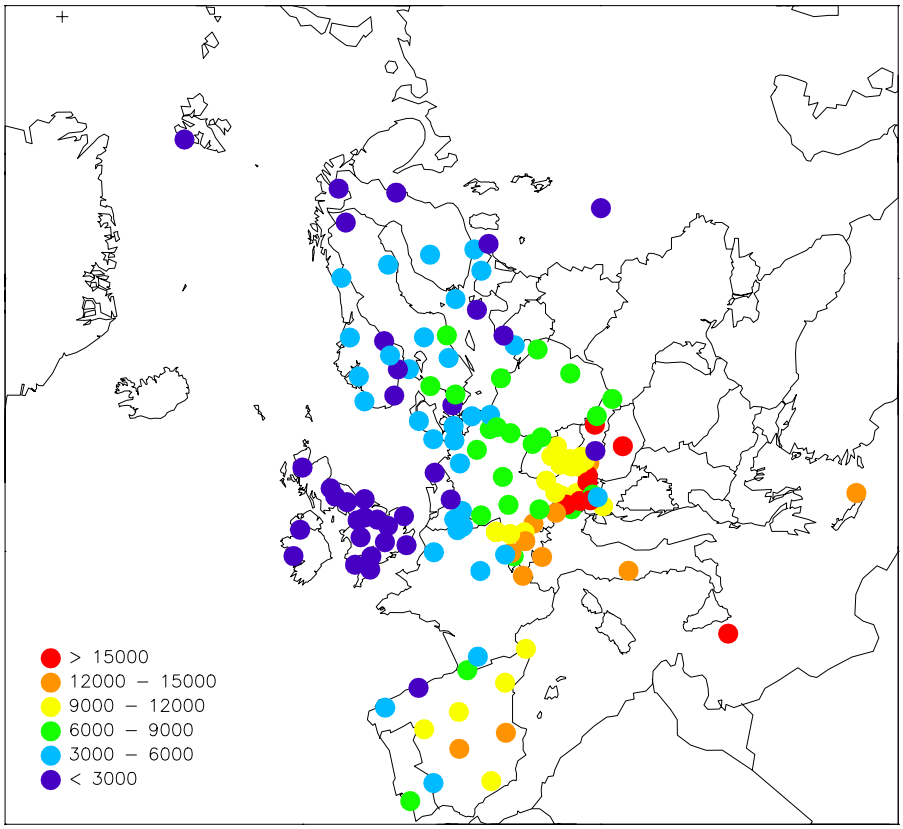
EMEP/CCC-Report 2/2004

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

Ozone measurements 2002

Anne-Gunn Hjellbrekke and Sverre Solberg



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NILU : EMEP/CCC-Report 2/2004
REFERENCE : O-99074
DATE : JUNE 2004

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Ozone measurements 2002

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 wide-spread. 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 $\mu g/m^3$ (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 $\mu g/m^3 h$ averaged over five years. In addition information should be given to the population when hourly means exceed 180 $\mu g/m^3$ and an alert warning should be issued if hourly means exceed 240 $\mu g/m^3$.

The critical level formulated by WHO for protection of health is 120 $\mu g/m^3$ 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/m^2 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 2002 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 2002. In total 129 stations in 26 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 2002.

Code	Station	Country	Latitude	Longitude	Altitude (m)
AT0002R	Illmitz	Austria	47 46 00 N	16 46 00 E	117
AT0004R	St. Koloman	Austria	47 39 00 N	13 12 00 E	851
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	09 55 36 E	1020
AT0033R	Stolzalpe bei Murau	Austria	47 07 45 N	14 12 14 E	1302
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
BE0001R	Offagne	Belgium	49 52 40 N	05 12 13 E	430
BE0032R	Eupen	Belgium	50 37 46 N	06 00 10 E	295
BE0035R	Vezin	Belgium	50 30 12 N	04 59 22 E	160
CH0002R	Payerne	Switzerland	46 49 00 N	06 57 00 E	500
CH0003R	Tänikon	Switzerland	47 29 00 N	08 54 00 E	540
CH0004R	Chaumont	Switzerland	47 03 04 N	06 58 50 E	1130
CH0005R	Rigi	Switzerland	47 04 10 N	08 27 56 E	1028
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	08 18 35 E	12
DE0002R	Langenbrügge	Germany	52 48 08 N	10 45 34 E	74
DE0003R	Schauinsland	Germany	47 54 53 N	07 54 31 E	1205
DE0004R	Deuselbach	Germany	49 45 53 N	07 03 07 E	480
DE0005R	Brotjacklriegel	Germany	48 49 10 N	13 13 09 E	1016
DE0007R	Neuglobsow	Germany	53 10 00 N	13 02 00 E	65
DE0008R	Schmücke	Germany	50 39 00 N	10 46 00 E	937
DE0009R	Zingst	Germany	54 26 00 N	12 44 00 E	1
DE0012R	Bassum	Germany	52 51 00 N	08 42 00 E	52
DE0026R	Ueckermünde	Germany	53 27 00 N	14 24 00 E	1
DE0035R	Lückendorf	Germany	50 50 00 N	14 46 00 E	490
DE0039R	Aukrug	Germany	54 02 24 N	09 28 48 E	15
DE0042R	Öhringen	Germany	49 14 32 N	09 26 50 E	283
DE0045R	Schorfheide	Germany	52 58 00 N	13 39 00 E	70
DE0046R	Raisting	Germany	47 54 00 N	11 06 00 E	552
DE0047R	Falkenberg	Germany	52 10 00 N	14 07 00 E	73
DK0005R	Keldsnor	Denmark	54 44 00 N	10 44 00 E	10
DK0031R	Ulborg	Denmark	56 17 00 N	08 26 00 E	10
DK0032R	Frederiksborg	Denmark	55 58 00 N	12 20 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 18 N	03 28 28 W	1230
ES0008R	Niembro	Spain	43 26 32 N	04 51 01 W	134
ES0009R	Campisabalos	Spain	41 16 52 N	03 08 34 W	1360
ES0010R	Cabo de Creus	Spain	42 19 10 N	03 19 01 E	23
ES0011R	Barcarrola	Spain	38 28 33 N	06 55 22 W	393
ES0012R	Zarra	Spain	39 05 10 N	01 06 07 W	885
ES0013R	Penausende	Spain	41 17 00 N	05 52 00 W	985
ES0014R	Els Torms	Spain	41 24 00 N	00 43 00 E	470
ES0015R	Risco Llamo	Spain	39 31 00 N	04 21 00 W	1241
ES0016R	O Saviñao	Spain	43 13 52 N	07 41 59 W	506

Table 1, cont.

Code	Station	Country	Latitude	Longitude	Altitude (m)
FI0009R	Utö	Finland	59 46 45 N	21 22 38 E	7
FI0017R	Virolahti II	Finland	60 31 36 N	27 41 10 E	8
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
FR0008R	Donon	France	48 30 00 N	07 08 00 E	775
FR0009R	Revin	France	49 54 00 N	04 38 00 E	390
FR0010R	Morvan	France	47 16 00 N	04 05 00 E	620
FR0012R	Iraty	France	43 02 00 N	01 05 00 W	1300
FR0013R	Peyrusse Vieille	France	43 22 29 N	00 06 16 E	236
FR0014R	Montandon	France	47 18 00 N	06 49 00 E	746
FR0015R	La Tardière	France	49 37 00 N	01 50 00 E	
FR0016R	Le Casset	France	45 39 00 N	06 31 00 E	
GB0002R	Eskdalemuir	United Kingdom	55 18 47 N	03 12 15 W	269
GB0006R	Lough Navar	United Kingdom	54 26 35 N	07 52 12 W	130
GB0013R	Yarner Wood	United Kingdom	50 35 47 N	03 42 47 W	119
GB0014R	High Muffles	United Kingdom	54 20 04 N	00 48 27 W	267
GB0015R	Strath Vaich Dam	United Kingdom	57 44 04 N	04 46 28 W	270
GB0031R	Aston Hill	United Kingdom	52 30 14 N	03 01 59 W	370
GB0032R	Bottesford	United Kingdom	52 55 46 N	00 48 55 W	32
GB0033R	Bush	United Kingdom	55 51 31 N	03 12 18 W	180
GB0034R	Glazebury	United Kingdom	53 27 31 N	02 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	01 19 00 W	137
GB0037R	Ladybower Res.	United Kingdom	53 23 56 N	01 45 12 W	420
GB0038R	Lullington Heath	United Kingdom	50 47 34 N	00 10 46 E	120
GB0039R	Sibton	United Kingdom	52 17 38 N	01 27 47 E	46
GB0043R	Narberth	United Kingdom	51 46 53 N	04 41 34 W	160
GB0044R	Somerton	United Kingdom	51 13 52 N	03 02 53 W	55
GB0045R	Wicken Fen	United Kingdom	52 17 54 N	00 17 34 W	5
GR0002R	Finokalia	Greece	35 19 00 N	25 40 00 E	150
HU0002R	K-puszta	Hungary	46 58 00 N	19 35 00 E	125
IE0031R	Mace Head	Ireland	53 10 00 N	09 30 00 W	15
IT0001R	Montelibretti	Italy	42 06 00 N	12 38 00 E	48
IT0004R	Ispra	Italy	45 48 00 N	08 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
NL0009R	Kollumerwaard	Netherlands	53 20 02 N	06 16 38 E	1
NL0010R	Vredepeel	Netherlands	51 32 28 N	05 51 13 E	28
NO0001R	Birkenes	Norway	58 23 00 N	08 15 00 E	190
NO0015R	Tustervatn	Norway	65 50 00 N	13 55 00 E	439
NO0039R	Kårvatn	Norway	62 47 00 N	08 53 00 E	210
NO0041R	Osen	Norway	61 15 00 N	11 47 00 E	440
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
NO0045R	Jeløya	Norway	59 26 00 N	10 36 00 E	3
NO0048R	Voss	Norway	60 36 00 N	06 32 00 E	500
NO0052R	Sandve	Norway	58 05 00 N	07 51 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
PT0004R	Monte Velho	Portugal	38 05 00 N	08 48 00 W	43

Table 1, cont.

