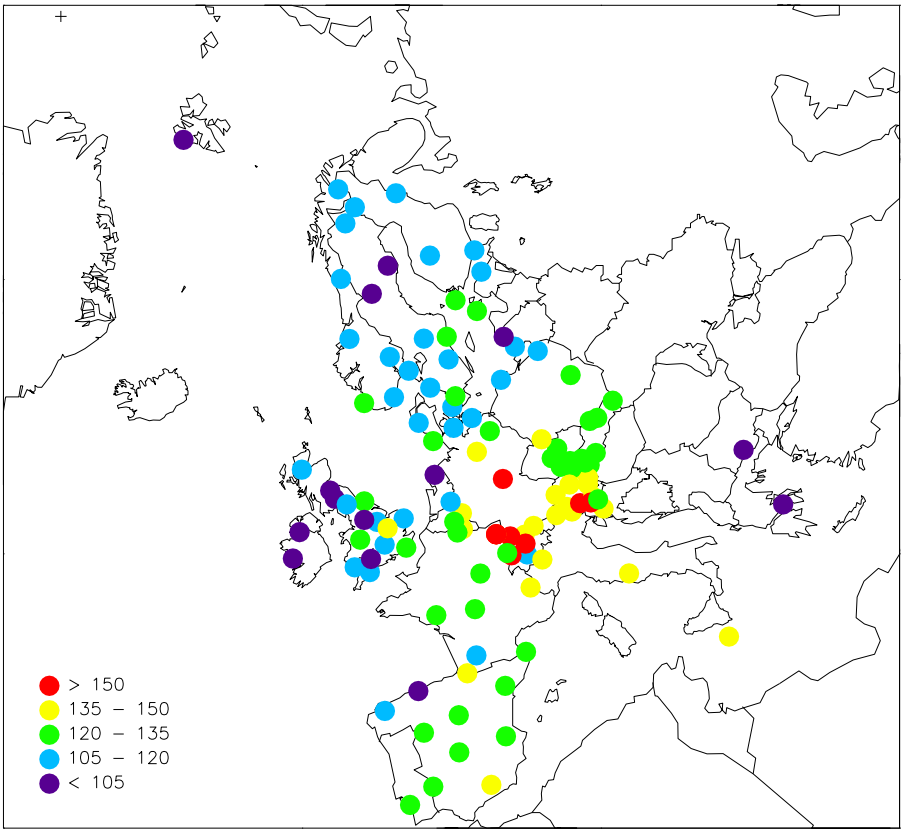
EMEP/CCC-Report 2/2008

EMEP Co-operative Programme for Monitoring and Evaluation of the Long-Range Transmission of Air Pollutants in Europe

Ozone measurements 2006

Ann Mari Fjæraa and Anne-Gunn Hjellbrekke



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1. Introduction

Ozone is a natural constituent of the atmosphere and plays a vital role in many atmospheric processes. However, man made emissions of volatile organic compounds and nitrogen oxides have increased the photochemical formation of ozone in the troposphere. Until the end of the 1960s the problem was basically believed to be one of the big cities and their immediate surroundings. In the 1970s, however, it was found that the problem of photochemical oxidant formation is much more widespread. The ongoing monitoring of ozone at rural sites throughout Europe shows that episodes of high concentrations of ground-level ozone occur over most parts of the continent every summer. During these episodes the ozone concentrations can reach values above ambient air quality standards over large regions and lead to adverse effects for human health and vegetation. Historical records of ozone measurements in Europe and North America indicate that in the last part of the nineteenth century the values were only about half of the average surface ozone concentrations measured in the same regions during the last 10-15 years (Bojkov, 1986; Volz and Kley, 1988).

The formation of ozone is due to a large number of photochemical reactions taking place in the atmosphere and depends on the temperature, humidity and solar radiation as well as the primary emissions of nitrogen oxides and volatile organic compounds. Together with the non-linear relationships between the primary emissions and the ozone formation, these effects complicates the abatement strategies for ground-level ozone and makes photochemical models crucial in addition to the monitoring data.

The 1999 Gothenburg Protocol is designed for a joint abatement of acidification, eutrophication and ground-level ozone. It has been estimated that once the Protocol is implemented, the number of days with excessive ozone levels will be halved and that the exposure of vegetation to excessive ozone levels will be 44% down on 1990.

2. Critical levels

Ozone concentrations vary widely from region to region, with the time of year, and with time of day. Typically, high concentrations of ozone are observed in periods with anticyclonic conditions. Such episodes may lead to adverse environmental effects such as impact on human health, agricultural crops, forests and materials. National authorities and international organisations have therefore formulated critical levels for ozone.

The critical levels defined by ECE for protection of vegetation are 150 $\mu g/m^3$ for hourly mean, 60 $\mu g/m^3$ for eight-hour mean and 50 $\mu g/m^3$ for seven-hour mean (9 a.m. -4 p.m.) averaged over the growing season (April-September). In EU the ozone directive (Directive 2002/3/EC) has defined a number of target values and

long-term objectives for the protection of vegetation and human health. The target value for human health for 2010 is that 120 g/m^3 (8h mean) is not to be exceeded on more than 25 days per year averaged over 3 years. For protection of vegetation AOT40 (May-July) should not exceed 18,000 g/m^3h averaged over five years. In addition information should be given to the population when hourly means exceed 180 µg/m^3 and an alert warning should be issued if hourly means exceed 240 µg/m^3.

The critical level formulated by WHO for protection of health is 120 µg/m^3 for eight-hour mean.

In defining the harmful effects of ozone exposure to plants, attention must be given to the physiological response to ozone. Ozone is generally taken up through the stomata, and reacts with a number of enzymes and antioxidants. Several studies have shown that plants respond by reduced carbon dioxide uptake, and other symptoms of damage to the respiration system, for ozone exposure above a certain threshold (e.g. Forberg et al., 1987). This concentration threshold varies between plant species, cultivars, and phenological development.

Previously recommended critical levels for ozone based on seven-hour mean concentrations in the growing season do not take into account the existence of such a threshold, and have been criticised because the effects on vegetation of a generally high concentration level of ozone may be less harmful than the exposure to short-term and episodic high concentrations, which may cause permanent damage to the cell tissue.

Within the framework of the UN-ECE Convention on long-range transboundary air pollution, workshops held at Egham, UK (Ashmore and Wilson, 1992) and at Bern, Switzerland (Führer and Achermann, 1994) have recommended that critical levels for ozone exposure should be based on the accumulated exposure in ppb hours over a concentration threshold during the growing season (AOT). The Egham workshop was not able to decide conclusively on the threshold concentration or the accumulated dose corresponding to the critical loads, but the Bern workshop made specific recommendations to use a threshold of 40 ppb. The critical levels were revised at a UN-ECE workshop in Kuopio, Finland (Kärenlampi and Skärby, 1996) with minor changes to the Bern recommendations and are defined as:

- Critical level for agricultural crops: The AOT40 for crops is calculated as an accumulated ozone exposure above a threshold of 40 ppb for a period of three months during daylight hours, defined as those hours the mean global radiation is 50 W/m2 or greater. The AOT40 value for comparison with the critical level should be calculated as the highest running three months sum during the period when crops are grown. If a fixed period is required for modelling assessment the period, May to July should be used. Data from open-top chamber experiments indicate that an AOT40 of 3000 ppbh corresponds to a 5% yield loss for wheat. This value is only applicable when soil moisture is

not limiting because of sufficient precipitation or irrigation. Short term critical level for crops: The critical levels are defined as:

  - 500 ppbh over five days for high (water) vapour pressure deficit conditions
  - 200 ppbh over five days for low (water) vapour pressure deficit conditions.

  As for the long-term critical level, the short-term critical levels refer to daylight hours only and should not be applied when soil moisture is limiting.

- For natural vegetation, since the sensitivity of the most sensitive species is considered to be similar to that of the most sensitive crops, the same long-term critical level as for agricultural crops is used.

- Critical level for forests: AOT40 of 10 000 ppbh, calculated for daylight hours only, defined as for crops, during a six months period from April to September.

Although these critical loads are based on relatively strong experimental evidence, changes in the formulations may be expected when more information is available on the response of different plants to ozone exposure. The vegetation periods above are defined as being typical of climatic conditions in Northern Europe whereas other vegetation periods may be more appropriate for other areas, such as Southern Europe and Northern Scandinavia.

The critical levels are considered to be suitable for exceedance mapping and integrated assessment modelling, but should not be used for economic assessment of crop or biomass losses. For these purposes, it is needed to take into account different species and modifying factors such as (water) vapour pressure deficit, soil moisture content, nutritional status, altitude, other pollutants etc.

Work is currently in progress to revise the critical levels for ozone (level II) and was the focus of a UNECE Workshop in Gothenburg, November 2002. Although substantial progress was made, no final recommendations have yet been defined.

3. Measurement network

Surface ozone measurements have been a part of the EMEP extended (voluntary) measurement activities since the third phase (1 January 1984–31 December 1986). Due to the lack of funds, the systematic collection and checking of data within EMEP, did not start until 1 January 1987. The measurement of ozone data within the EMEP region was a continuation of the OECD's oxidant data collection programme OXIDATE. Ozone data from the OXIDATE project have been reported in three reports (Grennfelt and Schjoldager, 1984; Grennfelt et al., 1988 and 1989).

This report presents surface ozone data measured at rural and background EMEP sites during 2006 with emphasis on statistical summaries and geographical distributions. Earlier reports are listed in Annex 5.

Table 1 and Figure 1 show the location of the monitoring stations reporting data from whole or part of 2006. In total 122 stations in 27 different countries reported data. One of these sites (Ispra) is operated by the Commission of the European Communities in Italy.

Table 1: List of EMEP ozone monitoring stations in operation 2006.

Code	Station	Country	Latitude	Longitude	Altitude (m)
AT0002R	Illmitz	Austria	47 46 00 N	16 46 00 E	117
AT0005R	Vorhegg	Austria	46 40 40 N	12 58 20 E	1020
AT0030R	Pillersdorf bei Retz	Austria	48 43 16 N	15 56 32 E	315
AT0032R	Sulzberg	Austria	47 31 45 N	9 55 36 E	1020
AT0034G	Sonnblick	Austria	47 03 16 N	12 57 30 E	3106
AT0037R	Zillertaler Alpen	Austria	47 08 13 N	11 52 12 E	1970
AT0038R	Gerlitzen	Austria	46 41 37 N	13 54 54 E	1895
AT0040R	Masenberg	Austria	47 20 53 N	15 52 56 E	1170
AT0041R	Haunsberg	Austria	47 58 23 N	13 00 58 E	730
AT0042R	Heidenreichstein	Austria	48 52 43 N	15 02 48 E	570
AT0043R	Forsthof	Austria	48 06 22 N	15 55 10 E	581
AT0044R	Graz Platte	Austria	47 06 47 N	15 28 14 E	651
AT0045R	Dunkelsteinerwald	Austria	48 22 16 N	15 32 48 E	320
AT0046R	Gänserndorf	Austria	48 20 05 N	16 43 50 E	161
AT0047R	Stixneusiedl	Austria	48 03 03 N	16 40 36 E	240
AT0048R	Zoebelboden	Austria	47 50 19 N	14 26 29 E	899
BE0001R	Offagne	Belgium	49 52 40 N	5 12 13 E	430
BE0032R	Eupen	Belgium	50 37 46 N	6 00 10 E	295
BE0035R	Vezin	Belgium	50 30 12 N	4 59 22 E	160
BG0053R	Rojen peak	Bulgaria	41 41 45 N	24 44 19 E	1750
CH0001G	Jungfraujoch	Switzerland	46 32 51 N	7 59 06 E	3578
CH0002R	Payerne	Switzerland	46 48 47 N	6 56 41 E	489
CH0003R	Tänikon	Switzerland	47 28 47 N	8 54 17 E	539
CH0004R	Chaumont	Switzerland	47 02 59 N	6 58 46 E	1137
CH0005R	Rigi	Switzerland	47 04 03 N	8 27 50 E	1031
CY0002R	Ayia Marina	Cyprus	33 02 21 N	33 03 29 E	532
CZ0001R	Svratouch	Czech Republic	49 44 00 N	16 02 00 E	737
CZ0003R	Kosetice	Czech Republic	49 35 00 N	15 05 00 E	534
DE0001R	Westerland	Germany	54 55 32 N	8 18 35 E	12
DE0002R	Langenbrügge	Germany	52 48 08 N	10 45 34 E	74
DE0003R	Schauinsland	Germany	47 54 53 N	7 54 31 E	1205
DE0007R	Neuglobsow	Germany	53 10 00 N	13 02 00 E	62
DE0008R	Schmücke	Germany	50 39 00 N	10 46 00 E	937
DE0009R	Zingst	Germany	54 26 00 N	12 44 00 E	1
DK0005R	Keldsnor	Denmark	54 44 00 N	10 44 00 E	10
DK0031R	Ulborg	Denmark	56 17 00 N	8 26 00 E	10
DK0041R	Lille Valby	Denmark	55 41 13 N	12 07 34 E	10
EE0009R	Lahemaa	Estonia	59 30 00 N	25 54 00 E	32
EE0011R	Vilsandy	Estonia	58 23 00 N	21 49 00 E	6
ES0007R	Víznar	Spain	37 14 00 N	3 32 00 W	1265
ES0008R	Niembro	Spain	43 26 32 N	4 51 01 W	134
ES0009R	Campisabalos	Spain	41 16 52 N	3 08 34 W	1360
ES0010R	Cabo de Creus	Spain	42 19 10 N	3 19 01 E	23
ES0011R	Barcarrola	Spain	38 28 33 N	6 55 22 W	393
ES0012R	Zarra	Spain	39 05 10 N	1 06 07 W	885
ES0013R	Penausende	Spain	41 17 00 N	5 52 00 W	985

Table 1, cont.

Code	Station	Country	Latitude	Longitude	Altitude (m)
ES0014R	Els Torms	Spain	41 24 00 N	0 43 00 E	470
ES0015R	Risco Llamo	Spain	39 31 00 N	4 21 00 W	1241
ES0016R	O Saviñao	Spain	43 13 52 N	7 41 59 W	506
FI0009R	Utö	Finland	59 46 45 N	21 22 38 E	7
FI0017R	Virolahti II	Finland	60 31 36 N	27 41 10 E	4
FI0022R	Oulanka	Finland	66 19 13 N	29 24 06 E	310
FI0037R	Ahtari II	Finland	62 35 00 N	24 11 00 E	180
FI0096G	Pallas/Särkijärvi	Finland	68 00 00 N	24 09 00 E	340
FR0008R	Donon	France	48 30 00 N	7 08 00 E	775
FR0009R	Revin	France	49 54 00 N	4 38 00 E	390
FR0010R	Morvan	France	47 16 00 N	4 05 00 E	620
FR0012R	Iraty	France	43 02 00 N	1 05 00 W	1300
FR0013R	Peyrusse Vieille	France	43 37 00 N	0 11 00 E	200
FR0014R	Montandon	France	47 18 00 N	6 50 00 E	836
FR0015R	La Tardière	France	46 39 00 N	0 45 00 W	133
FR0016R	Le Casset	France	45 00 00 N	6 31 00 E	1750
FR0017R	Montfranc	France	45 48 00 N	2 04 00 E	810
GB0002R	Eskdalemuir	United Kingdom	55 18 47 N	3 12 15 W	243
GB0006R	Lough Navar	United Kingdom	54 26 35 N	7 52 12 W	126
GB0013R	Yarner Wood	United Kingdom	50 35 47 N	3 42 47 W	119
GB0014R	High Muffles	United Kingdom	54 20 04 N	0 48 27 W	267
GB0015R	Strath Vaich Dam	United Kingdom	57 44 04 N	4 46 28 W	270
GB0031R	Aston Hill	United Kingdom	52 30 14 N	3 01 59 W	370
GB0032R	Bottesford	United Kingdom	52 55 46 N	0 48 55 W	32
GB0033R	Bush	United Kingdom	55 51 31 N	3 12 18 W	180
GB0034R	Glazebury	United Kingdom	53 27 31 N	2 27 59 W	21
GB0035R	Great Dun Fell	United Kingdom	54 41 00 N	2 27 00 W	847
GB0036R	Harwell	United Kingdom	51 34 23 N	1 19 00 W	137
GB0037R	Ladybower Res.	United Kingdom	53 23 56 N	1 45 12 W	420
GB0038R	Lullington Heath	United Kingdom	50 47 34 N	0 10 46 E	120
GB0039R	Sibton	United Kingdom	52 17 38 N	1 27 47 E	46
GB0043R	Narberth	United Kingdom	51 14 00 N	4 42 00 W	160
GB0044R	Somerton	United Kingdom	51 13 52 N	3 02 53 W	55
GB0045R	Wicken Fen	United Kingdom	52 17 54 N	0 17 34 W	5
GR0001R	Aliartos	Greece	38 22 00 N	23 05 00 E	110
HU0002R	K-puszta	Hungary	46 58 00 N	19 35 00 E	125
IE0031R	Mace Head	Ireland	53 10 00 N	9 30 00 W	15
IT0001R	Montelibretti	Italy	42 06 00 N	12 38 00 E	48
IT0004R	Ispra	Italy	45 48 00 N	8 38 00 E	209
LT0015R	Preila	Lithuania	55 21 00 N	21 04 00 E	5
LV0010R	Rucava	Latvia	56 13 00 N	21 13 00 E	5
MT0001R	Giordan lighthouse	Malta	36 06 00 N	14 12 00 E	160
NL0007R	Eibergen	The Netherlands	52 05 00 N	6 34 00 E	20
NL0009R	Kollumerwaard	The Netherlands	53 20 02 N	6 16 38 E	1
NL0010R	Vredepeel	The Netherlands	51 32 28 N	5 51 13 E	28
NO0001R	Birkenes	Norway	58 23 00 N	8 15 00 E	190
NO0015R	Tustervatn	Norway	65 50 00 N	13 55 00 E	439
NO0039R	Kårvatn	Norway	62 47 00 N	8 53 00 E	210
NO0042G	Spitsbergen, Zeppelinfjell	Norway	78 54 00 N	11 53 00 E	474
NO0043R	Prestebakke	Norway	59 00 00 N	11 32 00 E	160
NO0052R	Sandve	Norway	59 12 00 N	5 12 00 E	15
NO0055R	Karasjok	Norway	69 28 00 N	25 13 00 E	333
NO0056R	Hurdal	Norway	60 22 00 N	11 04 00 E	300
PL0002R	Jarczew	Poland	51 49 00 N	21 59 00 E	180
PL0003R	Sniezka	Poland	50 44 00 N	15 44 00 E	1603
PL0004R	Leba	Poland	54 45 00 N	17 32 00 E	2
PL0005R	Diabla Gora	Poland	54 09 00 N	22 04 00 E	157

Table 1, cont.

Code	Station	Country	Latitude	Longitude	Altitude (m)
PT0004R	Monte Velho	Portugal	38 05 00 N	8 48 00 W	43
SE0005R	Bredkälen	Sweden	63 51 00 N	15 20 00 E	404
SE0011R	Vavihill	Sweden	56 01 00 N	13 09 00 E	175
SE0012R	Aspvreten	Sweden	58 48 00 N	17 23 00 E	20
SE0013R	Esrange	Sweden	67 53 00 N	21 04 00 E	475
SE0014R	Råö	Sweden	57 23 38 N	11 54 50 E	5
SE0032R	Norra-Kvill	Sweden	57 49 00 N	15 34 00 E	261
SE0035R	Vindeln	Sweden	64 15 00 N	19 46 00 E	225
SE0039R	Grimsö	Sweden	59 43 40 N	15 28 19 E	132
SI0008R	Iskrba	Slovenia	45 34 00 N	14 52 00 E	520
SI0031R	Zarodnje	Slovenia	46 25 43 N	15 00 12 E	770
SI0032R	Krvavec	Slovenia	46 17 58 N	14 32 19 E	1740
SI0033R	Kovk	Slovenia	46 07 43 N	15 06 50 E	600
SK0002R	Chopok	Slovakia	48 56 00 N	19 35 00 E	2008
SK0004R	Stará Lesná	Slovakia	49 09 00 N	20 17 00 E	808
SK0005R	Liesek	Slovakia	49 22 00 N	19 41 00 E	892
SK0006R	Starina	Slovakia	49 03 00 N	22 16 00 E	345
SK0007R	Topolniky	Slovakia	47 57 36 N	17 51 38 E	113

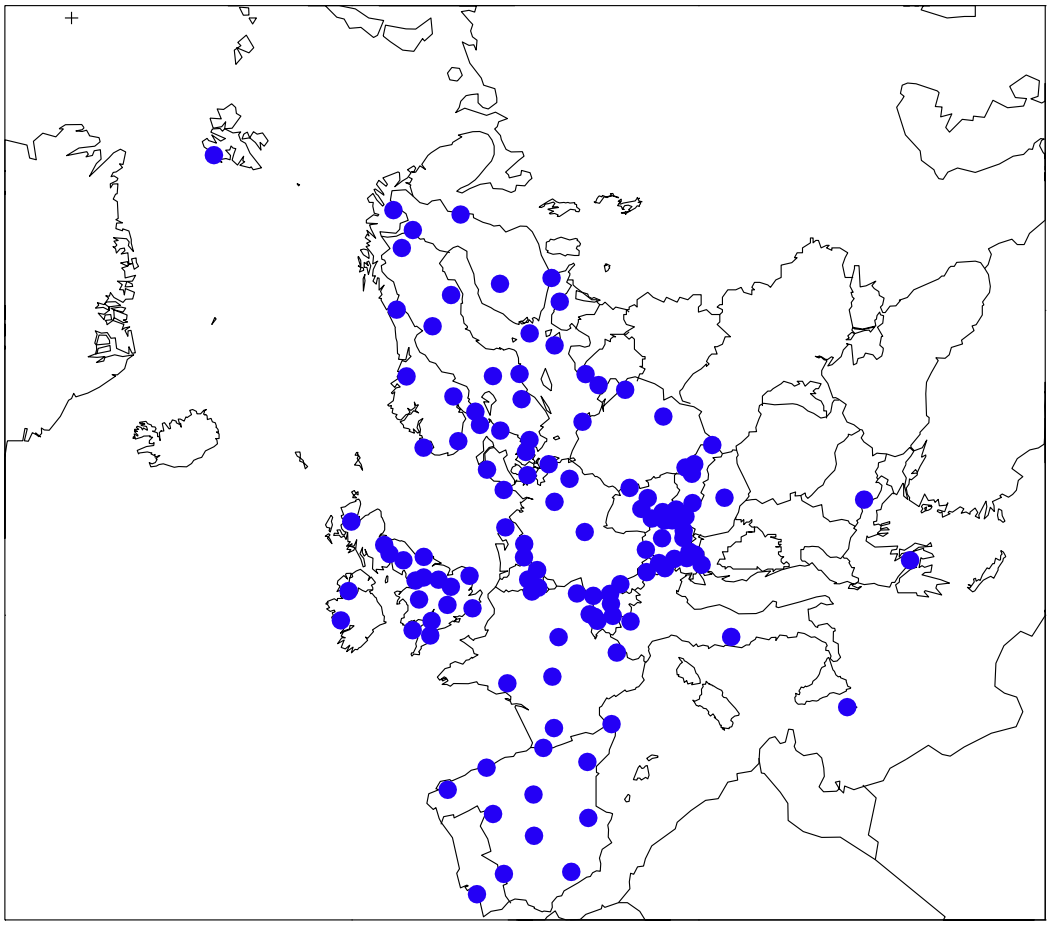

Figure 1: Location of the monitoring stations.

At Donon (FR08) the measurements are taken at four different heights above the ground:

FR08A: 8.6 m, ground level
FR08B: 17.6 m, half height of the trees
FR08C: 31.2 m, canopy of the trees
FR08D: 45.2 m, approximately 15 m above the trees.

As in earlier years, the ozone concentrations reported for the Greek station GR0001 Aliartos showed lower concentrations during the whole year compared to other EMEP sites. Furthermore, monitoring of NO_2 at the site revealed monthly mean concentrations of the order of 6.22 to 17.02 µg/m^3. These findings indicate that the site is significantly influenced by nearby anthropogenic emissions, presumably from the Athens region, and thus not well suited as a regional background site for surface ozone. The ozone data from GR0001 is therefore not included in this report.

The ozone sites are situated mainly in Central, Western and Northern Europe and the network of density is insufficient in the Eastern and Mediterranean parts of Europe.

The monitoring stations have been selected by the countries, and only a small number of them are regular EMEP sites. Information about the ozone data quality, calibration and maintenance procedures was in 2000 collected from the participants (Aas et al., 2000).

The UV absorption method was the only measurement method in use in 2006.

All data presented in this report are given in µg/m^3. The conversion factor used to calculate from ppb to µg/m^3 is given in Table 2. Most countries use a conversion factor of 2.0, which corresponds to 20°C and 1013 hPa. Switzerland uses the mean annual conditions at the stations (9°C and 950 mbar at Payerne, Tänikon, Rigi, Chaumont and Sion). A number of countries report ozone data in ppb, and in this case the data are converted to µg/m^3 by multiplying by 2.0 at the CCC.

Table 2: Conversion factor ppb – $\mu g/m^3$.

Country	Conversion factor
Austria	2.0
Belgium	unknown
Bulgaria	
Cyprus	
Czech Republic	2.0
Denmark	2.0
Estonia	2.14
Finland	2.0
France	2.0
Germany	2.0
Greece (Aliartos)	1.96
Greece (Finokalia)	reported in ppb
Hungary	2.0
Ireland (Mace Head)	reported in ppb
Italy (Ispra)	2.0
Italy (Montelibretti)	reported in ppb
Latvia	2.0
Lithuania	2.0
Malta	
Netherlands	2.0
Norway	2.0
Poland	2.0
Portugal	1.96
Russia	2.0
Slovakia	reported in ppb
Slovenia	2.0
Spain	2.0
Sweden	2.0
Switzerland	1.96
United Kingdom	reported in ppb

4. Data completeness

The annual data capture (number of valid measurements in per cent of the total number of measurements) for each station is given in Table 3. Even though the number of stations with data capture above 90% was lower than last year, 101, compared to 108 stations in 2005, the data capture was in general good. Six sites had data capture below 75%.

Table 3: Data capture in per cent, 2006.

Code	Station	Data capture 2006
AT0002R	Illmitz	94.5
AT0005R	Vorhegg	93.7
AT0030R	Pillersdorf bei Retz	95.2
AT0032R	Sulzberg	94.8
AT0034G	Sonnblick	92.1
AT0037R	Zillertaler Alpen	95.8
AT0038R	Gerlitzen	94.0
AT0040R	Masenberg	85.9
AT0041R	Haunsberg	95.3
AT0042R	Heidenreichstein	93.5
AT0043R	Forsthof	95.0
AT0044R	Graz Platte	94.4
AT0045R	Dunkelsteinerwald	95.5
AT0046R	Gänserndorf	94.6
AT0047R	Stixneusiedl	95.5
AT0048R	Zoebelboden	93.6
BE0001R	Offagne	86.7
BE0032R	Eupen	87.4
BE0035R	Vezin	91.5
BG0053R	Rojen peak	76.0
CH0001G	Jungfraujoch	96.7
CH0002R	Payerne	93.5
CH0003R	Tänikon	94.8
CH0004R	Chaumont	95.3
CH0005R	Rigi	95.3
CY0002R	Ayia Marina	97.9
CZ0001R	Svratouch	85.7
CZ0003R	Kosetice	97.4
DE0001R	Westerland	95.7
DE0002R	Langenbrügge	95.7
DE0003R	Schauinsland	95.8
DE0007R	Neuglobsow	94.1
DE0008R	Schmücke	94.5
DE0009R	Zingst	95.5
DK0005R	Keldsnor	98.2
DK0031R	Ulborg	96.4
DK0041R	Lille Valby	90.2
EE0009R	Lahemaa	96.7
EE0011R	Vilsandy	100.0
ES0007R	Víznar	97.5
ES0008R	Niembro	98.5
ES0009R	Campisabalos	95.4
ES0010R	Cabo de Creus	96.1
ES0011R	Barcarrola	97.8
ES0012R	Zarra	96.9
ES0013R	Penausende	96.6
ES0014R	Els Torms	98.4
ES0015R	Risco Llamo	76.9
ES0016R	O Saviñao	97.1
FI0009R	Utö	99.7
FI0017R	Virolahti II	98.9
FI0022R	Oulanka	98.4
FI0037R	Ahtari II	88.2
FI0096G	Pallas/Särkijärvi	99.3

Table 3, cont.

Code	Station	Data capture 2006
FR0008R	Donon A	92.2
FR0008R	Donon B	92.0
FR0008R	Donon C	93.7
FR0008R	Donon D	93.7
FR0009R	Revin	94.8
FR0010R	Morvan	99.1
FR0012R	Iraty	95.3
FR0013R	Peyrusse Vieille	97.1
FR0014R	Montandon	98.9
FR0015R	La Tardière	88.3
FR0016R	Le Casset	95.9
FR0017R	Montfranc	94.6
GB0002R	Eskdalemuir	98.8
GB0006R	Lough Navar	98.8
GB0013R	Yarner Wood	96.4
GB0014R	High Muffles	89.5
GB0015R	Strath Vaich Dam	83.6
GB0031R	Aston Hill	92.4
GB0032R	Bottesford	98.8
GB0033R	Bush	97.9
GB0034R	Glazebury	73.9
GB0035R	Great Dun Fell	99.0
GB0036R	Harwell	93.6
GB0037R	Ladybower Res.	94.9
GB0038R	Lullington Heath	89.1
GB0039R	Sibton	92.0
GB0043R	Narberth	91.6
GB0044R	Somerton	92.2
GB0045R	Wicken Fen	86.4
HU0002R	K-puszta	67.1
IE0031R	Mace Head	99.1
IT0001R	Montelibretti	98.7
IT0004R	Ispra	93.1
LT0015R	Preila	94.5
LV0010R	Rucava	85.1
MT0001R	Giordan lighthouse	79.9
NL0007R	Eibergen	70.0
NL0009R	Kollumerwaard	99.1
NL0010R	Vredepeel	92.5
NO0001R	Birkenes	98.5
NO0015R	Tustervatn	99.5
NO0039R	Kårvatn	99.5
NO0042G	Spitsbergen, Zeppelinfjell	97.6
NO0043R	Prestebakke	99.7
NO0052R	Sandve	95.3
NO0055R	Karasjok	99.6
NO0056R	Hurdal	99.7
PL0002R	Jarczew	94.7
PL0003R	Sniezka	99.9
PL0004R	Leba	99.6
PL0005R	Diabla Gora	95.4
PT0004R	Monte Velho	96.1

Table 3, cont.

Code	Station	Data capture 2006
SE0005R	Bredkälen	99.6
SE0011R	Vavihill	98.8
SE0012R	Aspvreten	94.0
SE0013R	Esrange	99.7
SE0014R	Råö	99.8
SE0032R	Norra-Kvill	95.2
SE0035R	Vindeln	97.7
SE0039R	Grimsö	99.5
SI0008R	Iskrba	95.6
SI0031R	Zarodnje	94.9
SI0032R	Krvavec	93.7
SI0033R	Kovk	88.3
SK0002R	Chopok	71.0
SK0004R	Stará Lesná	89.1
SK0005R	Liesek	96.3
SK0006R	Starina	75.1
SK0007R	Topolniky	98.3

Missing data in the measurement series may be critical, especially in summer when the highest ozone concentrations occur. In particular calculations of AOT40 values may be strongly affected by missing data, and a correction is necessary in order to obtain comparable calculations. In the mapping of AOT40, a data capture of 85% has been required and an adjustment proportional to the number of missing data has been applied, i.e. exposure index divided by the fraction of data available. This correction will give a good approximation when the missing data are randomly scattered throughout the dataset, but a better correction is needed for larger gaps in the dataset. Calculations of percentiles are less sensitive to missing data, and a data capture of 75% has been regarded as sufficient for the mapping.

5. Concentration summaries and episodes

The summer 2006 was extremely warm and dry in Central Europe. The warm and sunny weather contributed to a higher frequency of exceedances of the threshold value of 180 µg/m^3 than previous years. High ozone concentrations and exceedances were observed in some of the central European countries, mostly during a situation with dry and warm weather in July.

The target value to protect human health (120 µg/m^3) was exceeded in significant parts of Europe. The occurrence of exceedances in summer 2006 was the second highest in the last decade in Europe (EEA, 2007).

Table 1.1 in Annex 1 shows the extreme concentrations for 2006. The number of hours and days the ozone concentrations exceeded 120, 150, 180 and 200 µg/m^3 and the maxima are given. The highest hourly mean values were found at Wicken Fen, UK (278.0 µg/m^3, 19th July), Eupen, Belgium (260.0 µg/m^3, 26th July) and Ispra, Italy (254.1 µg/m^3, 23rd June). These numbers are higher the highest hourly

mean values measured in 2004 and in 2005, which are 253.0 µg/m^3 and 264.0 µg/m^3, respectively.

Values above 200 µg/m^3 were during 2006 measured at 27 sites mainly in central European countries such as Austria, Belgium, Switzerland, Germany and Italy, but also at some stations in the southern UK, compared to 6 sites in 2004 and 12 sites in 2005. The lowest maximum values were observed at Storebaelt, Denmark (109.3 µg/m^3, 19th November).

Most of the highest values were measured in mid July. The one hour critical level for ozone formulated by the ECE for protection of vegetation, 150 µg/m^3, was in 2006 exceeded at 119 sites, i.e. at almost all measuring stations (Figure 1.3, Annex 1). At both the two Italian stations the limit was exceeded 38 days. At 22 sites the limit was exceeded 20 days or more, which is significantly higher than in 2005, when the limit was exceeded 20 days or more at 4 stations only.

Figure 1.4 in Annex 1 shows the number of exceedances of the threshold value of 180 µg/m^3 formulated by the EU for the public. At Ispra, the threshold value was exceeded 17 days, and 20 additional sites, mostly located in Central Europe and in the UK, measured above 180 µg/m^3 for five days or more. In total values above 180 µg/m^3 were measured at 65 sites compared to 36 sites the year before.

