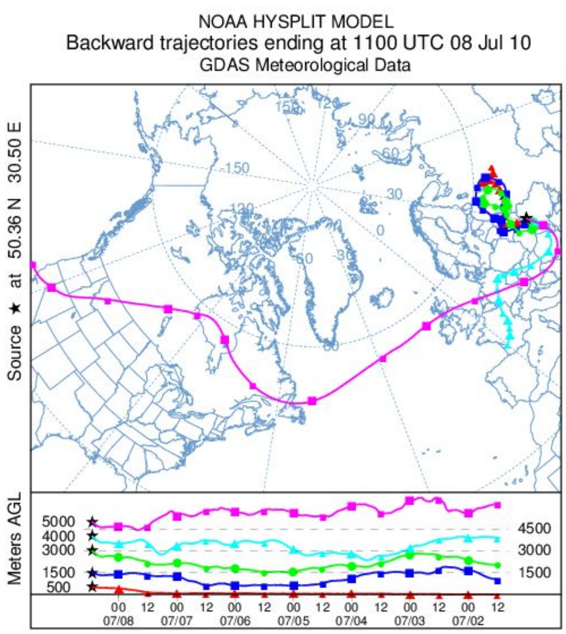


Figure S24. July 8, 2010

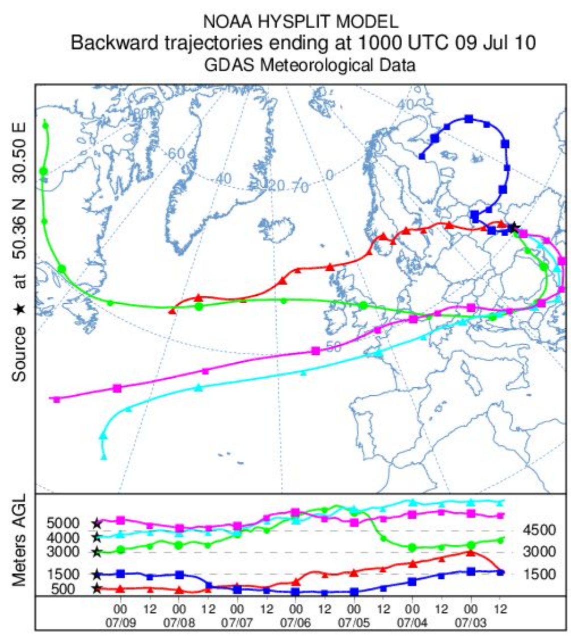


Figure S25. July 9, 2010

The aerosol load over Kyiv during July 10–27 (Fig. 5a in the Manuscript) was changing under the influence of air masses mainly coming from the Atlantic and the Arctic Ocean through the ETR, where fires burned (**Fig. S26**). These air masses crossed Kazakhstan and steppe zones of the ETR and through south-eastern Ukraine. Air masses were also circulating over the Central and Western regions of the ETR, Belarus and Ukraine and other neighboring countries, where at that time vegetation and peat fire were observed (**Fig. S27**). The number of fires and their intensity were gradually increasing towards end of July (Fig. 2 e,f in the Manuscript). Consequently, the increase of AOD over Kyiv during those days was caused by the accumulation of aerosol particles from the regions of active fires or formed under the influence of combustion products. Intermediate AOD decreases are caused by below cloud scavenging from occasional rains over Kyiv.

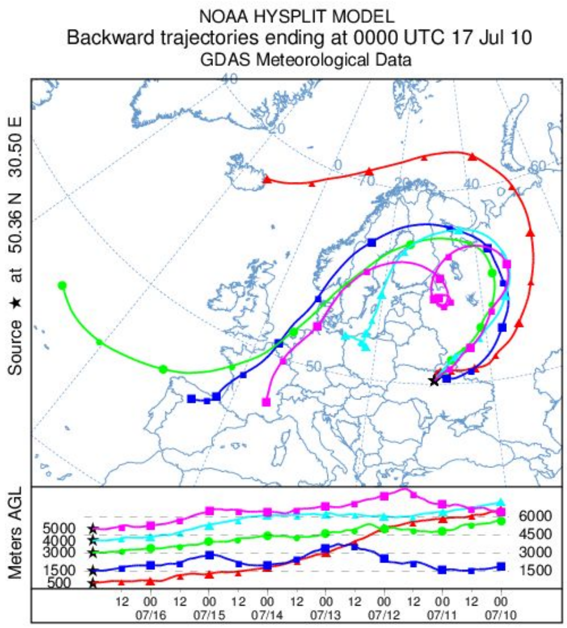


Figure S26. July 17, 2010

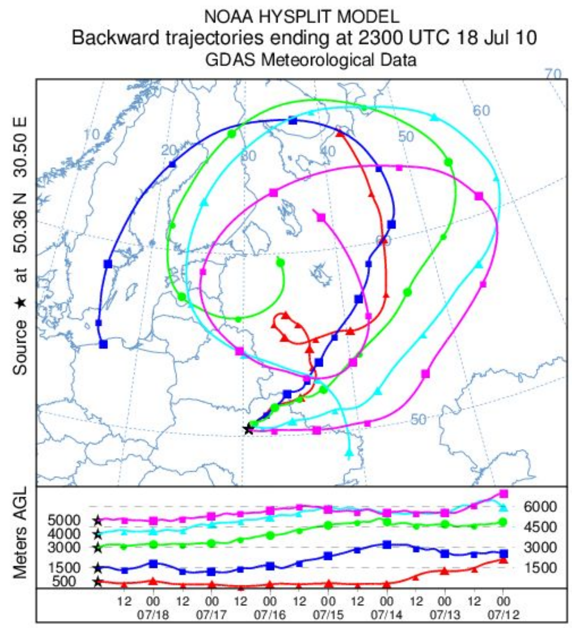


Figure S27. July 18, 2010

Rainy weather on July 27–28 over Kyiv site and a change in the transport pathways caused a significant decrease in AOD during July 29–30. Air masses entered Kyiv in the altitude range 500 m–5 km, coming from North Atlantic, passing Western Europe, the Mediterranean, the Balkans, Romania, Moldova, and western regions of Ukraine (**Fig. S28**).

During July 31–August 1 an increase of AOD over Kyiv was observed (Fig. 5a in the Manuscript), with air masses originating over the Atlantic and traveling throughout Scandinavia, Western and Southern Europe, the Mediterranean, the Balkans, later circulating over Ukraine, the Baltics, Poland, Romania and Moldova. Likely the increase of AOD was observed due to intense biomass burning in Ukraine and neighbouring territories (Fig. 2 g in the Manuscript). On August 2, air masses in the altitude range 500 m–3 km were transported to Kyiv from western and central regions of the ETR, from Kazakhstan throughout North Caucasus and the steppe zone of the ETR, as well as throughout south-eastern Ukraine (**Fig. S29**). In those regions intense forest, peat and vegetation fires were detected at that time (Fig. 2g in the Manuscript). Accordingly, these events were the reason of aerosol pollution over this region and Ukraine in particular till August 18.

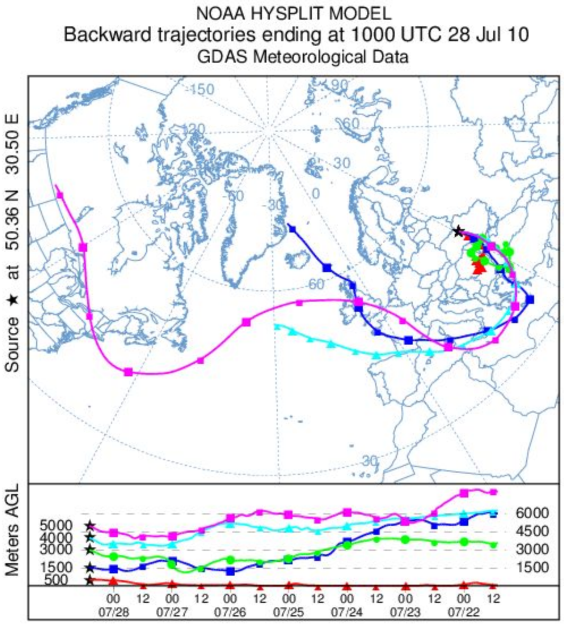


Figure S28. July 28, 2010

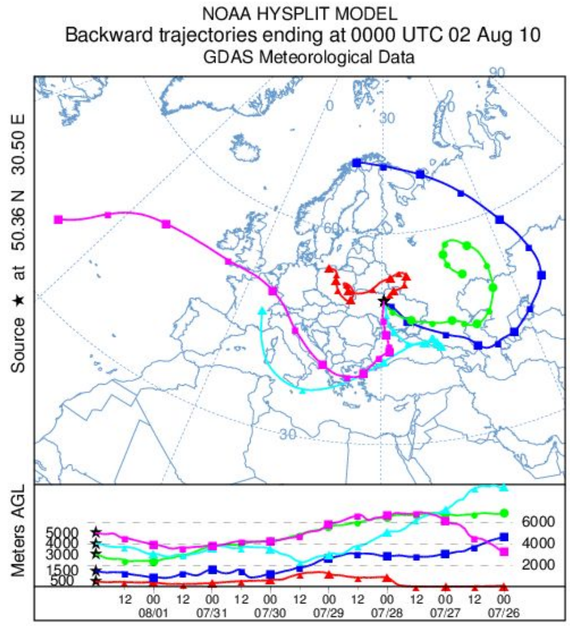


Figure S29. August 2, 2010

Between August 2–18 AOD over Kyiv were increasing and reached maximum values on 15 August with about 1.26 at 500 nm, respectively. This is more than factor 2 larger than during the fire period before August 2. For the following 2 days, August 16–17, the AOD level remained high. It increased so much because air masses circulated over the entire region, from Ural and Kazakhstan to Central Europe and the Baltic (**Fig. S30-S31**).

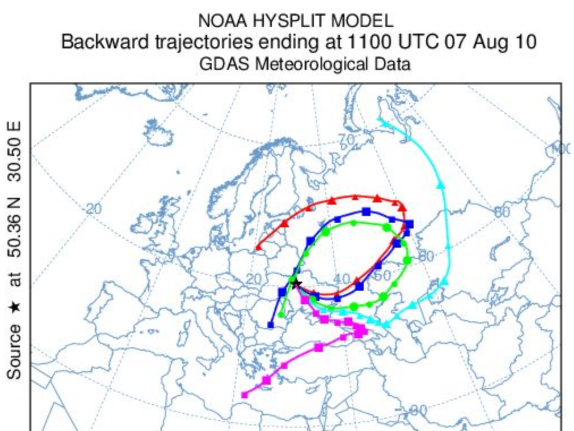


Figure S30. August 7, 2010

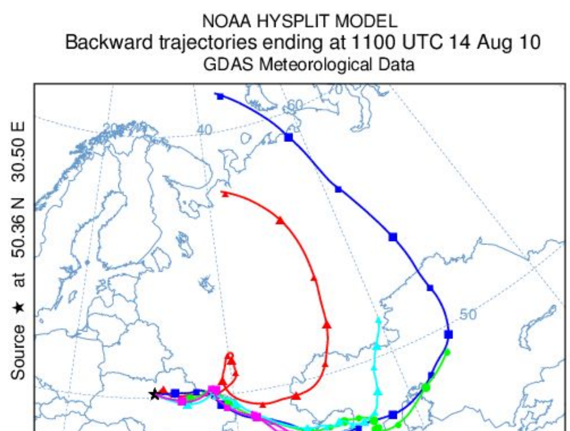


Figure S31. August 14, 2010

During August 18–21 atmospheric fronts of an active cyclone, which moved from the south of the Baltics to Samara region, caused significant weather change with rains in Eastern Europe. **Figures S32-S34** show back trajectories for the Kyiv site at 00 UTC, 06 UTC, and 12 UTC respectively . Towards 12 UTC the direction of incoming air changed completely from the eastern to western. Aerosol washout cleaned the atmosphere over investigated sites and caused the sharp AOD decrease seen in the Manuscript, Fig. 5a. Until the end of analysing period, i.e. end of August 2010, the average AOD level over Kyiv remained as low as during less polluted days in June 2010.