Code	Station	Country	Latitude	Longitude	Altitude (m)
RU0016R	Shepeljovo	Russia	59 58 00 N	29 07 00 E	4
RU0018R	Danki	Russia	54 54 00 N	37 48 00 E	150
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
SK0006R	Starina	Slovakia	49 03 00 N	22 16 00 E	345
SK0007R	Topolniky	Slovakia	47 57 36 N	17 51 38 E	113

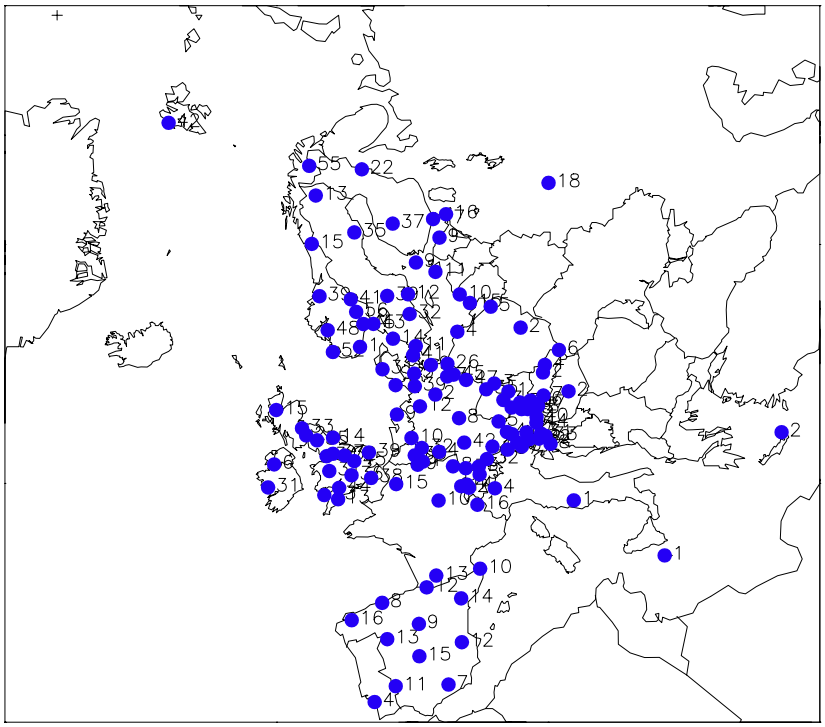

Figure 1: Location of the monitoring stations.

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

The ozone sites are situated mainly in central, western and northern Europe and the network 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 have during 2000 been collected from the participants (Aas et al., 2000).

The UV-absorption method was the only measurement method in use in 2002.

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 – µg/m^3.

Country	Conversion factor
Austria	2.0
Belgium	unknown
Czech Republic	2.0
Denmark	2.0
Estonia	2.14
Finland	2.0
France	2.0
Germany	2.0
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
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. The capture was in general good, and in 2002 more than 100 stations had a capture above 90%. Only five sites was below 75%.

Table 3: Data capture in per cent, 2002.

Code	Station	Data capture 2002
AT0002R	Illmitz	96.0
AT0004R	St. Koloman	95.9
AT0005R	Vorhegg	95.7
AT0030R	Pillersdorf bei Retz	95.7
AT0032R	Sulzberg	99.5
AT0033R	Stolzalpe bei Murau	96.0
AT0034G	Sonnblick	95.8
AT0037R	Zillertaler Alpen	91.7
AT0038R	Gerlitzen	95.1
AT0040R	Masenberg	95.4
AT0041R	Haunsberg	95.4
AT0042R	Heidenreichstein	94.2
AT0043R	Forsthof	95.5
AT0044R	Graz Platte	91.5
AT0045R	Dunkelsteinerwald	95.4
AT0046R	Gänserndorf	95.5
AT0047R	Stixneusiedl	95.1
BE0001R	Offagne	92.7
BE0032R	Eupen	93.0
BE0035R	Vezin	90.7
CH0002R	Payerne	95.3
CH0003R	Tänikon	95.2
CH0004R	Chaumont	95.3
CH0005R	Rigi	95.2
CZ0001R	Svratouch	97.8
CZ0003R	Košetice	94.6
DE0001R	Westerland	94.6
DE0002R	Langenbrügge	95.5
DE0003R	Schauinsland	90.8
DE0004R	Deuselbach	91.1
DE0005R	Brotjacklriegel	96.5
DE0007R	Neuglobsow	90.4
DE0008R	Schmücke	91.0
DE0009R	Zingst	95.7
DE0012R	Bassum	90.8
DE0026R	Ueckermünde	91.1
DE0035R	Lückendorf	85.8
DE0039R	Aukrug	93.0
DE0042R	Öhringen	87.1
DE0045R	Schorfheide	93.0
DE0046R	Raisting	94.4
DE0047R	Falkenberg	94.7
DK0005R	Keldsnor	100.0
DK0031R	Ulborg	98.7
DK0041R	Lille Valby	95.5
EE0009R	Lahemaa	98.2
EE0011R	Vilsandy	99.0

Table 3, cont.

Code	Station	Data capture 2002
ES0007R	Víznar	97.8
ES0008R	Niembro	97.5
ES0009R	Campisabalos	96.4
ES0010R	Cabo de Creus	96.5
ES0011R	Barcarrola	97.6
ES0012R	Zarra	96.9
ES0013R	Penausende	97.7
ES0014R	Els Torms	98.6
ES0015R	Risco Llamo	96.3
ES0016R	O Saviñao	93.3
FI0009R	Utö	73.6
FI0017R	Virolahti II	99.3
FI0022R	Oulanka	94.6
FI0037R	Ahtari II	99.1
FR0008R	Donon	95.9
FR0008R	Donon	96.1
FR0008R	Donon	97.6
FR0008R	Donon	97.6
FR0009R	Revin	98.3
FR0010R	Morvan	91.2
FR0012R	Iraty	86.4
FR0013R	Peyrusse Vieille	98.4
FR0014R	Montandon	96.9
FR0015R	La Tardière	98.5
FR0016R	Le Casset	98.9
GB0002R	Eskdalemuir	99.4
GB0006R	Lough Navar	87.7
GB0013R	Yarner Wood	92.0
GB0014R	High Muffles	93.8
GB0015R	Strath Vaich Dam	95.3
GB0031R	Aston Hill	90.0
GB0032R	Bottesford	99.3
GB0033R	Bush	97.4
GB0034R	Glazebury	98.5
GB0035R	Great Dun Fell	74.3
GB0036R	Harwell	97.1
GB0037R	Ladybower Res.	97.3
GB0038R	Lullington Heath	93.6
GB0039R	Sibton	99.1
GB0043R	Narberth	90.8
GB0044R	Somerton	97.5
GB0045R	Wicken Fen	98.5
GR0002R	Finokalia	70.5
HU0002R	K-puszta	97.2
IE0031R	Mace Head	98.3
IT0001R	Montelibretti	91.9
IT0004R	Ispra	82.5
LT0015R	Preila	99.0
LV0010R	Rucava	88.1
MT0001R	Giordan lighthouse	94.3
NL0009R	Kollumerwaard	95.0
NL0010R	Vredepeel	92.9
NO0001R	Birkenes	98.9
NO0015R	Tustervatn	96.2
NO0039R	Kårvatn	99.3
NO0041R	Osen	97.8

Table 3, cont.

Code	Station	Data capture 2002
NO0042G	Spitsbergen, Zeppelinfjell	97.4
NO0043R	Prestebakke	99.6
NO0045R	Jeløya	100.0
NO0048R	Voss	99.8
NO0052R	Sandve	99.7
NO0055R	Karasjok	98.3
NO0056R	Hurdal	99.6
PL0002R	Jarczew	100.0
PL0003R	Sniezka	100.0
PL0004R	Leba	100.0
PL0005R	Diabla Gora	95.7
PT0004R	Monte Velho	89.8
RU0016R	Shepeljovo	54.4
RU0018R	Danki	39.5
SE0011R	Vavihill	98.6
SE0012R	Aspvreten	95.3
SE0013R	Esrange	99.9
SE0014R	Råö	98.6
SE0032R	Norra-Kvill	98.8
SE0035R	Vindeln	99.4
SE0039R	Grimsö	99.8
SI0008R	Iskrba	91.2
SI0031R	Zarodnje	93.6
SI0032R	Krvavec	93.5
SI0033R	Kovk	77.1
SK0002R	Chopok	96.6
SK0004R	Stará Lesná	99.6
SK0006R	Starina	99.7
SK0007R	Topolniky	99.1

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 85% data capture 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

Table 1.1 in Annex 1 shows the extreme concentrations for 2002. The number of hours and days the ozone concentrations exceed 120, 150, 180 and 200 µg/m^3 and the maxima are given. The highest hourly mean values was found at the two Italian sites Montelibretti (242 µg/m^3, 20th June) and Ispra (236 µg/m^3, 18th June). Values above 200 µg/m^3 were during 2002 measured at 7 sites in Central Europe, compared to 14 sites in 2001. The lowest maximum values were observed at Shepeljovo, Russia (103 µg/m^3, 20th March).

The one hour critical level for ozone formulated by the ECE for protection of vegetation, 150 µg/m^3, was in 2002 exceeded at 94 sites (Figure 1.3). In the central parts of Europe the exceedances were considerable, and at Ispra this limit was exceeded 50 days during 2002. Figure 1.4 shows the number of exceedances of the threshold value of 180 µg/m^3 formulated by the EU for informing the public. Two sites, Ispra and Montelibretti, exceeded the threshold value more than 10 days, while 35 additional sites measured above 180 µg/m^3 one or two days. Comparison with data submitted to the European Commission under Directive 92/72/EEC on air pollution by ozone (Fiala et. al., 2002) shows good agreement, except for an area in Italy and southeast France with numerous exceedances.

Table 1.2 shows the 25-, 50-, 75-, 90-, 95-, 98- and 99-percentiles for the period April–September. Graphical distributions of the 99-percentile and 95-percentile are shown in Figure 1.1 and Figure 1.2. The lowest values are found in Ireland, Scotland and Scandinavia, where the 99-percentile is below 120 µg/m^3. Low concentrations are also measured in Latvia and Lithuania. The concentrations are higher in central Europe, where the 99-percentile generally ranges from 140-170 µg/m^3. The concentration levels on the Iberian peninsula are variable, possibly due to local influence and topographical differences.

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 exceeding 50 W/m^2. Since the CCC has no access to measurements of global radiation a simple approach have been used for the calculations in this report, defining daylight as solar zenith angle less that 80°.

AOT40 and AOT60 for forests and agricultural crops for 2002 are shown in Tables 2.1 and 2.2 in Annex 2, and the corresponding geographical distributions of AOT40 and AOT60 in Figures 2.1-2.4. The maps of AOT40 show a general increasing gradient from west to east. The lowest values are found in Scandinavia, in the Baltic region and in the northern parts of Ireland and the United Kingdom, while the highest values are found in Austria, Hungary, Slovenia and on Malta.

The maps show that the exceedances of the critical levels are considerable. The critical level for forests (10 000 ppbh) is exceeded in larger parts of central and Eastern Europe. Several stations in central Europe had AOT40 values above 20 000 ppbh. The critical level for agricultural crops, 3000 ppbh, was in 2002 exceeded at most stations in central Europe.

7. Seasonal variation

Monthly mean concentrations for 2002 are given in Table 3.1 in Annex 3 and monthly data capture in Table 3.2. The concentrations show a clear pattern with maximum values during spring or early summer and a minimum in winter. The

seasonal variations 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 1990–2002 are given in Figure 3.1.

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 springtime 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) 2002 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 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 Schauinsland, 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 14 June, 2004.

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.

10. References

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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
Commission of the European Communities	Joint Research Center. Ispra Establishment
Czech Republic	Czech Hydrometeorological Institute
Denmark	National Environmental Research Institute
Finland	Finnish Meteorological Institute
France	l' Ecole des Mines de Douai Laboratories Wolff
Germany	Umweltbundesamt
Greece	Environmental Chemical Processes Laboratory, University of Crete
Hungary	Institute for Atmospheric Physics, Dep. for Air Chemistry
Italy	C.N.R. Istituto Inquinamento Atmosferico
Latvia	Latvian Hydrometeorological Agency
Lithuania	Institute of Physics
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	Ministério do ambiente e recursos naturais
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/m³ and maximum concentrations in 2002.