Table 1.2 in Annex 1 shows the 25-, 50-, 75-, 90-, 95-, 98- and 99-precentles for the period April-September for stations with data capture higher that 75%. Graphical distributions of the 99-precentiles and 95-percentiles are shown in Figure 1.1 and Figure 1.2 in Annex 1.

The lowest values are found in Scandinavia and the northern UK where the 99-percentile is below 130 µg/m^3.

The concentrations are higher in Central Europe, where the 99-percentile generally ranges from 150-180 µg/m^3. A few sites, including Ispra, had values above 180 µg/m^3.

6. Calculation of AOT40

According to the workshop on critical levels for ozone in Europe, held in Kuopio, 1996, the AOT40 values for forest and agricultural crops are accumulated during daylight hours only, defined as hours with mean global radiation, a simple approach have been used for the calculations in this report, defining daylight hours as solar zenith angle less than 80°.

AOT40 and AOT60 for forest and agricultural corps for 2006 are shown in Table 2.1 and Table 2.2 in Annex 2, and the corresponding geographical distributions of AOT40 and AOT60 are shown in Figure 2.1–2.4. The maps of AOT40 show a general increasing gradient from west to east and from north to south. The lowest values are found in Scandinavia, in the Baltic region and in

Ireland and in the UK, while the highest values are found in Spain, Austria and Italy.

The maps show that the exceedances for critical levels are considerable. The critical level for forest in April-September (10 000 ppbh) is exceded in most European countries, including stations in southern Scandinavia. UK, Spain, France, Switzerland, Austria, Italy and Slovenia had AOT40 (May-July) values above 15 000 ppbh. The critical level for agricultural crops, 3 000 ppbh, was in 2006 exceeded at most European stations except elevated stations in Austria and stations in northern Scandinavia and in Ireland and the UK.

7. Seasonal variation

Monthly mean concentrations for 2006 are given in Table 3.1 and monthly data capture in Table 3.2 in Annex 3. The concentrations show a clear pattern with maximum values during spring or early summer and minimum in winter. The seasonal variation is the net result of a number of processes such as dry deposition, photochemical loss (titration with NO_x) and formation, and varying influx from the stratosphere as well as varying background ozone concentrations.

Plots of the seasonal variations 1990-2006 are given in Figure 3.1 in Annex 3.

The seasonal variation of ozone shows characteristics, which seem to be bound by the geographical location of the station (Roemer et al., 1996). In Central and Alpine Europe the variation is characterised by a broad summer maximum with high monthly means from May to August. A springtime maximum in April and May followed by a gradual decline to a minimum in November-December is found for sites in England, the Netherlands and the southern parts of Scandinavia and Finland. A spring maximum followed by a minimum in the summer is generally found in Ireland, Scotland and the northern parts of Scandinavia and Finland.

8. Diurnal variation

In addition to the seasonal variation, ozone concentrations show a variation on a shorter time scale. The diurnal variation is a result of the variation in vertical mixing, surface dry deposition and photochemistry. Thus, coastal and mountain sites away from NO_x sources generally show the least diurnal cycles, whereas diurnal cycles will be most pronounced at inland sites in spring and summer.
The average diurnal variation of surface ozone for summer (April-September) 2006 is shown in Annex 4. In general the lowest concentrations are found in early morning and the highest in the afternoon.

The most pronounced diurnal variation is found at the rural sites in Central Europe e.g. sites in Austria, Switzerland, most of the German sites and Ispra in Italy. Typical for those sites is a more marked peak in the diurnal cycle with a characteristic maximum around mid-afternoon. The pronounced diurnal peak during the summer months is due to photochemical generation of ozone during

daytime as a result of higher temperature and insolation during this time of the day. However, during the night, more stable atmospheric conditions and nocturnal inversions prevent the vertical mixing and the transport of ozone from the free troposphere into the boundary layer.

A weaker diurnal variation is observed at the coastal and island stations and at the remote sites in Norway and Sweden. Mace Head, situated on the west coast of Ireland, has roughly the same average concentrations as the rural sites in Central Europe but almost no diurnal variation due to remoteness from source areas and prevailing westerly winds. Zeppelinfjellet at Spitsbergen shows no diurnal variation. Elevated sites like Chaumont and Krvavec show a weaker diurnal cycle and the average concentration level is also high, due to influence of air from the free troposphere.

9. Update

The data compiled in this report represent the quality assured and quality controlled data at present. If errors are detected in the future, the data will be corrected in the database. It is important that users make certain they have access to the most recent version of the data. For the data presented here, the latest alteration was 29.March, 2008.

Complete data sets are available upon request to the CCC (e-mail: anne-gunn.hjellbrekke@nilu.no). Information about the EMEP network and measurement data is also available on the web at http://www.emep.int and http://www.nilu.no/projects/ccc/index.html.

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11. List of participating institutions

Austria	Umweltbundesamt Provincial Government of Tyrol Provincial Government of Carinthia Environment Institute Vorarlberg Provincial Government Styria Provincial Government Salzburg Provincial Government Lower Austria
Belgium	CELINE – IRCEL
Bulgaria	Executive Environment Agency
Commission of the European Communities	Joint Research Center. Ispra Establishment
Cyprus	Ministry of Labour and Social Insurance
Czech Republic	Czech Hydrometeorological Institute
Denmark	National Environmental Research Institute (DMI)
Estonia	Estonian Environmental Research Laboratory Ltd.
Finland	Finnish Meteorological Institute (FMI)
France	l' Ecole des Mines de Douai Laboratories Wolff
Germany	Umweltbundesamt
Greece	Environmental Chemical Processes Laboratory, University of Crete Ministry of Environmental Physical Planning and Public Works
Hungary	Meteorological Service, Institute for Atmospheric Physics, Dep. for Air Chemistry
Italy	C.N.R. Istituto Inquinamento Atmosferico
Latvia	Latvian Environment, Geology and Meteorology Agency
Lithuania	Environmental Physics and Chemistry Laboratory, Institute of Physics
Malta	University of Malta
Netherlands	National Institute for Public Health and Environmental Protection (RIVM)
Norway	Norwegian Institute for Air Research (NILU)
Poland	Institute of Meteorology and Water Management Institute of Environmental Protection
Portugal	Instituto de Meteorologica
Russian Federation	Institute of Global Climate and Ecology
Slovakia	Slovak Hydrometeorological Institute
Slovenia	Hydrometeorological Institute of Slovenia
Spain	Dirección General de Calidad y Evaluacíon Ambiental
Sweden	Swedish Environmental Research Institute (IVL)
Switzerland	Swiss Federal Laboratory of Testing Materials and Research (EMPA)
United Kingdom	AEA Technology

Annex 1

Concentration summaries and episodes, tables and figures

Table 1.1: Number of hours (h) and days (d) exceeding 120, 150, 180 and 200 μg/m^3 and maximum concentrations in 2006.

Code	Station	Total		>120		>150		>180		>200		Max concentrations	
		hours	days	hours	days	hours	days	hours	days	hours	days	μg/m^3	day(s)
AT0002R	Illmitz	8278	365	391	70	89	23	19	9	1	1	201.0	25.07.2006
AT0005R	Vorhegg	8204	362	477	64	75	20	9	3	0	0	198.0	28.06.2006
AT0030R	Pillersdorf bei Retz	8337	365	405	70	64	16	9	3	2	1	214.0	20.07.2006
AT0032R	Sulzberg	8303	364	734	75	164	21	12	3	2	1	210.0	27.07.2006
AT0034G	Sonnblick	8064	355	1419	113	95	17	0	0	0	0	168.0	21.07.2006
AT0037R	Zillertaler Alpen	8394	365	830	70	55	9	0	0	0	0	172.0	20.07.2006, 22.07.2006
AT0038R	Gerlitzen	8230	364	1406	101	242	34	4	1	0	0	184.0	21.07.2006
AT0040R	Masenberg	7527	333	782	63	138	17	0	0	0	0	173.0	21.07.2006
AT0041R	Haunsberg	8349	365	558	70	124	24	10	5	0	0	189.0	22.07.2006
AT0042R	Heidenreichstein	8189	359	344	65	59	15	3	3	0	0	185.0	17.06.2006
AT0043R	Forsthof	8323	365	636	69	124	23	9	5	0	0	194.0	11.07.2006
AT0044R	Graz Platte	8269	365	568	63	69	12	0	0	0	0	173.0	28.07.2006
AT0045R	Dunkelsteinerwald	8363	365	364	73	76	18	21	8	0	0	200.0	20.07.2006, 21.07.2006, 28.07.2006, 29.07.2006
AT0046R	Gänserndorf	8286	363	363	70	87	22	14	4	5	2	219.0	22.07.2006
AT0047R	Stixneusiedl	8363	365	381	62	84	21	18	8	3	1	215.0	21.07.2006
AT0048R	Zoebelboden	8194	365	571	55	92	14	11	3	0	0	191.0	22.07.2006
BE0001R	Offagne	7591	345	398	50	89	13	28	5	14	4	235.0	26.07.2006
BE0032R	Eupen	7652	347	392	45	99	18	23	4	14	2	260.0	26.07.2006
BE0035R	Vezin	8015	359	282	41	91	17	29	9	10	2	234.0	26.07.2006
BG0053R	Rojen peak	6659	285	0	0	0	0	0	0	0	0	115.3	25.07.2006
CH0001G	Jungfraujoch	8471	365	29	4	0	0	0	0	0	0	132.7	12.04.2006
CH0002R	Payerne	8187	360	391	57	99	20	0	0	0	0	179.5	19.07.2006
CH0003R	Tänikon	8300	364	405	62	133	24	17	4	5	2	210.7	15.06.2006
CH0004R	Chaumont	8349	365	816	71	225	24	10	4	0	0	186.7	14.06.2006
CH0005R	Rigi	8345	365	811	73	220	23	25	10	3	1	209.5	19.07.2006
CY0002R	Ayia Marina	8575	363	224	47	0	0	0	0	0	0	145.7	18.10.2006
CZ0001R	Svratouch	7502	319	443	46	61	11	0	0	0	0	177.0	21.07.2006
CZ0003R	Kosetice	8533	360	367	52	66	13	0	0	0	0	179.6	21.07.2006
DE0001R	Westerland	8381	365	286	36	53	12	0	0	0	0	174.6	13.06.2006
DE0002R	Langenbrügge	8385	365	381	50	121	19	13	5	5	1	216.1	20.07.2006
DE0003R	Schauinsland	8387	365	987	84	305	29	50	8	26	4	226.8	19.07.2006

Table 1.1, cont.

Code	Station	Total		>120		>150		>180		>200		Max concentrations	
		hours	days	hours	days	hours	days	hours	days	hours	days	µg/m^3	day(s)
DE0007R	Neuglobsow	8244	365	313	49	81	16	12	5	0	0	195.0	20.07.2006
DE0008R	Schmücke	8274	363	900	74	223	27	15	3	2	1	202.3	20.07.2006
DE0009R	Zingst	8367	365	164	25	15	3	0	0	0	0	176.6	05.05.2006
DK0005R	Keldsnor	8599	361	117	21	9	3	0	0	0	0	179.2	06.07.2006
DK0031R	Ulborg	8445	356	209	23	36	8	5	2	0	0	195.1	13.06.2006
DK0041R	Lille Valby	7903	335	176	29	29	6	1	1	0	0	181.1	05.05.2006
EE0009R	Lahemaa	8466	356	212	24	42	8	0	0	0	0	174.0	06.05.2006
EE0011R	Vilsandy	8759	365	312	30	47	8	0	0	0	0	168.0	08.07.2006
ES0007R	Víznar	8539	363	1033	119	58	17	0	0	0	0	165.2	07.07.2006
ES0008R	Niembro	8624	364	63	12	7	2	0	0	0	0	171.5	17.07.2006
ES0009R	Campisabalos	8359	363	344	55	20	9	0	0	0	0	175.7	21.07.2006
ES0010R	Cabo de Creus	8413	361	278	48	24	5	4	2	1	1	201.6	16.07.2006
ES0011R	Barcarrola	8565	365	335	47	7	1	2	1	0	0	198.5	12.08.2006
ES0012R	Zarra	8489	364	627	119	30	13	0	0	0	0	177.9	29.04.2006
ES0013R	Penausende	8464	362	288	44	2	2	0	0	0	0	158.2	31.08.2006
ES0014R	Els Torms	8617	364	576	89	43	17	2	1	0	0	183.2	14.07.2006
ES0015R	Risco Llamo	6736	326	568	72	10	6	0	0	0	0	154.8	23.08.2006
ES0016R	O Saviñao	8507	364	127	24	9	4	3	2	0	0	187.7	07.06.2006
FI0009R	Utö	8734	365	236	31	23	4	0	0	0	0	166.0	06.05.2006
FI0017R	Virolahti II	8659	364	191	22	32	7	5	1	0	0	195.0	05.05.2006
FI0022R	Oulanka	8617	363	62	8	10	2	0	0	0	0	171.0	03.05.2006
FI0037R	Ahtari II	7726	325	160	22	13	4	0	0	0	0	165.0	02.05.2006
FI0096G	Pallas/Särkijärvi	8695	364	105	13	13	2	0	0	0	0	161.0	02.05.2006
FR0008R	Donon A	8078	344	717	60	193	26	29	8	0	0	199.0	27.07.2006
FR0008R	Donon B	8060	344	788	61	228	29	29	7	0	0	198.0	25.07.2006
FR0008R	Donon C	8204	344	848	67	252	29	34	7	1	1	202.0	25.07.2006
FR0008R	Donon D	8203	344	870	68	264	31	37	9	1	1	201.0	27.07.2006
FR0009R	Revin	8302	354	277	36	48	6	14	2	3	1	208.0	26.07.2006
FR0010R	Morvan	8679	365	310	35	40	8	0	0	0	0	180.0	18.07.2006
FR0012R	Iraty	8348	361	797	76	159	22	3	2	0	0	192.0	17.07.2006
FR0013R	Peyrusse Vieille	8505	358	145	25	12	5	0	0	0	0	165.0	20.07.2006

Table 1.1, cont.

Code	Station	Total		>120		>150		>180		>200		Max concentrations	
		hours	days	hours	days	hours	days	hours	days	hours	days	μg/m^3	day(s)
FR0014R	Montandon	8659	364	226	30	24	11	0	0	0	0	167.0	18.07.2006
FR0015R	La Tardière	7738	325	246	32	55	10	2	1	0	0	187.0	18.07.2006
FR0016R	Le Casset	8398	357	1486	119	67	17	0	0	0	0	172.0	24.06.2006
FR0017R	Montfranc	8288	358	406	34	3	2	0	0	0	0	153.0	14.07.2006
GB0002R	Eskdalemuir	8659	364	75	11	17	4	0	0	0	0	176.0	19.07.2006
GB0006R	Lough Navar	8658	365	38	6	6	2	0	0	0	0	170.0	19.07.2006
GB0013R	Yarner Wood	8446	358	122	19	57	7	20	4	10	2	234.0	18.07.2006
GB0014R	High Muffles	7844	333	183	22	32	8	0	0	0	0	174.0	02.07.2006
GB0015R	Strath Vaich Dam	7326	311	117	14	29	4	1	1	0	0	182.0	19.07.2006
GB0031R	Aston Hill	8093	344	247	24	88	12	33	6	12	1	220.0	19.07.2006
GB0032R	Bottesford	8658	363	171	24	68	15	11	4	0	0	196.0	20.07.2006
GB0033R	Bush	8580	363	20	5	2	1	0	0	0	0	158.0	10.06.2006
GB0034R	Glazebury	6476	275	118	17	57	12	4	2	0	0	188.0	19.07.2006
GB0035R	Great Dun Fell	8673	365	157	15	20	6	0	0	0	0	176.0	18.07.2006
GB0036R	Harwell	8196	352	137	22	39	9	8	2	3	2	212.0	18.07.2006
GB0037R	Ladybower Res.	8313	355	83	14	11	4	0	0	0	0	168.0	10.06.2006
GB0038R	Lullington Heath	7807	331	275	31	84	14	25	6	10	3	238.0	18.07.2006
GB0039R	Sibton	8060	339	184	29	32	7	3	1	0	0	184.0	04.07.2006
GB0043R	Narberth	8024	355	96	15	23	5	3	1	0	0	198.0	04.07.2006
GB0044R	Somerton	8075	346	110	18	21	3	3	1	0	0	192.0	04.07.2006
GB0045R	Wicken Fen	7565	322	364	55	154	23	55	11	29	5	278.0	19.07.2006
HU0002R	K-puszta	5881	251	294	44	85	18	5	3	0	0	197.0	25.07.2006
IE0031R	Mace Head	8684	365	53	7	9	1	0	0	0	0	168.0	19.07.2006
IT0001R	Montelibretti	8645	364	579	122	124	38	29	13	8	5	229.3	22.07.2006
IT0004R	Ispra	8158	357	395	73	166	38	58	17	23	8	254.1	23.06.2006
LT0015R	Preila	8277	353	206	28	11	3	1	1	0	0	181.0	05.05.2006
LV0010R	Rucava	7454	316	87	15	4	3	0	0	0	0	158.0	08.07.2006
MT0001R	Giordan lighthouse	6999	307	1082	113	26	11	0	0	0	0	175.0	08.09.2006
NL0007R	Eibergen	6135	265	152	24	23	5	4	2	0	0	182.9	18.07.2006
NL0009R	Kollumerwaard	8681	364	69	15	3	2	0	0	0	0	163.1	05.07.2006
NL0010R	Vredepeel	8105	351	136	25	23	5	0	0	0	0	171.3	26.07.2006

Table 1.1, cont.

Code	Station	Total		>120		>150		>180		>200		Max concentrations	
		hours	days	hours	days	hours	days	hours	days	hours	days	μg/m^3	day(s)
NO0001R	Birkenes	8625	365	184	22	20	5	0	0	0	0	164.0	11.05.2006
NO0015R	Tustervatn	8712	365	164	16	47	5	1	1	0	0	181.2	12.06.2006
NO0039R	Kårvatn	8719	365	151	15	15	3	0	0	0	0	157.9	07.05.2006
NO0042G	Spitsbergen, Zeppelinfjell	8547	364	112	7	44	4	0	0	0	0	164.6	03.05.2006
NO0043R	Prestebakke	8730	365	150	21	9	1	0	0	0	0	174.2	13.06.2006
NO0052R	Sandve	8351	354	224	17	39	7	0	0	0	0	175.1	12.06.2006
NO0055R	Karasjok	8724	365	62	6	5	2	0	0	0	0	160.0	13.06.2006
NO0056R	Hurdal	8735	365	166	18	20	5	1	1	0	0	185.8	13.06.2006
PL0002R	Jarczew	8293	351	345	54	44	8	6	1	3	1	210.0	05.05.2006
PL0003R	Sniezka	8753	365	662	59	89	16	5	2	0	0	187.0	21.07.2006
PL0004R	Leba	8728	365	217	31	19	6	0	0	0	0	179.0	07.07.2006
PL0005R	Diabla Gora	8352	350	192	33	1	1	0	0	0	0	151.0	10.07.2006
PT0004R	Monte Velho	8416	361	249	41	60	13	12	4	2	2	207.0	12.08.2006
SE0005R	Bredkälen	8727	365	2	1	0	0	0	0	0	0	129.0	07.07.2006
SE0011R	Vavihill	8654	365	221	30	36	8	0	0	0	0	167.0	05.05.2006, 06.05.2006
SE0012R	Aspvreten	8236	353	321	32	66	11	3	1	0	0	192.0	06.05.2006
SE0013R	Esrange	8736	365	144	16	11	5	0	0	0	0	157.0	02.05.2006
SE0014R	Råö	8742	365	202	22	26	5	2	1	0	0	193.0	06.07.2006
SE0032R	Norra-Kvill	8340	352	135	18	4	2	0	0	0	0	161.0	14.06.2006
SE0035R	Vindeln	8558	360	85	13	7	2	0	0	0	0	156.0	02.05.2006, 08.05.2006
SE0039R	Grimsö	8718	365	144	18	5	2	0	0	0	0	160.0	06.05.2006
SI0008R	Iskrba	8373	365	612	79	68	15	1	1	0	0	182.0	16.06.2006
SI0031R	Zarodnje	8314	365	580	63	58	12	0	0	0	0	179.0	16.06.2006
SI0032R	Krvavec	8208	364	1413	93	318	36	23	8	1	1	203.0	16.06.2006
SI0033R	Kovk	7730	355	434	54	60	12	0	0	0	0	176.0	26.07.2006
SK0002R	Chopok	6219	275	958	78	72	14	2	1	0	0	183.0	22.07.2006
SK0004R	Stará Lesná	7807	345	435	63	40	8	1	1	0	0	183.4	05.05.2006
SK0005R	Liesek	8439	356	381	67	36	8	1	1	0	0	180.2	27.07.2006
SK0006R	Starina	6582	287	253	41	16	4	3	1	0	0	196.4	05.05.2006
SK0007R	Topolniky	8614	364	358	66	52	13	0	0	0	0	180.0	22.07.2006

Table 1.2: Percentiles of hourly ozone values April–September 2006.

Code	Station	25%	50%	75%	90%	95%	98%	99%	Data capture
AT0002R	Illmitz	60.0	77.0	96.0	119.0	134.0	153.0	167.0	94.1
AT0005R	Vorhegg	65.0	85.0	103.0	124.0	137.0	150.0	163.0	92.4
AT0030R	Pillersdorf bei Retz	66.0	80.0	98.0	118.0	131.0	147.0	158.1	95.3
AT0032R	Sulzberg	79.0	93.0	110.0	131.0	145.8	159.0	167.0	95.7
AT0034G	Sonnblick	99.0	111.0	126.0	137.0	144.0	152.0	157.0	94.5
AT0037R	Zillertaler Alpen	87.0	100.0	115.0	128.0	137.0	147.0	152.0	96.2
AT0038R	Gerlitzen	99.0	110.0	127.0	144.0	152.0	164.0	168.1	95.4
AT0040R	Masenberg	80.0	93.0	112.0	134.0	144.0	155.0	159.9	93.5
AT0041R	Haunsberg	66.0	84.0	103.0	125.0	139.0	156.0	166.0	95.5
AT0042R	Heidenreichstein	57.0	76.0	96.0	116.0	129.0	145.0	156.0	95.6
AT0043R	Forsthof	73.0	89.0	108.0	128.0	141.0	156.0	164.0	95.5
AT0044R	Graz Platte	78.0	91.0	108.0	125.0	136.0	149.0	158.8	93.8
AT0045R	Dunkelsteinerwald	53.0	72.0	92.0	116.0	132.0	148.8	164.0	95.8
AT0046R	Gänserndorf	53.0	71.0	92.0	117.0	132.0	151.0	158.0	95.5
AT0047R	Stixneusiedl	59.0	75.0	95.0	118.0	132.0	151.0	166.0	95.6
AT0048R	Zoebelboden	77.0	91.0	106.0	127.0	138.0	151.0	162.0	93.8
BE0001R	Offagne	55.0	75.0	95.0	122.0	136.0	154.0	172.0	86.7
BE0032R	Eupen	49.0	69.0	91.0	120.0	140.0	154.9	164.5	90.0
BE0035R	Vezin	32.0	57.0	81.0	110.0	133.0	153.0	175.0	91.3
BG0053R	Rojen peak	62.9	71.3	80.5	88.4	92.9	97.8	101.2	84.9
CH0001G	Jungfraujoch	74.5	82.7	91.8	100.4	105.6	109.7	115.3	97.0
CH0002R	Payerne	47.6	69.6	93.7	117.8	135.6	153.6	161.6	94.2
CH0003R	Tänikon	50.2	71.5	94.5	119.5	138.5	160.9	171.6	94.2
CH0004R	Chaumont	83.1	96.5	113.7	137.1	150.9	163.6	169.6	95.2
CH0005R	Rigi	82.2	97.1	113.6	135.7	151.0	169.4	176.8	95.3
CY0002R	Ayia Marina	80.9	94.4	106.9	114.8	118.9	124.2	127.3	98.5
CZ0001R	Svratouch	65.9	81.0	100.1	119.3	131.0	143.9	155.5	98.9
CZ0003R	Kosetice	59.1	78.2	97.0	116.7	130.1	146.4	153.6	95.9
DE0001R	Westerland	69.2	84.1	97.2	110.9	127.1	143.1	152.5	96.0
DE0002R	Langenbrügge	49.3	68.9	90.7	117.8	136.5	157.3	167.1	95.7
DE0003R	Schauinsland	84.5	100.0	118.2	141.6	157.6	174.7	184.4	95.5
DE0007R	Neuglobsow	45.6	66.6	88.9	112.9	128.8	149.8	162.8	94.1
DE0008R	Schmücke	74.3	90.6	115.4	139.9	150.7	162.5	171.3	93.9
DE0009R	Zingst	60.1	74.1	87.5	102.4	112.7	127.3	134.9	95.8
DK0005R	Keldsnor	56.9	68.4	81.7	99.3	110.1	122.8	131.9	96.8
DK0031R	Ulborg	58.7	73.2	89.1	102.6	119.9	137.6	148.9	95.7
DK0041R	Lille Valby	57.3	74.6	88.3	104.7	118.0	134.3	143.8	90.6
EE0009R	Lahemaa	52.0	71.0	88.0	104.0	119.6	140.6	150.0	99.4
EE0011R	Vilsandy	67.0	81.0	95.0	114.0	127.0	140.0	153.0	100.0
ES0007R	Víznar	89.9	105.0	119.4	130.8	138.2	146.4	152.7	95.8
ES0008R	Niembro	59.1	72.4	86.4	98.7	105.0	115.9	123.9	98.8
ES0009R	Campisabalos	69.4	87.1	103.1	117.7	126.8	135.9	143.6	94.5
ES0010R	Cabo de Creus	80.6	92.0	104.7	114.8	123.1	133.4	142.1	95.0
ES0011R	Barcarrola	55.7	77.9	97.5	115.8	126.2	136.5	140.5	97.4
ES0012R	Zarra	81.1	98.4	112.9	123.7	131.4	139.8	145.7	97.0
ES0013R	Penausende	68.0	85.5	100.4	114.9	123.2	132.4	137.6	98.2
ES0014R	Els Torms	80.1	96.0	111.0	124.0	132.1	141.7	150.1	98.7
ES0015R	Risco Llamo	85.6	98.8	112.5	125.1	131.6	138.1	142.7	87.3
ES0016R	O Saviñao	50.3	65.7	83.0	98.5	110.5	126.2	135.1	97.8
FI0009R	Utö	70.0	81.0	94.0	110.0	122.0	133.0	143.0	99.9
FI0017R	Virolahti II	57.0	74.0	89.0	105.0	116.0	136.0	148.0	99.0
FI0022R	Oulanka	52.0	66.0	84.0	98.0	106.0	114.0	127.9	98.2
FI0037R	Ahtari II	53.0	70.0	87.0	107.0	117.0	129.0	143.0	97.7
FI0096G	Pallas/Särkijärvi	58.0	71.0	87.0	103.0	110.0	123.0	136.2	99.7
FR0008R	Donon A	73.0	89.0	110.0	134.0	149.0	165.0	175.1	97.8
FR0008R	Donon B	76.0	92.0	112.0	136.0	151.0	166.0	178.0	97.2
FR0008R	Donon C	78.0	94.0	114.0	137.0	153.1	168.0	178.0	99.2
FR0008R	Donon D	78.0	94.0	114.0	138.0	153.1	169.0	178.4	99.2
FR0009R	Revin	52.0	68.0	88.0	113.0	126.0	141.8	154.8	93.6
FR0010R	Morvan	57.0	76.0	93.0	112.0	130.0	145.0	150.0	98.4
FR0012R	Iraty	87.0	98.0	113.0	135.0	147.0	159.0	164.0	94.3
FR0013R	Peyrusse Vieille	55.0	71.0	88.0	103.0	115.0	128.0	134.5	96.8
FR0014R	Montandon	46.0	63.0	81.0	104.0	121.0	141.0	148.0	99.2
FR0015R	La Tardière	52.0	71.0	90.0	110.0	122.0	143.6	154.0	98.4
FR0016R	Le Casset	97.0	112.0	124.0	136.0	143.0	149.0	154.0	93.4
FR0017R	Montfranc	71.0	87.0	102.0	121.0	129.0	136.0	139.8	91.6

Table 1.2, cont.

Code	Station	25%	50%	75%	90%	95%	98%	99%	Data capture
GB0002R	Eskdalemuir	46.0	62.0	78.0	92.0	100.0	118.0	136.0	98.8
GB0006R	Lough Navar	34.0	48.0	64.0	78.0	84.0	94.0	116.0	98.3
GB0013R	Yarner Wood	48.0	64.0	84.0	102.0	112.0	136.0	162.0	97.2
GB0014R	High Muffles	46.0	62.0	84.0	102.6	122.0	140.0	150.0	83.2
GB0015R	Strath Vaich Dam	58.0	72.0	90.0	102.0	108.0	128.0	144.0	96.4
GB0031R	Aston Hill	60.0	74.0	90.0	104.0	126.0	153.8	176.0	96.9
GB0032R	Bottesford	38.0	56.0	74.0	94.0	114.0	146.0	164.0	99.6
GB0033R	Bush	48.0	60.0	76.0	86.0	92.0	102.0	112.0	98.6
GB0034R	Glazebury	30.0	52.0	70.0	88.0	100.0	134.0	158.0	98.4
GB0035R	Great Dun Fell	52.0	64.0	78.0	94.0	114.0	132.0	142.0	99.1
GB0036R	Harwell	42.0	56.0	74.0	94.0	112.0	134.0	151.7	89.1
GB0037R	Ladybower Res.	34.0	54.0	74.0	88.0	98.0	120.0	136.0	98.2
GB0038R	Lullington Heath	50.0	68.0	86.0	108.0	128.0	150.0	170.4	97.4
GB0039R	Sibton	46.0	62.0	80.0	96.0	118.0	136.0	146.0	99.2
GB0043R	Narberth	52.0	66.0	82.0	96.0	108.0	124.0	140.6	91.9
GB0044R	Somerton	46.0	62.0	78.0	94.0	104.0	128.0	140.0	94.5
GB0045R	Wicken Fen	50.0	72.0	98.0	118.0	142.0	172.0	186.7	94.8
IE0031R	Mace Head	60.0	74.0	88.0	100.0	104.0	110.0	126.0	99.1
IT0001R	Montelibretti	30.2	61.7	101.3	126.0	140.0	158.3	172.6	98.0
IT0004R	Ispra	25.8	57.7	88.7	119.6	142.3	173.2	187.3	91.1
LT0015R	Preila	64.0	77.0	91.0	106.0	117.0	129.0	138.0	96.2
LV0010R	Rucava	42.0	60.0	78.0	92.0	103.0	122.0	131.0	91.8
MT0001R	Giordan lighthouse	96.4	108.6	120.8	132.0	137.8	144.2	147.8	90.1
NL0009R	Kollumerwaard	38.8	56.9	74.5	87.5	98.5	114.5	128.2	99.6
NL0010R	Vredepeel	24.4	44.1	64.6	90.4	111.0	129.0	140.8	93.6
NO0001R	Birkenes	49.6	70.0	87.4	101.0	116.8	132.4	141.1	98.8
NO0015R	Tustervatn	51.7	66.6	84.8	99.1	111.6	132.8	152.1	99.6
NO0039R	Kårvatn	28.4	55.2	80.6	99.8	109.2	132.0	140.2	99.4
NO0042G	Spitsbergen, Zeppelinfjell	55.2	64.4	80.8	98.6	103.4	135.5	150.8	99.4
NO0043R	Prestebakke	49.4	64.6	81.6	97.0	114.6	129.2	140.0	99.9
NO0052R	Sandve	64.3	76.6	88.9	100.8	121.0	138.7	149.4	99.7
NO0055R	Karasjok	47.0	61.0	87.0	100.6	107.5	114.7	128.1	99.5
NO0056R	Hurdal	44.9	63.5	83.0	101.3	112.6	131.8	141.2	99.7
PL0002R	Jarczew	44.0	67.0	92.0	114.0	125.0	141.0	151.0	99.5
PL0003R	Sniezka	80.0	93.0	109.0	126.0	139.0	151.0	157.0	100.0
PL0004R	Leba	61.0	76.0	91.0	105.0	117.0	132.0	140.0	99.3
PL0005R	Diabla Gora	51.0	73.0	89.0	104.0	113.0	125.0	133.0	91.2
PT0004R	Monte Velho	39.0	65.0	89.0	109.0	124.0	144.0	157.8	98.2
SE0005R	Bredkälen	50.0	63.0	75.0	85.0	90.0	96.0	100.3	99.4
SE0011R	Vavihill	62.0	76.0	93.0	110.0	121.0	138.0	148.0	97.8
SE0012R	Aspvreten	58.0	79.0	98.0	115.0	133.0	148.0	156.0	92.4
SE0013R	Esrange	51.0	64.0	84.0	97.0	113.0	128.0	137.0	99.8
SE0014R	Råö	61.0	76.0	89.0	103.0	118.0	139.0	146.0	99.7
SE0032R	Norra-Kvill	63.0	75.0	89.0	102.3	112.0	127.0	134.0	97.6
SE0035R	Vindeln	44.0	64.0	80.0	93.0	104.0	120.0	128.2	99.6
SE0039R	Grimsö	46.0	64.0	80.0	96.0	111.0	130.0	139.0	99.6
SI0008R	Iskrba	18.0	69.0	102.0	127.0	138.0	149.0	154.0	95.8
SI0031R	Zarodnje	76.0	91.0	108.0	126.0	136.0	147.0	154.0	95.2
SI0032R	Krvavec	98.0	110.0	129.0	147.0	155.0	167.5	174.2	92.8
SI0033R	Kovk	69.0	89.0	105.0	123.0	135.0	148.0	156.0	84.3
SK0002R	Chopok	92.4	103.8	119.4	133.9	141.1	149.5	161.2	85.2
SK0004R	Stará Lesná	62.3	82.8	100.2	117.0	127.7	139.0	146.8	85.2
SK0005R	Liesek	50.3	72.7	93.2	112.2	126.2	137.5	146.7	95.1
SK0007R	Topolniky	52.1	71.1	95.4	115.9	128.8	143.5	153.0	98.8

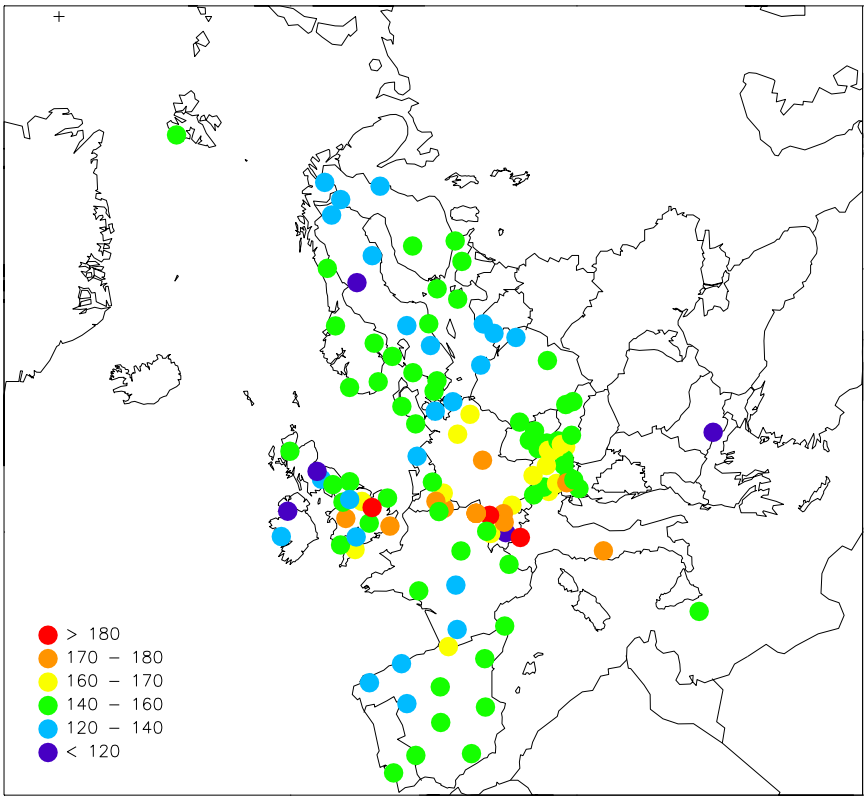


Figure 1.1: Ozone April–September 2006. 99-percentiles (μg/m^3).