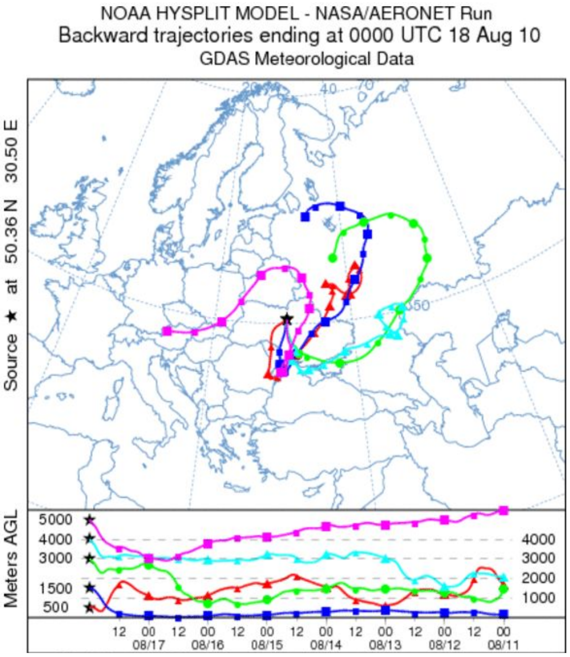


Figure S32. 00 UTC, August 18, 2010

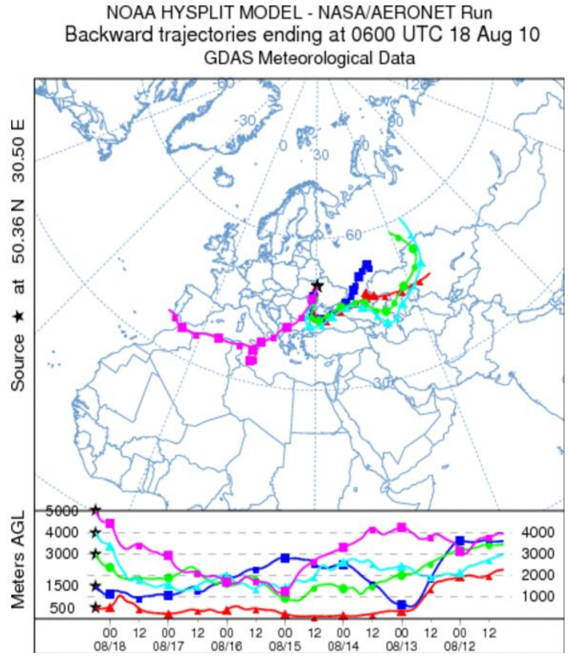


Figure S33. 06 UTC August 18, 2010

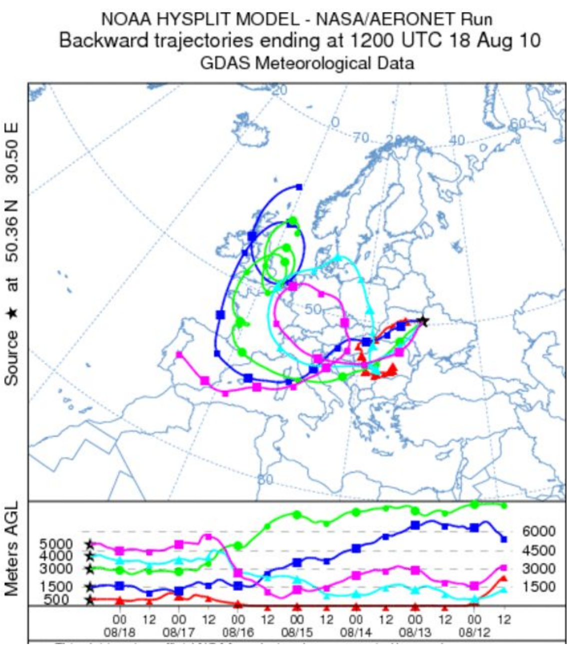


Figure S34. 12 UTC August 18, 2010

Table S35 . Aerosol Single Scattering Albedo (SSA) and Real (Re) and imaginary (Im) parts of refractive index from AERONET measurements at Kyiv site during June 1-August 31 2010.

Date	SSA		Refractive Index				Observations Number/day
	440nm	870nm	Re 440nm	Im 440nm	Re 870nm	Im 870nm	
1	2	3	4	5	6	7	8
09.06.2010	0.95	0.92	1.38	0.006	1.38	0.005	1
12.06.2010	0.95	0.93	1.34	0.003	1.41	0.004	2
13.06.2010	0.97	0.97	1.36	0.002	1.41	0.002	3
14.06.2010	0.97	0.98	1.48	0.002	1.50	0.002	1
30.06.2010	0.92	0.91	1.50	0.008	1.52	0.007	1
10.07.2010	0.94	0.90	1.37	0.008	1.39	0.010	1
19.07.2010	0.93	0.87	1.43	0.008	1.46	0.011	4
20.07.2010	0.98	0.90	1.40	0.006	1.44	0.008	2
31.07.2010	0.94	0.89	1.41	0.007	1.43	0.009	3
02.08.2010	0.94	0.95	1.52	0.006	1.55	0.005	4
05.08.2010	0.94	0.92	1.49	0.006	1.53	0.006	1
07.08.2010	0.94	0.92	1.51	0.008	1.53	0.009	8
08.08.2010	0.92	0.89	1.51	0.009	1.56	0.009	4
10.08.2010	0.93	0.87	1.48	0.011	1.50	0.016	3
11.08.2010	0.94	0.90	1.46	0.008	1.49	0.011	8
12.08.2010	0.94	0.91	1.50	0.008	1.52	0.010	3
13.08.2010	0.93	0.88	1.48	0.009	1.51	0.012	10
14.08.2010	0.94	0.89	1.49	0.008	1.52	0.011	3
15.08.2010	0.96	0.95	1.52	0.006	1.53	0.006	8
16.08.2010	0.97	0.95	1.49	0.006	1.51	0.007	10

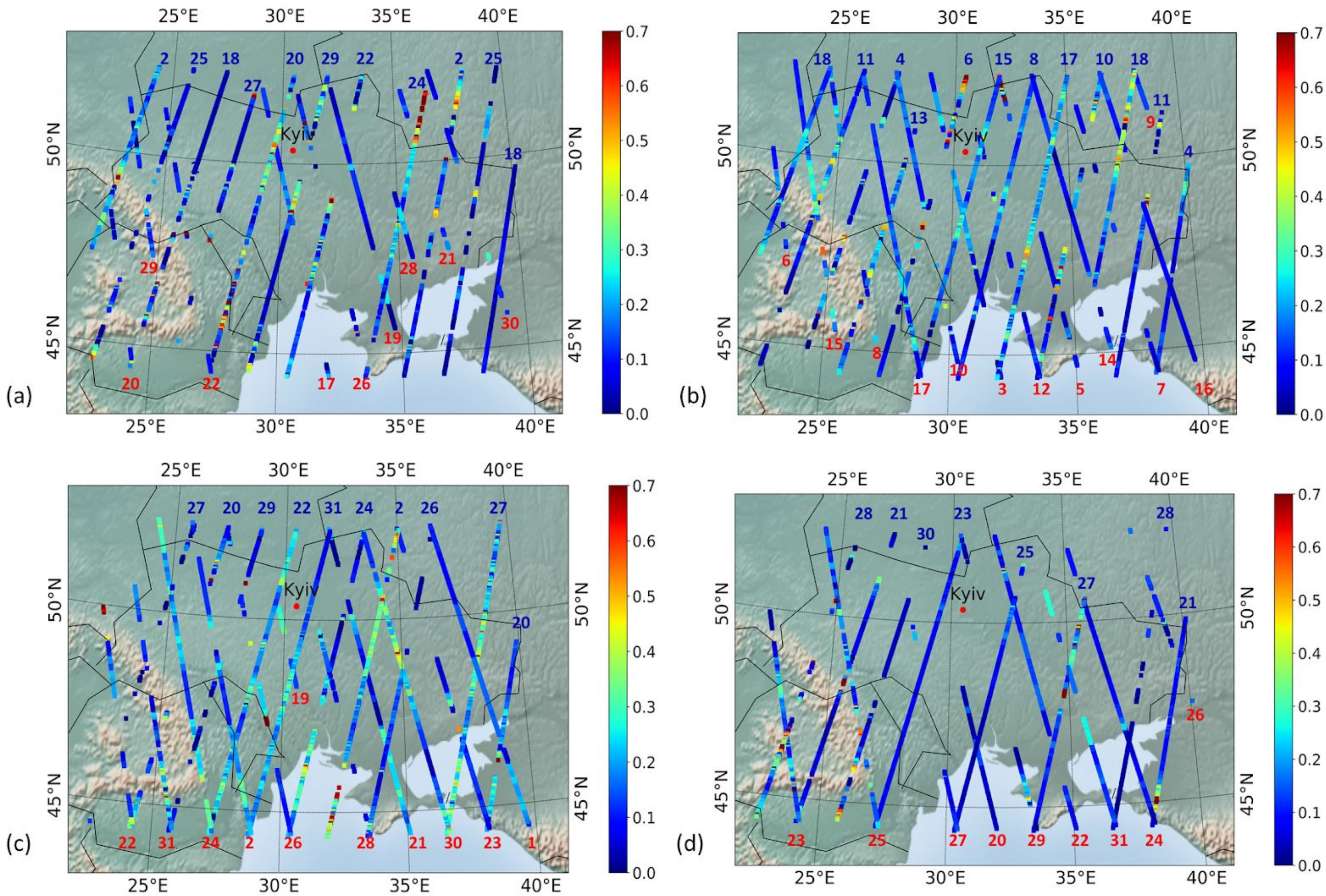


Figure S36. AOD 532 nm distribution over Ukraine in summer 2010 from CALIOP measurements during 16 day period from June 17 to July 2 (a), from July 3 to 18 (b), from Jul 19 to August 3 (c), and during 12 day period from August 20 to 31 (d). Red numbers at the bottom of the map indicate dates of each daytime track running to north-west and blue numbers at the top of the map indicate the date of each nocturnal track running to south-west.

Figures S37– S94 represent extinction coefficient of aerosol obtained from CALIPSO for the period August 7-12, 2010. Additional information is added to each figure and was taken directly from the CALIPSO Aerosols Profile Product Level 2.0 Version 3.01 and 3.02 data base. This additional information consists of:

- Date and Time
- Location
- AOD 532 nm
- Extinction Coefficient (plotted on Figures)
- Maximum of the Extinction Coefficient (Extinc.koef.max) and its uncertainty (Extinc.koef.max.Uncert)
- Average of the Extinction Coefficient (Extinc.koef.average)
- Median of the Extinction Coefficient (Extinc.koef.median)
- Heights of top and bottom of integral aerosol layers (Layer Height max, Layer Height min correspondingly)
- Height of Extinction Coefficient maximum (Height of Extinc.koef.max)
- Effective height of aerosol layer (Effective Height of Layer)

* Average of the Extinction Coefficient (Extinc.koef.average) of integral aerosol layers were computed using data mentioned above.

Effective heights of integral aerosol layers were computed from Extinction Coefficient vertical profile data as

$$H_{Eff} = \frac{\int_{H_{Min}}^{H_{Max}} z \cdot C_{Ext}(z) \cdot dz}{\int_{H_{Min}}^{H_{Max}} C_{Ext}(z) \cdot dz},$$

where z is the vertical coordinate,
$C_{Ext}(z)$ is the Extinction Coefficient,
H_{Min}, H_{Max} are respectively the bottom and top bounds of the integral aerosol layer.