Code	Station	Total		>120		>150		>180		>200		Max concentrations	
		hours	days	hours	days	hours	days	hours	days	hours	days	μg/m³	day(s)
AT0002R	Illmitz	8411	365	435	84	15	6	1	1	0	0	182	30.07.2002
AT0004R	St. Koloman	8398	365	438	52	36	6	0	0	0	0	171	18.05.2002
AT0005R	Vorhegg	8379	365	289	52	40	9	1	1	0	0	185	23.06.2002
AT0030R	Pillersdorf bei Retz	8384	365	347	66	21	7	1	1	0	0	182	19.06.2002
AT0032R	Sulzberg	8712	365	520	52	43	9	2	1	0	0	185	20.06.2002
AT0033R	Stolzalpe bei Murau	8407	365	178	33	3	2	0	0	0	0	157	19.06.2002
AT0034G	Sonnblick	8390	365	1098	134	18	6	0	0	0	0	160	05.03.2002
AT0037R	Zillertaler Alpen	8030	354	753	83	6	4	0	0	0	0	155	01.06.2002
AT0038R	Gerlitzen	8329	361	1310	116	76	13	1	1	0	0	185	11.07.2002
AT0040R	Masenberg	8360	365	1047	101	52	9	1	1	0	0	181	17.05.2002
AT0041R	Haunsberg	8357	351	433	62	39	7	2	1	0	0	188	17.05.2002
AT0042R	Heidenreichstein	8249	359	455	78	30	9	1	1	0	0	192	19.06.2002
AT0043R	Forsthof	8363	365	400	67	10	5	0	0	0	0	161	21.06.2002
AT0044R	Graz Platte	8017	351	1030	104	67	16	0	0	0	0	176	21.06.2002
AT0045R	Dunkelsteinerwald	8355	365	457	80	41	14	1	1	0	0	187	19.08.2002
AT0046R	Gänserndorf	8370	365	400	75	23	11	0	0	0	0	166	23.06.2002
AT0047R	Stixneusiedl	8333	363	405	75	22	5	0	0	0	0	175	12.04.2002
BE0001R	Offagne	8119	359	111	25	4	2	0	0	0	0	156	30.07.2002
BE0032R	Eupen	8149	356	168	36	14	4	2	1	0	0	197	29.07.2002
BE0035R	Vezin	7948	350	104	21	18	5	4	1	0	0	198	29.07.2002
CH0002R	Payerne	8347	365	288	51	25	9	0	0	0	0	172.2	19.06.2002
CH0003R	Tänikon	8342	365	310	55	53	17	7	2	1	1	204.9	18.06.2002
CH0004R	Chaumont	8344	365	651	65	58	15	7	2	0	0	194.6	18.06.2002
CH0005R	Rigi	8340	365	649	76	77	16	11	2	6	1	224.3	19.06.2002
CZ0001R	Svratouch	8567	360	421	61	11	5	0	0	0	0	160	09.07.2002
CZ0003R	Kosetice	8285	353	337	61	9	3	0	0	0	0	170	10.07.2002
DE0001R	Westerland	8291	359	182	34	14	4	2	1	0	0	194	18.06.2002
DE0002R	Langenbrügge	8362	365	251	45	34	10	0	0	0	0	169	09.07.2002
DE0003R	Schauinsland	7958	356	524	60	47	12	5	1	1	1	202	19.06.2002
DE0004R	Deuselbach	7977	350	231	39	21	8	0	0	0	0	175	26.06.2002

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)
DE0005R	Brotjacklriegel	8453	363	547	70	38	7	0	0	0	0	176	20.06.2002
DE0007R	Neuglobsow	7918	362	228	42	23	9	2	1	0	0	199	10.07.2002
DE0008R	Schmücke	7968	364	470	56	35	8	5	1	0	0	188	18.06.2002
DE0009R	Zingst	8381	365	97	21	3	2	0	0	0	0	155	20.08.2002
DE0012R	Bassum	7956	362	87	20	3	1	0	0	0	0	167	30.07.2002
DE0026R	Ueckermünde	7976	361	84	19	3	2	0	0	0	0	160	28.08.2002
DE0035R	Lückendorf	7514	343	100	24	5	3	0	0	0	0	157	17.05.2002
DE0039R	Aukrug	8146	360	125	23	33	8	0	0	0	0	177	30.07.2002
DE0042R	Öhringen	7626	337	267	55	14	5	0	0	0	0	178	18.06.2002
DE0045R	Schorfheide	8148	365	329	57	48	10	4	1	1	1	202	10.07.2002
DE0046R	Raisting	8269	364	192	38	17	5	2	1	0	0	198	19.06.2002
DE0047R	Falkenberg	8293	365	227	47	20	6	2	1	0	0	199	10.07.2002
DK0005R	Keldsnor	8758	365	140	29	6	3	0	0	0	0	160.8	21.08.2002
DK0031R	Ulborg	8650	362	117	21	5	2	0	0	0	0	157.1	21.08.2002
DK0041R	Lille Valby	8369	359	64	14	3	3	0	0	0	0	155.4	21.08.2002
EE0009R	Lahemaa	8601	364	161	24	12	4	0	0	0	0	167	12.04.2002
EE0011R	Vilsandy	8673	365	149	27	1	1	0	0	0	0	152	15.08.2002
ES0007R	Víznar	8566	365	443	70	7	5	0	0	0	0	161	24.03.2002
ES0008R	Niembro	8541	365	0	0	0	0	0	0	0	0	115	15.9.2002, 16.9.2002
ES0009R	Campisabalos	8449	365	214	44	9	7	0	0	0	0	163	18.6.2002, 20.7.2002
ES0010R	Cabo de Creus	8452	364	385	60	25	7	1	1	0	0	191	22.06.2002
ES0011R	Barcarrola	8554	365	47	13	0	0	0	0	0	0	140	29.08.2002
ES0012R	Zarra	8492	363	406	77	25	10	0	0	0	0	172	18.06.2002
ES0013R	Penausende	8560	365	306	52	24	7	1	1	0	0	183	14.04.2002
ES0014R	Els Torms	8633	365	435	69	4	2	0	0	0	0	158	25.4.2002, 19.6.2002
ES0015R	Risco Llamo	8440	364	756	83	45	11	1	1	0	0	181	19.07.2002
ES0016R	O Saviñao	8174	364	150	31	11	4	0	0	0	0	175	02.09.2002
FI0009R	Utö	6448	275	102	22	1	1	0	0	0	0	152	09.05.2002
FI0017R	Virolahti II	8696	365	101	24	1	1	0	0	0	0	154	12.04.2002

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)
FI0022R	Oulanka	8286	351	91	9	0	0	0	0	0	0	148	13.04.2002
FI0037R	Ahtari II	8682	365	78	11	0	0	0	0	0	0	141	30.05.2002
FR0008R	Donon	8402	363	468	55	49	12	2	1	0	0	187	17.06.2002
FR0008R	Donon	8420	363	501	60	55	12	2	1	0	0	185	17.06.2002
FR0008R	Donon	8547	363	589	62	67	14	4	2	0	0	190	17.06.2002
FR0008R	Donon	8547	363	607	64	68	13	3	2	0	0	195	17.06.2002
FR0009R	Revin	8611	364	104	21	9	2	0	0	0	0	160	29.07.2002
FR0010R	Morvan	7987	345	57	16	5	3	0	0	0	0	168	18.04.2002
FR0012R	Iraty	7568	326	496	67	14	5	0	0	0	0	177	19.07.2002
FR0013R	Peyrusse Vieille	8624	362	49	11	0	0	0	0	0	0	149	20.07.2002
FR0014R	Montandon	8490	364	87	17	7	2	0	0	0	0	168	19.06.2002
FR0015R	La Tardière	8626	363	100	20	4	2	0	0	0	0	158	20.07.2002
FR0016R	Le Casset	8660	363	510	64	8	3	0	0	0	0	158	17.5.2002, 20.7.2002
GB0002R	Eskdalemuir	8709	365	0	0	0	0	0	0	0	0	108	23.02.2002
GB0006R	Lough Navar	7681	329	0	0	0	0	0	0	0	0	110	05.04.2002
GB0013R	Yarner Wood	8061	341	10	2	0	0	0	0	0	0	136	30.03.2002
GB0014R	High Muffles	8221	347	40	11	2	1	0	0	0	0	164	17.08.2002
GB0015R	Strath Vaich Dam	8347	352	7	4	0	0	0	0	0	0	134	03.04.2002
GB0031R	Aston Hill	7883	334	2	1	0	0	0	0	0	0	124	02.06.2002
GB0032R	Bottesford	8697	365	53	12	9	2	1	1	0	0	192	29.07.2002
GB0033R	Bush	8531	359	2	1	1	1	0	0	0	0	160	23.02.2002
GB0034R	Glazebury	8632	365	5	2	0	0	0	0	0	0	130	01.06.2002
GB0035R	Great Dun Fell	6508	276	55	11	2	1	0	0	0	0	154	04.04.2002
GB0036R	Harwell	8505	362	26	6	0	0	0	0	0	0	148	29.07.2002
GB0037R	Ladybower Res.	8521	362	18	4	0	0	0	0	0	0	150	02.06.2002
GB0038R	Lullington Heath	8196	350	44	9	2	1	0	0	0	0	166	16.08.2002
GB0039R	Sibton	8679	365	47	10	14	3	3	2	2	1	218	17.08.2002
GB0043R	Narberth	7950	348	7	5	0	0	0	0	0	0	132	11.04.2002
GB0044R	Somerton	8544	362	10	5	0	0	0	0	0	0	130	29.3.2002, 6.8.2002
GB0045R	Wicken Fen	8630	365	49	8	8	2	2	1	0	0	184	29.07.2002