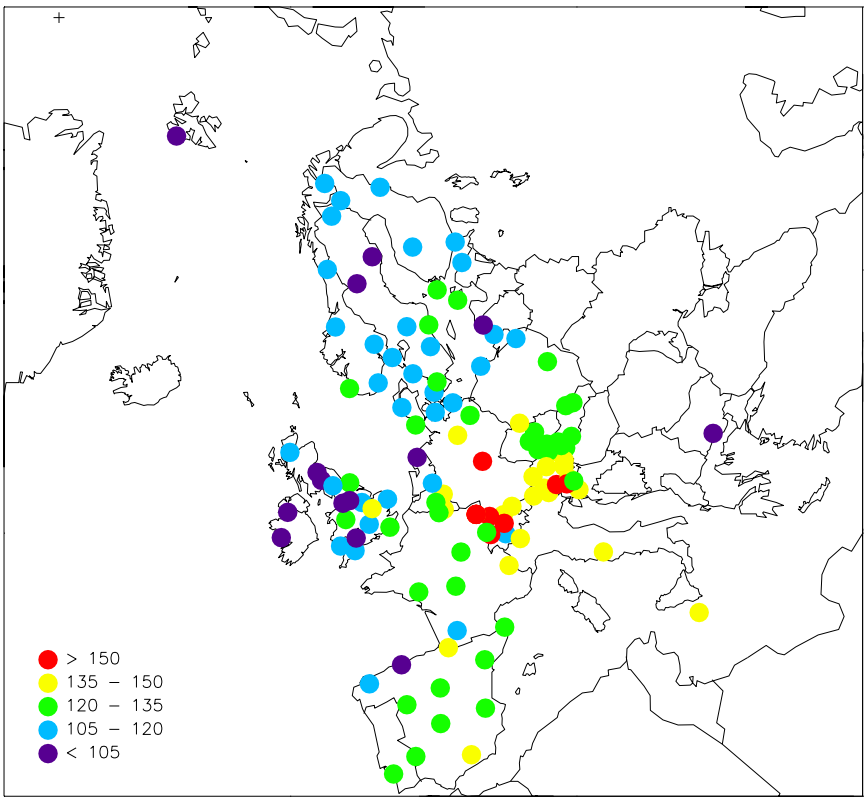


Figure 1.2: Ozone April–September 2006. 95-percentiles (μg/m^3).

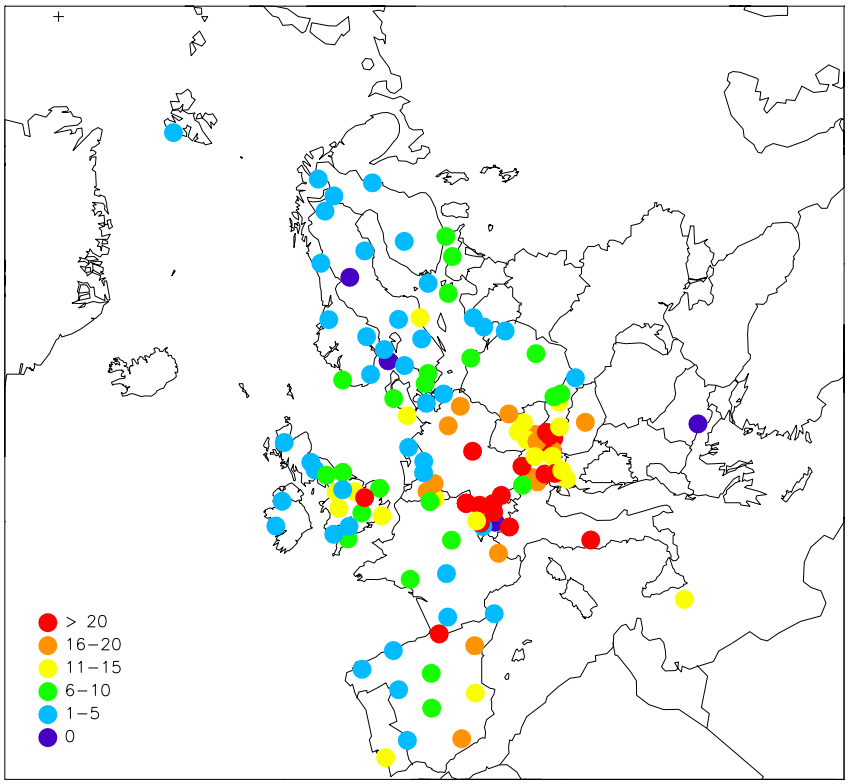


Figure 1.3: Number of exceedances of the threshold value of 150 µg/m^3. (Unit: number of days).

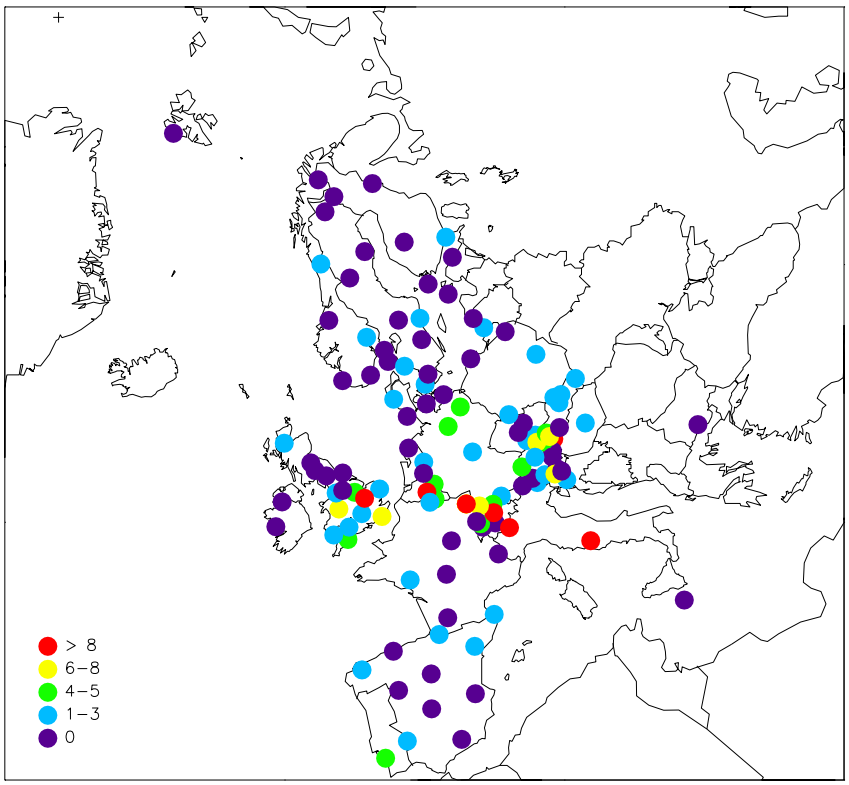


Figure 1.4: Number of exceedances of the threshold value of 180 µg/m^3. (Unit: number of days).

Annex 2

AOT40 and AOT60, figures and tables

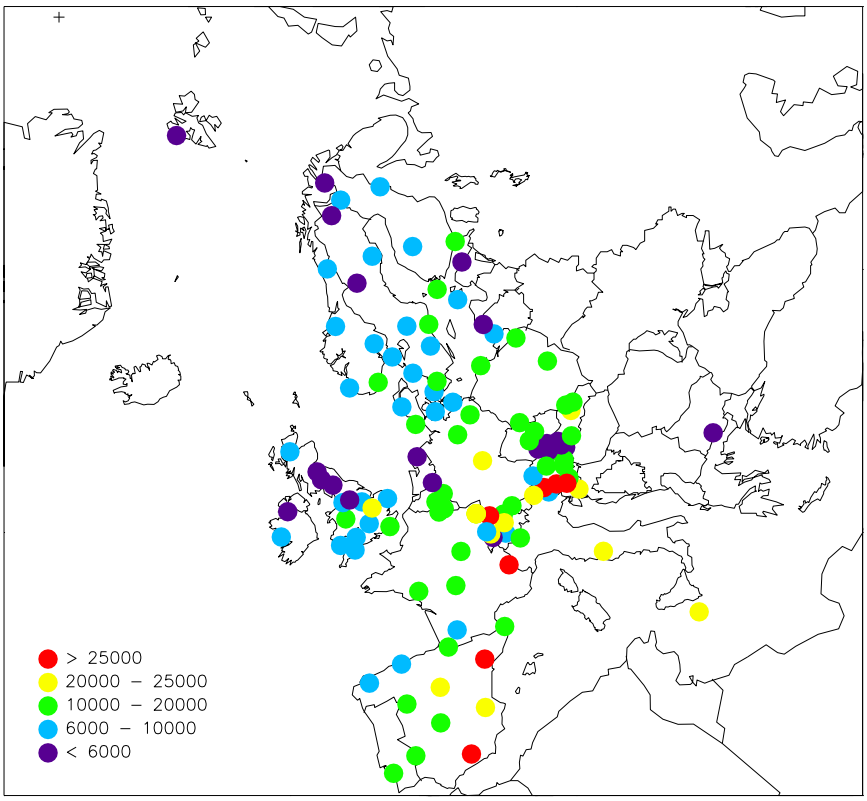


Figure 2.1: AOT40 (ppbh) April–September 2006 (daylight hours).

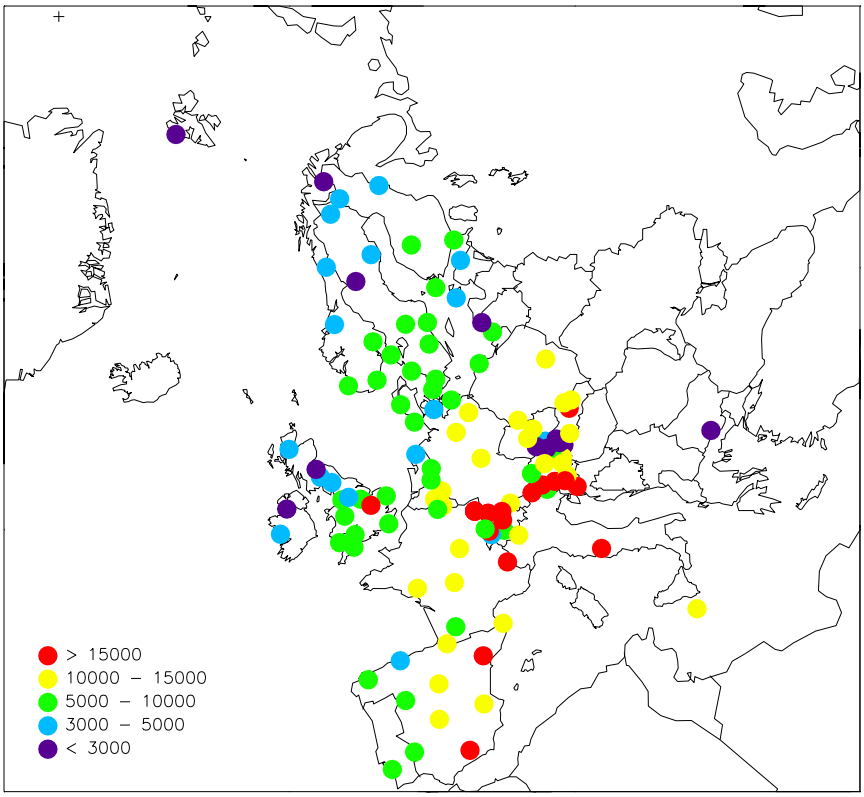


Figure 2.2: AOT40 (ppbh) May, June and July 2006 (daylight hours).

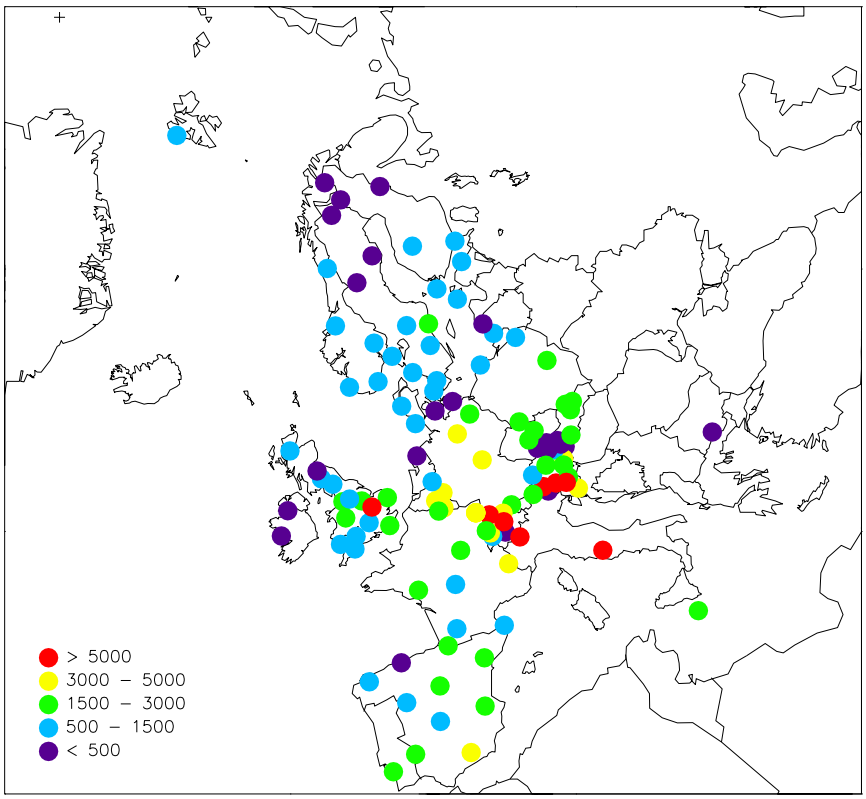


Figure 2.3: AOT60 (ppbh) April-September 2006 (daylight hours).

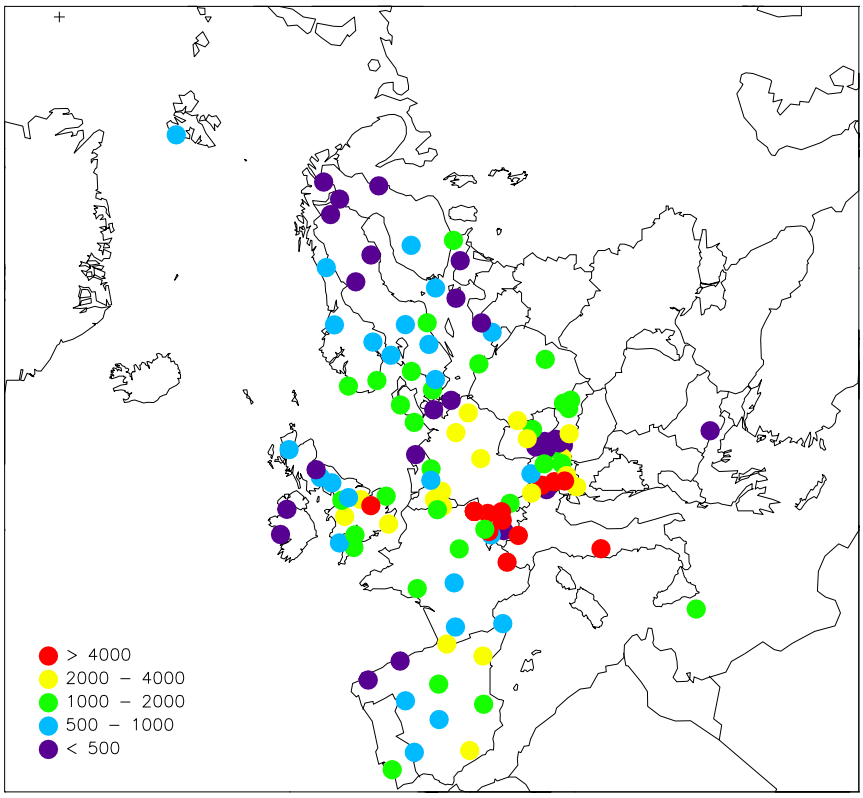


Figure 2.4: AOT60 (ppbh) May, June and July 2006 (daylight hours).

Table 2.1: AOT40 and AOT60 April–September 2006 (daylight hours).

Code	Station	AOT40	AOT40 corrected	AOT60	AOT60 corrected	Data capture
AT0002R	Illmitz	2676	2823	42	44	95
AT0005R	Vorhegg	6721	7350	498	545	91
AT0030R	Pillersdorf bei Retz	4546	4807	241	255	95
AT0032R	Sulzberg	14356	15624	1728	1880	92
AT0034G	Sonnblick	34571	35871	5849	6069	96
AT0037R	Zillertaler Alpen	22843	24486	2568	2753	93
AT0038R	Gerlitzen	33154	34925	5683	5987	95
AT0040R	Masenberg	18372	19866	3027	3273	92
AT0041R	Haunsberg	8733	9106	773	806	96
AT0042R	Heidenreichstein	2475	2591	104	109	96
AT0043R	Forsthof	13111	13682	1435	1497	96
AT0044R	Graz Platte	14627	15646	1537	1644	93
AT0045R	Dunkelsteinerwald	2236	2338	94	98	96
AT0046R	Gänserndorf	1198	1253	16	16	96
AT0047R	Stixneusiedl	2507	2617	112	116	96
AT0048R	Zoebelboden	14992	15961	1706	1816	94
BE0001R	Offagne	15446	17959	3407	3961	86
BE0032R	Eupen	14894	16604	3787	4222	90
BE0035R	Vezin	13052	14465	3501	3880	90
BG0053R	Rojen peak	1043	1199	0	0	87
CH0001G	Jungfraujoch	8007	8296	24	25	97
CH0002R	Payerne	17338	18503	3860	4120	94
CH0003R	Tänikon	18770	19936	4707	5000	94
CH0004R	Chaumont	22540	23805	4273	4513	95
CH0005R	Rigi	24210	25529	5444	5741	95
CY0002R	Ayia Marina	17079	17407	207	211	98
CZ0001R	Svratouch	14953	15070	1810	1824	99
CZ0003R	Kosetice	17912	18605	2778	2886	96
DE0001R	Westerland	12586	13090	1417	1474	96
DE0002R	Langenbrügge	14328	15052	3511	3689	95
DE0003R	Schauinsland	25738	26413	5740	5890	97
DE0007R	Neuglobsow	13185	14037	2520	2682	94
DE0008R	Schmücke	20225	21607	4218	4506	94
DE0009R	Zingst	7865	8192	431	449	96
DK0005R	Keldsnor	6033	6207	451	465	97
DK0031R	Ulborg	9619	10097	1435	1506	95
DK0041R	Lille Valby	9671	10556	1051	1147	92
EE0009R	Lahemaa	5312	5359	602	607	99
EE0011R	Vilsandy	7186	7186	526	526	100
ES0007R	Víznar	28554	30164	4131	4364	95
ES0008R	Niembro	6474	6597	281	287	98
ES0009R	Campisabalos	21619	22735	1845	1941	95
ES0010R	Cabo de Creus	17418	18575	1030	1099	94
ES0011R	Barcarrola	16783	17269	1616	1662	97
ES0012R	Zarra	22915	23750	1732	1795	96
ES0013R	Penausende	16096	16520	945	970	97
ES0014R	Els Torms	25263	25916	2868	2942	97
ES0015R	Risco Llamo	18420	21663	1147	1349	85
ES0016R	O Saviñao	8771	8956	776	793	98
FI0009R	Utö	11629	11651	1055	1057	100
FI0017R	Virolahti II	10773	10931	1353	1372	99
FI0022R	Oulanka	6096	6221	404	412	98
FI0037R	Ahtari II	9098	9379	773	796	97
FI0096G	Pallas/Särkijärvi	6506	6540	455	457	99
FR0008R	Donon A	19523	19786	3762	3813	99
FR0008R	Donon B	21704	22106	4518	4601	98
FR0008R	Donon C	22936	23221	4880	4941	99
FR0008R	Donon D	23113	23413	4966	5030	99
FR0009R	Revin	11467	12270	1875	2006	93
FR0010R	Morvan	13687	13948	1935	1972	98
FR0012R	Iraty	19487	20594	2616	2765	95
FR0013R	Peyrusse Vieille	8900	9143	720	739	97
FR0014R	Montandon	9906	10009	1669	1686	99

Table 2.1, cont.

Code	Station	AOT40	AOT40 corrected	AOT60	AOT60 corrected	Data capture
FR0015R	La Tardière	13936	14227	1998	2040	98
FR0016R	Le Casset	33237	35064	4983	5257	95
FR0017R	Montfranc	13803	15293	922	1022	90
GB0002R	Eskdalemuir	5534	5629	716	728	98
GB0006R	Lough Navar	1930	1972	343	350	98
GB0013R	Yarner Wood	9158	9520	1497	1556	96
GB0014R	High Muffles	7453	9201	1003	1238	81
GB0015R	Strath Vaich Dam	8073	8445	745	779	96
GB0031R	Aston Hill	10213	10581	2319	2402	97
GB0032R	Bottesford	8486	8552	2151	2168	99
GB0033R	Bush	2850	2919	118	121	98
GB0034R	Glazebury	6456	6606	1646	1684	98
GB0035R	Great Dun Fell	4894	4951	700	708	99
GB0036R	Harwell	6909	7944	1460	1679	87
GB0037R	Ladybower Res.	4590	4701	640	655	98
GB0038R	Lullington Heath	10704	10980	2535	2600	97
GB0039R	Sibton	9517	9619	1709	1727	99
GB0043R	Narberth	6190	6631	712	763	93
GB0044R	Somerton	6713	7157	1015	1082	94
GB0045R	Wicken Fen	20575	21793	5467	5791	94
HU0002R	K-puszta	11817	20377	2590	4466	58
IE0031R	Mace Head	6092	6173	299	303	99
IT0001R	Montelibretti	22948	23402	5326	5431	98
IT0004R	Ispra	17222	18976	5525	6088	91
LT0015R	Preila	8446	8738	701	725	97
LV0010R	Rucava	3842	4133	304	326	93
MT0001R	Giordan lighthouse	24965	28149	2413	2721	89
NL0007R	Eibergen	5658	9423	1011	1683	60
NL0009R	Kollumerwaard	4155	4176	318	320	100
NL0010R	Vredepeel	5755	6066	917	967	95
NO0001R	Birkenes	10988	11224	1210	1236	98
NO0015R	Tustervatn	6661	6709	943	950	99
NO0039R	Kårvatn	8104	8154	947	952	99
NO0042G	Spitsbergen, Zeppelinfjell	4495	4545	646	653	99
NO0043R	Prestebakke	7393	7400	743	743	100
NO0052R	Sandve	9359	9395	1095	1099	100
NO0055R	Karasjok	5871	5902	343	345	99
NO0056R	Hurdal	7955	7990	956	960	100
PL0002R	Jarczew	16288	16369	2263	2274	100
PL0003R	Sniezka	17985	17985	2120	2120	100
PL0004R	Leba	12196	12231	1031	1033	100
PL0005R	Diabla Gora	10169	11245	564	623	90
PT0004R	Monte Velho	14904	15007	2617	2635	99
SE0005R	Bredkälen	2097	2113	6	6	99
SE0011R	Vavihill	12122	12408	1295	1325	98
SE0012R	Aspvreten	14186	15451	1831	1994	92
SE0013R	Esrange	5596	5614	476	477	100
SE0014R	Råö	9674	9725	1103	1109	99
SE0032R	Norra-Kvill	8669	8895	578	593	97
SE0035R	Vindeln	6069	6103	396	398	99
SE0039R	Grimsö	6931	6967	705	708	99
SI0008R	Iskrba	22071	23123	3863	4047	95
SI0031R	Zarodnje	18272	18515	2547	2581	99
SI0032R	Krvavec	30958	33526	6196	6710	92
SI0033R	Kovk	15000	18314	1968	2402	82
SK0002R	Chopok	22580	25873	2534	2904	87
SK0004R	Stará Lesná	19973	19973	2072	2072	100
SK0005R	Liesek	16691	16773	2110	2120	100
SK0006R	Starina	9624	17642	1418	2600	55
SK0007R	Topolniky	18655	18848	2745	2773	99

Table 2.2: AOT40 and AOT60 May–July 2006 (daylight hours).

Code	Station	AOT40	AOT40 corrected	AOT60	AOT60 corrected	Data capture
AT0002R	Illmitz	2219	2317	42	43	96
AT0005R	Vorhegg	5254	5787	498	548	91
AT0030R	Pillersdorf bei Retz	4006	4238	233	246	95
AT0032R	Sulzberg	11242	12222	1723	1873	92
AT0034G	Sonnblick	23358	24420	5095	5326	96
AT0037R	Zillertaler Alpen	16116	17306	2325	2497	93
AT0038R	Gerlitzen	21793	23190	4778	5084	94
AT0040R	Masenberg	13911	15110	2874	3121	92
AT0041R	Haunsberg	7434	7768	773	808	96
AT0042R	Heidenreichstein	2155	2259	104	109	95
AT0043R	Forsthof	9729	10162	1261	1317	96
AT0044R	Graz Platte	10254	11053	1433	1545	93
AT0045R	Dunkelsteinerwald	1950	2034	94	98	96
AT0046R	Gänserndorf	1091	1143	16	16	95
AT0047R	Stixneusiedl	2065	2163	93	97	95
AT0048R	Zoebelboden	11271	12157	1666	1797	93
BE0001R	Offagne	12665	14595	3343	3852	87
BE0032R	Eupen	12851	13801	3780	4059	93
BE0035R	Vezin	11276	12098	3477	3731	93
BG0053R	Rojen peak	698	700	0	0	100
CH0001G	Jungfraujoch	6399	6671	24	25	96
CH0002R	Payerne	13761	14580	3673	3891	94
CH0003R	Tänikon	15207	16114	4547	4818	94
CH0004R	Chaumont	17372	18282	4105	4321	95
CH0005R	Rigi	18504	19551	5208	5502	95
CY0002R	Ayia Marina	11589	11763	183	186	99
CZ0001R	Svratouch	11577	11598	1751	1754	100
CZ0003R	Kosetice	13518	13872	2554	2621	97
DE0001R	Westerland	9142	9558	1405	1469	96
DE0002R	Langenbrügge	12228	12795	3486	3648	96
DE0003R	Schauinsland	20227	20851	5650	5824	97
DE0007R	Neuglobsow	10386	11134	2432	2607	93
DE0008R	Schmücke	14131	14849	3207	3369	95
DE0009R	Zingst	5691	5955	431	451	96
DK0005R	Keldsnor	4638	4658	448	450	100
DK0031R	Ulborg	7451	7922	1422	1512	94
DK0041R	Lille Valby	7501	7695	1037	1064	97
EE0009R	Lahemaa	3414	3437	364	367	99
EE0011R	Vilsandy	4996	4996	341	341	100
ES0007R	Víznar	15196	16555	2103	2291	92
ES0008R	Niembro	4077	4177	281	288	98
ES0009R	Campisabalos	14857	15807	1520	1617	94
ES0010R	Cabo de Creus	12936	13057	994	1004	99
ES0011R	Barcarrola	9359	9577	712	729	98
ES0012R	Zarra	14699	15361	1294	1352	96
ES0013R	Penausende	9954	10390	569	593	96
ES0014R	Els Torms	17267	17435	2452	2476	99
ES0015R	Risco Llamo	11436	12981	717	813	88
ES0016R	O Saviñao	5464	5601	490	502	98
FI0009R	Utö	7353	7353	810	810	100
FI0017R	Virolahti II	6760	6908	1129	1153	98
FI0022R	Oulanka	3637	3767	404	418	97
FI0037R	Ahtari II	5982	6311	536	565	95
FI0096G	Pallas/Särkijärvi	3562	3579	408	410	100
FR0008R	Donon A	15559	15658	3651	3674	99
FR0008R	Donon B	17029	17295	4354	4422	98
FR0008R	Donon C	17893	17991	4674	4699	99
FR0008R	Donon D	18009	18123	4744	4774	99
FR0009R	Revin	9644	9913	1863	1914	97
FR0010R	Morvan	10885	11066	1895	1927	98
FR0012R	Iraty	12431	12890	2148	2227	96
FR0013R	Peyrusse Vieille	6991	7069	711	719	99
FR0014R	Montandon	9087	9136	1669	1678	99

Table 2.2, cont.

Code	Station	AOT40	AOT40 corrected	AOT60	AOT60 corrected	Data capture
FR0015R	La Tardière	10934	11279	1995	2058	97
FR0016R	Le Casset	22373	22765	4504	4583	98
FR0017R	Montfranc	10089	11813	917	1074	85
GB0002R	Eskdalemuir	4194	4223	716	721	99
GB0006R	Lough Navar	1592	1627	343	351	98
GB0013R	Yarner Wood	5854	6158	1491	1568	95
GB0014R	High Muffles	5865	8176	1003	1398	72
GB0015R	Strath Vaich Dam	4782	5134	745	800	93
GB0031R	Aston Hill	8193	8370	2307	2357	98
GB0032R	Bottesford	7327	7417	2149	2175	99
GB0033R	Bush	1676	1733	118	122	97
GB0034R	Glazebury	5561	5595	1646	1656	99
GB0035R	Great Dun Fell	4571	4599	700	704	99
GB0036R	Harwell	5987	7603	1438	1826	79
GB0037R	Ladybower Res.	4025	4067	640	647	99
GB0038R	Lullington Heath	8704	8781	2444	2466	99
GB0039R	Sibton	7775	7829	1691	1703	99
GB0043R	Narberth	5376	6060	712	803	89
GB0044R	Somerton	5352	5970	1007	1123	90
GB0045R	Wicken Fen	15597	16261	5321	5548	96
HU0002R	K-puszta	9010	18151	2503	5042	50
IE0031R	Mace Head	3398	3410	299	300	100
IT0001R	Montelibretti	15489	15918	4295	4414	97
IT0004R	Ispra	13962	15403	5186	5722	91
LT0015R	Preila	6094	6327	631	655	96
LV0010R	Rucava	2854	2889	259	262	99
MT0001R	Giordan lighthouse	14638	16225	1686	1869	90
NL0007R	Eibergen	5596	6517	1011	1177	86
NL0009R	Kollumerwaard	3505	3537	303	306	99
NL0010R	Vredepeel	5392	5472	917	931	99
NO0001R	Birkenes	8277	8384	1208	1224	99
NO0015R	Tustervatn	3941	3970	871	877	99
NO0039R	Kårvatn	4637	4672	722	727	99
NO0042G	Spitsbergen, Zeppelinfjell	2323	2339	577	580	99
NO0043R	Prestebakke	5922	5921	742	742	100
NO0052R	Sandve	6780	6797	1093	1095	100
NO0055R	Karasjok	2985	2997	343	344	100
NO0056R	Hurdal	6226	6253	936	940	100
PL0002R	Jarczew	11878	11888	1973	1975	100
PL0003R	Sniezka	13518	13518	2036	2036	100
PL0004R	Leba	9251	9299	1023	1028	99
PL0005R	Diabla Gora	6348	7701	506	614	82
PT0004R	Monte Velho	7326	7414	1017	1030	99
SE0005R	Bredkälen	1424	1443	6	6	99
SE0011R	Vavihill	7096	7246	942	962	98
SE0012R	Aspvreten	9438	10404	1610	1775	91
SE0013R	Esrange	3280	3298	361	363	99
SE0014R	Råö	7814	7855	1095	1100	99
SE0032R	Norra-Kvill	6376	6678	556	582	95
SE0035R	Vindeln	3780	3799	310	311	100
SE0039R	Grimsö	5037	5084	622	628	99
SI0008R	Iskrba	15657	16337	3163	3300	96
SI0031R	Zarodnje	13180	13433	2244	2287	98
SI0032R	Krvavec	21415	23097	5200	5609	93
SI0033R	Kovk	9539	12553	1521	2002	76
SK0002R	Chopok	15219	16428	1907	2059	93
SK0004R	Stará Lesná	13007	13007	1598	1598	100
SK0005R	Liesek	11200	11272	1760	1772	99
SK0006R	Starina	4565	13547	848	2518	34
SK0007R	Topolniky	12450	12689	2269	2312	98

Annex 3

Seasonal variation

Table 3.1: Monthly mean concentrations 2006 ($\mu g/m^3$).