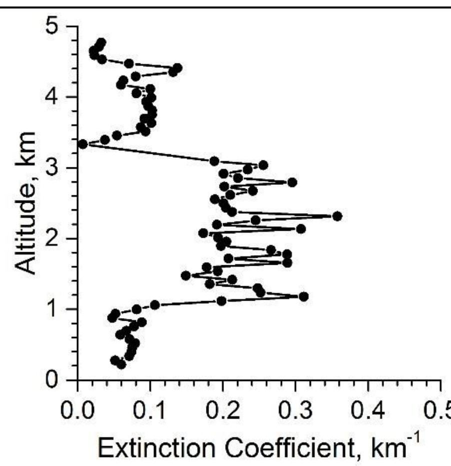
Figure S37. Date: August 07, 2010 Time(GMT) = 0h 26m 30.8s Latitude, deg = 51.3113 Longitude, deg = 29.9597 AOD 532 = 0.64 Extinc.koef.max = 0.36 km^{-1} Extinc.koef.max.Uncert. = 0.26 km^{-1} Extinc.koef.average = 0.14 km^{-1} Extinc.koef.median = 0.11 km^{-1} Layer Height max = 4.768 km Layer Height min = 0.217 km Height of Extinc.koef.max = 2.313 km Effective Height of Layer = 2.321 km	

Figure S38.
Date: August 07, 2010
Time(GMT) = 0h 26m 44.2s
Latitude, deg = 50.5201
Longitude, deg = 29.6139
AOD 532 = 1.92
Extinc.koef.max = 3.02 km^{-1}
Extinc.koef.max.Uncert. = 22.14 km^{-1}
Extinc.koef.average = 0.42 km^{-1}
Extinc.koef.median = 0.29 km^{-1}
Layer Height max = 4.768 km
Layer Height min = 0.217 km
Height of Extinc.koef.max = 0.217 km
Effective Height of Layer = 1.406 km

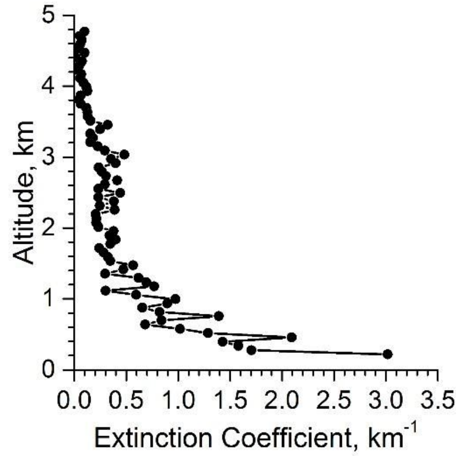


Figure S39.
Date: August 07, 2010
Time(GMT) = 0h 27m 19.9s
Latitude, deg = 48.4042
Longitude, deg = 28.7376
AOD 532 = 0.55
Extinc.koef.max = 0.40 km^{-1}
Extinc.koef.max.Uncert. = 0.31 km^{-1}
Extinc.koef.average = 0.12 km^{-1}
Extinc.koef.median = 0.08 km^{-1}
Layer Height max = 4.888 km
Layer Height min = 0.337 km
Height of Extinc.koef.max = 0.457 km
Effective Height of Layer = 1.793 km

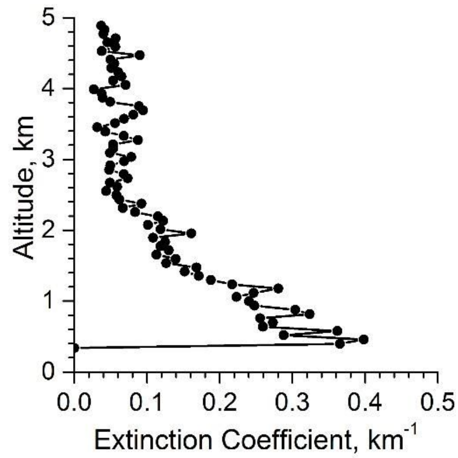


Figure S40.
Date: August 08, 2010
Time(GMT) = 10h 41m 8.9s
Latitude, deg = 47.6677
Longitude, deg = 36.9564
AOD 532 = 1.01
Extinc.koef.max = 3.42 km^{-1}
Extinc.koef.max.Uncert. = 5.64 km^{-1}
Extinc.koef.average = 0.29 km^{-1}
Extinc.koef.median = 0.10 km^{-1}
Layer Height max = 3.750 km
Layer Height min = 0.217 km
Height of Extinc.koef.max = 3.331 km
Effective Height of Layer = 2.930 km

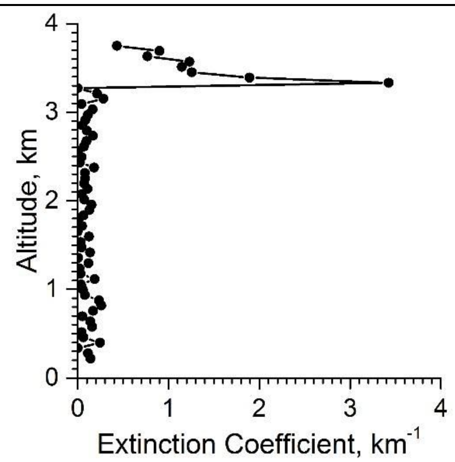


Figure S41.
Date: August 08, 2010
Time(GMT) = 10h 41m 19.3s
Latitude, deg = 48.2863
Longitude, deg = 36.7132
AOD 532 = 0.84
Extinc.koef.max = 2.36 km^{-1}
Extinc.koef.max.Uncert. = 1.59 km^{-1}
Extinc.koef.average = 0.21 km^{-1}
Extinc.koef.median = 0.05 km^{-1}
Layer Height max = 4.169 km
Layer Height min = 0.158 km
Height of Extinc.koef.max = 3.451 km
Effective Height of Layer = 3.065 km

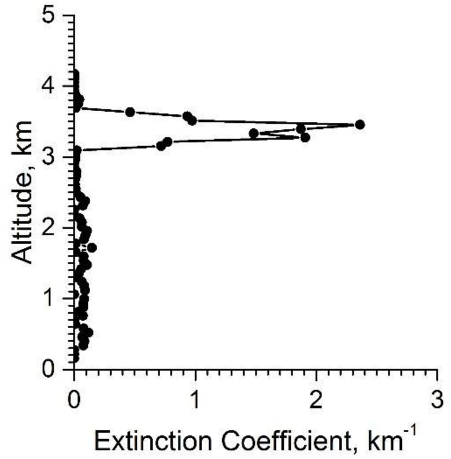


Figure S42.
Date: August 08, 2010
Time(GMT) = 10h 41m 55.0s
Latitude, deg = 50.4036
Longitude, deg = 35.8398
AOD 532 = 2.14
Extinc.koef.max = 4.04 km^{-1}
Extinc.koef.max.Uncert. = 99.99 km^{-1}
Extinc.koef.average = 0.54 km^{-1}
Extinc.koef.median = 0.27 km^{-1}
Layer Height max = 4.169 km
Layer Height min = 0.217km
Height of Extinc.koef.max = 0.217 km
Effective Height of Layer = 1.690 km

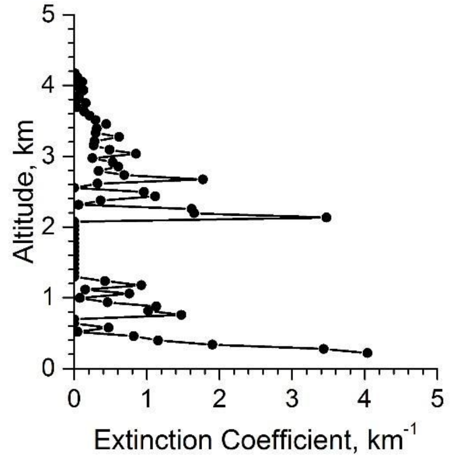


Figure S43.
Date: August 08, 2010
Time(GMT) = 10h 42m 12.2s
Latitude, deg = 51.4143
Longitude, deg = 35.3986
AOD532 = 0.82
Extinc.koef.max = 1.51 km^{-1}
Extinc.koef.max.Uncert. = 2.91 km^{-1}
Extinc.koef.average = 0.31 km^{-1}
Extinc.koef.median = 0.27 km^{-1}
Layer Height max = 2.912 km
Layer Height min = 0.277 km
Height of Extinc.koef.max = 0.337 km
Effective Height of Layer = 1.418 km

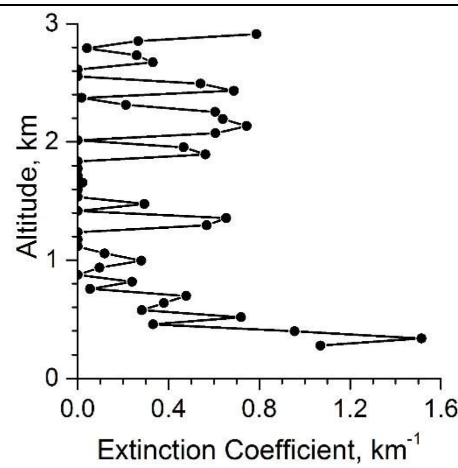
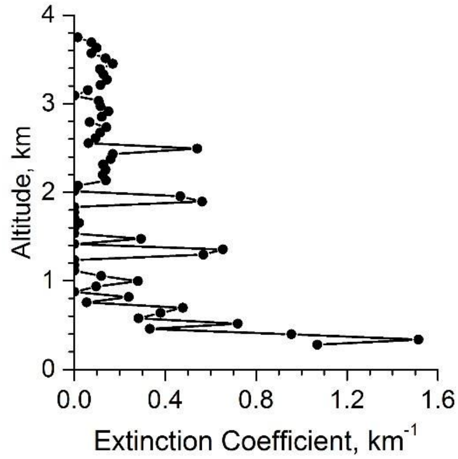
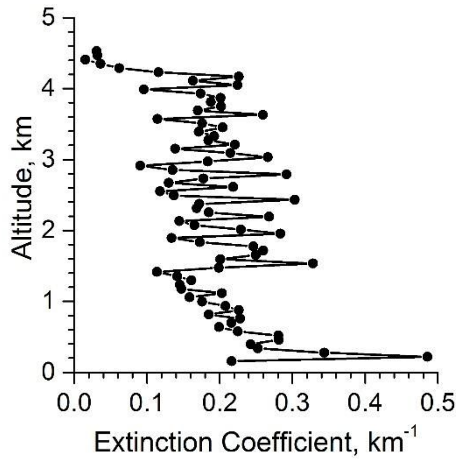
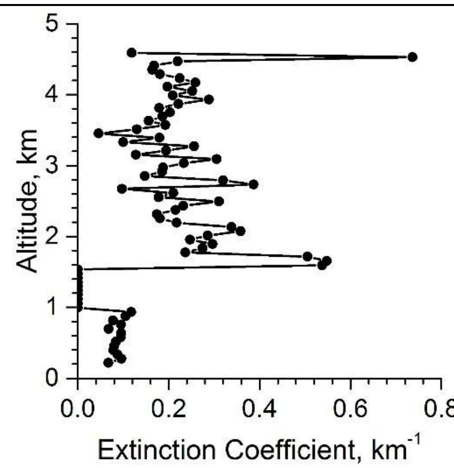


Figure S44. Date: August 08, 2010 Time(GMT) = 10h 42m 22.0s Latitude, deg = 51.9867 Longitude, deg = 35.1411 AOD 532 = 0.72 Extinc.koef.max = 1.51 km^{-1} Extinc.koef.max.Uncert. = 2.91 km^{-1} Extinc.koef.average = 0.21 km^{-1} Extinc.koef.median = 0.12 km^{-1} Layer Height max = 3.750 km Layer Height min = 0.277 km Height of Extinc.koef.max = 0.337 km Effective Height of Layer = 1.398 km	
Figure S45. Date: August 09, 2010 Time(GMT) = 0h 14m 4.5s Latitude, deg = 51.5390 Longitude, deg = 33.1510 AOD 532 = 0.84 Extinc.koef.max = 0.49 km^{-1} Extinc.koef.max.Uncert. = 0.19 km^{-1} Extinc.koef.average = 0.19 km^{-1} Extinc.koef.median = 0.19 km^{-1} Layer Height max = 4.529 km Layer Height min = 0.158 km Height of Extinc.koef.max = 0.217 km Effective Height of Layer = 2.083 km	
Figure S46. Date: August 09, 2010 Time(GMT) = 0h 14m 23.1s Latitude, deg = 50.4398 Longitude, deg = 32.6701 AOD 532 = 0.81 Extinc.koef.max = 0.74 km^{-1} Extinc.koef.max.Uncert. = 0.32 km^{-1} Extinc.koef.average = 0.19 km^{-1} Extinc.koef.median = 0.18 km^{-1} Layer Height max = 4.588 km Layer Height min = 0.217 km Height of Extinc.koef.max = 4.528 km Effective Height of Layer = 2.797 km	