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)
GR0002R	Finokalia	6180	285	416	51	4	2	0	0	0	0	170.9	22.07.2002
HU0002R	K-puszta	8518	364	1009	135	161	44	1	1	0	0	182	22.06.2002
IE0031R	Mace Head	8612	363	3	1	0	0	0	0	0	0	124	25.05.2002
IT0001R	Montelibretti	8053	346	473	95	141	40	28	13	10	6	241.5	20.06.2002
IT0004R	Ispra	7227	314	530	101	201	50	47	16	16	7	235.8	18.06.2002
LT0015R	Preila	8672	365	28	9	1	1	0	0	0	0	153	11.08.2002
LV0010R	Rucava	7714	337	60	16	0	0	0	0	0	0	139	08.05.2002
MT0001R	Giordan lighthouse	8231	352	1368	135	53	17	1	1	0	0	183	23.06.2002
NL0009R	Kollumerwaard	8323	358	26	8	5	3	0	0	0	0	155.4	28.07.2002
NL0010R	Vredepeel	8137	353	54	14	6	2	0	0	0	0	169.2	30.07.2002
NO0001R	Birkenes	8661	365	17	6	0	0	0	0	0	0	133.7	11.04.2002
NO0015R	Tustervatn	8429	353	15	5	0	0	0	0	0	0	137	08.06.2002
NO0039R	Kårvatn	8703	365	42	9	0	0	0	0	0	0	131.8	10.07.2002
NO0041R	Osen	8567	361	12	5	0	0	0	0	0	0	128.8	04.04.2002
NO0042G	Spitsbergen, Zeppelinfjell	8532	359	0	0	0	0	0	0	0	0	114.4	26.05.2002
NO0043R	Prestebakke	8724	364	41	10	0	0	0	0	0	0	132	21.08.2002
NO0045R	Jeløya	8757	365	3	1	0	0	0	0	0	0	127	22.08.2002
NO0048R	Voss	8739	365	61	11	0	0	0	0	0	0	134.4	03.04.2002
NO0052R	Sandve	8730	365	52	11	1	1	0	0	0	0	150.6	22.08.2002
NO0055R	Karasjok	8613	362	10	1	0	0	0	0	0	0	133.6	20.04.2002
NO0056R	Hurdal	8729	365	29	9	0	0	0	0	0	0	130.4	03.06.2002
PL0002R	Jarczew	8759	365	329	65	8	3	0	0	0	0	158	29.08.2002
PL0003R	Sniezka	8757	365	472	71	2	2	0	0	0	0	155	23.08.2002
PL0004R	Leba	8757	365	163	33	7	3	0	0	0	0	159	28.08.2002
PL0005R	Diabla Gora	8381	356	325	57	13	5	0	0	0	0	159	30.08.2002
PT0004R	Monte Velho	7868	343	195	36	32	8	5	2	0	0	198	17.07.2002

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)
RU0016R	Shepeljovo	4764	204	0	0	0	0	0	0	0	0	103.2	20.03.2002
RU0018R	Danki	3460	149	49	12	6	2	0	0	0	0	160	13.04.2002
SE0011R	Vavihill	8633	361	229	35	0	0	0	0	0	0	149	21.08.2002
SE0012R	Aspvreten	8349	358	224	35	4	3	0	0	0	0	154	21.08.2002
SE0013R	Esrange	8752	365	23	2	0	0	0	0	0	0	143	20.04.2002
SE0014R	Råö	8635	364	217	39	17	5	0	0	0	0	168	21.08.2002
SE0032R	Norra-Kvill	8659	362	170	26	4	2	0	0	0	0	159	21.08.2002
SE0035R	Vindeln	8710	365	27	4	0	0	0	0	0	0	132	30.05.2002
SE0039R	Grimsö	8742	365	46	12	0	0	0	0	0	0	138	12.08.2002
SI0008R	Iskrba	7992	362	235	44	7	4	0	0	0	0	161	15.06.2002
SI0031R	Zarodnje	8196	363	107	24	0	0	0	0	0	0	145	18.05.2002
SI0032R	Krvavec	8190	359	1100	110	78	14	0	0	0	0	175	18.05.2002
SI0033R	Kovk	6750	305	95	19	3	2	0	0	0	0	156	15.6.2002, 16.6.2002
SK0002R	Chopok	8463	365	1095	114	13	7	2	2	0	0	189	31.05.2002
SK0004R	Stará Lesná	8728	365	111	28	0	0	0	0	0	0	143	02.07.2002
SK0006R	Starina	8736	365	161	44	0	0	0	0	0	0	148	24.06.2002
SK0007R	Topolniky	8678	365	205	41	10	6	0	0	0	0	163	24.08.2002

Table 1.2: Percentiles of hourly ozone values April–September 2002.

Code	Station	25%	50%	75%	90%	95%	98%	99%	Data capture
AT0002R	Illmitz	59.0	78.0	102.0	120.0	130.0	140.0	145.7	96.3
AT0004R	St. Koloman	77.0	93.0	108.0	121.0	128.0	138.0	147.7	96.2
AT0005R	Vorhegg	59.0	78.0	98.0	115.0	123.0	137.0	149.0	95.7
AT0030R	Pillersdorf bei Retz	63.0	81.0	101.0	117.0	126.0	137.0	143.0	95.6
AT0032R	Sulzberg	75.0	90.0	107.0	123.0	134.0	144.0	150.0	99.7
AT0033R	Stolzalpe bei Murau	58.0	79.0	97.0	111.0	119.0	127.4	134.7	96.3
AT0034G	Sonnblick	103.0	112.0	121.0	128.0	133.0	139.0	142.0	95.1
AT0037R	Zillertaler Alpen	89.0	103.0	116.0	126.0	133.0	140.0	144.9	95.8
AT0038R	Gerlitzen	99.0	111.0	122.0	132.0	138.0	149.0	156.0	95.8
AT0040R	Masenberg	92.0	106.0	120.0	131.0	138.0	147.0	153.0	95.4
AT0041R	Haunsberg	68.0	86.0	104.0	120.0	130.0	140.0	149.2	99.8
AT0042R	Heidenreichstein	55.0	80.0	103.0	122.0	132.0	142.0	148.0	92.2
AT0043R	Forsthof	69.0	87.0	106.0	119.0	127.0	136.0	140.0	95.2
AT0044R	Graz Platte	85.0	103.0	119.0	132.0	140.0	148.3	154.2	95.3
AT0045R	Dunkelsteinerwald	48.0	69.0	97.0	121.0	133.0	142.0	149.0	95.5
AT0046R	Gänserndorf	53.0	72.0	98.0	119.0	129.0	140.0	146.0	95.5
AT0047R	Stixneusiedl	57.0	76.0	102.0	120.0	128.0	138.0	144.4	94.7
BE0001R	Offagne	50.0	68.0	85.0	101.0	112.0	124.0	131.0	94.0
BE0032R	Eupen	45.2	66.0	86.0	104.0	117.0	128.0	136.0	96.8
BE0035R	Vezin	27.0	52.0	76.0	94.0	106.6	125.0	134.3	94.9
CH0002R	Payerne	42.6	66.0	88.7	112.0	125.9	137.8	145.1	95.5
CH0003R	Tänikon	44.1	66.4	88.8	112.2	128.1	143.8	153.5	95.2
CH0004R	Chaumont	78.9	93.3	110.8	128.0	136.6	146.6	151.8	95.3
CH0005R	Rigi	76.2	92.7	110.0	126.7	137.4	148.8	155.5	95.3
CZ0001R	Svratouch	72.0	89.0	106.0	120.0	127.0	136.0	141.0	96.3
CZ0003R	Košetice	59.0	79.0	100.0	117.0	126.0	134.0	138.0	98.8
DE0001R	Westerland	68.0	80.0	93.0	108.0	118.0	129.0	134.0	97.1
DE0002R	Langenbrügge	45.0	65.0	87.0	108.0	124.0	137.0	148.0	95.5
DE0003R	Schauinsland	79.0	93.0	110.0	123.0	133.0	144.0	151.0	92.8
DE0004R	Deuselbach	57.0	73.0	92.0	110.0	121.0	134.0	143.0	94.8
DE0005R	Brotjacklriegel	77.0	95.0	112.0	123.0	132.0	142.0	150.0	96.3
DE0007R	Neuglobsow	44.0	67.0	89.0	111.0	123.0	139.0	146.0	89.3
DE0008R	Schmücke	69.0	85.0	105.0	123.0	131.3	143.0	150.0	90.5
DE0009R	Zingst	59.0	72.0	87.0	103.0	112.0	122.0	129.0	95.9
DE0012R	Bassum	35.8	51.0	70.0	91.0	104.0	122.0	131.0	91.3
DE0026R	Ueckermünde	52.0	69.0	86.0	102.0	111.0	121.0	134.0	90.5
DE0035R	Lückendorf	55.0	74.0	90.0	108.0	115.8	124.0	132.0	79.8
DE0039R	Aukrug	41.0	58.0	76.0	95.0	111.0	127.0	142.2	95.2
DE0042R	Öhringen	41.0	64.0	90.0	113.0	124.0	134.0	143.0	88.4
DE0045R	Schorfheide	46.0	67.0	92.0	116.0	130.0	141.0	152.0	93.1
DE0046R	Raisting	34.0	59.0	86.0	107.0	118.1	131.0	139.4	94.7
DE0047R	Falkenberg	44.0	63.0	86.0	110.0	122.0	133.0	139.0	95.5
DK0005R	Keldsnor	64.0	75.5	88.9	103.5	114.9	125.4	132.9	100.0
DK0031R	Ulborg	56.3	69.5	85.1	100.3	110.3	123.1	132.0	98.6
DK0041R	Lille Valby	50.8	64.3	79.4	94.0	104.7	116.0	126.7	96.3
EE0009R	Lahemaa	49.0	70.0	89.0	105.0	114.4	128.0	133.3	99.5
EE0011R	Vilsandy	70.0	83.0	95.0	107.0	116.0	128.9	136.0	99.1
ES0007R	Víznar	76.8	91.4	106.0	119.0	126.0	135.0	141.0	97.7
ES0008R	Niembro	43.7	54.4	65.6	78.5	85.9	94.2	101.0	98.1
ES0009R	Campisabalos	69.9	86.4	99.8	112.0	121.0	130.0	137.0	95.6
ES0010R	Cabo de Creus	83.4	94.6	107.0	118.0	126.0	137.0	144.8	98.4
ES0011R	Barcarrola	50.2	68.3	86.4	100.0	108.0	117.0	121.0	97.2
ES0012R	Zarra	80.3	93.7	107.0	119.0	128.0	139.0	145.0	96.5
ES0013R	Penausende	69.5	84.3	99.3	114.0	124.5	135.0	143.9	98.1
ES0014R	Els Torms	77.9	93.2	108.0	120.0	126.0	133.0	137.0	98.1
ES0015R	Risco Llamo	89.6	102.0	115.0	129.0	137.0	145.0	151.0	96.2
ES0016R	O Saviñao	58.9	74.1	89.6	104.0	115.0	130.0	137.0	93.3
FI0009R	Utö	71.0	82.0	95.0	106.0	114.0	123.0	130.5	89.9
FI0017R	Virolahti II	45.0	67.0	85.0	100.5	111.0	122.0	128.0	99.4
FI0022R	Oulanka	50.0	63.0	79.0	98.0	110.0	120.0	129.1	90.9
FI0037R	Ahtari II	55.0	71.0	86.0	101.0	109.0	120.0	126.0	98.9
FR0008R	Donon	71.0	87.0	104.0	122.0	131.0	144.0	152.0	96.0
FR0008R	Donon	73.0	90.0	106.0	125.0	134.0	147.0	155.0	97.4
FR0008R	Donon	74.0	90.0	107.0	126.0	134.0	147.0	157.0	97.3
FR0008R	Donon	70.0	86.0	103.0	122.0	130.0	143.7	152.0	95.9
FR0009R	Revin	49.0	65.0	84.0	101.0	112.0	122.0	129.0	99.2
FR0010R	Morvan	47.0	63.0	81.0	98.0	108.0	116.0	123.0	89.3
FR0012R	Iraty	83.0	97.0	110.0	123.0	132.0	140.0	145.0	86.5
FR0013R	Peyrusse Vieille	56.0	71.0	84.0	97.0	105.0	115.0	123.0	97.0
FR0014R	Montandon	46.0	62.0	80.0	96.0	107.0	121.0	129.0	96.4
FR0015R	La Tardière	52.0	68.0	84.0	99.0	109.0	121.0	127.0	99.7
FR0016R	Le Casset	88.0	101.0	112.0	121.0	127.0	134.2	141.0	97.7

Table 1.2, cont.