Code	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
AT0002R	Illmitz	38.9	56.7	76.7	85.3	82.9	86.7	94.1	69.3	60.8	45.3	35.3	25.6
AT0005R	Vorhegg	67.8	75.3	86.5	91.9	87.2	100.7	101.8	66.2	67.0	52.3	62.3	55.4
AT0030R	Pillersdorf bei Retz	47.0	60.5	83.2	86.0	86.2	87.6	101.6	67.9	70.6	50.0	37.4	29.0
AT0032R	Sulzberg	73.1	71.0	94.8	93.4	93.6	104.9	123.9	81.5	78.6	64.4	64.0	66.2
AT0034G	Sonnblick	91.2	96.6	103.8	114.4	115.0	116.2	131.4	97.3	96.8	88.3	88.2	89.9
AT0037R	Zillertaler Alpen	86.1	87.0	99.9	105.1	101.6	108.0	120.2	84.7	84.9	78.9	80.6	83.3
AT0038R	Gerlitzen	81.2	87.5	100.5	116.8	117.2	120.0	130.2	97.7	99.1	86.0	84.4	83.7
AT0040R	Masenberg	72.5	79.5	92.8	99.2	98.4	104.6	119.5	81.2	84.5	66.0	61.4	-
AT0041R	Haunsberg	56.2	61.2	87.3	84.3	91.1	94.2	109.9	70.7	65.3	54.2	46.2	42.6
AT0042R	Heidenreichstein	56.3	62.2	82.2	77.8	85.3	81.9	83.3	64.2	66.6	48.8	40.9	33.4
AT0043R	Forsthof	54.1	68.6	89.2	94.9	93.8	94.5	113.2	76.1	77.9	53.0	42.4	41.4
AT0044R	Graz Platte	44.5	61.1	84.4	93.2	91.0	98.0	110.2	76.5	87.9	60.0	45.2	36.1
AT0045R	Dunkelsteinerwald	42.4	55.4	79.3	78.2	77.7	78.6	93.4	63.4	56.2	37.0	33.5	24.5
AT0046R	Gänserndorf	37.3	51.2	75.0	76.7	76.7	78.5	89.1	62.0	60.7	44.4	32.7	22.1
AT0047R	Stixneusiedl	42.1	58.8	79.3	83.1	82.9	79.7	96.2	67.1	64.0	51.6	36.3	26.8
AT0048R	Zoebelboden	72.8	75.8	95.9	97.4	98.9	98.9	112.1	82.3	74.1	66.0	60.7	63.1
BE0001R	Offagne	33.5	48.1	69.8	73.3	75.9	89.3	102.4	58.4	63.5	49.8	47.5	41.2
BE0032R	Eupen	31.3	40.5	60.9	66.9	76.5	77.9	98.3	52.6	61.5	46.0	43.0	37.4
BE0035R	Vezin	18.0	31.5	51.2	59.0	61.3	69.7	82.2	43.5	44.1	35.7	33.5	30.8
BG0053R	Rojen peak	79.5	87.8	86.2	75.4	74.9	68.8	73.6	70.0	31.9	44.0	33.1	45.6
CH0001G	Jungfraujoch	66.6	70.4	74.7	81.7	81.4	87.9	97.3	76.6	74.1	63.2	64.7	64.8
CH0002R	Payerne	29.8	39.3	71.0	71.8	71.1	83.1	95.1	61.4	49.9	31.1	28.3	25.5
CH0003R	Tänikon	28.5	43.4	76.5	73.5	74.6	84.0	100.3	64.8	49.3	34.8	31.6	27.7
CH0004R	Chaumont	75.1	71.7	90.7	97.3	95.0	111.9	129.0	82.4	83.5	69.6	67.6	64.9
CH0005R	Rigi	75.3	64.8	90.6	94.4	94.5	112.8	128.5	84.9	83.6	65.4	66.7	62.8
CY0002R	Ayia Marina	70.1	71.8	75.8	78.6	99.7	97.2	101.5	94.7	88.0	97.8	97.2	80.7
CZ0001R	Svratouch	49.8	96.0	82.1	85.8	87.3	87.5	106.4	63.6	72.8	54.3	38.9	35.4
CZ0003R	Kosetice	55.7	64.7	84.9	84.2	90.2	82.9	92.5	55.1	64.2	52.1	44.1	38.6
DE0001R	Westerland	37.3	51.9	78.3	83.0	94.5	88.7	90.4	79.6	68.3	53.9	56.4	62.3
DE0002R	Langenbrügge	28.8	44.1	67.9	63.2	80.9	76.0	94.2	53.8	61.9	40.0	37.2	34.0
DE0003R	Schauinsland	80.2	73.6	91.9	96.2	98.3	117.7	136.0	84.5	88.6	70.2	58.0	65.8
DE0007R	Neuglobsow	31.5	45.7	67.6	64.7	77.0	68.8	88.0	54.8	58.2	33.7	32.8	36.4
DE0008R	Schmücke	56.8	60.8	74.9	83.1	94.4	98.3	119.4	76.1	104.2	56.4	51.2	48.0
DE0009R	Zingst	43.0	51.6	75.6	73.1	81.5	75.4	82.4	71.7	63.3	41.4	41.8	43.6

Table 3.1, cont.

Code	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
DK0005R	Keldsnor	41.3	45.5	76.0	66.6	77.2	69.1	77.5	71.0	60.1	45.9	40.3	46.6
DK0031R	Ulborg	38.6	43.8	68.1	81.1	92.2	80.4	77.3	59.5	60.1	45.0	54.4	58.0
DK0041R	Lille Valby	38.6	51.7	68.0	73.3	85.0	75.0	75.4	64.6	61.2	40.7	42.1	48.7
EE0009R	Lahemaa	48.8	62.8	78.7	88.3	80.6	69.2	68.0	60.5	52.6	37.8	44.2	51.9
EE0011R	Vilsandy	52.5	68.4	83.1	92.1	92.2	87.6	79.8	74.6	69.7	48.8	51.6	56.5
ES0007R	Víznar	74.7	82.6	89.4	98.1	97.5	101.8	118.8	113.9	96.1	76.5	67.4	67.7
ES0008R	Niembro	55.0	66.0	72.6	85.8	76.8	77.9	67.5	62.3	67.3	58.8	56.4	62.3
ES0009R	Campisabalos	59.0	68.5	77.1	82.8	88.3	97.4	96.8	80.1	70.8	60.8	57.1	57.0
ES0010R	Cabo de Creus	63.2	69.5	83.3	87.9	91.6	99.3	107.3	85.1	82.6	74.9	62.6	56.8
ES0011R	Barcarrola	44.6	62.8	64.8	64.5	79.4	79.0	81.0	88.0	64.8	59.2	46.4	42.6
ES0012R	Zarra	65.4	66.3	87.3	103.5	98.7	105.4	110.1	95.0	60.0	55.1	63.4	58.1
ES0013R	Penausende	52.7	70.5	75.5	83.0	87.3	91.2	89.6	79.3	78.8	48.1	41.6	53.7
ES0014R	Els Torms	47.8	58.6	76.0	89.2	96.5	105.5	110.9	86.7	84.8	67.8	57.2	39.8
ES0015R	Risco Llamo	66.9	77.0	78.9	90.3	97.8	103.6	109.1	100.9	91.8	69.9	62.4	56.8
ES0016R	O Saviñao	44.5	56.5	68.4	72.5	69.6	72.1	67.4	60.1	65.2	52.4	58.8	65.7
FI0009R	Utö	59.5	70.5	77.5	88.6	89.7	84.4	80.3	83.3	74.9	58.5	56.1	59.2
FI0017R	Virolahti II	53.5	58.0	74.2	86.9	83.1	73.5	58.0	61.1	74.9	58.5	56.1	59.2
FI0022R	Oulanka	63.4	68.6	82.0	93.1	76.2	76.4	60.5	50.1	53.9	51.7	49.8	57.4
FI0037R	Ahtari II	-	65.5	77.8	91.0	86.1	74.8	66.9	60.7	52.6	40.3	48.9	56.3
FI0096G	Pallas/Särkijärvi	76.5	81.2	84.8	98.1	82.9	76.1	63.1	59.8	63.3	63.3	59.2	65.0
FR0008R	Donon A	61.9	60.0	79.6	89.7	91.5	107.1	118.7	73.0	81.2	63.8	61.9	57.8
FR0008R	Donon B	63.7	60.6	80.2	91.9	93.0	109.2	121.0	75.7	83.9	65.4	63.4	58.7
FR0008R	Donon C	64.8	61.0	80.8	92.9	94.8	111.1	122.9	77.4	85.9	66.9	64.4	59.7
FR0008R	Donon D	65.5	61.2	80.9	93.1	95.3	111.7	123.7	78.0	86.7	67.4	64.8	60.0
FR0009R	Revin	29.2	43.6	61.4	72.8	67.4	82.4	95.3	53.1	58.9	45.3	45.0	35.3
FR0010R	Morvan	46.4	52.4	77.6	74.5	73.4	87.4	96.9	59.1	64.2	56.6	56.5	48.9
FR0012R	Iraty	76.8	82.2	87.0	94.2	95.1	105.4	114.4	92.5	108.3	80.6	80.1	81.1
FR0013R	Peyrusse Vieille	39.8	57.8	72.0	73.4	72.9	81.0	81.0	63.4	60.9	51.5	41.4	33.5
FR0014R	Montandon	33.5	36.5	66.4	57.6	62.8	71.6	94.9	56.1	51.0	45.0	49.1	46.9
FR0015R	La Tardière	38.2	40.0	72.6	73.7	68.3	86.4	90.3	60.2	58.7	48.7	45.5	35.4
FR0016R	Le Casset	92.0	100.4	109.0	115.6	108.4	119.6	128.0	101.3	94.9	75.6	78.8	81.2
FR0017R	Montfranc	63.8	65.3	88.4	91.6	86.2	104.9	102.5	69.9	74.8	68.9	67.7	65.0

Table 3.1, cont.

Code	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
GB0002R	Eskdalemuir	49.3	54.7	64.9	73.6	72.5	62.4	64.9	46.3	48.3	46.5	59.8	52.5
GB0006R	Lough Navar	38.9	46.3	58.1	64.8	58.2	49.8	43.7	36.7	40.3	39.9	46.1	45.3
GB0013R	Yarner Wood	48.1	62.1	80.1	90.4	65.6	71.4	67.6	55.4	55.0	51.1	58.2	47.9
GB0014R	High Muffles	41.7	58.3	73.0	78.7	91.6	69.0	80.3	47.1	46.9	40.6	45.0	43.5
GB0015R	Strath Vaich Dam	59.3	70.1	84.0	94.6	87.3	74.9	64.6	59.4	63.0	65.8	78.5	-
GB0031R	Aston Hill	53.4	70.4	87.3	86.4	83.0	81.8	92.0	58.5	64.9	59.3	69.4	65.0
GB0032R	Bottesford	35.6	47.8	63.2	63.1	60.4	65.8	71.0	42.9	47.3	43.2	46.1	42.0
GB0033R	Bush	48.8	60.9	65.2	78.4	69.7	61.3	57.0	48.2	49.9	44.3	59.3	55.0
GB0034R	Glazebury	25.5	39.9	51.8	63.1	54.2	53.3	62.1	39.7	37.0	49.3	-	-
GB0035R	Great Dun Fell	53.3	60.3	61.9	74.3	74.9	70.3	80.1	48.9	57.5	55.3	57.4	64.1
GB0036R	Harwell	33.5	48.8	60.3	60.7	68.9	65.5	68.8	48.9	50.4	45.9	51.8	54.6
GB0037R	Ladybower Res.	30.9	46.3	66.0	73.3	68.4	61.9	63.5	26.4	36.0	37.5	38.8	38.6
GB0038R	Lullington Heath	41.3	50.0	63.0	71.4	69.5	78.2	87.5	56.2	63.9	54.9	54.6	46.3
GB0039R	Sibton	41.0	48.5	65.8	68.3	65.4	69.3	77.9	51.9	54.1	43.4	38.4	42.0
GB0043R	Narberth	57.3	68.5	83.3	75.2	77.9	84.9	69.9	50.4	56.1	53.2	63.3	49.7
GB0044R	Somerton	39.3	41.5	69.2	71.5	69.0	70.2	66.8	50.3	52.7	49.7	50.6	49.2
GB0045R	Wicken Fen	-	58.5	74.4	80.4	78.8	83.2	90.7	59.5	59.6	45.5	44.2	47.9
HU0002R	K-puszta	38.1	-	65.6	53.4	-	82.8	82.6	65.8	63.6	51.1	42.0	21.2
IE0031R	Mace Head	64.9	75.0	82.4	94.0	82.3	78.8	65.4	58.2	68.9	69.7	80.3	71.6
IT0001R	Montelibretti	27.3	41.2	54.2	58.7	65.0	69.1	87.6	68.3	58.1	38.6	23.5	20.6
IT0004R	Ispra	13.5	23.5	46.6	55.9	55.3	90.4	81.4	48.0	40.2	14.1	13.9	9.0
LT0015R	Preila	55.5	71.9	96.4	87.1	85.5	81.2	79.3	67.7	63.5	45.7	43.2	42.1
LV0010R	Rucava	42.5	51.1	82.4	72.5	73.3	59.7	58.3	51.5	45.1	34.2	34.1	37.8
MT0001R	Giordan lighthouse	87.1	94.7	104.2	113.3	117.4	112.3	107.4	101.5	100.2	56.5	76.9	57.5
NL0007R	Eibergen	20.2	31.7	48.6	53.1	63.7	65.9	70.9	-	-	31.2	25.2	24.7
NL0009R	Kollumerwaard	25.6	40.4	59.3	62.0	66.2	64.8	61.9	46.9	41.7	33.5	37.3	37.5
NL0010R	Vredepeel	18.8	36.4	45.8	43.7	52.4	53.8	59.1	38.5	33.4	24.7	25.0	24.8
NO0001R	Birkenes	48.6	58.6	77.9	75.6	77.9	70.6	71.5	56.2	57.2	43.6	51.4	53.8
NO0015R	Tustervatn	72.5	77.9	85.0	96.8	87.9	66.8	56.8	52.0	55.5	55.9	66.1	70.8
NO0039R	Kårvatn	64.6	67.0	83.7	89.2	82.9	51.9	41.9	39.0	29.1	28.4	54.5	49.8
NO0042G	Spitsbergen, Zeppelinfjell	79.5	79.7	83.6	97.0	81.7	69.6	53.4	54.1	62.5	68.4	73.5	67.9
NO0043R	Prestebakke	48.4	57.9	76.8	74.7	78.0	70.6	70.0	50.4	52.9	42.7	51.3	52.2
NO0052R	Sandve	49.4	59.5	75.6	84.1	91.5	79.5	73.9	62.6	71.5	54.5	64.6	61.2

Table 3.1, cont.

Code	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
NO0055R	Karasjok	68.2	74.8	84.1	99.1	84.3	67.7	52.3	44.1	52.7	55.7	55.9	64.1
NO0056R	Hurdal	49.8	63.6	75.5	75.8	80.7	73.2	65.8	47.1	44.9	31.4	43.7	41.9
PL0002R	Jarczew	43.0	60.2	80.4	78.8	81.8	71.3	80.8	52.9	49.6	38.6	29.9	26.1
PL0003R	Sniezka	78.1	74.8	87.2	100.4	104.3	94.0	113.4	80.4	81.0	80.2	82.2	82.4
PL0004R	Leba	45.7	62.3	82.5	78.3	89.3	78.6	83.4	62.7	64.9	44.4	43.8	45.0
PL0005R	Diabla Gora	50.3	68.4	94.5	80.7	73.1	75.2	76.7	59.6	54.4	44.1	42.6	40.8
PT0004R	Monte Velho	48.1	56.8	59.5	76.4	74.6	67.0	55.9	69.2	47.1	45.4	50.6	55.8
SE0005R	Bredkälen	44.7	62.3	76.3	75.7	71.2	66.4	54.5	58.0	46.5	44.6	52.2	57.2
SE0011R	Vavihill	45.7	56.6	72.2	70.7	84.5	70.1	82.0	81.0	80.2	40.3	41.2	48.4
SE0012R	Aspvreten	52.3	67.3	80.9	84.7	91.5	79.5	79.0	68.8	60.0	44.3	51.5	54.2
SE0013R	Esrange	64.1	73.6	80.8	93.5	82.5	69.2	59.2	49.6	52.8	50.5	51.4	64.2
SE0014R	Råö	41.2	52.6	70.2	76.4	90.0	82.3	82.1	57.9	66.6	52.0	46.6	28.4
SE0032R	Norra-Kvill	55.1	63.4	78.3	80.2	86.2	79.3	84.0	68.3	65.3	48.2	51.6	57.3
SE0035R	Vindeln	46.5	55.9	74.7	85.4	73.1	67.6	55.9	48.1	40.2	36.7	38.8	21.6
SE0039R	Grimsö	46.4	57.9	69.8	70.7	74.6	68.5	65.0	57.5	43.2	36.4	47.0	53.6
SI0008R	Iskrba	49.5	62.5	80.1	75.8	79.9	69.4	75.9	46.6	43.2	44.2	48.4	39.9
SI0031R	Zarodnje	52.6	67.6	86.9	97.2	95.9	101.0	106.1	73.7	77.7	58.2	48.5	43.6
SI0032R	Krvavec	84.1	87.0	100.2	118.6	118.2	124.9	129.2	94.8	98.2	85.5	80.1	81.1
SI0033R	Kovk	52.0	68.2	85.1	94.2	92.9	75.0	106.3	68.8	85.5	66.9	46.3	41.4
SK0002R	Chopok	84.6	-	103.5	114.3	111.1	108.6	115.8	93.9	47.6	-	78.4	81.6
SK0004R	Stará Lesná	64.7	75.4	95.9	89.3	92.1	83.5	90.3	65.8	68.6	57.7	31.1	35.7
SK0005R	Liesek	55.3	72.5	93.6	79.0	83.0	75.2	84.3	63.1	55.1	55.8	39.6	42.3
SK0006R	Starina	60.6	73.4	92.2	86.6	85.6	74.4	-	50.8	43.7	42.5	40.1	43.7
SK0007R	Topolniky	38.9	55.3	74.6	81.6	77.1	80.0	86.5	58.7	63.9	51.3	31.3	23.8

Table 3.2: Monthly data capture 2006 ($\mu g/m^3$).

Code	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
AT0002R	Illmitz	94	95	96	96	96	91	94	95	93	95	95	95
AT0005R	Vorhegg	94	95	94	94	94	95	85	92	95	95	95	95
AT0030R	Pillersdorf bei Retz	94	95	96	95	95	96	95	94	96	96	95	94
AT0032R	Sulzberg	93	96	88	96	96	96	96	96	95	96	95	95
AT0034G	Sonnblick	95	96	96	96	96	95	96	95	90	81	74	96
AT0037R	Zillertaler Alpen	94	96	94	96	97	95	97	96	96	96	97	96
AT0038R	Gerlitzen	95	96	95	96	96	93	96	95	96	94	85	90
AT0040R	Masenberg	94	96	94	95	94	94	89	94	96	94	94	0
AT0041R	Haunsberg	94	95	95	95	96	95	96	96	95	96	95	96
AT0042R	Heidenreichstein	77	92	96	96	96	95	96	96	95	96	95	93
AT0043R	Forsthof	89	96	96	95	95	96	96	96	96	96	96	96
AT0044R	Graz Platte	93	96	95	92	94	96	90	96	96	95	96	96
AT0045R	Dunkelsteinerwald	94	96	95	96	96	97	96	96	95	95	96	95
AT0046R	Gänserndorf	95	96	95	96	95	95	96	96	96	96	85	96
AT0047R	Stixneusiedl	95	96	95	96	95	96	96	96	95	96	96	96
AT0048R	Zoebelboden	89	93	95	94	94	91	94	95	95	94	93	95
BE0001R	Offagne	96	90	91	68	78	95	95	92	93	84	68	90
BE0032R	Eupen	92	94	93	73	94	93	93	91	95	91	64	74
BE0035R	Vezin	92	91	91	79	94	94	95	91	95	96	85	96
BG0053R	Rojen peak	98	100	88	100	100	100	100	86	23	24	9	85
CH0001G	Jungfraujoch	94	97	97	97	97	97	96	98	98	96	98	97
CH0002R	Payerne	96	95	95	95	95	95	94	91	96	95	95	81
CH0003R	Tänikon	95	95	95	95	95	94	95	90	95	95	95	96
CH0004R	Chaumont	95	95	95	95	95	95	95	95	96	95	95	96
CH0005R	Rigi	95	95	95	96	95	95	95	95	95	95	95	96
CY0002R	Ayia Marina	99	100	100	100	100	100	97	94	100	99	98	87
CZ0001R	Svratouch	78	7	44	97	100	100	99	98	100	100	100	100
CZ0003R	Kosetice	100	99	97	85	95	95	100	100	100	99	100	99

Table 3.2, cont.

Code	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
DE0001R	Westerland	95	96	95	96	96	96	96	96	96	94	96	96
DE0002R	Langenbrügge	96	96	96	95	96	96	96	95	96	96	96	95
DE0003R	Schauinsland	96	96	96	96	96	96	93	96	96	96	96	96
DE0007R	Neuglobsow	92	91	92	91	92	96	95	96	96	96	96	98
DE0008R	Schmücke	95	96	95	96	96	95	96	94	87	95	94	95
DE0009R	Zingst	96	94	96	96	96	96	96	95	96	95	95	96
DK0005R	Keldsnor	100	100	98	82	99	100	100	100	100	100	100	100
DK0031R	Ulborg	97	100	91	97	93	100	90	100	95	100	99	97
DK0041R	Lille Valby	100	98	100	100	100	100	92	78	75	97	100	46
EE0009R	Lahemaa	68	100	100	100	99	100	99	98	100	97	100	100
EE0011R	Vilsandy	100	100	100	100	100	100	100	100	100	100	100	100
ES0007R	Víznar	100	99	99	97	99	90	92	99	99	99	99	99
ES0008R	Niembro	95	100	99	100	99	99	99	99	98	100	99	97
ES0009R	Campisabalos	97	98	99	97	90	90	97	100	94	96	90	99
ES0010R	Cabo de Creus	96	94	99	97	99	99	100	90	86	96	99	99
ES0011R	Barcarrola	99	99	100	95	95	98	98	100	99	98	95	99
ES0012R	Zarra	96	100	91	100	98	94	96	99	96	97	98	99
ES0013R	Penausende	99	99	99	100	99	97	95	99	99	91	83	98
ES0014R	Els Torms	100	93	100	100	99	100	100	95	99	99	98	99
ES0015R	Risco Llamo	95	98	98	100	100	81	90	91	61	34	33	42
ES0016R	O Saviñao	90	100	97	98	97	98	95	99	99	97	95	99
FI0009R	Utö	100	100	98	100	100	100	100	99	100	100	99	100
FI0017R	Virolahti II	94	100	99	100	96	100	99	99	100	100	99	100
FI0022R	Oulanka	95	98	100	100	90	100	100	100	100	99	100	100
FI0037R	Ahtari II	0	79	95	100	100	86	100	100	100	100	99	100
FI0096G	Pallas/Särkijärvi	100	94	100	100	100	99	100	99	100	100	99	100

Table 3.2, cont.

Code	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
FR0008R	Donon A	32	99	98	96	98	98	98	98	98	96	99	98
FR0008R	Donon B	31	99	98	95	96	98	98	98	98	97	99	98
FR0008R	Donon C	32	100	100	97	100	100	100	100	99	98	100	100
FR0008R	Donon D	32	100	100	97	100	99	100	100	100	98	100	100
FR0009R	Revin	100	100	93	99	99	99	95	96	72	96	96	92
FR0010R	Morvan	100	100	100	97	100	99	97	100	98	100	100	100
FR0012R	Iraty	95	90	98	99	99	98	94	95	82	99	97	99
FR0013R	Peyrusse Vieille	97	100	88	99	100	100	97	100	84	100	100	100
FR0014R	Montandon	98	100	100	99	100	100	100	97	100	94	100	100
FR0015R	La Tardière	71	25	71	99	100	100	92	100	100	100	99	100
FR0016R	Le Casset	98	99	99	75	94	98	99	99	96	98	98	99
FR0017R	Montfranc	99	99	100	97	99	71	90	99	93	90	99	99
GB0002R	Eskdalemuir	99	95	100	100	100	100	100	94	100	100	100	99
GB0006R	Lough Navar	99	99	98	97	100	97	100	100	97	100	100	100
GB0013R	Yarner Wood	100	100	99	96	99	99	90	100	99	80	97	98
GB0014R	High Muffles	99	95	100	100	37	83	99	82	100	100	91	90
GB0015R	Strath Vaich Dam	100	93	100	100	100	82	99	97	100	100	34	0
GB0031R	Aston Hill	99	100	49	88	99	99	97	100	99	85	99	97
GB0032R	Bottesford	100	100	100	100	100	99	99	100	100	99	99	91
GB0033R	Bush	99	99	90	100	99	96	97	99	99	99	100	97
GB0034R	Glazebury	99	96	100	100	99	100	100	94	98	4	0	0
GB0035R	Great Dun Fell	96	99	100	100	100	100	99	97	99	99	100	99
GB0036R	Harwell	95	100	95	95	69	78	94	100	100	99	100	99
GB0037R	Ladybower Res.	78	99	95	100	99	100	100	93	99	78	99	100
GB0038R	Lullington Heath	99	98	4	88	99	100	99	100	99	96	99	91
GB0039R	Sibton	100	100	99	100	99	100	100	97	99	89	33	88
GB0043R	Narberth	93	95	88	92	94	95	71	99	99	97	96	80
GB0044R	Somerton	97	40	98	99	99	99	71	99	99	100	99	100
GB0045R	Wicken Fen	0	90	96	100	98	97	98	99	76	85	99	100

Table 3.2, cont.

Code	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HU0002R	K-puszta	55	0	100	65	0	48	100	91	42	98	100	100
IE0031R	Mace Head	100	100	100	100	100	100	100	97	99	100	100	96
IT0001R	Montelibretti	100	99	100	100	100	100	92	97	100	100	97	100
IT0004R	Ispra	93	83	95	89	91	96	87	100	83	100	100	100
LT0015R	Preila	88	100	82	98	93	100	93	100	93	92	96	100
LV0010R	Rucava	100	56	16	82	100	99	97	75	99	99	98	100
MT0001R	Giordan lighthouse	81	86	92	99	88	99	88	70	98	85	66	9
NL0007R	Eibergen	98	98	100	89	99	100	60	0	0	35	96	69
NL0009R	Kollumerwaard	100	100	99	100	100	98	99	100	100	93	99	100
NL0010R	Vredepeel	98	97	87	100	99	100	97	81	85	74	94	100
NO0001R	Birkenes	94	97	99	99	99	100	99	98	98	99	100	99
NO0015R	Tustervatn	99	100	100	99	100	99	100	100	100	99	99	99
NO0039R	Kårvatn	100	100	100	100	98	99	100	100	100	99	100	99
NO0042G	Spitsbergen, Zeppelinfjell	99	99	98	99	100	99	100	99	100	99	99	81
NO0043R	Prestebakke	99	100	100	100	100	100	100	100	100	100	98	99
NO0052R	Sandve	100	100	100	100	100	100	100	99	100	88	59	100
NO0055R	Karasjok	99	100	100	100	100	99	99	99	100	100	100	99
NO0056R	Hurdal	100	99	100	100	100	100	100	99	100	100	100	100
PL0002R	Jarczew	53	99	100	100	100	100	100	98	100	100	88	99
PL0003R	Sniezka	100	100	100	100	100	100	100	100	100	100	100	100
PL0004R	Leba	100	100	100	100	99	98	100	100	99	100	100	100
PL0005R	Diabla Gora	100	100	100	100	48	100	100	100	100	97	100	100
PT0004R	Monte Velho	98	95	94	99	94	99	97	100	100	99	97	80
SE0005R	Bredkälen	100	100	100	100	100	99	97	100	100	100	100	100
SE0011R	Vavihill	100	100	100	93	99	99	97	100	99	100	100	100
SE0012R	Aspvreten	100	100	90	83	100	93	80	98	100	99	90	96
SE0013R	Esrange	99	99	100	100	100	99	100	100	100	99	100	100

Table 3.2, cont.

Code	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
SE0014R	Råö	100	99	100	100	99	100	100	100	99	100	100	100
SE0032R	Norra-Kvill	100	99	100	100	87	100	99	100	100	99	99	61
SE0035R	Vindeln	100	100	99	99	99	100	100	100	100	97	98	82
SE0039R	Grimsö	100	99	100	100	99	100	98	100	100	99	99	100
SI0008R	Iskrba	96	95	94	96	96	95	96	96	96	96	96	96
SI0031R	Zarodnje	96	95	92	95	95	94	95	96	95	95	95	96
SI0032R	Krvavec	96	95	95	96	95	90	96	85	94	93	95	94
SI0033R	Kovk	86	95	91	84	79	72	81	95	95	90	95	96
SK0002R	Chopok	81	0	56	95	95	95	86	98	40	0	100	99
SK0004R	Stará Lesná	96	96	95	96	96	96	96	95	92	93	63	57
SK0005R	Liesek	70	98	100	100	99	99	100	100	100	91	100	99
SK0006R	Starina	100	99	86	96	79	18	0	48	100	97	84	97
SK0007R	Topolniky	100	97	94	100	100	95	98	100	100	100	97	100

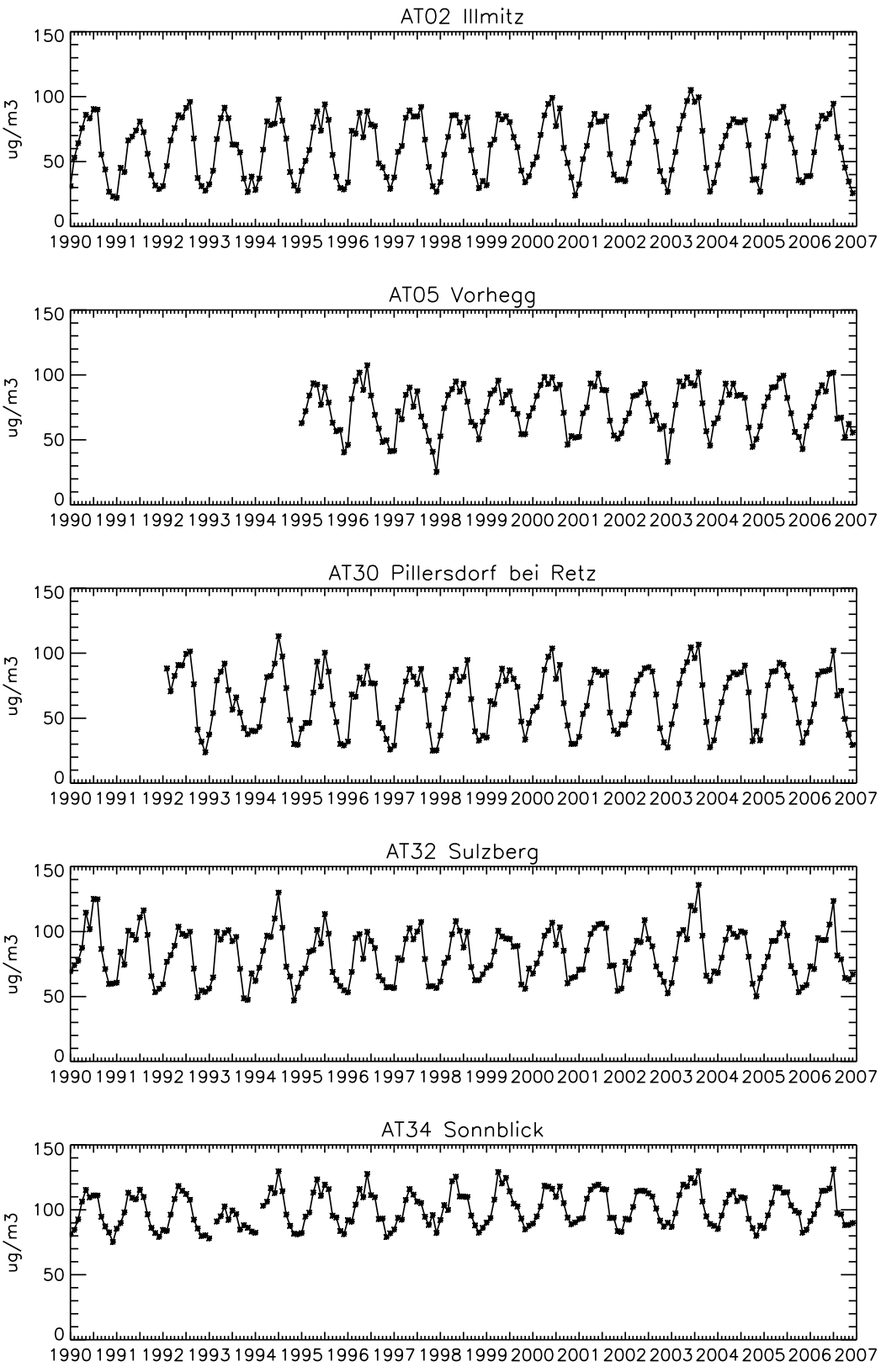
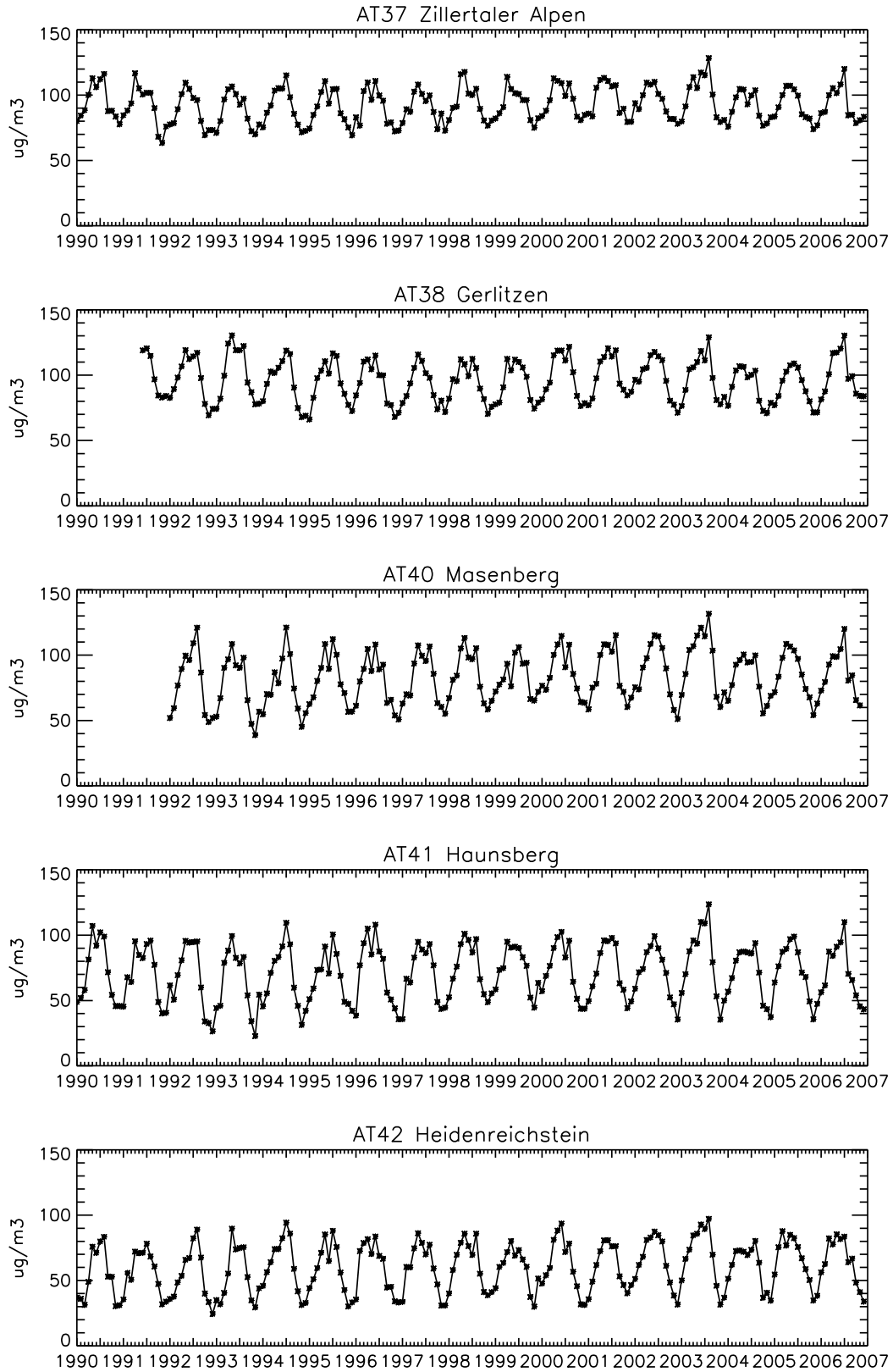


Figure 3.1: Seasonal variation, 1990–2006.