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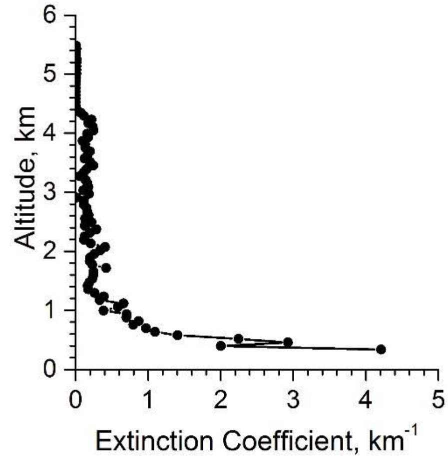
<tr><td>Figure S47.
Date: August 09, 2010
Time(GMT) = 0h 14m 49.9s
Latitude, deg = 48.8535
Longitude, deg = 32.0089
AOD 532 = 1.63
Extinc.koef.max = 4.21 km^{-1}
Extinc.koef.max.Uncert. = 4.08 km^{-1}
Extinc.koef.average = 0.32 km^{-1}
Extinc.koef.median = 0.17 km^{-1}
Layer Height max = 5.487 km
Layer Height min = 0.337 km
Height of Extinc.koef.max = 0.34 km
Effective Height of Layer = 1.380 km</td><td>
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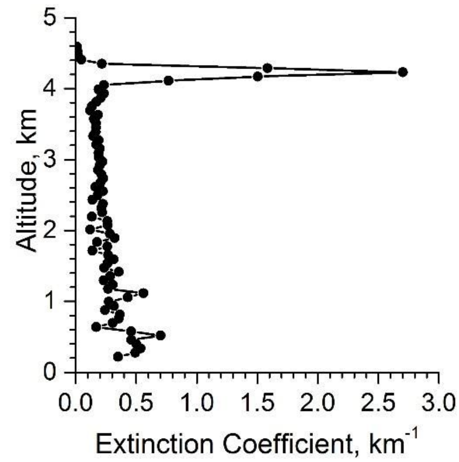
<tr><td>Figure S48.
Date: August 09, 2010
Time(GMT) = 0h 15m 9.2s
Latitude, deg = 47.7046
Longitude, deg = 31.5519
AOD 532 = 1.41
Extinc.koef.max = 2.70 km^{-1}
Extinc.koef.max.Uncert. = 1.29 km^{-1}
Extinc.koef.average = 0.32 km^{-1}
Extinc.koef.median = 0.23 km^{-1}
Layer Height max = 4.588 km
Layer Height min = 0.217 km
Height of Extinc.koef.max = 4.229 km
Effective Height of Layer = 2.487 km</td><td>
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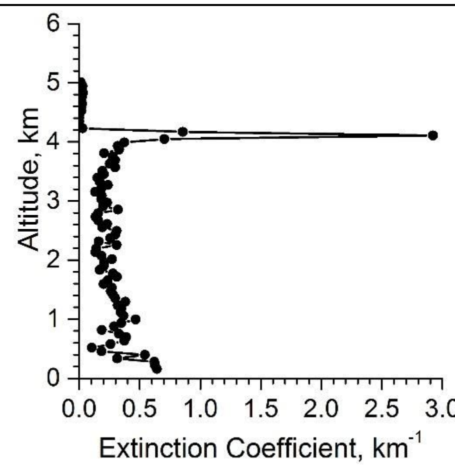
<tr><td>Figure S49.
Date: August 09, 2010
Time(GMT) = 0h 15m 20.4s
Latitude, deg = 47.0423
Longitude, deg = 31.2962
AOD 532 = 1.32
Extinc.koef.max = 2.92 km^{-1}
Extinc.koef.max.Uncert. = 1.15 km^{-1}
Extinc.koef.average = 0.27 km^{-1}
Extinc.koef.median = 0.24 km^{-1}
Layer Height max = 5.008 km
Layer Height min = 0.159 km
Height of Extinc.koef.max = 4.109 km
Effective Height of Layer = 2.372 km</td><td>
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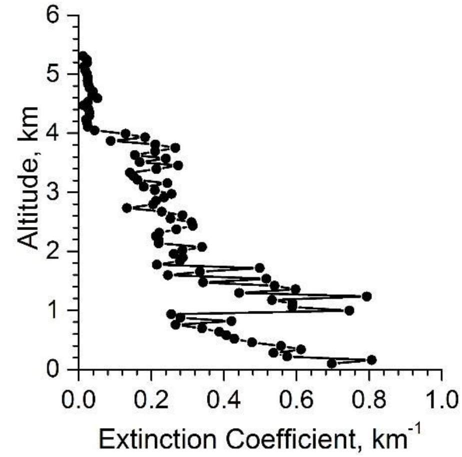
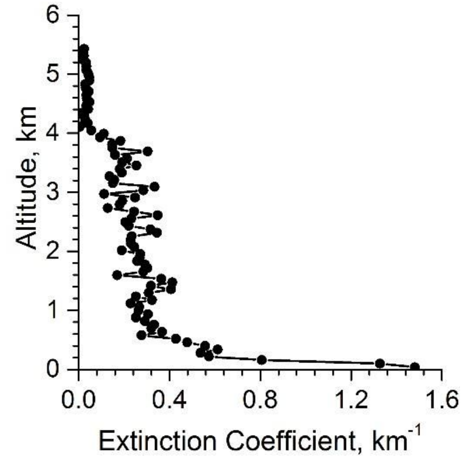
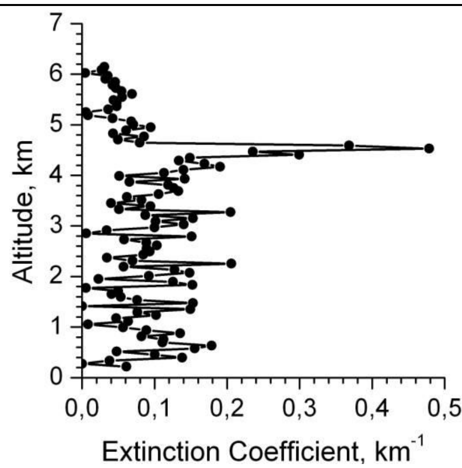
Figure S50. Date: August 09, 2010 Time(GMT) = 0h 15m 27.1s Latitude, deg = 46.6447 Longitude, deg = 31.1451 AOD 532 = 1.36 Extinc.koef.max = 0.81 km^{-1} Extinc.koef.max.Uncert. = 0.30 km^{-1} Extinc.koef.average = 0.26 km^{-1} Extinc.koef.median = 0.24 km^{-1} Layer Height max = 5.307 km Layer Height min = 0.098 km Height of Extinc.koef.max = 0.158 km Effective Height of Layer = 1.693 km	
Figure S51. Date: August 09, 2010 Time(GMT) = 0h 15m 33.8s Latitude, deg = 46.2468 Longitude, deg = 30.9956 AOD 532 = 1.27 Extinc.koef.max = 1.48 km^{-1} Extinc.koef.max.Uncert. = 0.61 km^{-1} Extinc.koef.average = 0.24 km^{-1} Extinc.koef.median = 0.23 km^{-1} Layer Height max = 5.427 km Layer Height min = 0.038 km Height of Extinc.koef.max = 0.038 km Effective Height of Layer = 1.648 km	
Figure S52. Date: August 11, 2010 Time(GMT) = 0h 1m 48.7s Latitude, deg = 51.1403 Longitude, deg = 36.0654 AOD 532 = 0.56 Extinc.koef.max = 0.48 km^{-1} Extinc.koef.max.Uncert. = 0.24 km^{-1} Extinc.koef.average = 0.09 km^{-1} Extinc.koef.median = 0.08 km^{-1} Layer Height max = 6.145 km Layer Height min = 0.217 km Height of Extinc.koef.max = 4.529 km Effective Height of Layer = 3.121 km	

Figure S53.
Date: August 11, 2010
Time(GMT) = 0h 2m 17.7s
Latitude, deg = 49.4225
Longitude, deg = 35.3326
AOD 532 = 0.75
Extinc.koef.max = 0.28 km^{-1}
Extinc.koef.max.Uncert. = 0.21 km^{-1}
Extinc.koef.average = 0.14 km^{-1}
Extinc.koef.median = 0.14 km^{-1}
Layer Height max = 5.427 km
Layer Height min = 0.217 km
Height of Extinc.koef.max = 4.109 km
Effective Height of Layer = 2.850 km

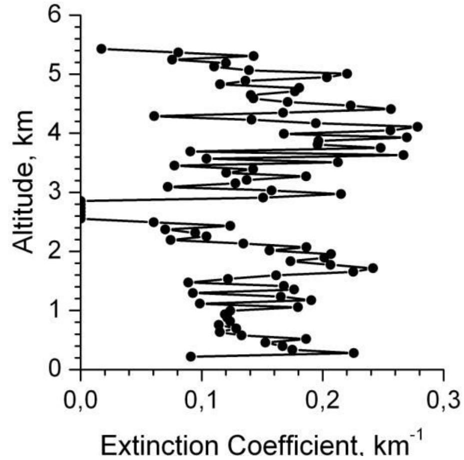


Figure S54.
Date: August 11, 2010
Time(GMT) = 0h 2m 28.1s
Latitude, deg = 48.8064
Longitude, deg = 35.0803
AOD 532 = 1.58
Extinc.koef.max = 1.54 km^{-1}
Extinc.koef.max.Uncert. = 0.57 km^{-1}
Extinc.koef.average = 0.31 km^{-1}
Extinc.koef.median = 0.24 km^{-1}
Layer Height max = 5.367 km
Layer Height min = 0.217 km
Height of Extinc.koef.max = 4.289 km
Effective Height of Layer = 2.144 km

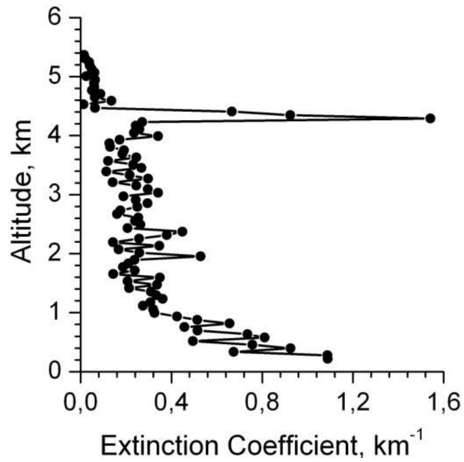


Figure S55.
Date: August 11, 2010
Time(GMT) = 0h 2m 38.5s
Latitude, deg = 48.1884
Longitude, deg = 34.8330
AOD 532 = 2.55
Extinc.koef.max = 3.63 km^{-1}
Extinc.koef.max.Uncert. = 1.37 km^{-1}
Extinc.koef.average = 0.51 km^{-1}
Extinc.koef.median = 0.31 km^{-1}
Layer Height max = 5.367 km
Layer Height min = 0.337 km
Height of Extinc.koef.max = 4.169 km
Effective Height of Layer = 1.983 km