Code	Station	25%	50%	75%	90%	95%	98%	99%	Data capture
GB0002R	Eskdalemuir	34.0	52.0	64.0	76.0	82.0	89.6	94.0	99.3
GB0006R	Lough Navar	32.0	48.0	64.0	78.0	86.0	94.0	100.0	90.9
GB0013R	Yarner Wood	44.0	58.0	74.0	86.0	92.0	100.0	104.0	85.1
GB0014R	High Muffles	50.0	62.0	78.0	90.0	98.0	110.0	118.0	98.4
GB0015R	Strath Vaich Dam	58.0	68.0	80.0	92.0	98.0	104.0	110.0	91.7
GB0031R	Aston Hill	52.0	66.0	78.0	88.0	94.0	100.0	106.0	94.2
GB0032R	Bottesford	32.0	54.0	72.0	86.0	98.0	110.0	122.0	99.3
GB0033R	Bush	44.0	56.0	70.0	81.8	88.0	94.0	98.0	95.4
GB0034R	Glazebury	20.0	42.0	60.0	74.0	82.0	92.0	96.0	97.9
GB0035R	Great Dun Fell	54.0	76.0	90.0	102.0	110.0	120.0	128.0	54.9
GB0036R	Harwell	38.0	56.0	72.0	86.0	94.0	104.0	112.0	98.4
GB0037R	Ladybower Res.	42.0	56.0	68.0	82.0	88.0	98.0	104.0	98.5
GB0038R	Lullington Heath	44.0	62.0	78.0	90.0	98.0	112.0	122.0	89.6
GB0039R	Sibton	38.0	56.0	72.0	86.0	96.0	108.0	124.0	98.4
GB0043R	Narberth	44.0	60.0	76.0	88.0	94.0	104.0	110.0	92.1
GB0044R	Somerton	42.0	60.0	74.0	86.0	94.0	102.0	110.0	98.0
GB0045R	Wicken Fen	32.0	52.0	72.0	88.0	96.0	108.0	122.0	98.3
GR0002R	Finokalia	84.1	99.1	111.9	122.3	128.5	135.7	139.7	76.2
HU0002R	K-puszta	62.0	87.0	118.0	140.0	148.0	156.0	161.3	97.3
IE0031R	Mace Head	62.0	72.0	88.0	96.0	100.0	104.0	110.0	96.9
IT0001R	Montelibretti	22.9	54.4	95.8	124.0	140.9	161.8	175.9	91.1
IT0004R	Ispra	30.2	61.0	93.4	129.2	149.4	169.7	185.0	91.9
LT0015R	Preila	59.0	72.0	84.0	95.0	102.0	112.0	118.0	99.0
LV0010R	Rucava	46.0	63.0	80.0	96.0	107.0	116.6	124.8	93.8
MT0001R	Giordan lighthouse	97.4	110.0	122.6	132.2	138.2	146.4	151.6	94.9
NL0009R	Kollumerwaard	38.0	55.0	70.3	84.5	92.9	105.9	113.7	92.6
NL0010R	Vredepeel	24.1	44.5	65.3	81.6	93.9	111.6	123.2	94.5
NO0001R	Birkenes	40.2	59.2	75.6	89.8	97.1	106.8	111.3	99.0
NO0015R	Tustervatn	57.1	71.5	87.3	99.6	105.3	111.1	114.8	100.0
NO0039R	Kårvatn	32.0	58.2	80.8	100.9	109.1	115.9	119.9	99.4
NO0041R	Osen	34.4	60.6	79.0	93.8	101.8	110.0	114.6	98.8
NO0042G	Spitsbergen, Zeppelinfj	53.8	62.6	76.4	88.0	91.6	94.6	97.4	99.6
NO0043R	Prestebakke	56.0	72.0	86.0	100.0	108.0	116.0	120.0	99.2
NO0045R	Jeløya	50.2	65.2	78.2	88.6	94.8	101.6	106.2	100.0
NO0048R	Voss	45.2	62.4	84.2	100.6	107.4	115.4	122.4	99.6
NO0052R	Sandve	61.8	75.4	88.2	100.0	107.8	116.1	122.0	99.5
NO0055R	Karasjok	51.0	62.4	76.8	92.0	98.7	105.0	108.4	96.9
NO0056R	Hurdal	43.6	61.6	79.6	94.6	102.8	112.4	117.6	99.5
PL0002R	Jarczew	47.0	70.0	97.0	116.0	125.0	134.0	139.0	100.0
PL0003R	Sniezka	76.0	93.0	109.0	120.0	127.0	134.2	140.0	99.9
PL0004R	Leba	62.0	78.0	94.0	108.0	117.0	128.2	137.1	100.0
PL0005R	Diabla Gora	57.0	77.0	96.0	115.0	126.0	137.0	143.3	99.4
PT0004R	Monte Velho	51.0	73.0	92.0	104.0	114.6	129.0	143.0	98.7
RU0016R	Shepeljovo	26.2	36.4	48.0	58.0	64.9	75.0	82.4	84.5
RU0018R	Danki	36.0	60.0	84.0	110.0	118.0	128.0	139.5	32.5
SE0011R	Vavihill	62.0	78.0	96.0	111.0	121.0	131.0	136.0	99.7
SE0012R	Aspvreten	58.0	78.0	96.0	112.0	121.0	132.0	139.0	99.8
SE0013R	Esrange	53.0	64.0	80.0	96.0	103.0	109.0	114.0	99.9
SE0014R	Råö	67.0	82.0	96.0	112.0	121.0	134.0	140.0	97.5
SE0032R	Norra-Kvill	65.0	78.0	94.0	109.0	118.0	127.0	133.0	99.9
SE0035R	Vindeln	43.0	64.0	81.0	95.0	103.0	113.0	117.0	99.4
SE0039R	Grimsö	40.0	61.0	79.0	97.0	107.0	115.0	121.0	99.8
SI0008R	Iskrba	15.0	61.0	93.0	112.0	122.0	133.0	139.1	93.2
SI0031R	Zarodnje	68.0	82.0	96.0	107.0	115.0	122.0	128.0	92.2
SI0032R	Krvavec	98.0	109.0	120.0	131.0	137.0	149.0	157.8	96.1
SI0033R	Kovk	67.0	82.0	96.0	108.0	117.0	124.0	132.6	64.7
SK0002R	Chopok	106.0	114.0	121.0	126.0	130.0	136.0	141.0	95.9
SK0004R	Stará Lesná	37.0	68.0	91.0	107.0	115.0	122.0	126.0	99.8
SK0006R	Starina	51.0	71.0	93.0	109.0	116.0	124.0	129.0	99.8
SK0007R	Topolniky	33.0	50.0	73.0	95.0	118.0	134.0	141.0	99.1

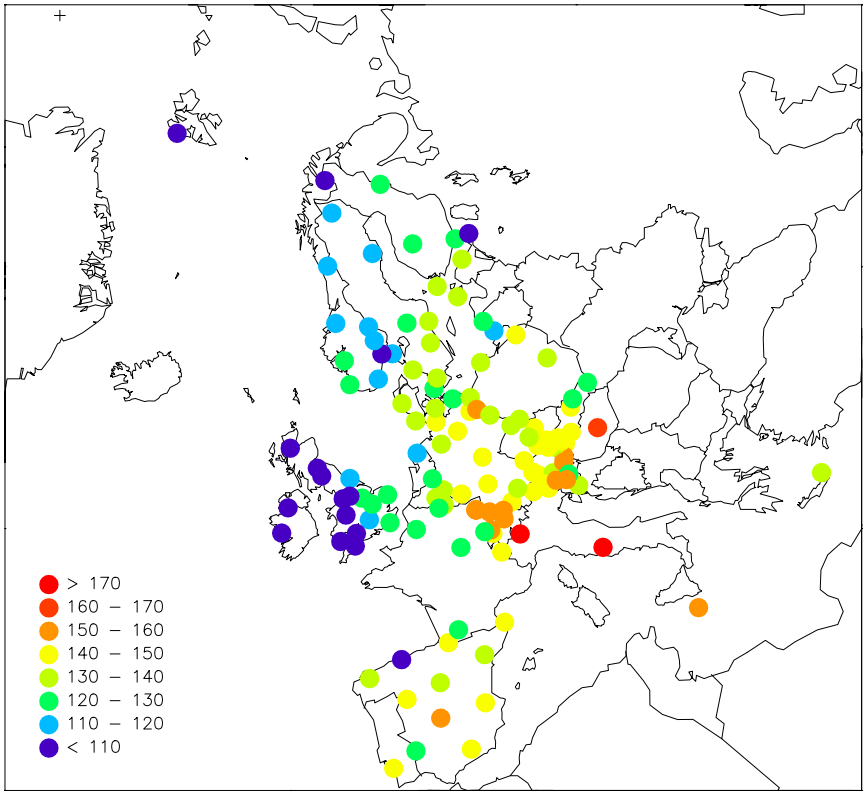


Figure 1.1: Ozone April–September 2002. 99-percentiles (µg/m^3).

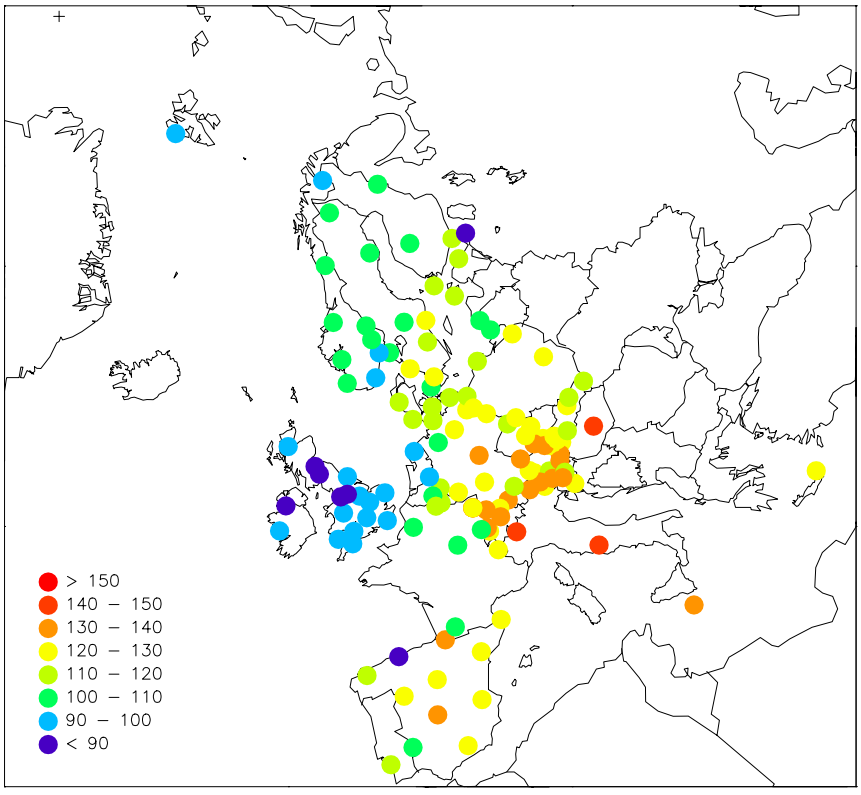


Figure 1.2: Ozone April–September 2002. 95-percentiles (µg/m^3).