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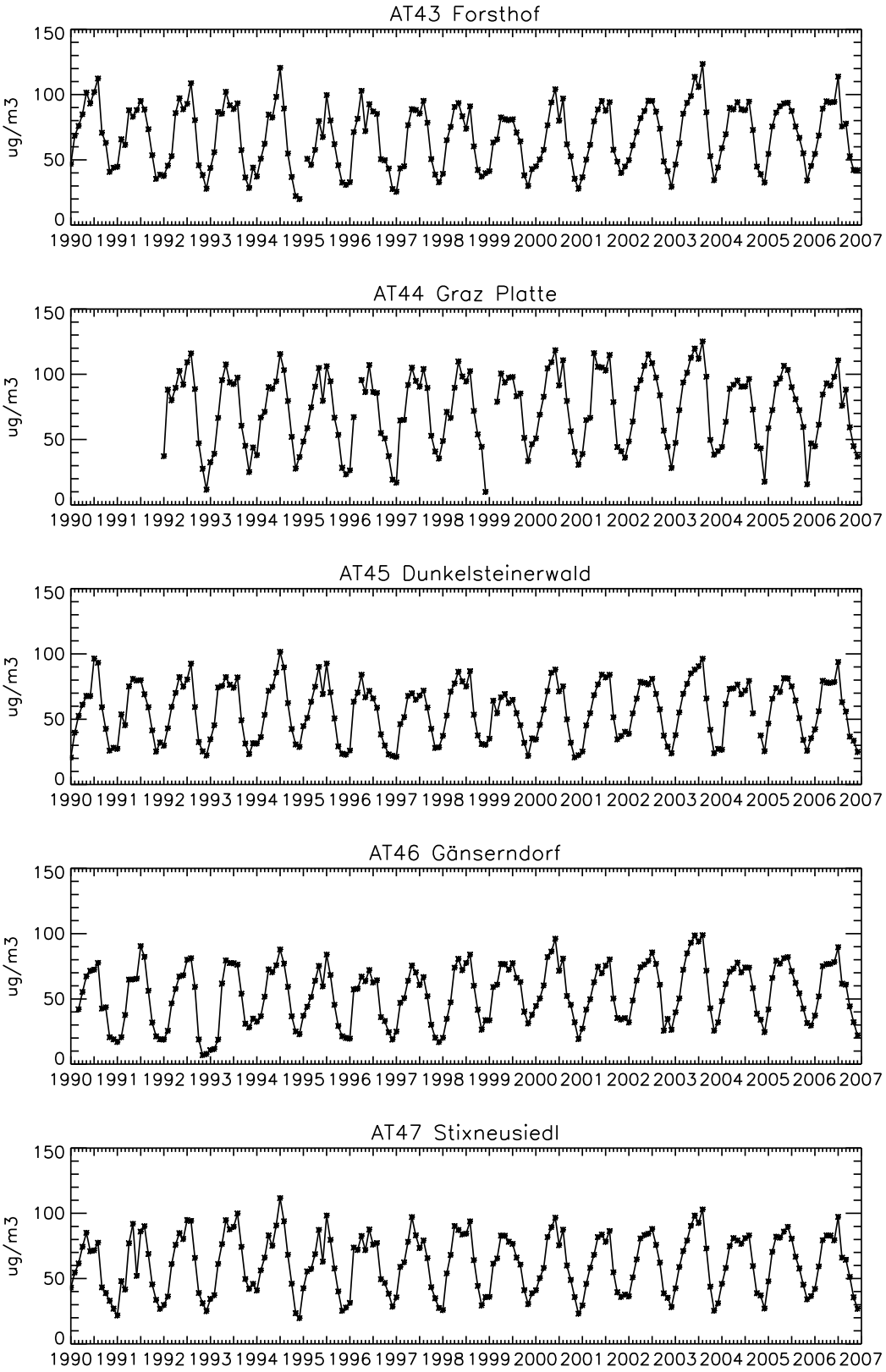

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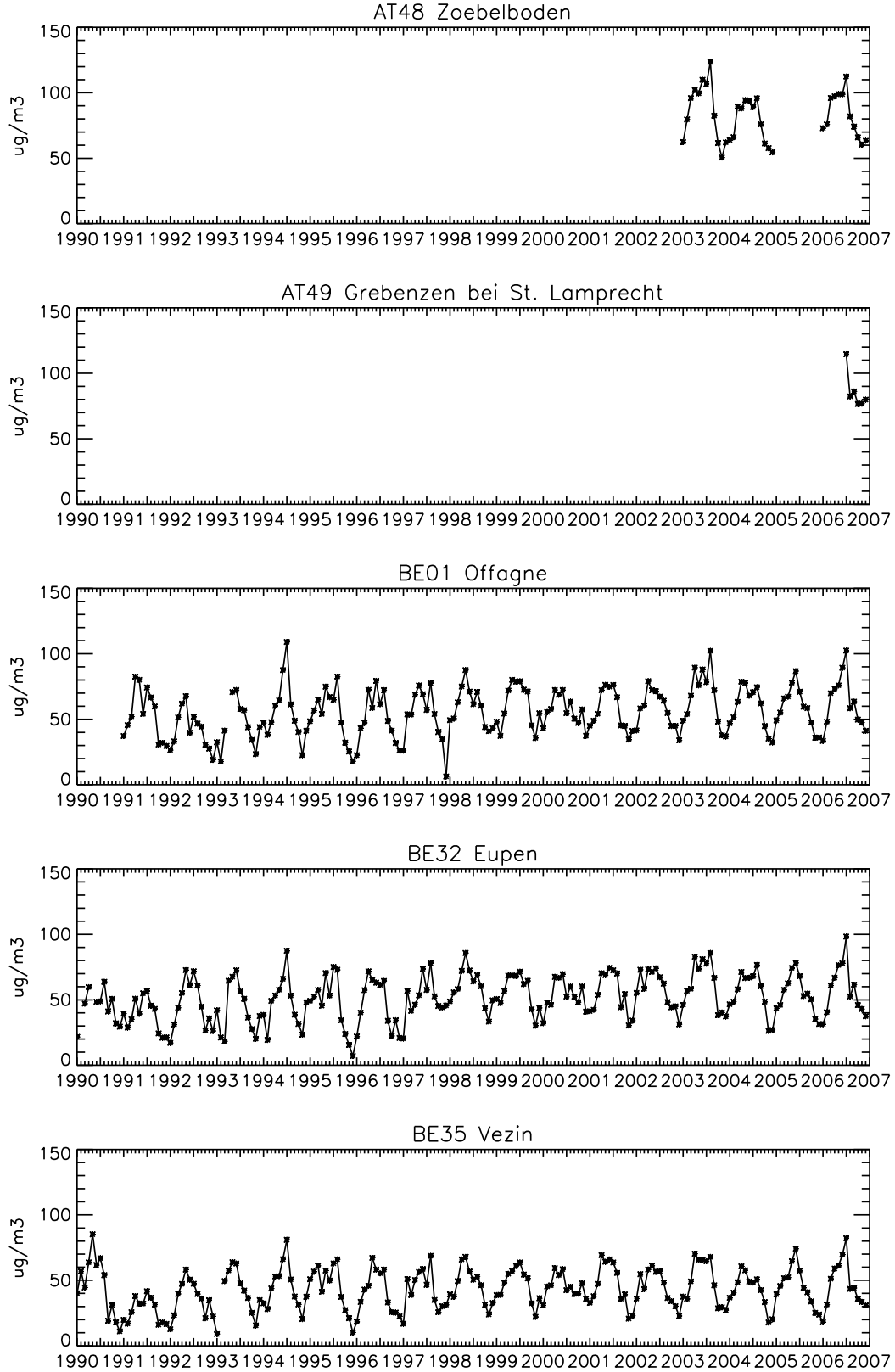

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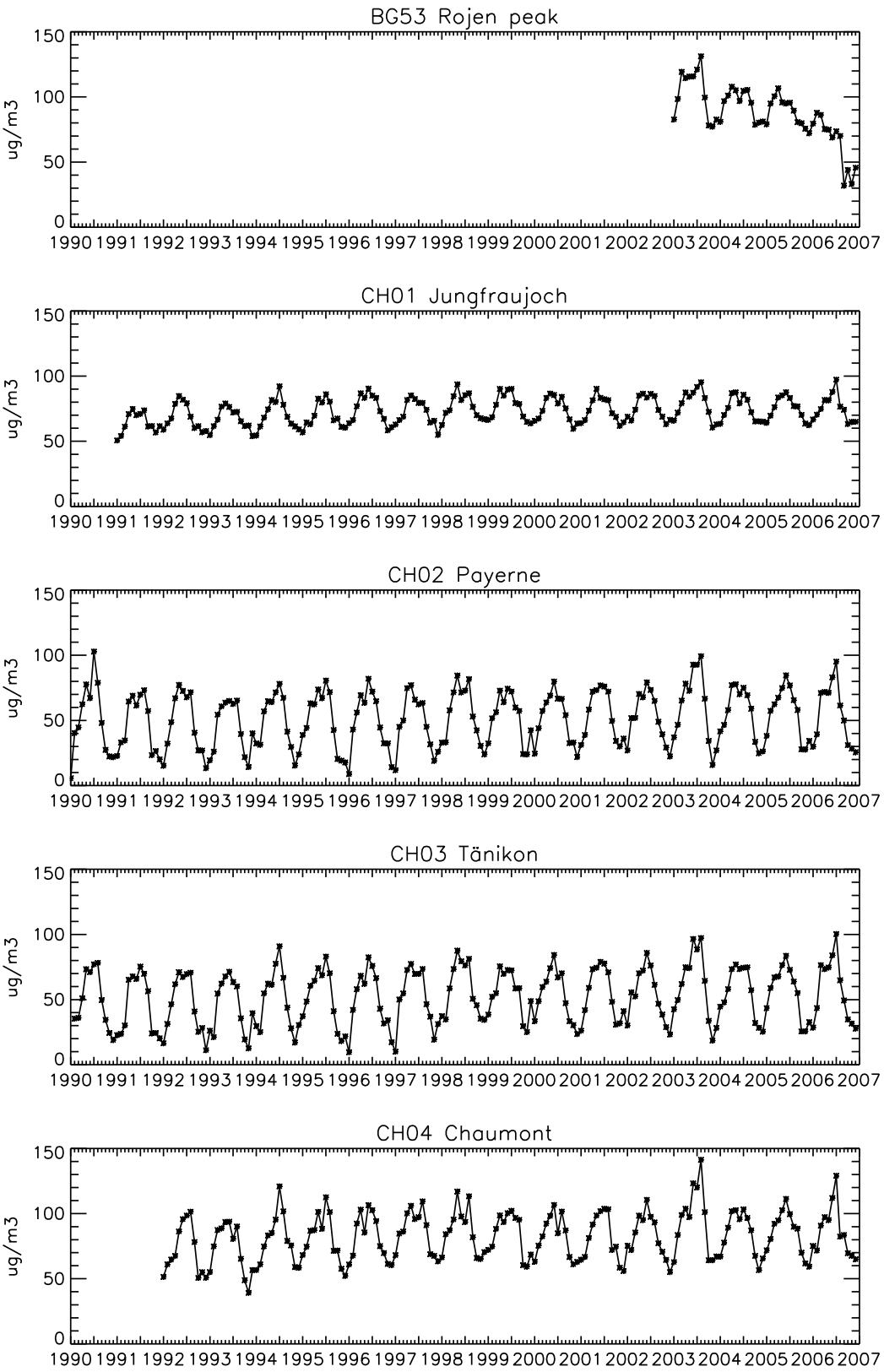

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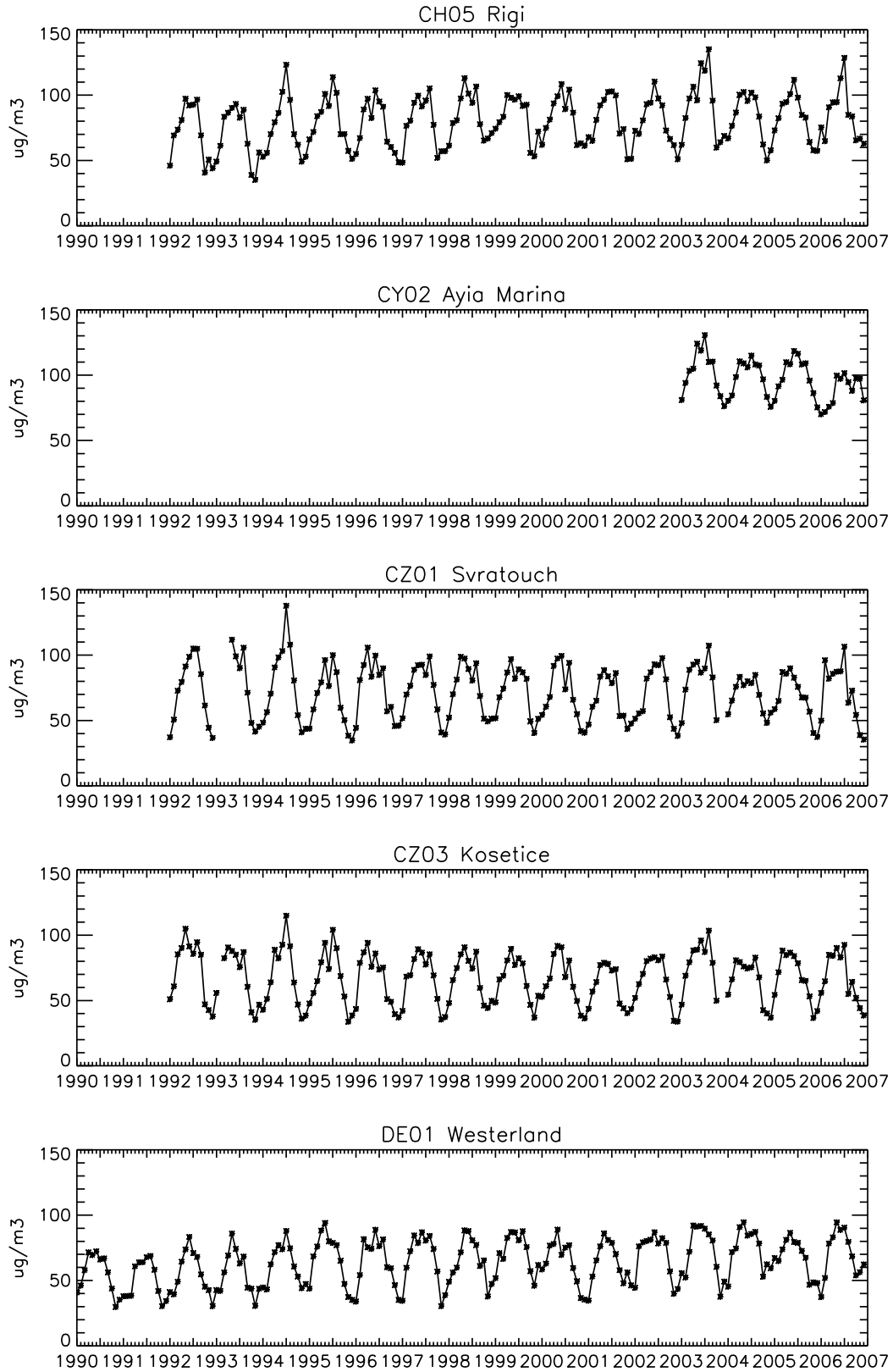

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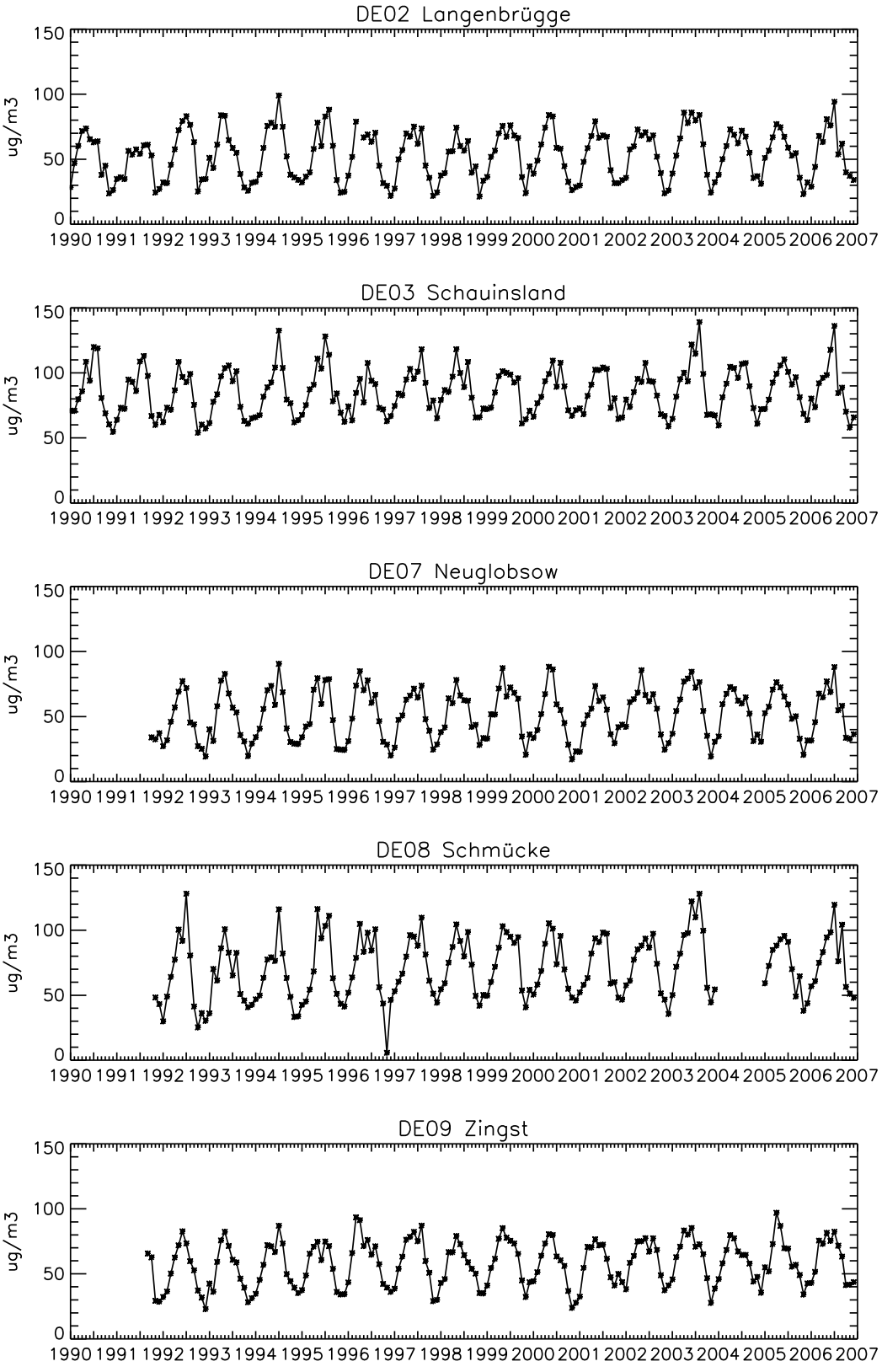

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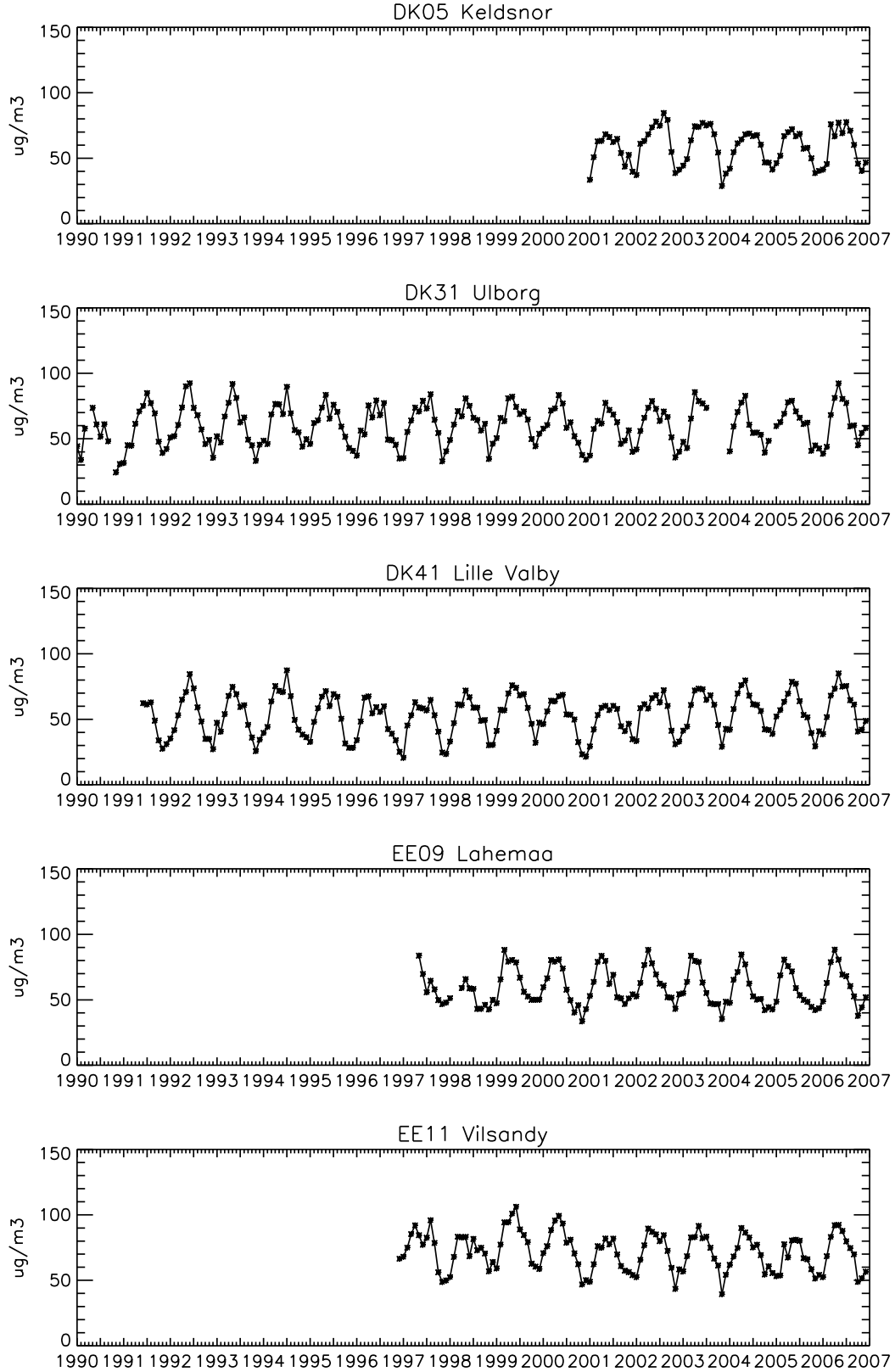

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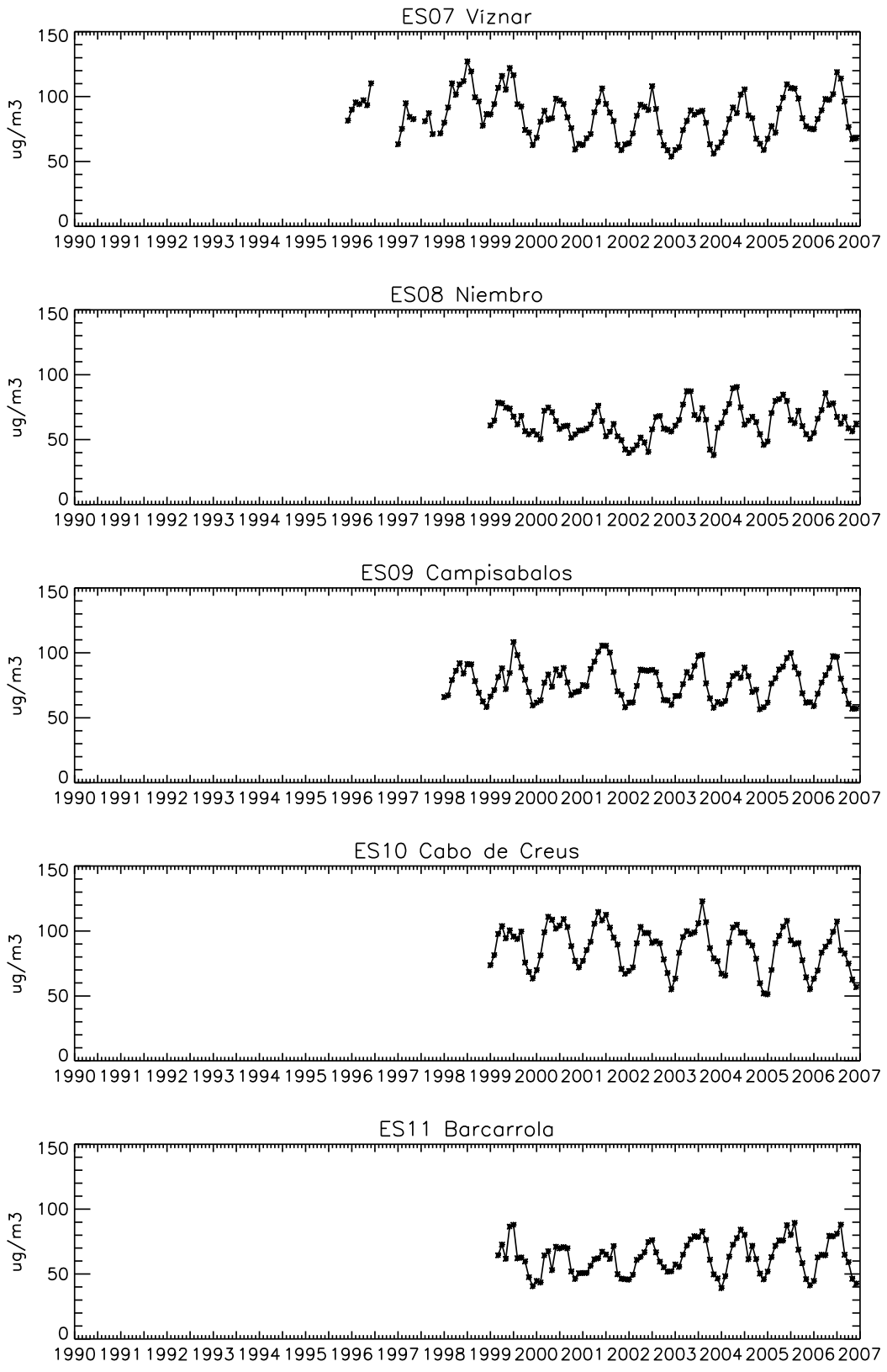

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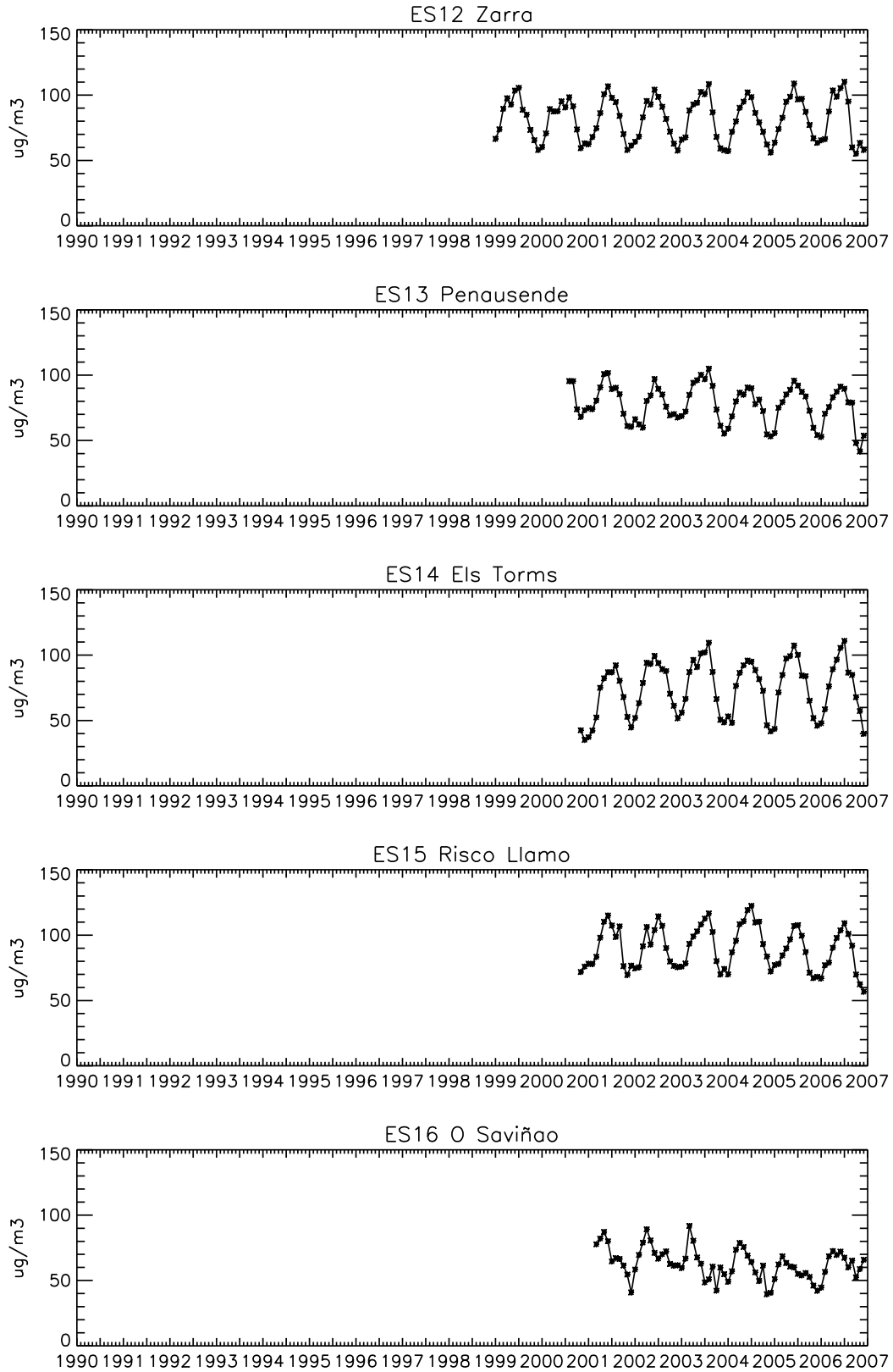