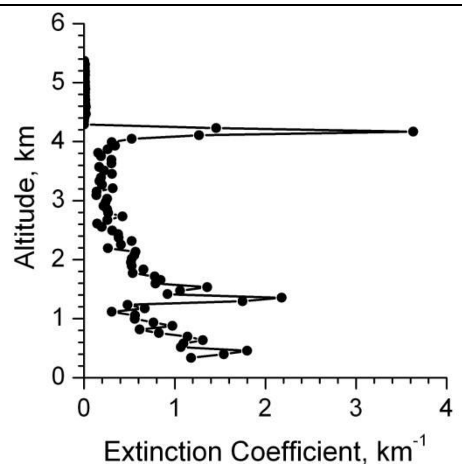


Figure S56.
Date: August 11, 2010
Time(GMT) = 0h 2m 48.2s
Latitude, deg = 47.6141
Longitude, deg = 34.6072
AOD 532 = 0.869
Extinc.koef.max = 1.83 km^{-1}
Extinc.koef.max.Uncert. = 0.66 km^{-1}
Extinc.koef.average = 0.21 km^{-1}
Extinc.koef.median = 0.18 km^{-1}
Layer Height max = 4.349 km
Layer Height min = 0.217 km
Height of Extinc.koef.max = 4.229 km
Effective Height of Layer = 2.423 km

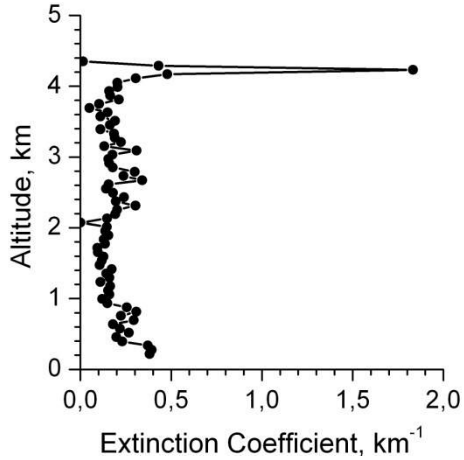


Figure S57.
Date: August 11, 2010
Time(GMT) = 0h 3m 13.5s
Latitude, deg = 46.1114
Longitude, deg = 34.0359
AOD 532 = 0.99
Extinc.koef.max = 1.51 km^{-1}
Extinc.koef.max.Uncert. = 0.58 km^{-1}
Extinc.koef.average = 0.19 km^{-1}
Extinc.koef.median = 0.15 km^{-1}
Layer Height max = 5.187 km
Layer Height min = 0.038 km
Height of Extinc.koef.max = 4.768 km
Effective Height of Layer = 2.790 km

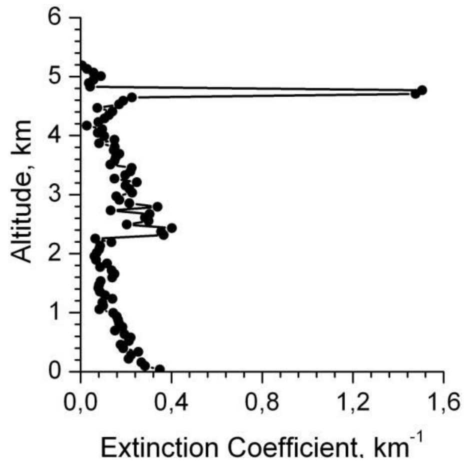


Figure S58.
Date: August 11, 2010
Time(GMT) = 11h 12m 5.0s
Latitude, deg = 47.8663
Longitude, deg = 29.1510
AOD 532 = 0.93
Extinc.koef.max = 0.78 km^{-1}
Extinc.koef.average = 0.21 km^{-1}
Extinc.koef.median = 0.18 km^{-1}
Layer Height max = 4.648 km
Layer Height min = 0.277 km
Height of Extinc.koef.max = 0.337 km
Effective Height of Layer = 1.573 km

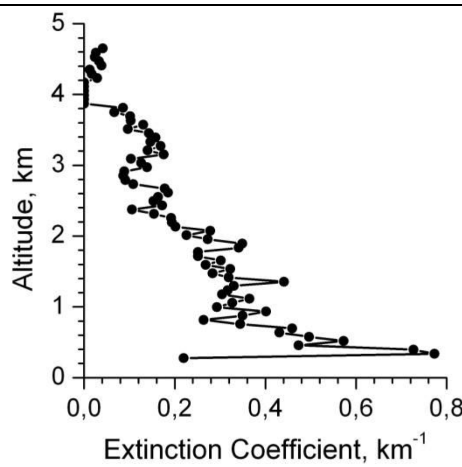


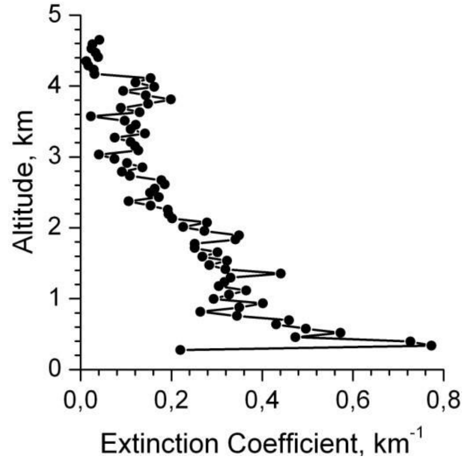
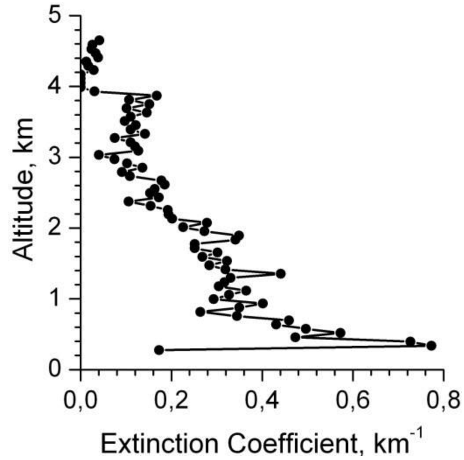
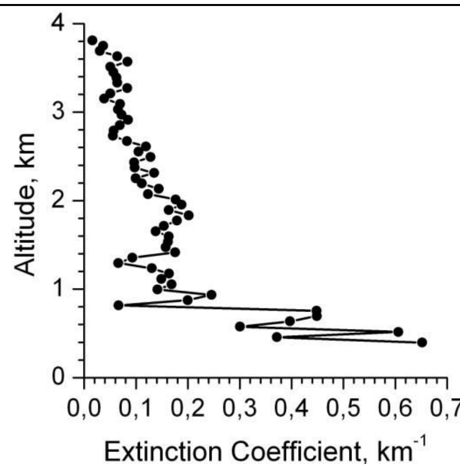
Figure S59. Date: August 11, 2010 Time(GMT) = 11h 12m 8.6s Latitude, deg = 48.0868 Longitude, deg = 29.0639 AOD 532 = 0.96 Extinc.koef.max = 0.77 km^{-1} Extinc.koef.average = 0.22 km^{-1} Extinc.koef.median = 0.18 km^{-1} Layer Height max = 4.648 km Layer Height min = 0.277 km Height of Extinc.koef.max = 0.337 km Effective Height of Layer = 1.666 km	
Figure S60. Date: August 11, 2010 Time(GMT) = 11h 12m 12.6s Latitude, deg = 48.3082 Longitude, deg = 28.9766 AOD 532 = 0.93 Extinc.koef.max = 0.77 km^{-1} Extinc.koef.average = 0.21 km^{-1} Extinc.koef.median = 0.17 km^{-1} Layer Height max = 4.648 km Layer Height min = 0.277 km Height of Extinc.koef.max = 0.337 km Effective Height of Layer = 1.591 km	
Figure S61. Date: August 11, 2010 Time(GMT) = 11h 12m 25.9s Latitude, deg = 49.1026 Longitude, deg = 28.6557 AOD 532 = 0.50 Extinc.koef.max = 0.65 km^{-1} Extinc.koef.average = 0.15 km^{-1} Extinc.koef.median = 0.12 km^{-1} Layer Height max = 3.810 km Layer Height min = 0.397 km Height of Extinc.koef.max = 0.397 km Effective Height of Layer = 1.536 km	

Figure S62.
Date: August 12, 2010
Time(GMT) = 0h 44m 50.9s
Latitude, deg = 51.9065
Longitude, deg = 25.5926
AOD 532 = 0.51
Extinc.koef.max = 0.96 km^{-1}
Extinc.koef.average = 0.13 km^{-1}
Extinc.koef.median = 0.06 km^{-1}
Layer Height max = 4.22913 km
Layer Height min = 0.277296 km
Height of Extinc.koef.max = 2.133 km
Effective Height of Layer = 2.273 km

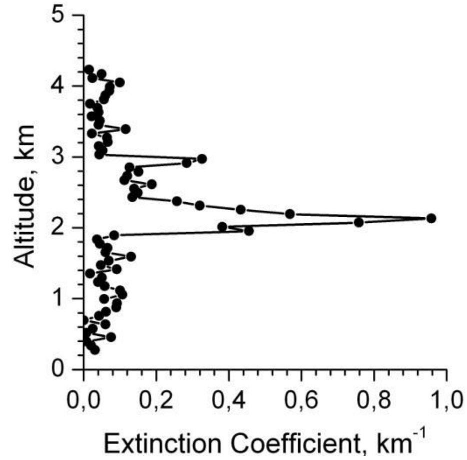


Figure S63.
Date: August 12, 2010
Time(GMT) = 0h 45m 13.9s
Latitude, deg = 50.5437
Longitude, deg = 24.9904
AOD 532 = 0.68
Extinc.koef.max = 0.96 km^{-1}
Extinc.koef.average = 0.20 km^{-1}
Extinc.koef.median = 0.13 km^{-1}
Layer Height max = 3.810 km
Layer Height min = 0.337 km
Height of Extinc.koef.max = 3.271 km
Effective Height of Layer = 2.182 km

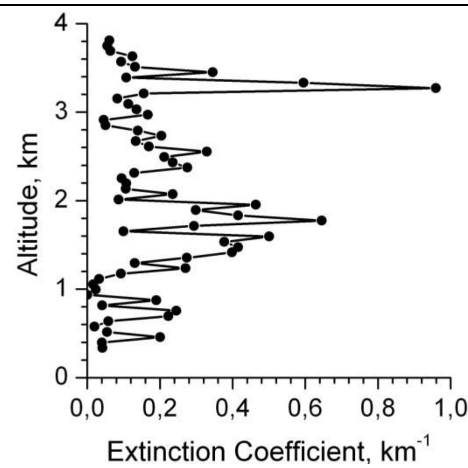


Figure S64.
Date: August 12, 2010
Time(GMT) = 0h 45m 42.2s
Latitude, deg = 48.8696
Longitude, deg = 24.2911
AOD 532 = 0.65
Extinc.koef.max = 0.53 km^{-1}
Extinc.koef.average = 0.23 km^{-1}
Extinc.koef.median = 0.21 km^{-1}
Layer Height max = 3.511 km
Layer Height min = 0.637 km
Height of Extinc.koef.max = 0.936 km
Effective Height of Layer = 2.211 km

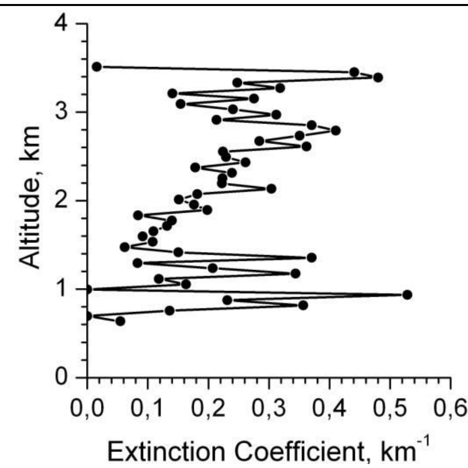


Figure S65.
Date: August 12, 2010
Time(GMT) = 0h 46m 3.8s
Latitude, deg = 47.5893
Longitude, deg = 23.7827
AOD 532 = 1.65
Extinc.koef.max = 7.01 km^{-1}
Extinc.koef.average = 0.61 km^{-1}
Extinc.koef.median = 0.24 km^{-1}
Layer Height max = 3.271 km
Layer Height min = 0.577 km
Height of Extinc.koef.max = 1.475 km
Effective Height of Layer = 1.342 km