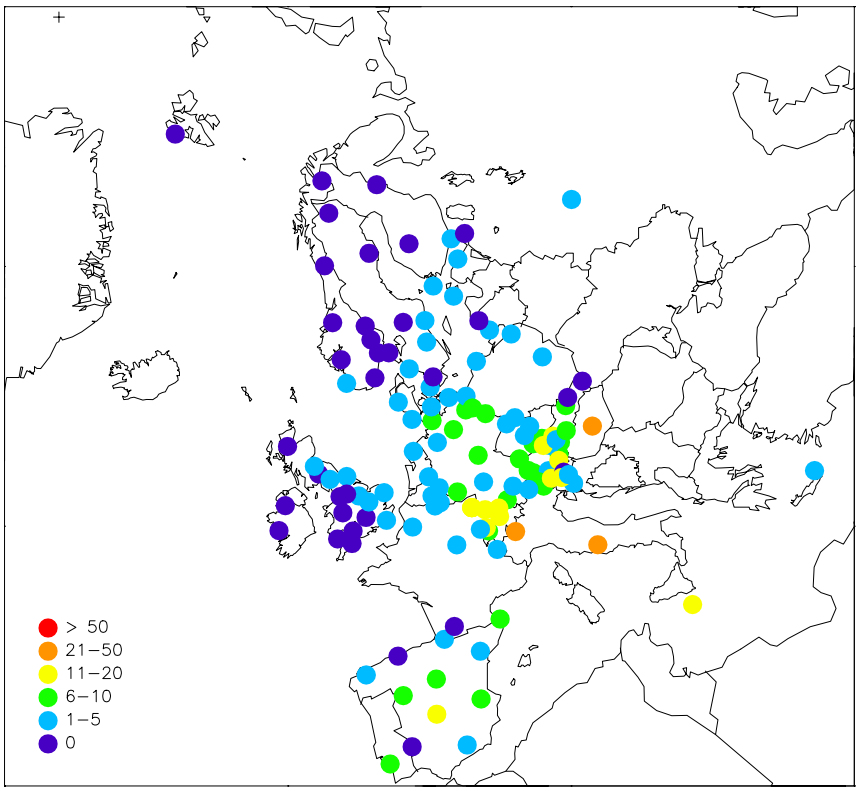


Figure 1.3: Number of exceedances of the threshold value of 150 µg/m^3. (Unit: number of days).

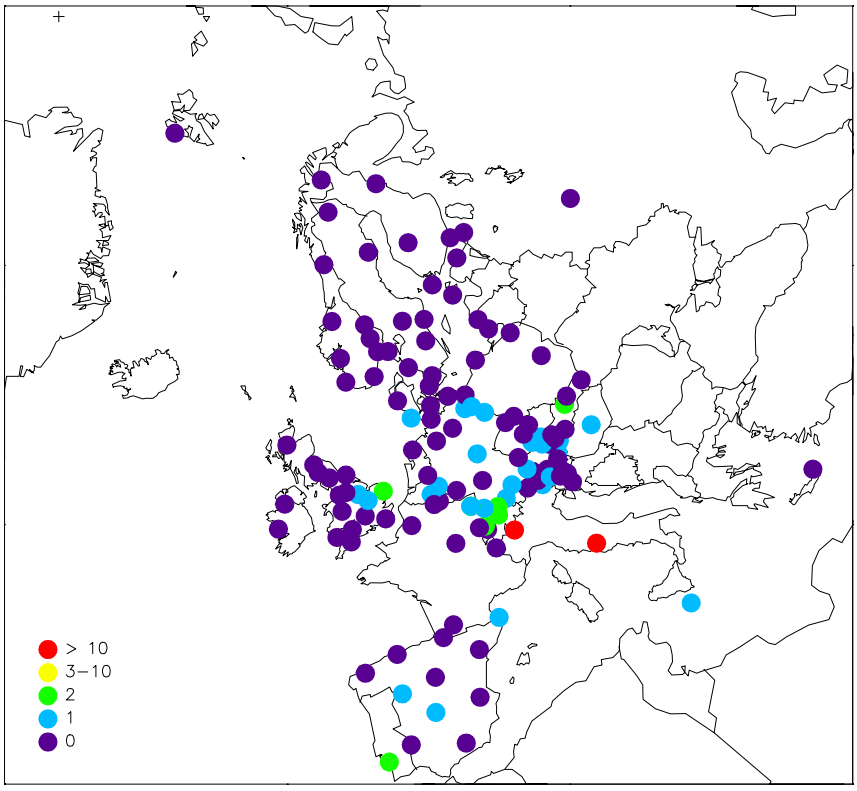


Figure 1.4: Number of exceedances of the threshold value of 180 µg/m^3. (Unit: number of days).

Annex 2

AOT40 and AOT60, figures and tables

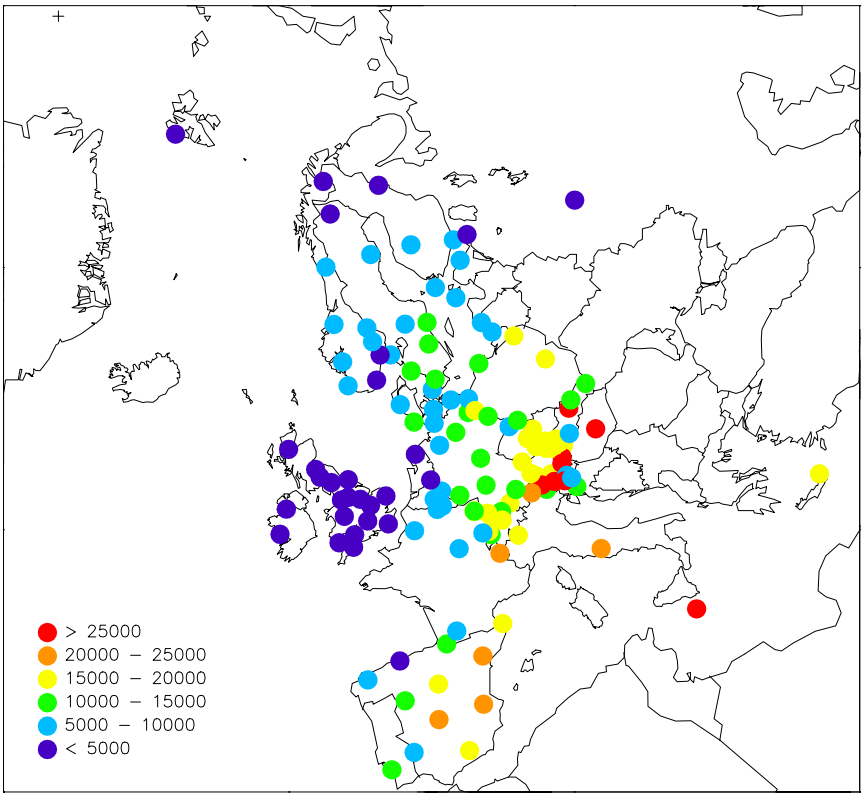


Figure 2.1: AOT40 (ppbh) April–September 2002 (daylight hours).

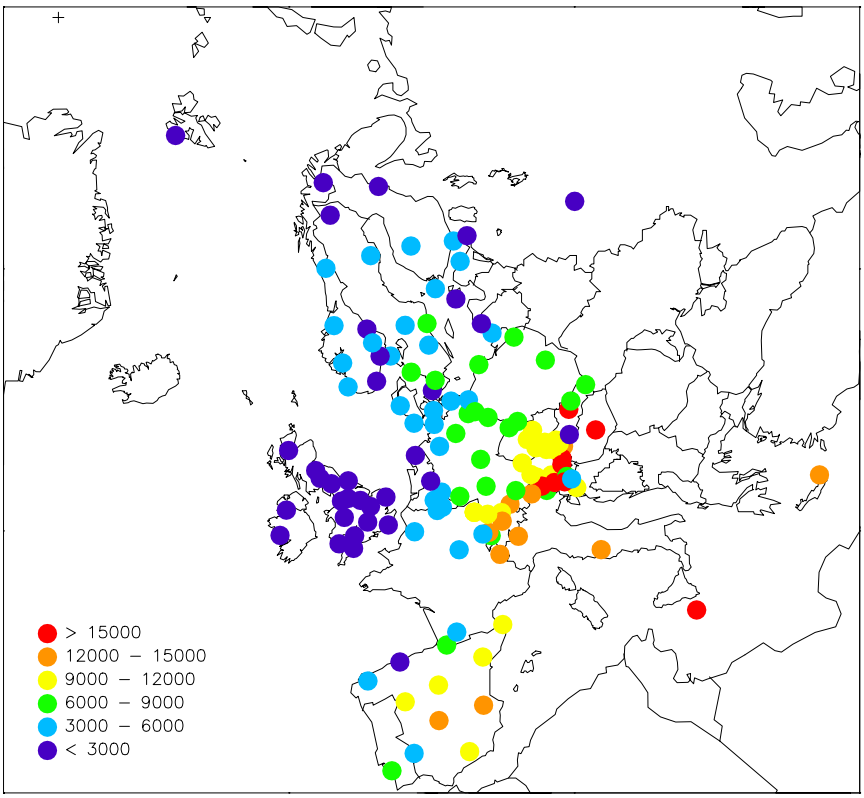


Figure 2.2: AOT40 (ppbh) May, June and July 2002 (daylight hours).