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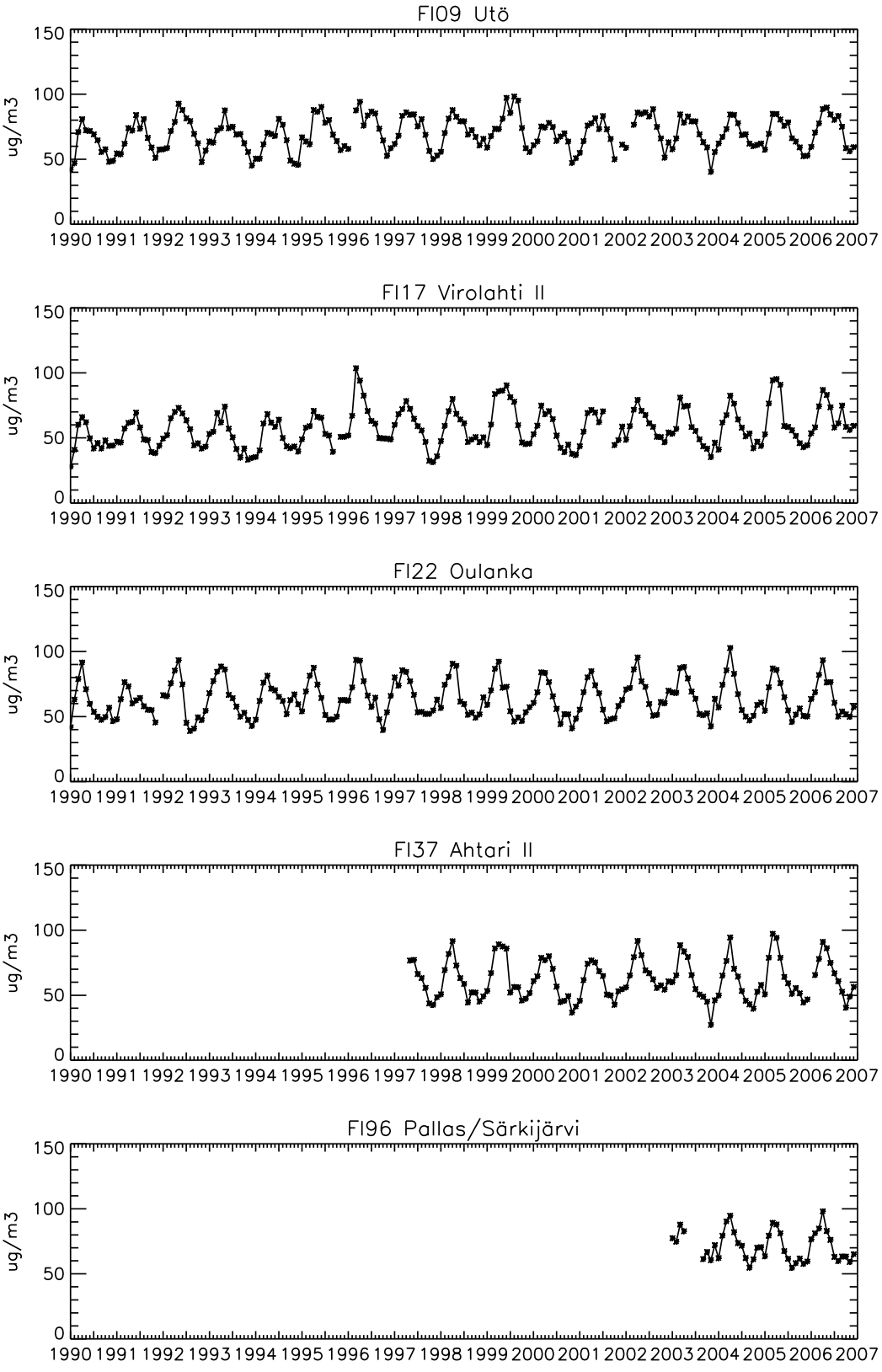

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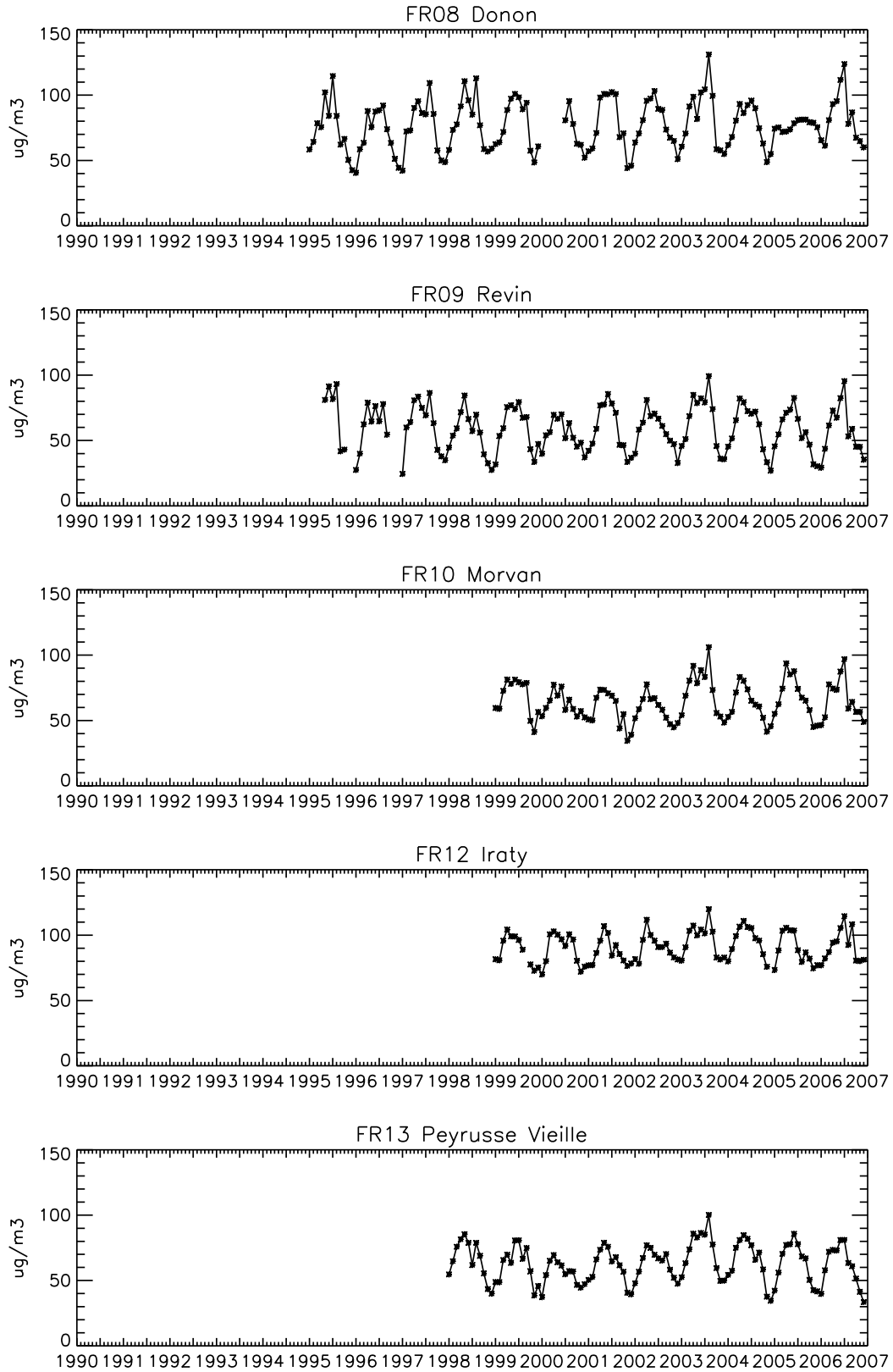

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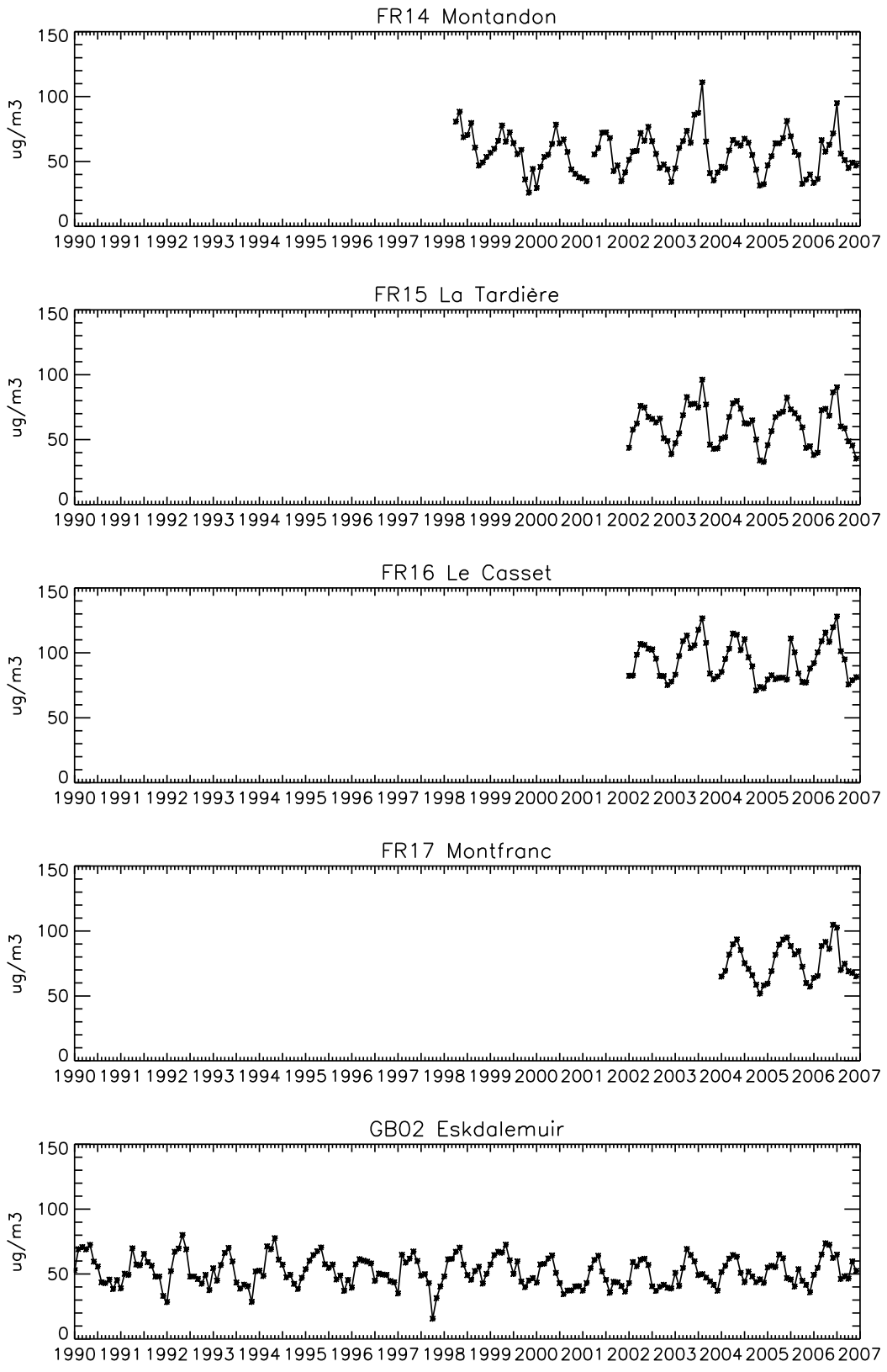

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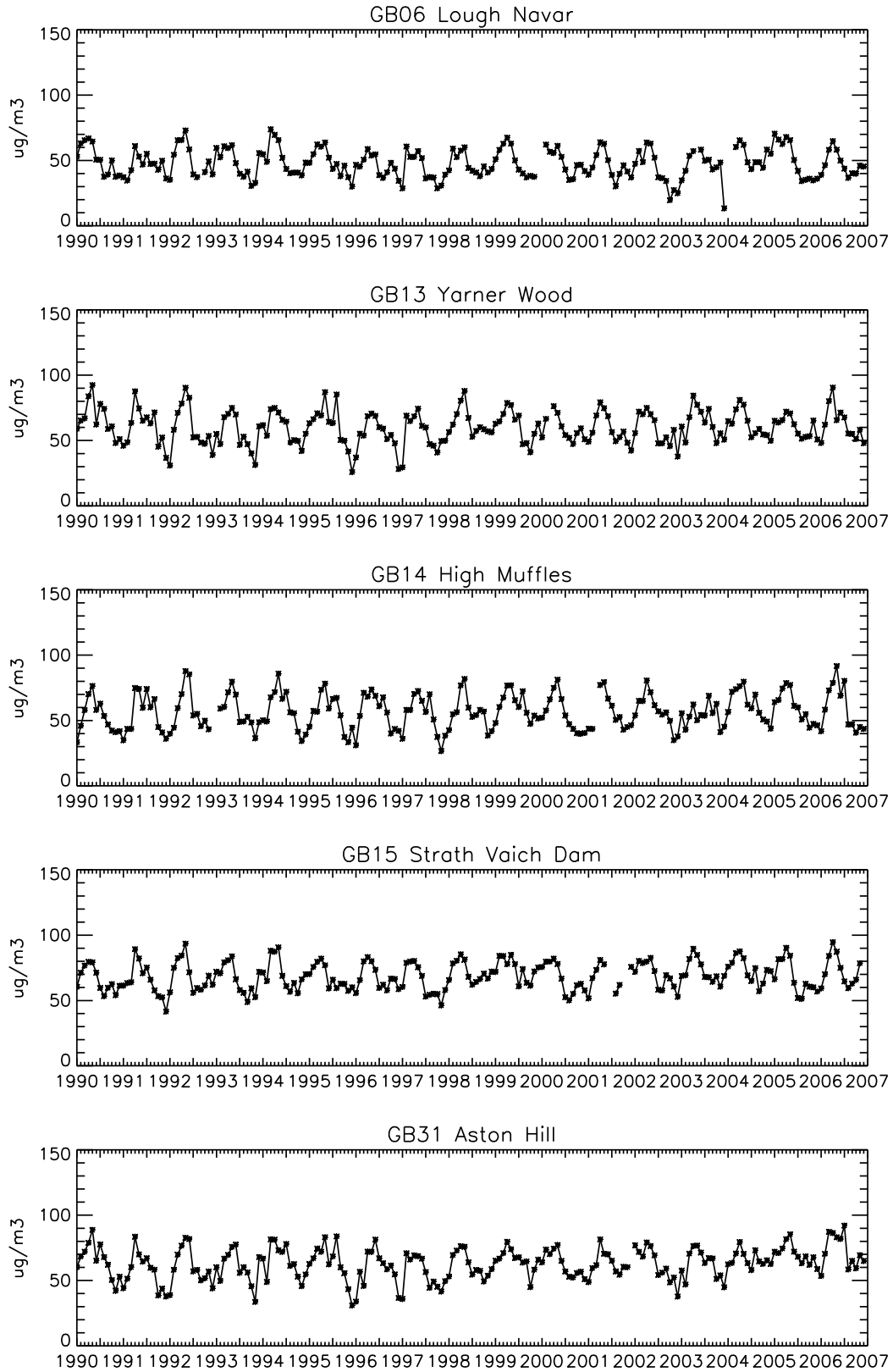

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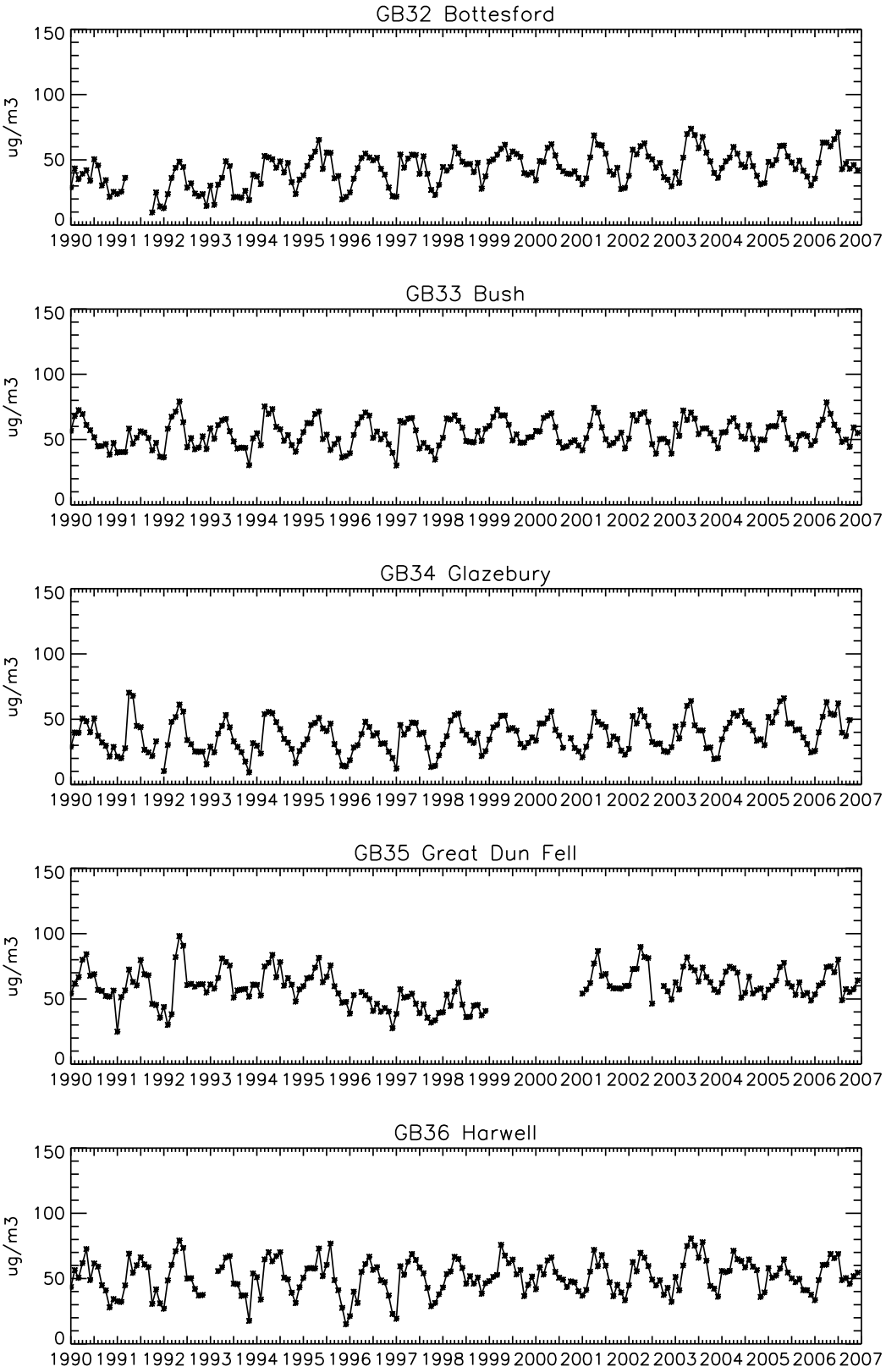

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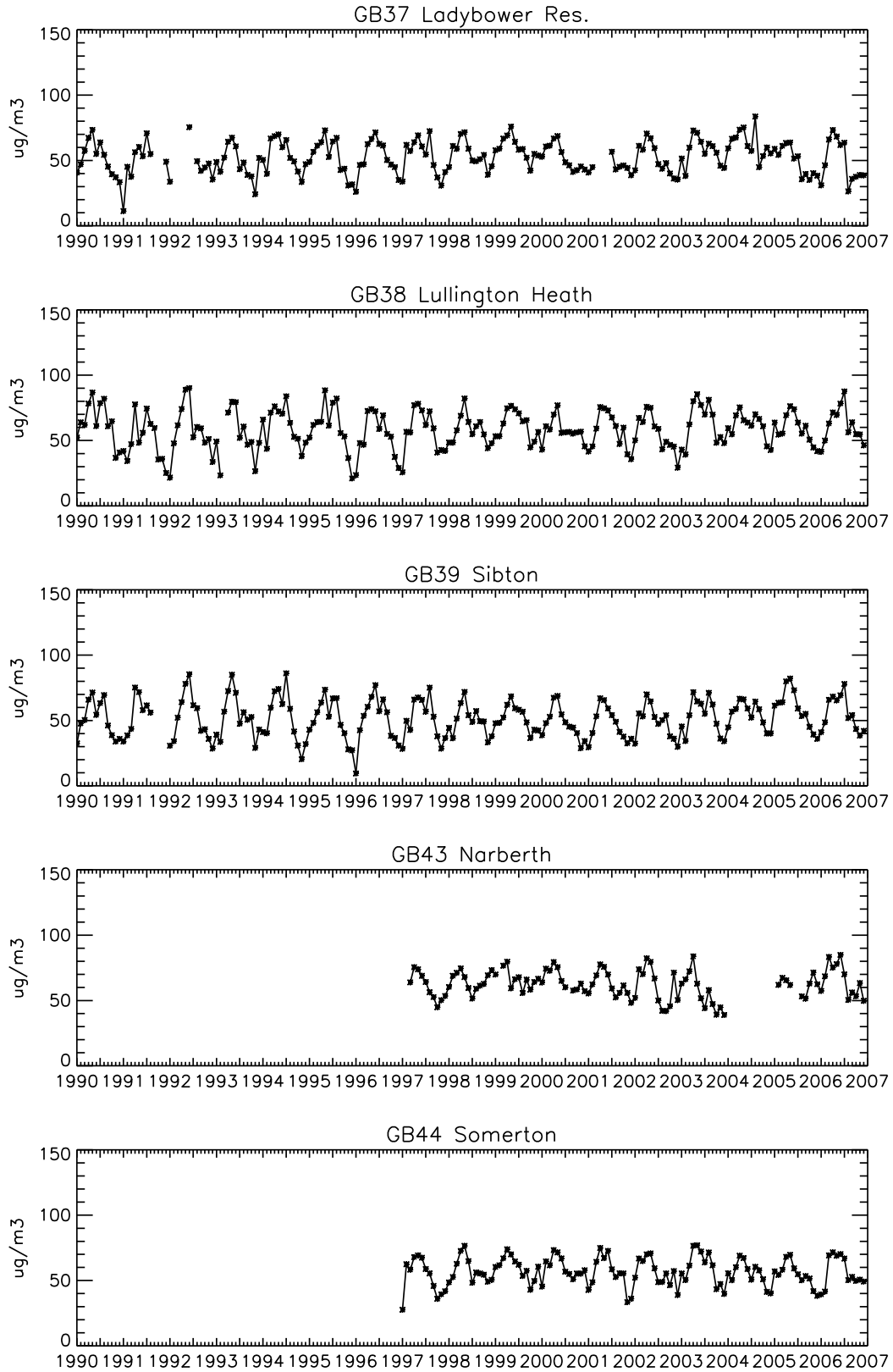

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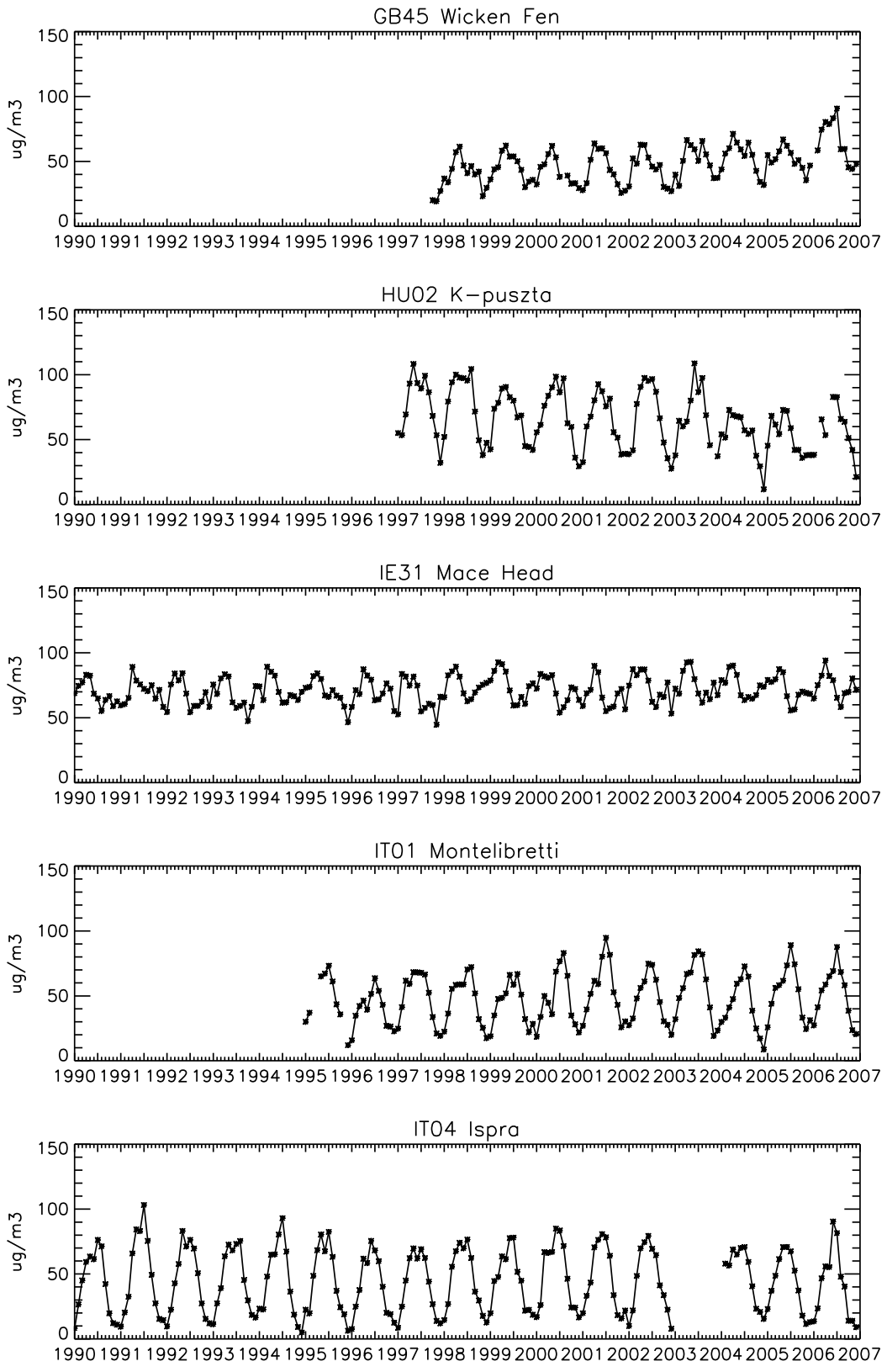

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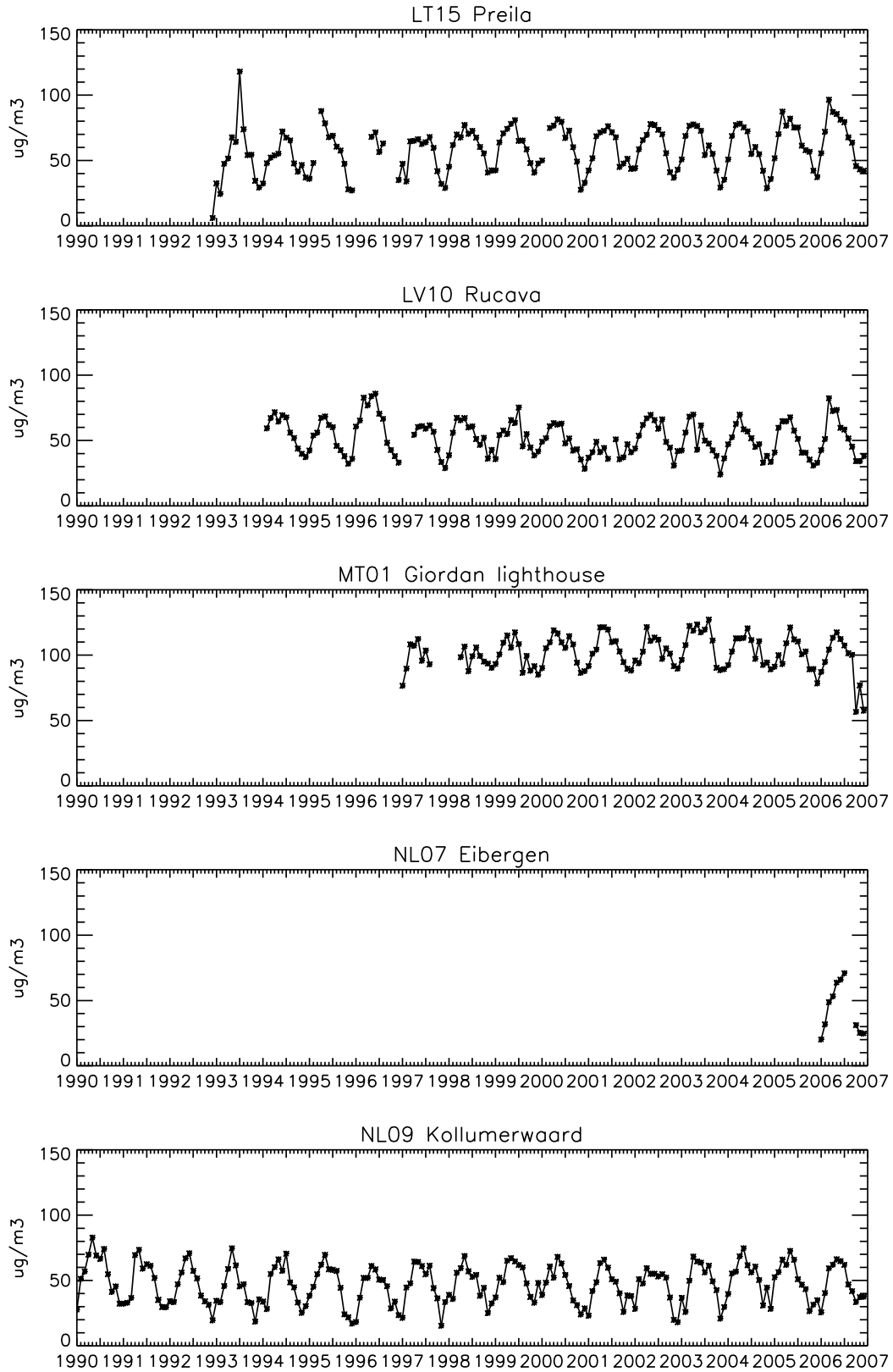

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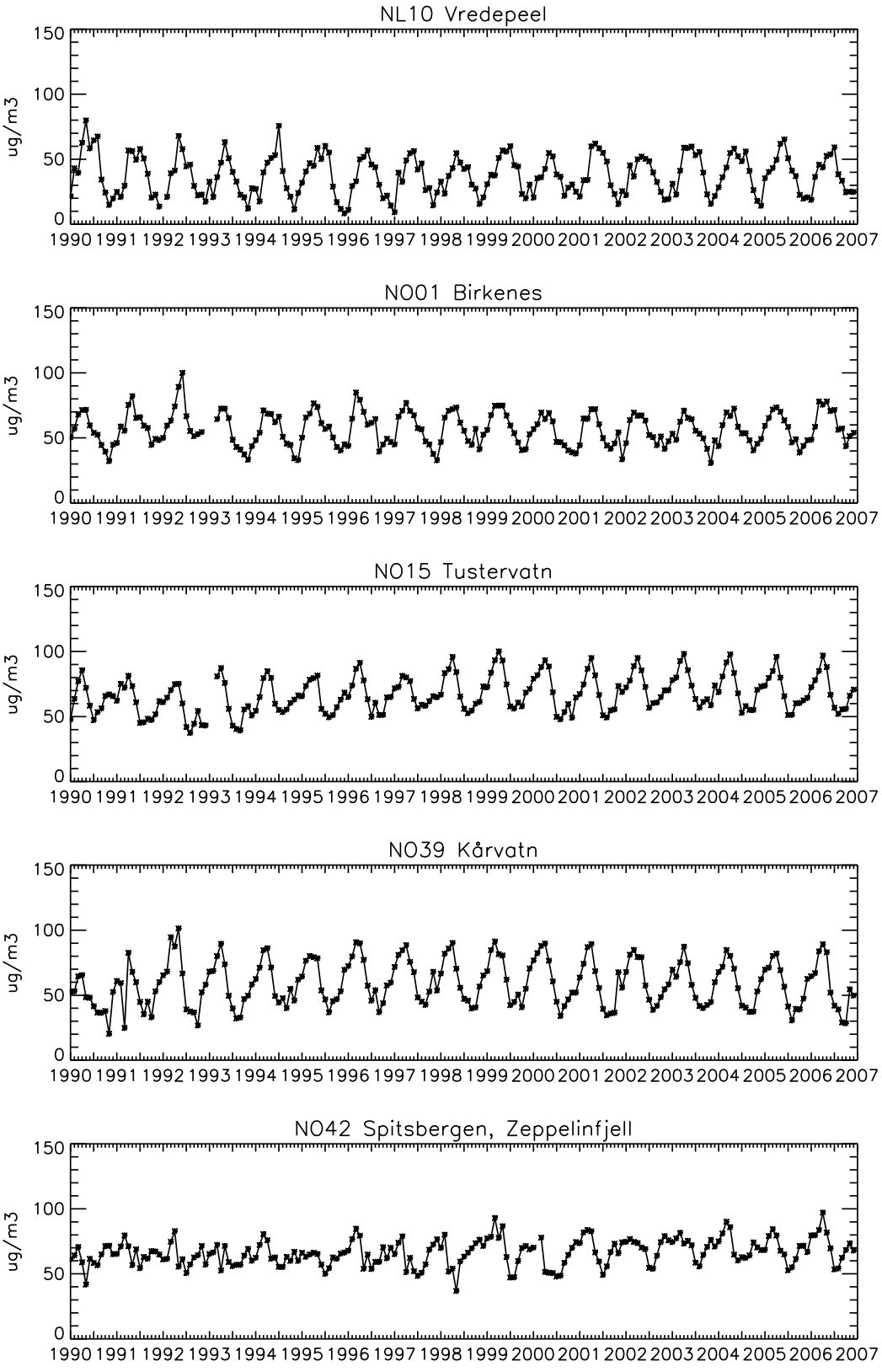