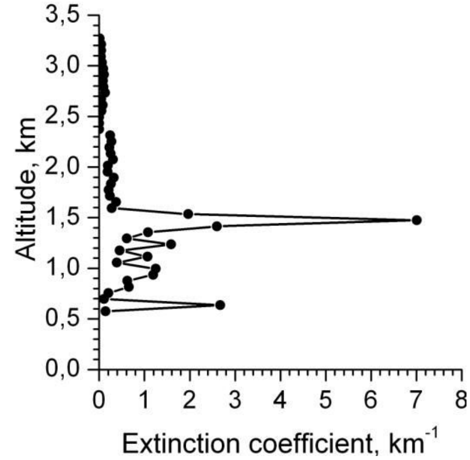


Figure S66.
Date: August 12, 2010
Time(GMT) = 0h 46m 53.6s
Latitude, deg = 44.6243
Longitude, deg = 22.6808
AOD 532 = 0.83
Extinc.koef.max = 1.12 km^{-1}
Extinc.koef.average = 0.22 km^{-1}
Extinc.koef.median = 0.10 km^{-1}
Layer Height max = 3.930 km
Layer Height min = 0.098 km
Height of Extinc.koef.max = 0.158 km
Effective Height of Layer = 1.000 km

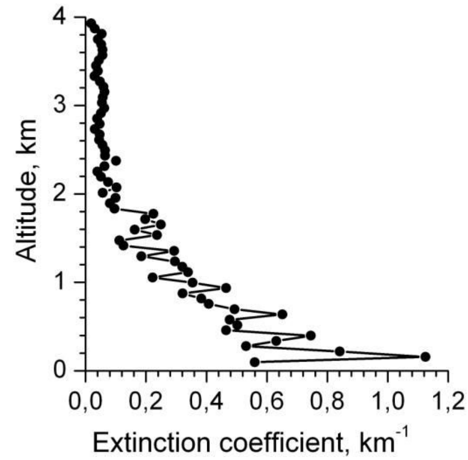


Figure S67.
Date: August 12, 2010
Time(GMT) = 23h 49m 11.3s
Latitude, deg = 52.0120
Longitude, deg = 39.5455
AOD 532 = 0.65
Extinc.koef.max = 0.47 km^{-1}
Extinc.koef.average = 0.12 km^{-1}
Extinc.koef.median = 0.05 km^{-1}
Layer Height max = 5.487 km
Layer Height min = 0.217 km
Height of Extinc.koef.max = 0.876 km
Effective Height of Layer = 1.477 km

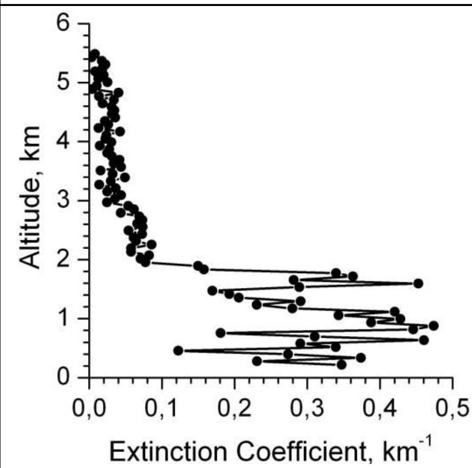


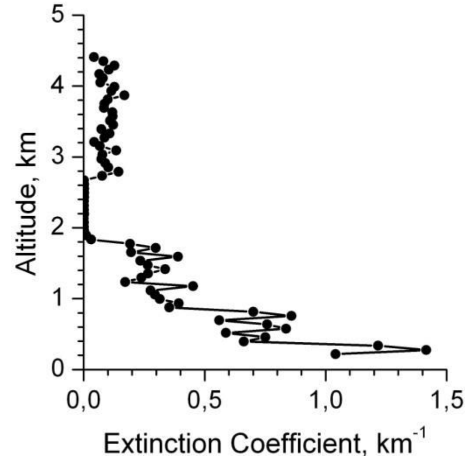
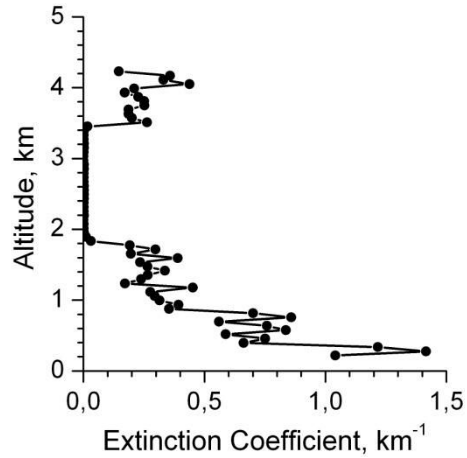
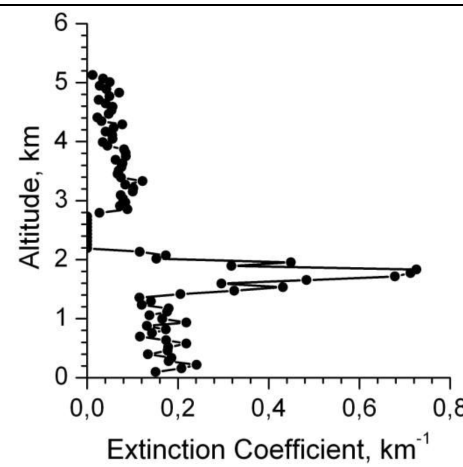
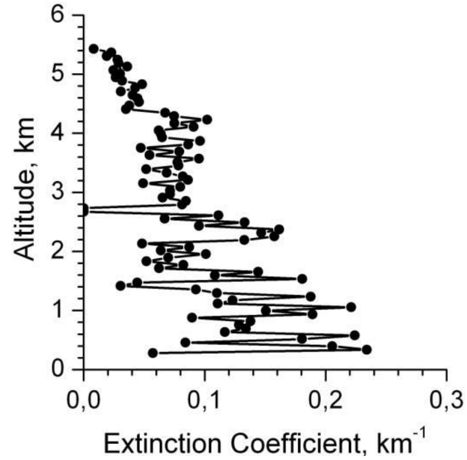
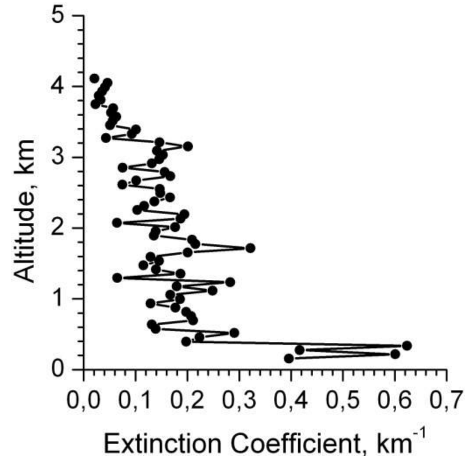
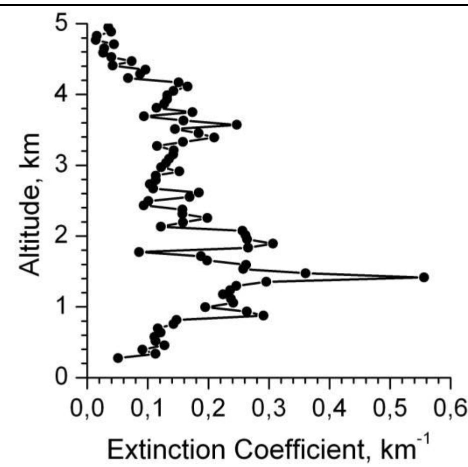
Figure S68. Date: August 12, 2010 Time(GMT) = 23h 49m 44.8s Latitude, deg = 50.0322 Longitude, deg = 38.6777 AOD 532 = 0.98 Extinc.koef.max = 1.42 km^{-1} Extinc.koef.average = 0.23 km^{-1} Extinc.koef.median = 0.11 km^{-1} Layer Height max = 4.409 km Layer Height min = 0.217 km Height of Extinc.koef.max = 0.277 km Effective Height of Layer = 1.256 km	
Figure S69. Date: August 12, 2010 Time(GMT) = 23h 49m 55.9s Latitude, deg = 49.3706 Longitude, deg = 38.4015 AOD 532 = 1.0 Extinc.koef.max = 1.42 km^{-1} Extinc.koef.average = 0.25 km^{-1} Extinc.koef.median = 0.20 km^{-1} Layer Height max = 4.229 km Layer Height min = 0.217 km Height of Extinc.koef.max = 0.277 km Effective Height of Layer = 1.380 km	
Figure S70. Date: August 13, 2010 Time(GMT) = 10h 59m 17.9s Latitude, deg = 46.4181 Longitude, deg = 32.7968 AOD 532 = 0.67 Extinc.koef.max = 0.73 km^{-1} Extinc.koef.average = 0.13 km^{-1} Extinc.koef.median = 0.08 km^{-1} Layer Height max = 5.127 km Layer Height min = 0.098 km Height of Extinc.koef.max = 1.834 km Effective Height of Layer = 1.862 km	

Figure S71. Date: August 13, 2010 Time(GMT) = 11h 0m 5.8s Latitude, deg = 49.2469 Longitude, deg = 31.6873 AOD 532 = 0.44 Extinc.koef.max = 0.23 km^{-1} Extinc.koef.average = 0.09 km^{-1} Extinc.koef.median = 0.08 km^{-1} Layer Height max = 5.427 km Layer Height min = 0.277 km Height of Extinc.koef.max = 0.337 km Effective Height of Layer = 2.205 km	
Figure S72. Date: August 14, 2010 Time(GMT) = 0h 32m 24.0s Latitude, deg = 52.1579 Longitude, deg = 28.7969 AOD 532 = 0.64 Extinc.koef.max = 0.63 km^{-1} Extinc.koef.average = 0.16 km^{-1} Extinc.koef.median = 0.15 km^{-1} Layer Height max = 4.109 km Layer Height min = 0.158 km Height of Extinc.koef.max = 0.337 km Effective Height of Layer = 1.568 km	
Figure S73. Date: August 14, 2010 Time(GMT) = 0h 32m 48.5s Latitude, deg = 50.7072 Longitude, deg = 28.1514 AOD 532 = 0.73 Extinc.koef.max = 0.56 km^{-1} Extinc.koef.average = 0.16 km^{-1} Extinc.koef.median = 0.14 km^{-1} Layer Height max = 4.948 km Layer Height min = 0.277 km Height of Extinc.koef.max = 1.415 km Effective Height of Layer = 2.229 km	