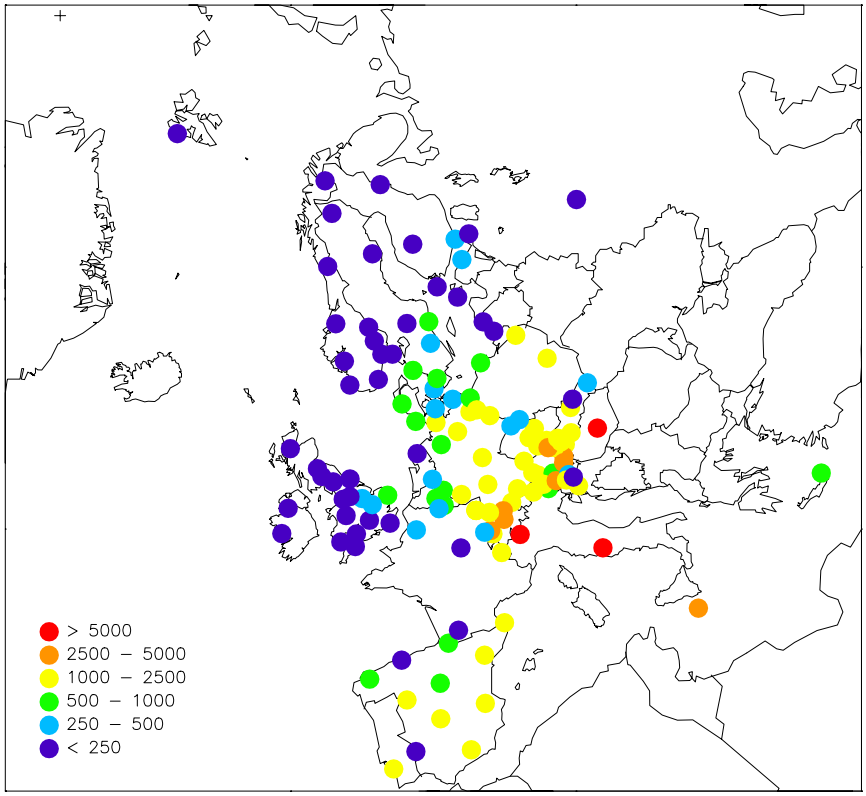


Figure 2.3: AOT60 (ppbh) April-September 2002 (daylight hours).

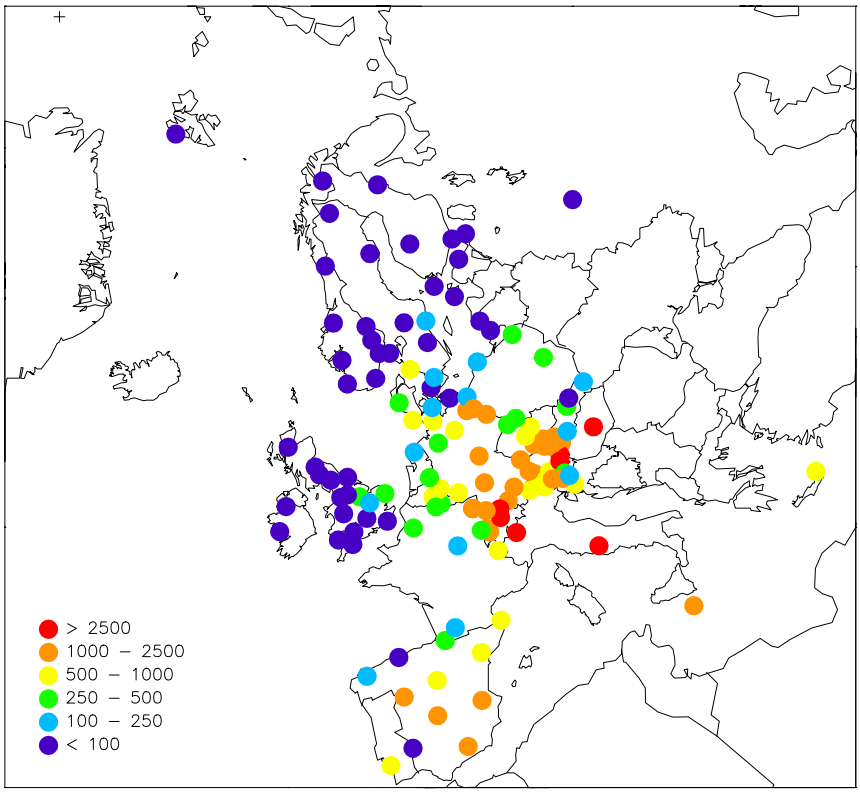


Figure 2.4: AOT60 (ppbh) May, June and July 2002 (daylight hours).

Table 2.1: AOT40 and AOT60 April–September 2002 (daylight hours).

Code	Station	AOT40	AOT40 corrected	AOT60	AOT60 corrected	Data capture
AT0002R	Illmitz	19016	19795	2338	2434	96
AT0004R	St. Koloman	15576	16468	1198	1266	95
AT0005R	Vorhegg	11870	12781	790	851	93
AT0030R	Pillersdorf bei Retz	18356	19793	1948	2101	93
AT0032R	Sulzberg	18194	18311	2140	2154	99
AT0033R	Stolzalpe bei Murau	15139	16128	714	761	94
AT0034G	Sonnblick	29027	30507	1394	1465	95
AT0037R	Zillertaler Alpen	21447	22490	1212	1270	95
AT0038R	Gerlitzen	28751	30179	2570	2698	95
AT0040R	Masenberg	27266	29043	3184	3391	94
AT0041R	Haunsberg	15942	16004	1710	1717	100
AT0042R	Heidenreichstein	17590	19156	2296	2500	92
AT0043R	Forsthof	16536	17530	1367	1449	94
AT0044R	Graz Platte	25318	26831	3812	4040	94
AT0045R	Dunkelsteinerwald	18380	19209	2860	2988	96
AT0046R	Gänserndorf	18756	19672	2331	2445	95
AT0047R	Stixneusiedl	18243	19312	1908	2019	94
BE0001R	Offagne	9260	9909	555	594	93
BE0032R	Eupen	9772	10029	853	875	97
BE0035R	Vezin	7269	7670	902	952	95
CH0002R	Payerne	13954	14615	2019	2114	95
CH0003R	Tänikon	14992	15743	2897	3042	95
CH0004R	Chaumont	19052	20017	2515	2643	95
CH0005R	Rigi	18802	19785	3096	3257	95
CZ0001R	Svratouch	18424	19101	1447	1500	96
CZ0003R	Košetice	18399	18759	1537	1567	98
DE0001R	Westerland	10912	11419	877	918	96
DE0002R	Langenbrügge	12589	13131	1790	1867	96
DE0003R	Schauinsland	16962	18034	1715	1823	94
DE0004R	Deuselbach	11896	12703	1186	1266	94
DE0005R	Brotjacklriegel	17981	18746	1571	1638	96
DE0007R	Neuglobsow	12284	13973	1682	1913	88
DE0008R	Schmücke	14266	15903	1574	1755	90
DE0009R	Zingst	8067	8437	366	383	96
DE0012R	Bassum	5554	6108	514	566	91
DE0026R	Ueckermünde	8153	8954	538	591	91
DE0035R	Lückendorf	8478	10530	494	613	81
DE0039R	Aukrug	7815	8202	1074	1127	95
DE0042R	Öhringen	12808	14587	1466	1669	88
DE0045R	Schorfheide	15538	16695	2478	2663	93
DE0046R	Raisting	12583	13290	1248	1319	95
DE0047R	Falkenberg	13134	13715	1402	1465	96
DK0005R	Keldsnor	8067	8067	474	474	100
DK0031R	Ulborg	8026	8170	509	518	98
DK0041R	Lille Valby	5715	5956	324	337	96
EE0009R	Lahemaa	6853	6903	274	276	99
EE0011R	Vilsandy	7006	7101	198	200	99
ES0007R	Víznar	18455	19123	1420	1472	97
ES0008R	Niembro	853	875	0	0	97
ES0009R	Campisabalos	18038	19098	959	1015	94
ES0010R	Cabo de Creus	19652	20099	1304	1334	98
ES0011R	Barcarrola	8325	8601	144	149	97
ES0012R	Zarra	20631	21574	1894	1980	96
ES0013R	Penausende	14667	15099	1080	1111	97
ES0014R	Els Torms	21082	21704	1218	1253	97
ES0015R	Risco Llamo	23805	25021	2360	2480	95
ES0016R	O Saviñao	9511	10188	698	748	93
FI0009R	Utö	9356	10394	204	227	90
FI0017R	Virolahti II	8749	8830	386	390	99
FI0022R	Oulanka	4760	5220	235	258	91
FI0037R	Ahtari II	7788	7889	206	208	99
FR0008R	Donon	14824	15144	1438	1469	98
FR0008R	Donon	16023	16345	1646	1680	98
FR0008R	Donon	17402	17751	1905	1943	98
FR0008R	Donon	17720	18103	1979	2022	98
FR0009R	Revin	8528	8656	483	490	99
FR0010R	Morvan	5837	6577	162	182	89
FR0012R	Iraty	14267	16645	816	953	86
FR0013R	Peyrusse Vieille	6098	6278	180	185	97
FR0014R	Montandon	7268	7474	441	453	97
FR0015R	La Tardière	8838	8877	452	454	100
FR0016R	Le Casset	23956	24561	1178	1207	98

Table 2.1, cont.

Code	Station	AOT40	AOT40 corrected	AOT60	AOT60 corrected	Data capture
GB0002R	Eskdalemuir	722	728	0	0	99
GB0006R	Lough Navar	1350	1476	0	0	91
GB0013R	Yarner Wood	2474	2987	12	14	83
GB0014R	High Muffles	4027	4100	176	179	98
GB0015R	Strath Vaich Dam	3678	3995	17	18	92
GB0031R	Aston Hill	2496	2648	3	3	94
GB0032R	Bottesford	4611	4676	422	428	99
GB0033R	Bush	1182	1239	0	0	95
GB0034R	Glazebury	1146	1169	16	16	98
GB0035R	Great Dun Fell	3500	6166	117	206	57
GB0036R	Harwell	3522	3611	121	124	98
GB0037R	Ladybower Res.	1946	1990	106	108	98
GB0038R	Lullington Heath	3632	4121	152	172	88
GB0039R	Sibton	3904	3999	510	522	98
GB0043R	Narberth	2718	2927	7	8	93
GB0044R	Somerton	3193	3269	21	21	98
GB0045R	Wicken Fen	4302	4426	366	377	97
GR0002R	Finokalia	16885	21999	800	1042	77
HU0002R	K-puszta	32344	33178	8218	8429	97
IE0031R	Mace Head	4834	4992	1	1	97
IT0001R	Montelibretti	22375	24425	5424	5921	92
IT0004R	Ispra	18013	19572	5727	6222	92
LT0015R	Preila	6180	6306	130	132	98
LV0010R	Rucava	5128	5388	124	130	95
MT0001R	Giordan lighthouse	30294	32083	3490	3696	94
NL0009R	Kollumerwaard	2928	3066	214	224	95
NL0010R	Vredepeel	3395	3527	355	369	96
NO0001R	Birkenes	4558	4634	45	46	98
NO0015R	Tustervatn	6491	6494	61	61	100
NO0039R	Kårvatn	7366	7412	48	49	99
NO0041R	Osen	5708	5786	19	19	99
NO0042G	Spitsbergen, Zeppelinfjell	1939	1952	0	0	99
NO0043R	Prestebakke	8625	8701	134	135	99
NO0045R	Jeløya	3283	3286	7	7	100
NO0048R	Voss	6778	6827	113	113	99
NO0052R	Sandve	8150	8185	184	185	100
NO0055R	Karasjok	2794	2881	26	27	97
NO0056R	Hurdal	5934	5963	53	53	100
PL0002R	Jarczew	17870	17879	1614	1615	100
PL0003R	Sniezka	14842	14842	492	492	100
PL0004R	Leba	13010	13010	857	857	100
PL0005R	Diabla Gora	16927	16952	1758	1761	100
PT0004R	Monte Velho	13045	13156	1399	1411	99
RU0016R	Shepeljovo	24	28	0	0	86
RU0018R	Danki	1355	4210	51	158	32
SE0011R	Vavihill	12201	12260	822	826	100
SE0012R	Aspvreten	12348	12390	711	713	100
SE0013R	Esrange	4127	4135	71	71	100
SE0014R	Råö	13781	14136	988	1014	97
SE0032R	Norra-Kvill	10920	10936	386	387	100
SE0035R	Vindeln	6461	6514	72	73	99
SE0039R	Grimsö	6944	6961	103	103	100
SI0008R	Iskrba	13750	14948	1114	1211	92
SI0031R	Zarodnje	9510	10023	284	300	95
SI0032R	Krvavec	26457	27545	1976	2058	96
SI0033R	Kovk	6872	10046	170	248	68
SK0002R	Chopok	31402	32725	1404	1463	96
SK0004R	Stará Lesná	12194	12194	198	198	100
SK0006R	Starina	14793	14822	468	469	100
SK0007R	Topolniky	9341	9428	1412	1426	99

Table 2.2: AOT40 and AOT60 May–July 2002 (daylight hours).