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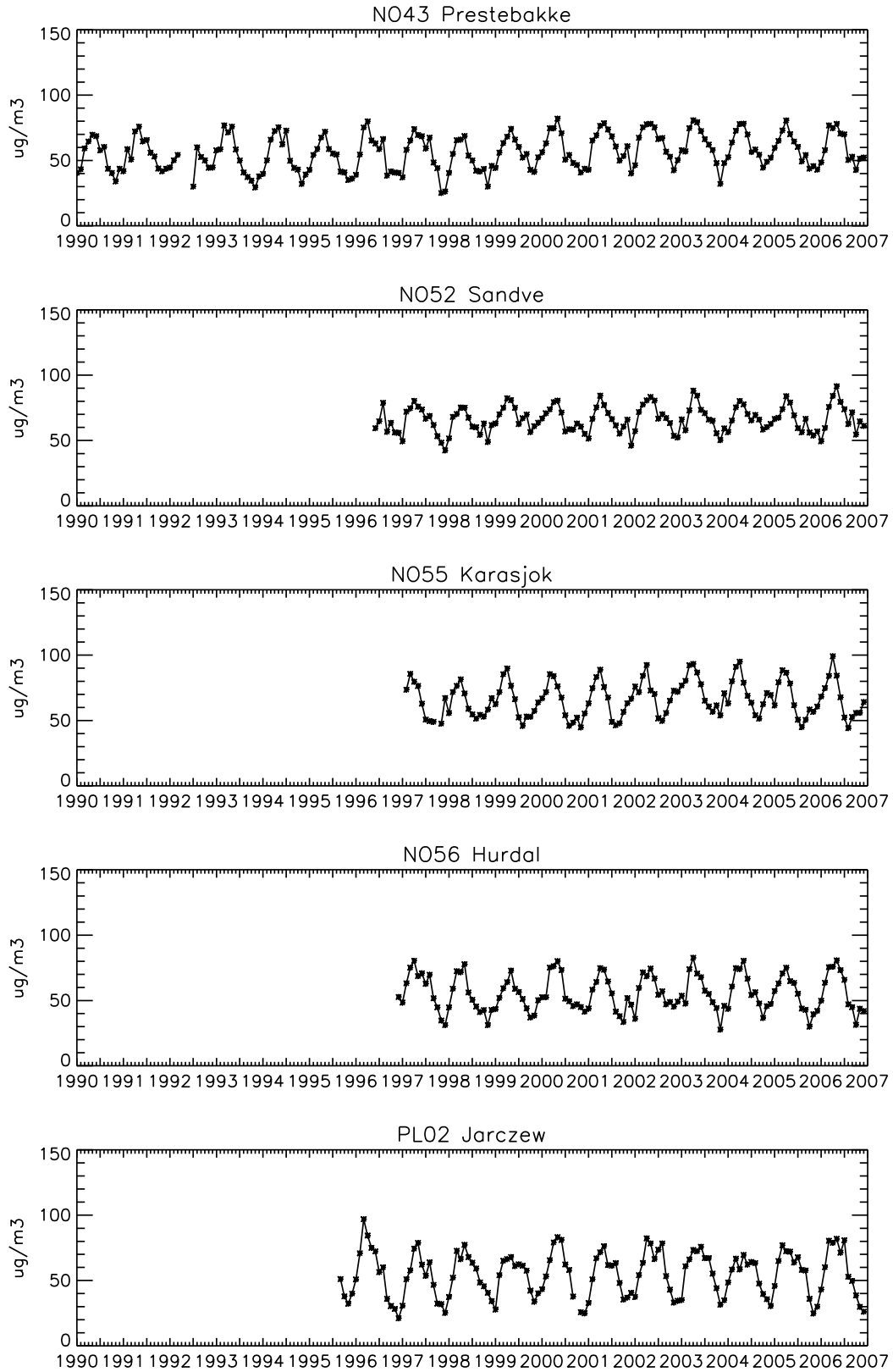

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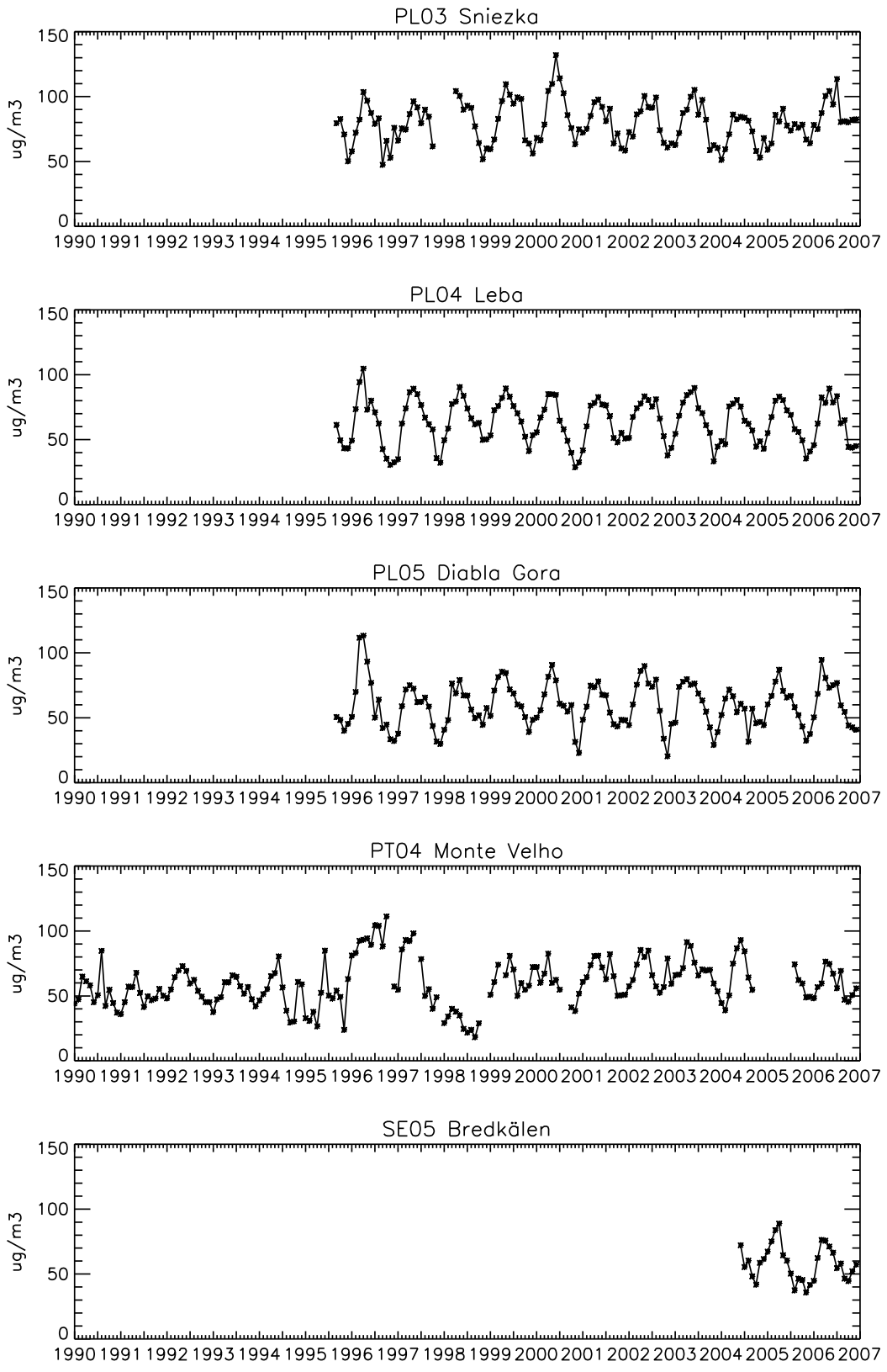

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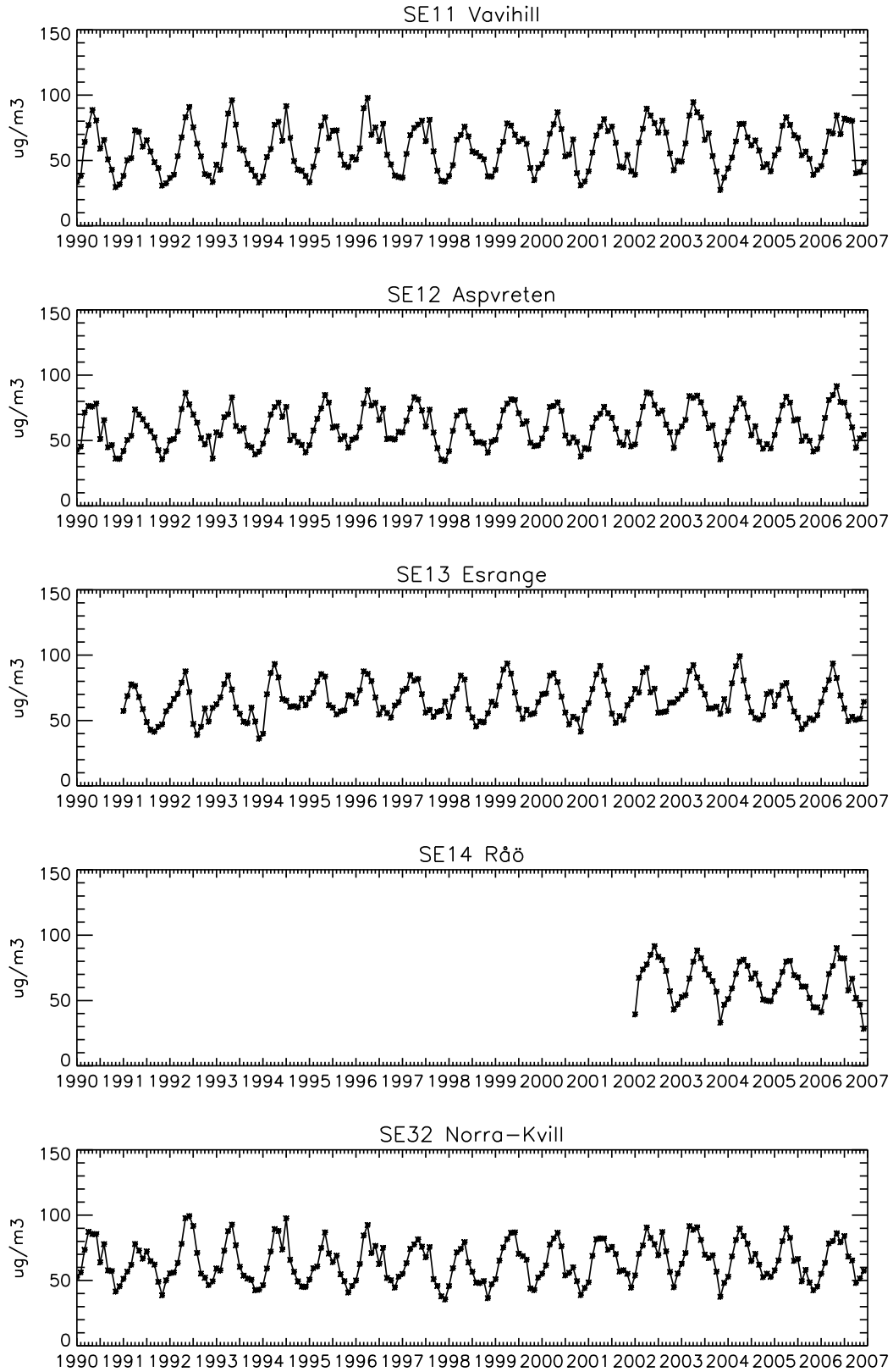

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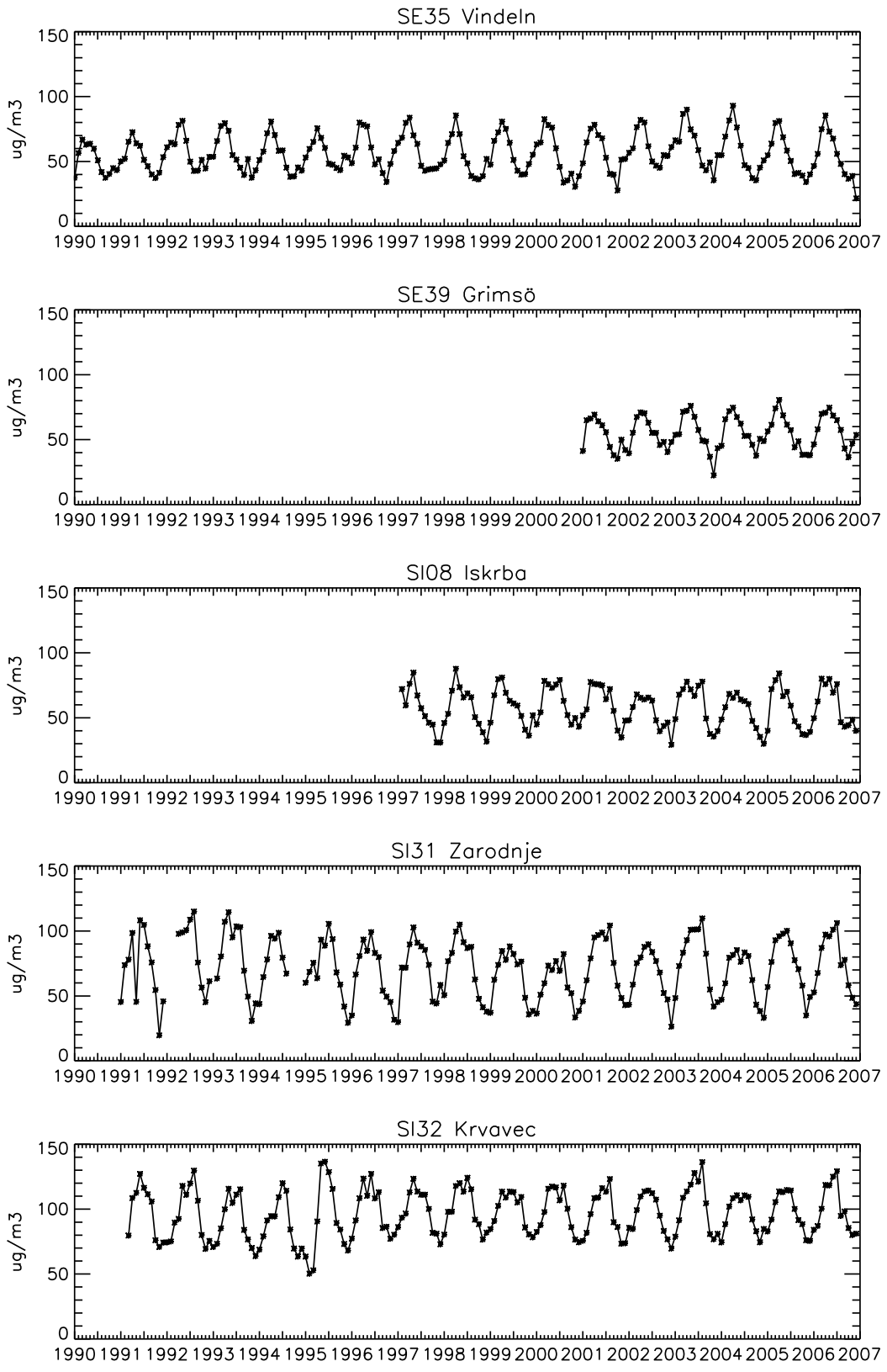

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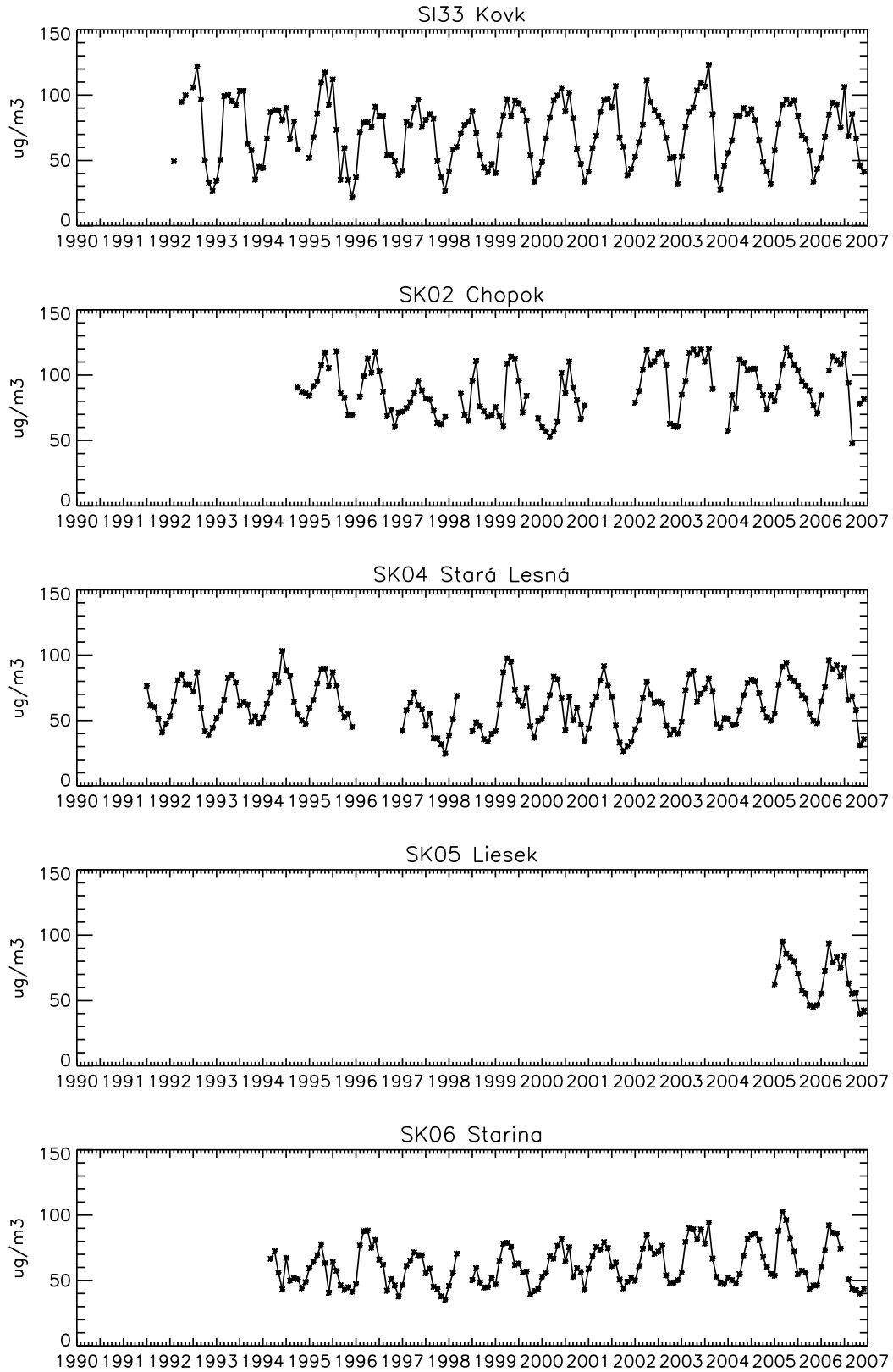

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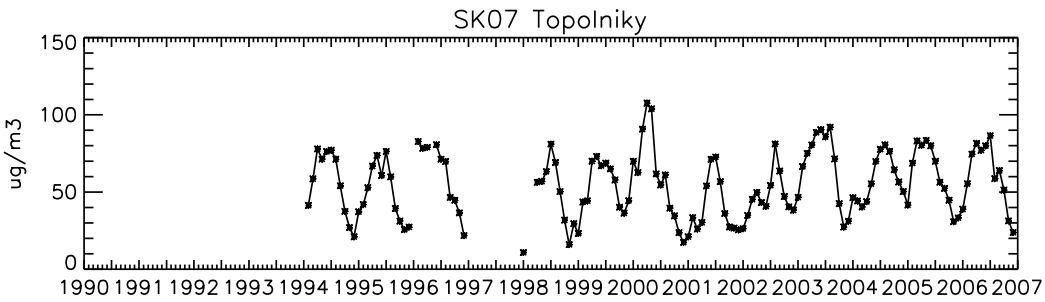


Figure 3.1, cont.

Annex 4

Diurnal variation, April–September 2006

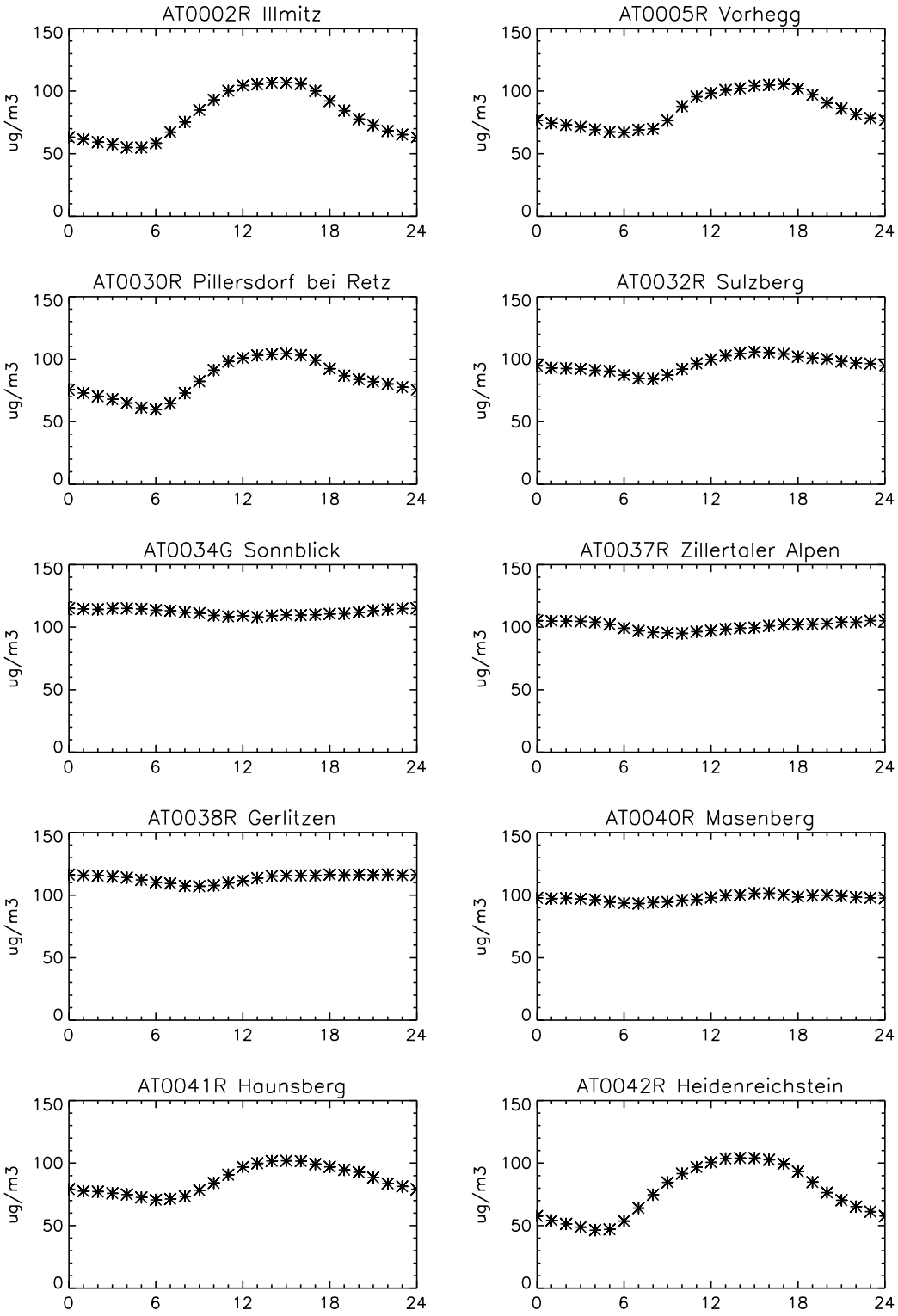
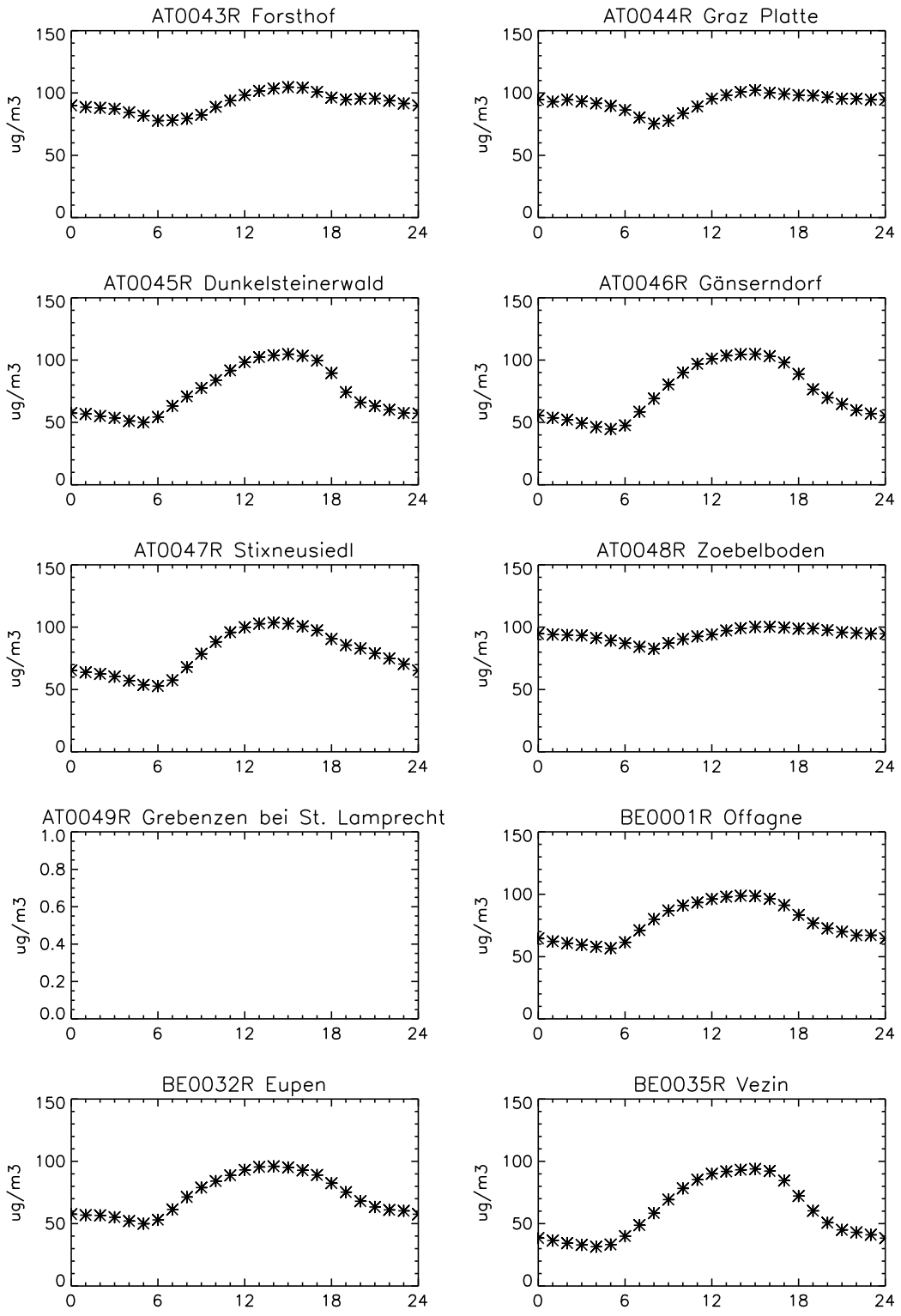


Figure 4.1: Diurnal variation, April–September 2006.



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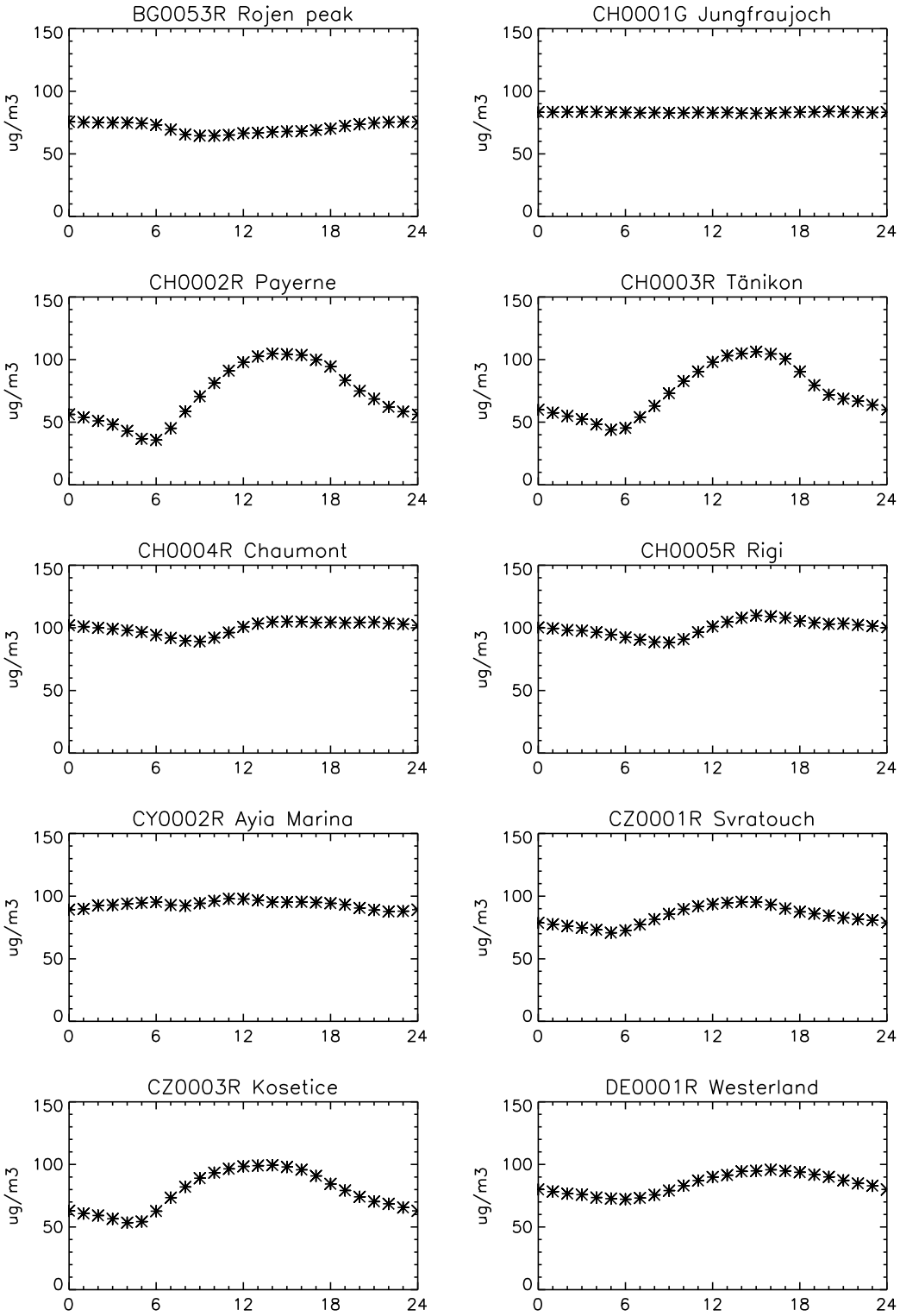

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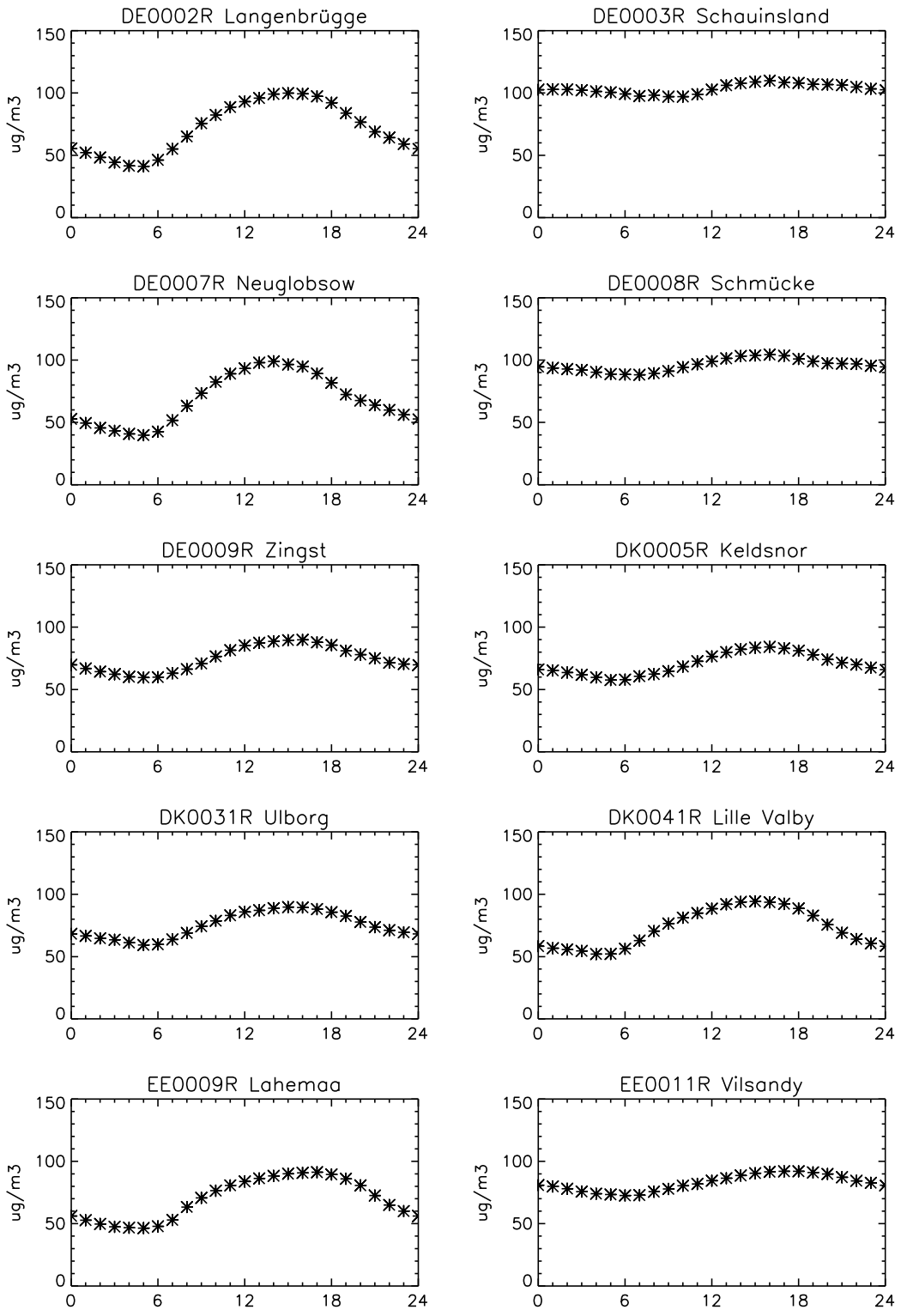