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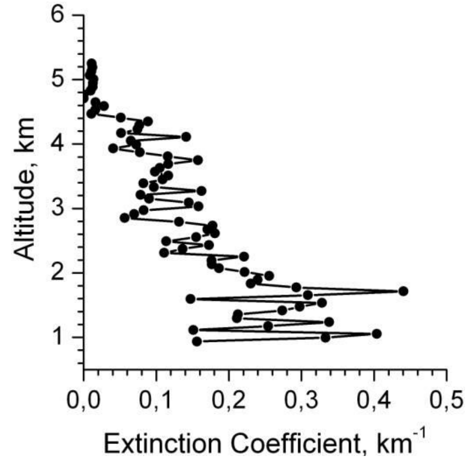
<td>Figure S74.
Date: August 14, 2010
Time(GMT) = 0h 32m 55.2s
Latitude, deg = 50.3112
Longitude, deg = 27.9810
AOD 532 = 0.59
Extinc.koef.max = 0.44 km^{-1}
Extinc.koef.average = 0.14 km^{-1}
Extinc.koef.median = 0.12 km^{-1}
Layer Height max = 5.247 km
Layer Height min = 0.936 km
Height of Extinc.koef.max = 1.714 km
Effective Height of Layer = 2.308 km</td>
<td>
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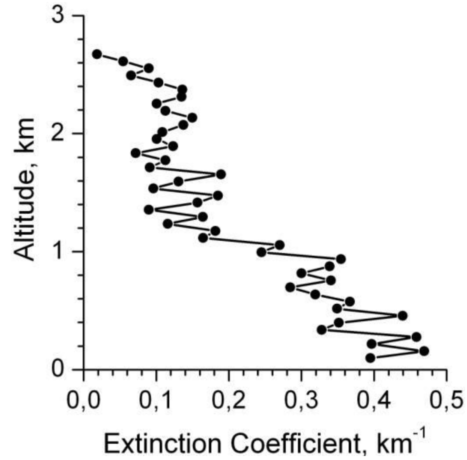
<td>Figure S75.
Date: August 17, 2010
Time(GMT) = 10h 34m 34.7s
Latitude, deg = 46.5620
Longitude, deg = 38.9265
AOD 532 = 0.54
Extinc.koef.max = 0.47 km^{-1}
Extinc.koef.average = 0.209 km^{-1}
Extinc.koef.median = 0.16 km^{-1}
Layer Height max = 2.672 km
Layer Height min = 0.098 km
Height of Extinc.koef.max = 0.158 km
Effective Height of Layer = 0.987 km</td>
<td>
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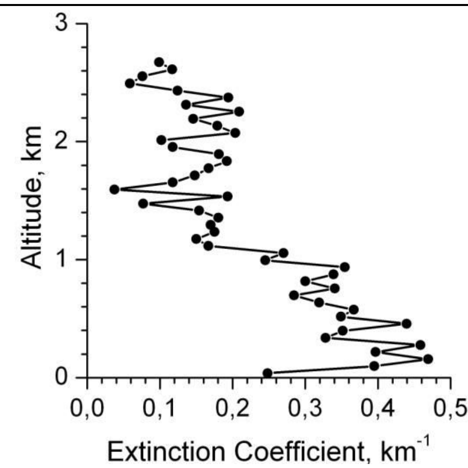
<td>Figure S76.
Date: August 17, 2010
Time(GMT) = 10h 34m 37.6s
Latitude, deg = 46.7382
Longitude, deg = 38.8598
AOD 532 = 0.60
Extinc.koef.max = 0.47 km^{-1}
Extinc.koef.average = 0.23 km^{-1}
Extinc.koef.median = 0.19 km^{-1}
Layer Height max = 2.672 km
Layer Height min = 0.038 km
Height of Extinc.koef.max = 0.158 km
Effective Height of Layer = 1.044 km</td>
<td>
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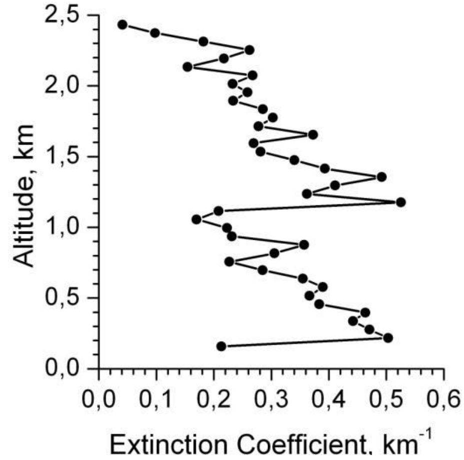
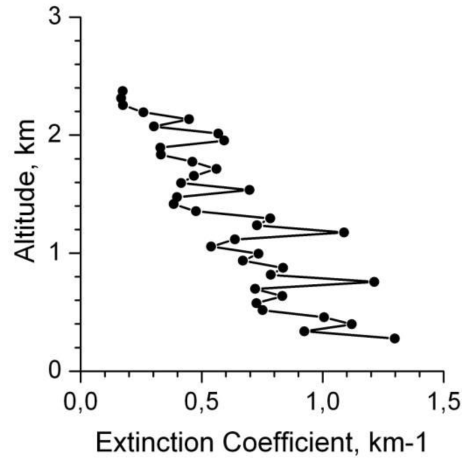
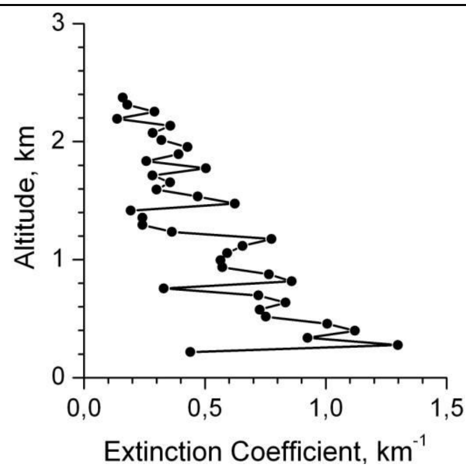
Figure S77. Date: August 17, 2010 Time(GMT) = 10h 34m 55.6s Latitude, deg = 47.7997 Longitude, deg = 38.4518 AOD 532 = 0.70 Extinc.koef.max = 0.53 km-1 Extinc.koef.average = 0.31 km-1 Extinc.koef.median = 0.29 km-1 Layer Height max = 2.433 km Layer Height min = 0.157 Height of Extinc.koef.max = 1.175 km Effective Height of Layer = 1.154 km	
Figure S78. Date: August 17, 2010 Time(GMT) = 10h 34m 59.9s Latitude, deg = 48.0657 Longitude, deg = 38.3472 AOD 532 = 1.29 Extinc.koef.max = 1.298 km^{-1} Extinc.koef.average = 0.62 km^{-1} Extinc.koef.median = 0.64 km^{-1} Layer Height max = 2.373 km Layer Height min = 0.277 km Height of Extinc.koef.max = 0.278 km Effective Height of Layer = 1.106 km	
Figure S79. Date: August 17, 2010 Time(GMT) = 10h 35m 7.4s Latitude, deg = 48.5061 Longitude, deg = 38.1715 AOD 532 = 1.13 Extinc.koef.max = 1.30 km^{-1} Extinc.koef.average = 0.53 km^{-1} Extinc.koef.median = 0.44 km^{-1} Layer Height max = 2.373 km Layer Height min = 0.217 km Height of Extinc.koef.max = 0.277 km Effective Height of Layer = 1.006 km	

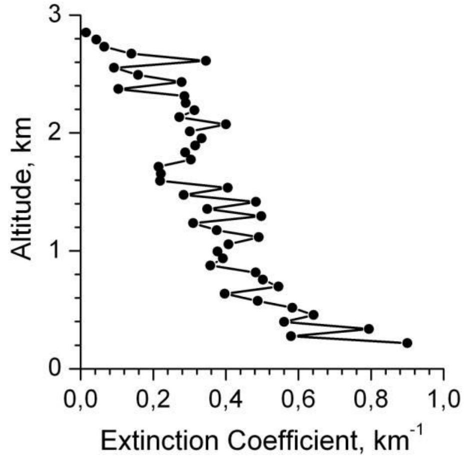
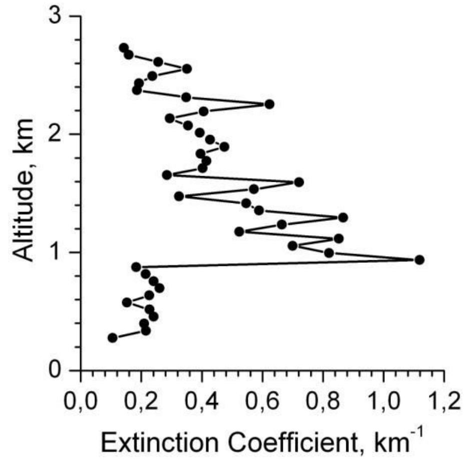
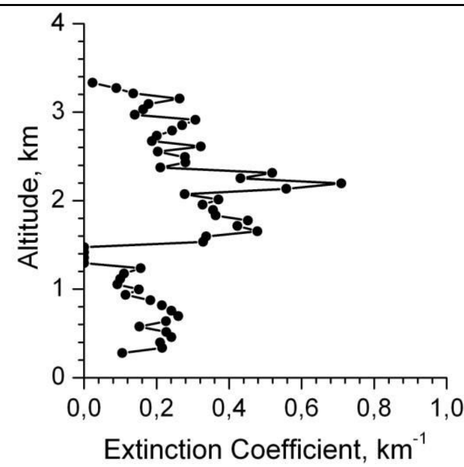
Figure S80. Date: August 17, 2010 Time(GMT) = 10h 35m 31.2s Latitude, deg = 49.9175 Longitude, deg = 37.5923 AOD 532 = 0.92 Extinc.koef.max = 0.90 km^{-1} Extinc.koef.average = 0.35 km^{-1} Extinc.koef.median = 0.34 km^{-1} Layer Height max = 2.852 km Layer Height min = 0.217 km Height of Extinc.koef.max = 0.217 km Effective Height of Layer = 1.239 km	
Figure S81. Date: August 17, 2010 Time(GMT) = 10h 35m 46.3s Latitude, deg = 50.7986 Longitude, deg = 37.2157 AOD 532 = 1.00 Extinc.koef.max = 1.12 km^{-1} Extinc.koef.average = 0.41 km^{-1} Extinc.koef.median = 0.35 km^{-1} Layer Height max = 2.732 km Layer Height min = 0.277 km Height of Extinc.koef.max = 0.936 km Effective Height of Layer = 1.480 km	
Figure S82. Date: August 17, 2010 Time(GMT) = 10h 35m 53.5s Latitude, deg = 51.2378 Longitude, deg = 37.0233 AOD 532 = 0.75 Extinc.koef.max = 0.71 km^{-1} Extinc.koef.average = 0.24 km^{-1} Extinc.koef.median = 0.23 km^{-1} Layer Height max = 3.331 km Layer Height min = 0.277 km Height of Extinc.koef.max = 2.193 km Effective Height of Layer = 1.900 km	

Figure S83.
Date: August 17, 2010
Time(GMT) = 10h 35m 58.2s
Latitude, deg = 51.5019
Longitude, deg = 36.9061
AOD 532 = 1.21
Extinc.koef.max = 1.95 km^{-1}
Extinc.koef.average = 0.41 km^{-1}
Extinc.koef.median = 0.28 km^{-1}
Layer Height max = 3.271 km
Layer Height min = 0.277 km
Height of Extinc.koef.max = 0.277 km
Effective Height of Layer = 1.170 km

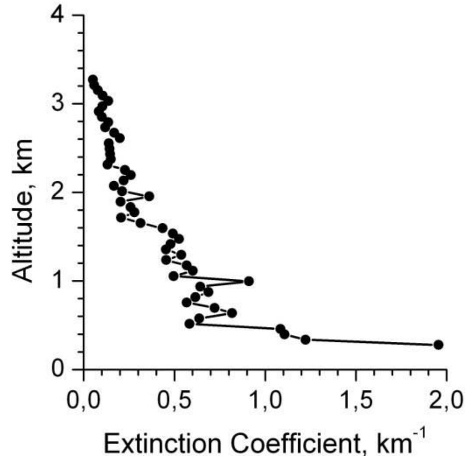


Figure S84.
Date: August 17, 2010
Time(GMT) = 10h 36m 11.5s
Latitude, deg = 52.2944
Longitude, deg = 36.5470
AOD 532 = 1.6
Extinc.koef.max = 1.86 km^{-1}
Extinc.koef.average = 0.52 km^{-1}
Extinc.koef.median = 0.46 km^{-1}
Layer Height max = 3.271 km
Layer Height min = 0.277 km
Height of Extinc.koef.max = 0.397 km
Effective Height of Layer = 1.280 km