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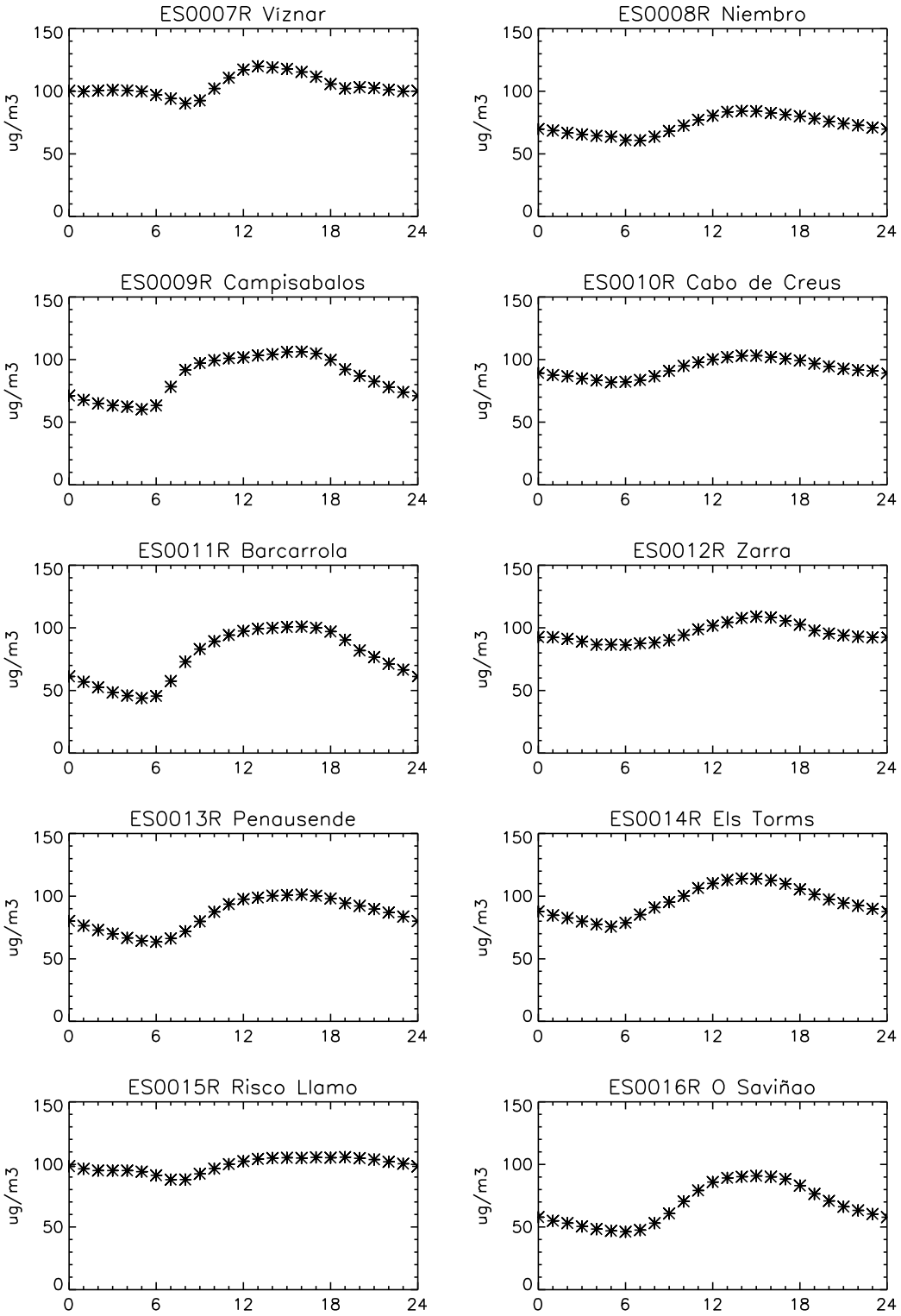

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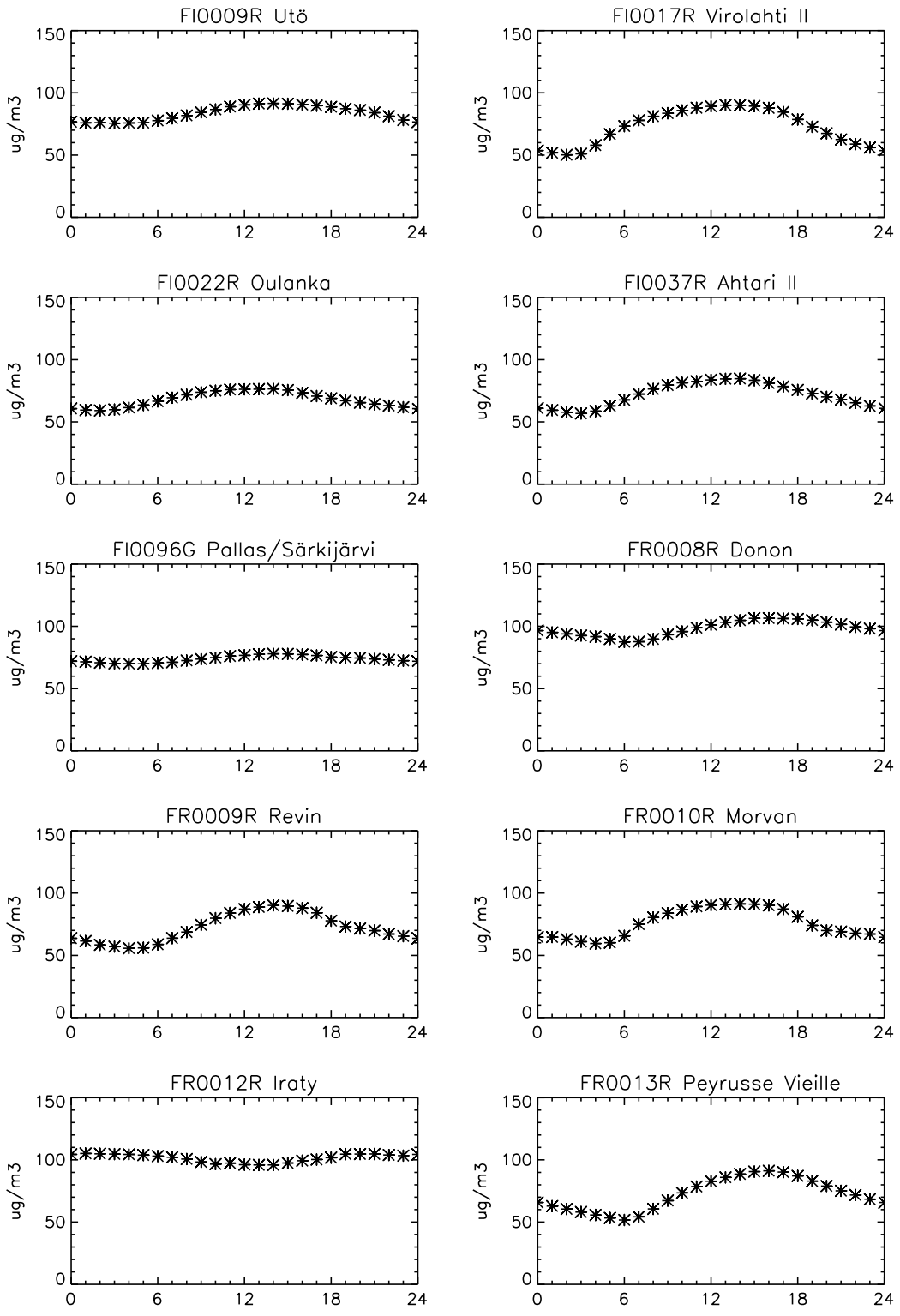

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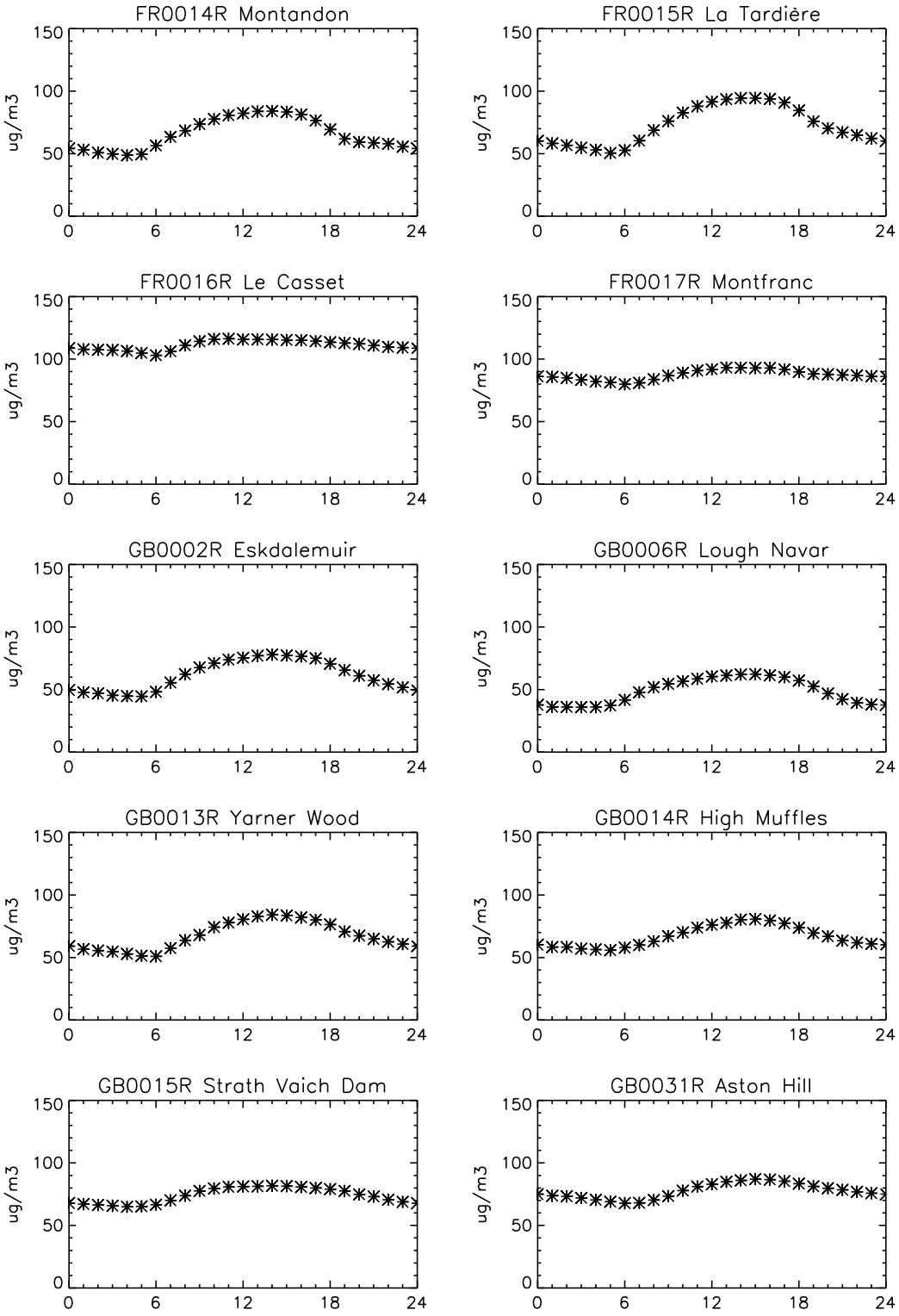

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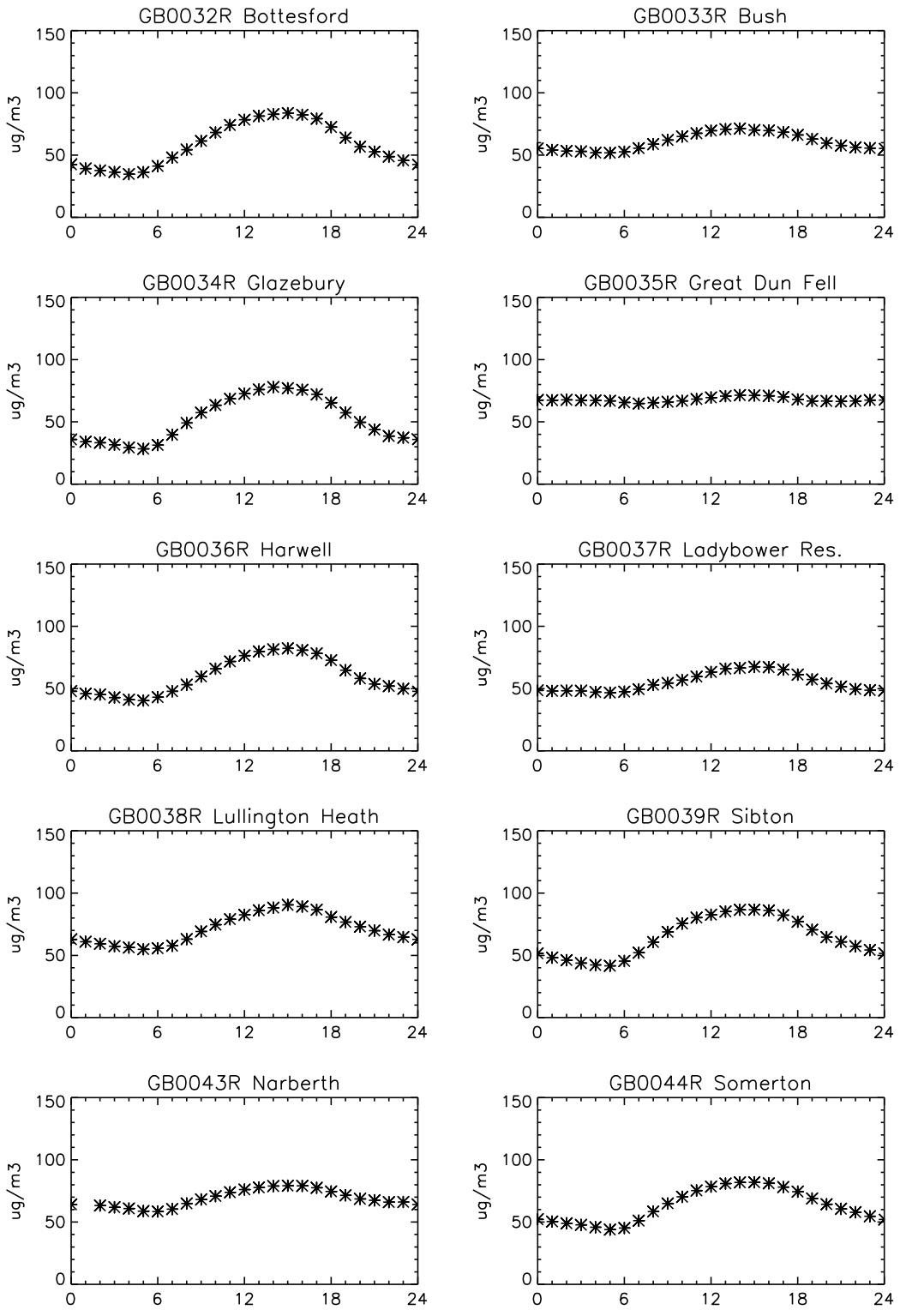

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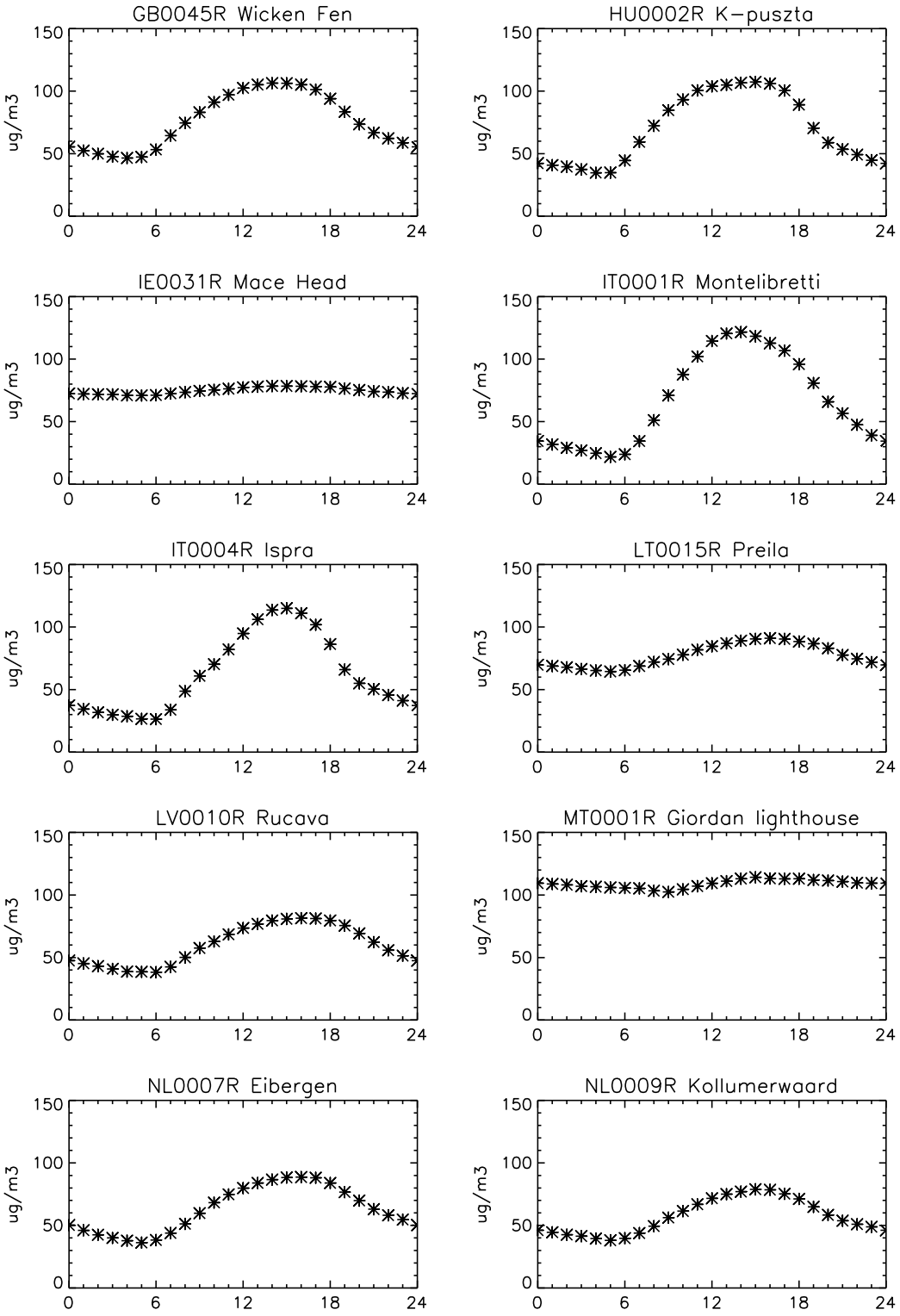

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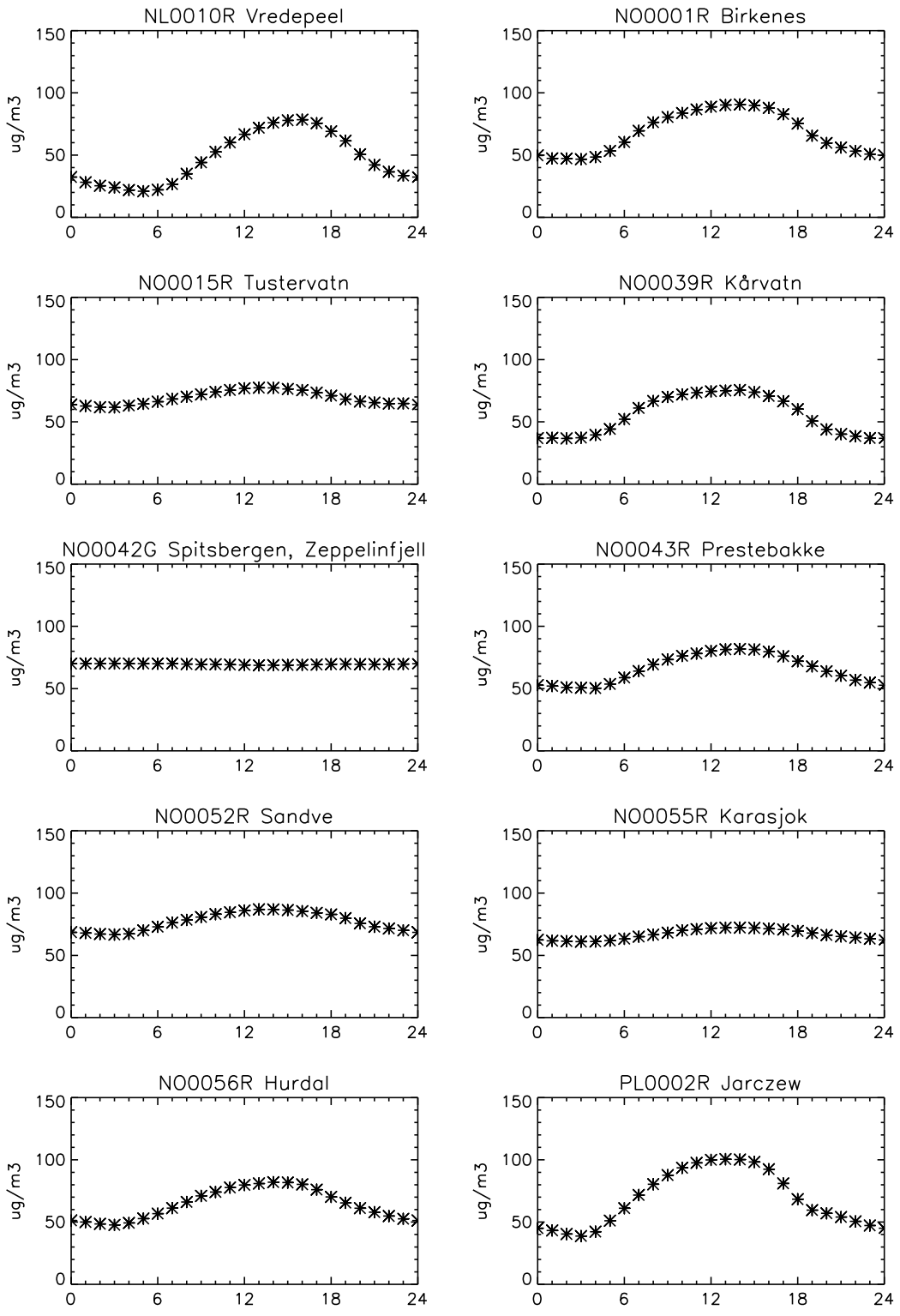

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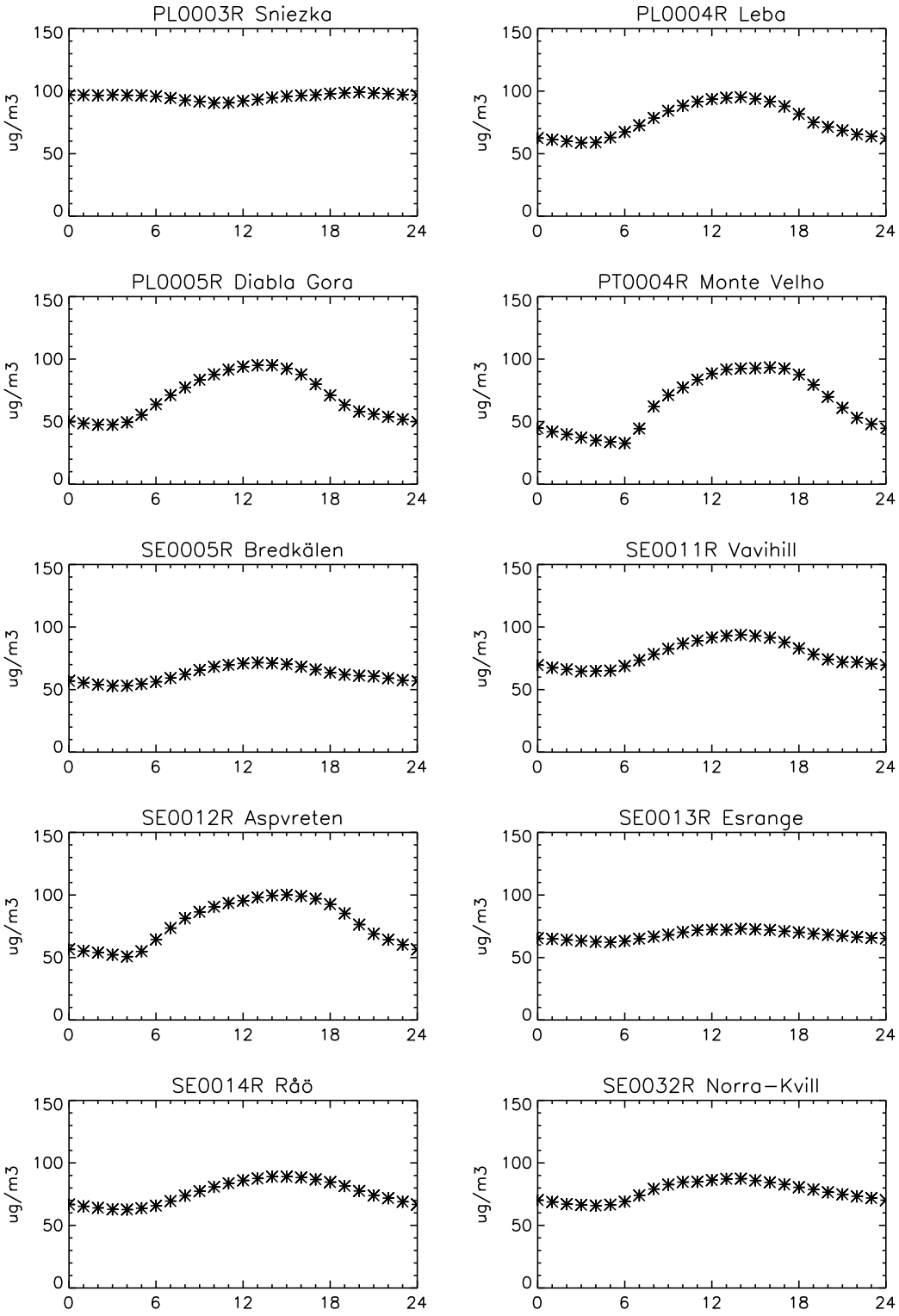

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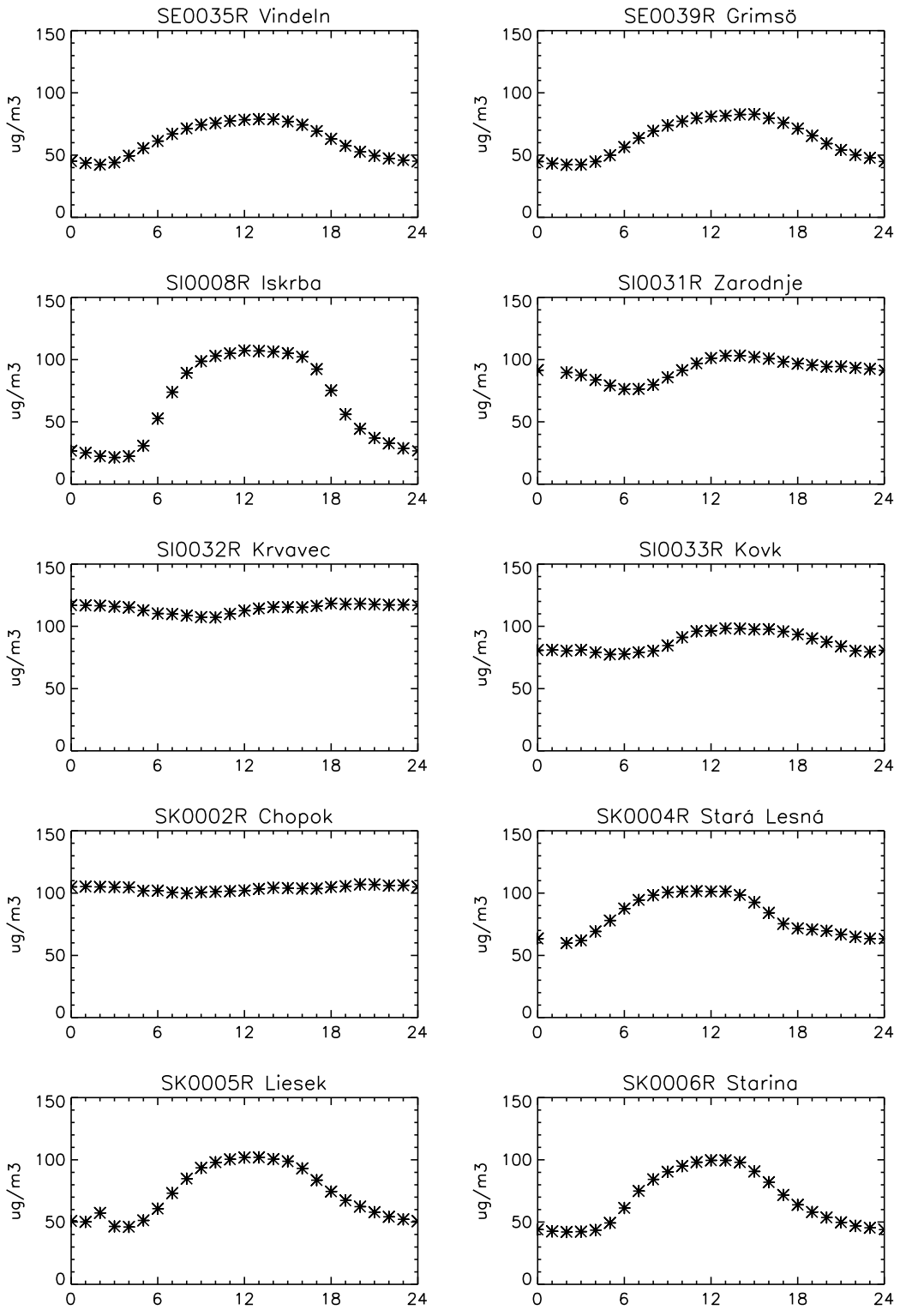

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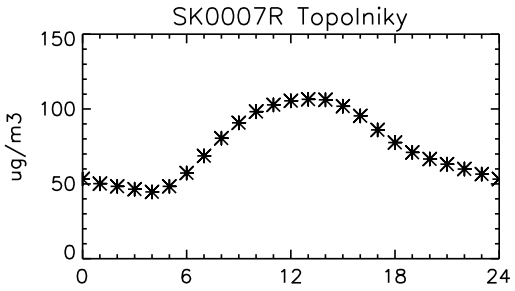

Figure 4.1, cont.

Annex 5

List of data reports

Ozone measurements in the ECE region January 1985–December 1985. Report no. 1.
EMEP/CCC-Report 3/89 by U. Feister and U. Pedersen.
Potsdam/Lillestrøm, Meteorological Service of the GDR/Norwegian Institute for Air Research, 1989.

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EMEP/CCC-Report 8/90 by U. Feister, U. Pedersen, E. Schulz and S. Hechler.
Lillestrøm, Norwegian Institute for Air Research, 1990.

Ozone data report 1988.
EMEP/CCC-Report 1/92 by U. Pedersen.
Lillestrøm, Norwegian Institute for Air Research, 1992.

Ozone data report 1989.
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EMEP/CCC-Report 4/95 by A.-G. Hjellbrekke.
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Kjeller, Norwegian Institute for Air Research, 2004.

Ozone measurements 2003.
EMEP/CCC-Report 4/2005 by A.-G. Hjellbrekke and S. Solberg.
Kjeller, Norwegian Institute for Air Research, 2005.

Ozone measurements 2004.
EMEP/CCC-Report 2/2006 by A.M. Fjæraa.
Kjeller, Norwegian Institute for Air Research, 2006.

Ozone measurements 2005.
EMEP/CCC-Report 2/2007 by A.M. Fjæraa and A.-G. Hjellbrekke.
Kjeller, Norwegian Institute for Air Research, 2007.

Ozone measurements 2006.
EMEP/CCC-Report 2/2008 by A.M. Fjæraa and A.-G. Hjellbrekke.
Kjeller, Norwegian Institute for Air Research, 2008.