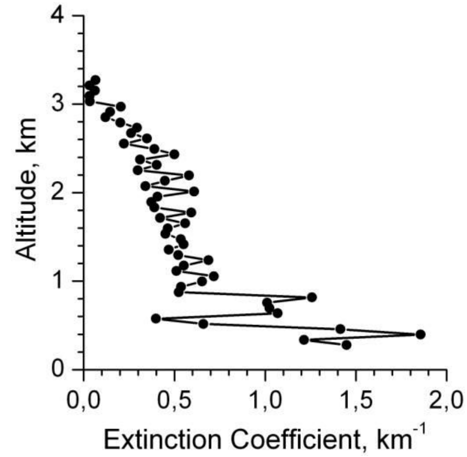


Figure S85.
Date: August 18, 2010
Time(GMT) = 0h 7m 36.2s
Latitude, deg = 52.2810
Longitude, deg = 35.0353
AOD 532 = 1.22
Extinc.koef.max = 2.18 km^{-1}
Extinc.koef.average = 0.42 km^{-1}
Extinc.koef.median = 0.35 km^{-1}
Layer Height max = 3.271 km
Layer Height min = 0.337 km
Height of Extinc.koef.max = 0.337 km
Effective Height of Layer = 1.355 km

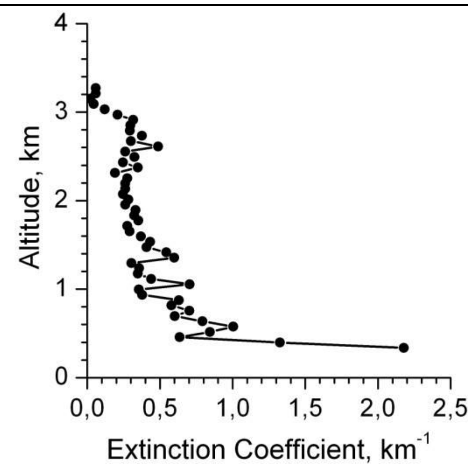


Figure S86.
Date: August 18, 2010
Time(GMT) = 0h 7m 40.7s
Latitude, deg = 52.0174
Longitude, deg = 34.9148
AOD 532 = 2.47
Extinc.koef.max = 8.94 km^{-1}
Extinc.koef.average = 0.88 km^{-1}
Extinc.koef.median = 0.47 km^{-1}
Layer Height max = 3.091 km
Layer Height min = 0.277 km
Height of Extinc.koef.max = 0.277 km
Effective Height of Layer = 0.986 km

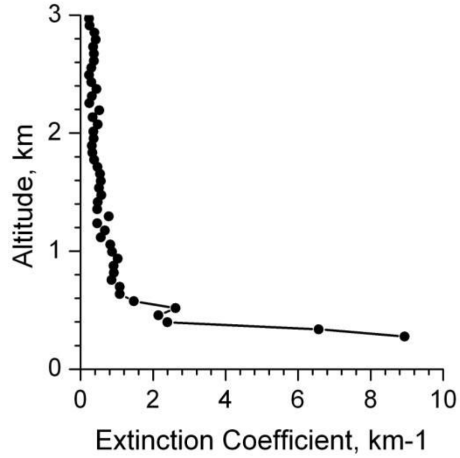


Figure S87.
Date: August 18, 2010
Time(GMT) = 0h 7m 44.4s
Latitude, deg = 51.7977
Longitude, deg = 34.8150
AOD 532 = 1.34
Extinc.koef.max = 2.53 km^{-1}
Extinc.koef.average = 0.47 km^{-1}
Extinc.koef.median = 0.37 km^{-1}
Layer Height max = 3.15 km^{-1}
Layer Height min = 0.277 km
Height of Extinc.koef.max = 0.277 km
Effective Height of Layer = 1.374 km

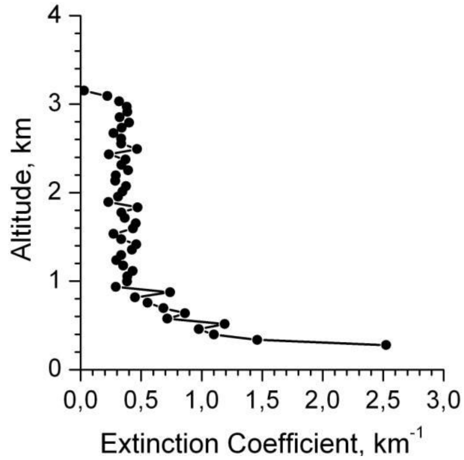


Figure S88.
Date: August 18, 2010
Time(GMT) = 0h 8m 3.0s
Latitude, deg = 50.6980
Longitude, deg = 34.3292
AOD 532 = 2.22
Extinc.koef.max = 6.59 km^{-1}
Extinc.koef.average = 0.70 km^{-1}
Extinc.koef.median = 0.52 km^{-1}
Layer Height max = 3.451 km
Layer Height min = 0.277 km
Height of Extinc.koef.max = 0.277 km
Effective Height of Layer = 1.432 km

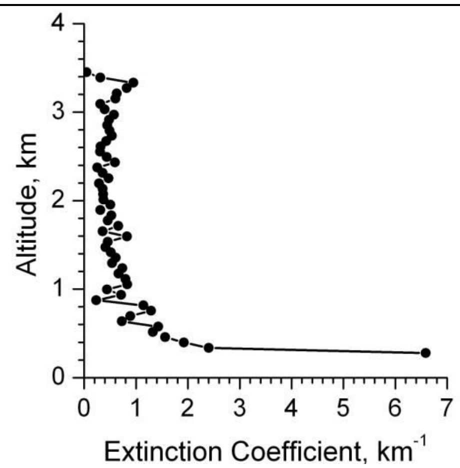


Figure S89.
Date: August 18, 2010
Time(GMT) = 0h 8m 13.4s
Latitude, deg = 50.0819
Longitude, deg = 34.0654
AOD 532 = 2.28
Extinc.koef.max = 2.96 km^{-1}
Extinc.koef.average = 0.67 km^{-1}
Extinc.koef.median = 0.49 km^{-1}
Layer Height max = 3.630 km
Layer Height min = 0.217 km
Height of Extinc.koef.max = 0.277 km
Effective Height of Layer = 1.432 km

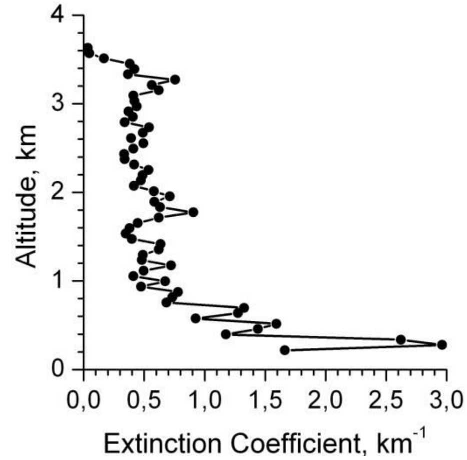


Figure S90.
Date: August 18, 2010
Time(GMT) = 0h 8m 26.1s
Latitude, deg = 49.3315
Longitude, deg = 33.7523
AOD 532 = 2.93
Extinc.koef.max = 6.75 km^{-1}
Extinc.koef.average = 0.73 km^{-1}
Extinc.koef.median = 0.55 km^{-1}
Layer Height max = 4.169 km
Layer Height min = 0.158 km
Height of Extinc.koef.max = 0.158 km
Effective Height of Layer = 1.439 km

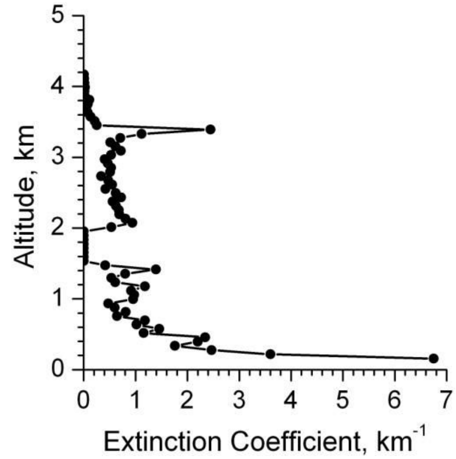


Figure S91.
Date: August 18, 2010
Time(GMT) = 0h 8m 47.6s
Latitude, deg = 48.0531
Longitude, deg = 33.2365
AOD 532 = 1.01
Extinc.koef.max = 1.77 km^{-1}
Extinc.koef.average = 0.32 km^{-1}
Extinc.koef.median = 0.25 km^{-1}
Layer Height max = 4.469 km
Layer Height min = 1.295 km
Height of Extinc.koef.max = 1.834 km
Effective Height of Layer = 2.369 km

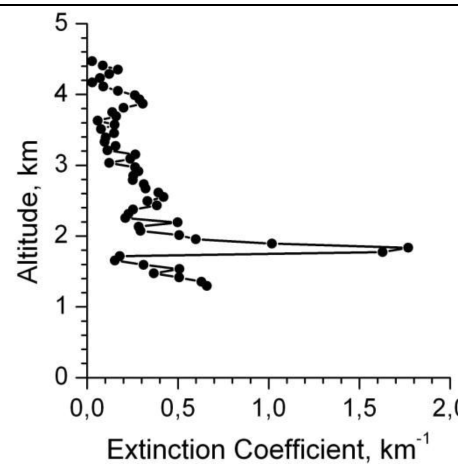
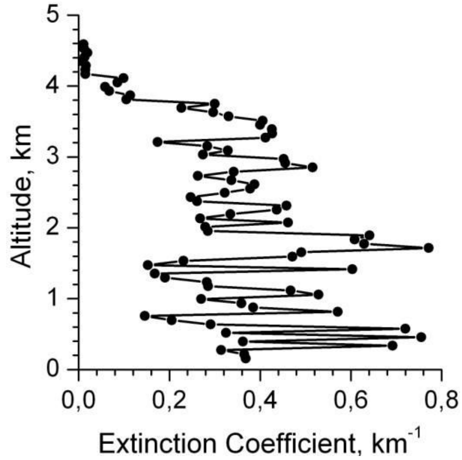
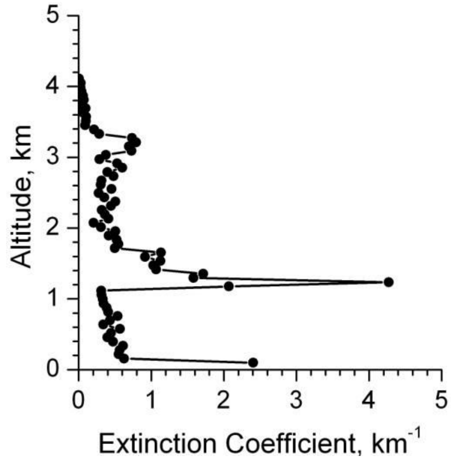


Figure S92. Date: August 18, 2010 Time(GMT) = 0h 8m 55.1s Latitude, deg = 47.6110 Longitude, deg = 33.0633 AOD 532 = 1.46 Extinc.koef.max = 0.77 km^{-1} Extinc.koef.average = 0.33 km^{-1} Extinc.koef.median = 0.32 km^{-1} Layer Height max = 4.588 km Layer Height min = 0.158 km Height of Extinc.koef.max = 1.714 km Effective Height of Layer = 1.918 km	
Figure S93. Date: August 18, 2010 Time(GMT) = 0h 9m 9.9s Latitude, deg = 46.7278 Longitude, deg = 32.7242 AOD 532 = 2.24 Extinc.koef.max = 4.27 km^{-1} Extinc.koef.average = 0.56 km^{-1} Extinc.koef.median = 0.41 km^{-1} Layer Height max = 4.109 km Layer Height min = 0.098 km Height of Extinc.koef.max = 1.235 km Effective Height of Layer = 1.635 km	
Figure S94. Date: August 18, 2010 Time(GMT) = 0h 9m 15.9s Latitude, deg = 46.3741 Longitude, deg = 32.5909 AOD 532 = 1.17 Extinc.koef.max = 1.14 km^{-1} Extinc.koef.average = 0.53 km^{-1} Extinc.koef.median = 0.52 km^{-1} Layer Height max = 3.630 km Layer Height min = 1.415 km Height of Extinc.koef.max = 1.654 km Effective Height of Layer = 2.305 km