Code	Station	AOT40	AOT40 corrected	AOT60	AOT60 corrected	Data capture
AT0002R	Illmitz	12394	12898	1706	1776	96
AT0004R	St. Koloman	10622	11153	1150	1207	95
AT0005R	Vorhegg	8240	8709	742	784	95
AT0030R	Pillersdorf bei Retz	11204	12055	1370	1474	93
AT0032R	Sulzberg	12536	12686	1961	1985	99
AT0033R	Stolzalpe bei Murau	10524	11132	698	738	95
AT0034G	Sonnblick	16704	17681	990	1048	94
AT0037R	Zillertaler Alpen	13053	13628	958	1000	96
AT0038R	Gerlitzen	18190	18833	2158	2234	97
AT0040R	Masenberg	18070	19001	2694	2832	95
AT0041R	Haunsberg	11124	11134	1608	1609	100
AT0042R	Heidenreichstein	10318	11692	1526	1729	88
AT0043R	Forsthof	10549	11121	1012	1066	95
AT0044R	Graz Platte	17554	18689	3351	3568	94
AT0045R	Dunkelsteinerwald	11624	12163	2168	2268	96
AT0046R	Gänserndorf	11420	11972	1479	1551	95
AT0047R	Stixneusiedl	11099	12028	1221	1323	92
BE0001R	Offagne	5151	5559	370	400	93
BE0032R	Eupen	5554	5762	661	686	96
BE0035R	Vezin	4253	4493	686	724	95
CH0002R	Payerne	8987	9458	1665	1752	95
CH0003R	Tänikon	10792	11305	2573	2696	95
CH0004R	Chaumont	12444	13072	2129	2236	95
CH0005R	Rigi	13133	13823	2768	2913	95
CZ0001R	Svratouch	10794	10843	821	825	100
CZ0003R	Košetice	10390	10591	862	879	98
DE0001R	Westerland	5932	6143	558	577	97
DE0002R	Langenbrügge	6623	7001	956	1010	95
DE0003R	Schauinsland	10926	11576	1516	1607	94
DE0004R	Deuselbach	7042	7432	912	963	95
DE0005R	Brotjacklriegel	11826	12528	1454	1540	94
DE0007R	Neuglobsow	7464	8613	1254	1446	87
DE0008R	Schmücke	8498	9350	1256	1381	91
DE0009R	Zingst	3830	3993	68	70	96
DE0012R	Bassum	3204	3468	401	434	92
DE0026R	Ueckermünde	4062	4489	200	222	90
DE0035R	Lückendorf	6160	6889	422	472	89
DE0039R	Aukrug	3404	3571	652	684	95
DE0042R	Öhringen	7524	7958	1027	1086	95
DE0045R	Schorfheide	8470	9138	1151	1242	93
DE0046R	Raisting	8808	9159	1170	1217	96
DE0047R	Falkenberg	8532	8881	1042	1084	96
DK0005R	Keldsnor	3595	3595	172	172	100
DK0031R	Ulborg	4300	4417	273	281	97
DK0041R	Lille Valby	2298	2415	72	76	95
EE0009R	Lahemaa	3205	3230	3	3	99
EE0011R	Vilsandy	2967	2992	1	1	99
ES0007R	Víznar	11852	12205	1092	1124	97
ES0008R	Niembro	148	150	0	0	98
ES0009R	Campisabalos	9088	9785	630	678	93
ES0010R	Cabo de Creus	10706	10888	822	836	98
ES0011R	Barcarrola	4981	5165	24	24	96
ES0012R	Zarra	12739	13064	1580	1620	98
ES0013R	Penausende	10339	10670	1018	1051	97
ES0014R	Els Torms	11637	11935	724	743	97
ES0015R	Risco Llamo	13024	13720	1378	1452	95
ES0016R	O Saviñao	4186	4470	198	211	94
FI0009R	Utö	5446	5707	73	76	95
FI0017R	Virolahti II	4422	4496	42	43	98
FI0022R	Oulanka	2320	2526	54	59	92
FI0037R	Ahtari II	3890	3952	58	59	98
FR0008R	Donon	9650	10022	1232	1280	96
FR0008R	Donon	10270	10627	1391	1439	97
FR0008R	Donon	11082	11467	1589	1644	97
FR0008R	Donon	11230	11653	1629	1690	96
FR0009R	Revin	4658	4717	364	369	99
FR0010R	Morvan	3026	3589	115	136	84
FR0012R	Iraty	6280	8145	444	576	77
FR0013R	Peyrusse Vieille	3204	3381	160	168	95
FR0014R	Montandon	5049	5249	438	455	96
FR0015R	La Tardière	5055	5068	401	402	100
FR0016R	Le Casset	14482	14521	806	808	100

Table 2.2, cont.

Code	Station	AOT40	AOT40 corrected	AOT60	AOT60 corrected	Data capture
GB0002R	Eskdalemuir	266	268	0	0	99
GB0006R	Lough Navar	632	683	0	0	93
GB0013R	Yarner Wood	912	1324	12	17	69
GB0014R	High Muffles	1812	1837	61	62	99
GB0015R	Strath Vaich Dam	2494	2568	0	0	97
GB0031R	Aston Hill	1166	1212	3	3	96
GB0032R	Bottesford	2148	2178	265	269	99
GB0033R	Bush	611	624	0	0	98
GB0034R	Glazebury	410	416	16	16	99
GB0035R	Great Dun Fell	1620	2145	44	58	76
GB0036R	Harwell	1692	1744	99	102	97
GB0037R	Ladybower Res.	962	977	94	95	98
GB0038R	Lullington Heath	1951	2397	81	100	81
GB0039R	Sibton	1678	1735	294	304	97
GB0043R	Narberth	1412	1498	1	1	94
GB0044R	Somerton	1394	1405	9	9	99
GB0045R	Wicken Fen	2107	2156	233	238	98
GR0002R	Finokalia	12379	14706	672	798	84
HU0002R	K-puszta	20027	20569	5318	5461	97
IE0031R	Mace Head	2785	2807	1	1	99
IT0001R	Montelibretti	14223	16212	4037	4601	88
IT0004R	Ispra	12354	12893	4591	4791	96
LT0015R	Preila	3586	3651	73	74	98
LV0010R	Rucava	2023	2061	20	21	98
MT0001R	Giordan lighthouse	16129	17839	1833	2027	90
NL0009R	Kollumerwaard	1573	1611	213	218	98
NL0010R	Vredepeel	2256	2280	313	316	99
NO0001R	Birkenes	2420	2464	5	5	98
NO0015R	Tustervatn	3526	3529	59	59	100
NO0039R	Kårvatn	4396	4429	36	36	99
NO0041R	Osen	2967	3039	0	0	98
NO0042G	Spitsbergen, Zeppelinfjell	1438	1445	0	0	100
NO0043R	Prestebakke	4770	4845	18	18	98
NO0045R	Jeløya	1614	1617	0	0	100
NO0048R	Voss	3179	3195	12	12	99
NO0052R	Sandve	4407	4434	14	14	99
NO0055R	Karasjok	1209	1209	0	0	100
NO0056R	Hurdal	3317	3336	24	24	99
PL0002R	Jarczew	8586	8593	408	409	100
PL0003R	Sniezka	8412	8412	284	284	100
PL0004R	Leba	6472	6472	164	164	100
PL0005R	Diabla Gora	8006	8028	370	372	100
PT0004R	Monte Velho	7936	7972	690	693	100
RU0016R	Shepeljovo	1	1	0	0	99
RU0018R	Danki	602	1893	19	60	32
SE0011R	Vavihill	6074	6095	235	236	100
SE0012R	Aspvreten	6572	6583	179	179	100
SE0013R	Esrange	1913	1919	0	0	100
SE0014R	Råö	8494	8853	582	607	96
SE0032R	Norra-Kvill	4690	4703	32	32	100
SE0035R	Vindeln	3722	3774	54	55	99
SE0039R	Grimsö	3735	3751	22	22	100
SI0008R	Iskrba	9784	10629	975	1059	92
SI0031R	Zarodnje	6936	7168	284	294	97
SI0032R	Krvavec	16462	16949	1668	1717	97
SI0033R	Kovk	4748	6796	126	180	70
SK0002R	Chopok	16098	16768	426	444	96
SK0004R	Stará Lesná	6274	6274	98	98	100
SK0006R	Starina	6996	6996	184	184	100
SK0007R	Topolniky	1592	1612	192	194	99

Annex 3

Seasonal variation

Table 3.1: Monthly mean concentrations 2002 (μg/m³).

Code	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
AT0002R	Illmitz	35.0	48.6	64.5	74.2	84.4	86.7	91.5	79.0	65.2	42.7	34.8	26.6
AT0004R	St. Koloman	76.3	74.5	80.9	91.8	93.8	105.5	95.4	88.8	78.1	64.3	59.6	48.7
AT0005R	Vorhegg	64.7	70.4	83.7	84.4	86.9	93.0	78.0	64.7	68.8	58.4	60.5	33.1
AT0030R	Pillersdorf bei Retz	44.8	54.3	68.2	78.9	83.5	88.2	89.2	86.0	68.1	42.2	31.4	27.4
AT0032R	Sulzberg	76.7	70.8	83.4	93.0	91.8	108.7	94.2	88.5	73.1	67.1	61.3	52.4
AT0033R	Stolzalpe bei Murau	74.1	69.0	81.2	82.1	83.9	88.4	81.6	67.7	61.7	51.2	57.4	46.4
AT0034G	Sonnblick	93.1	92.4	102.1	114.1	114.7	114.4	112.6	110.2	100.9	91.6	87.1	90.0
AT0037R	Zillertaler Alpen	93.8	89.2	-	109.5	108.1	110.1	100.9	97.2	87.4	81.8	81.7	78.1
AT0038R	Gerlitzen	96.5	94.9	104.5	105.4	115.3	117.8	114.4	111.4	95.6	80.5	77.4	71.2
AT0040R	Masenberg	75.3	73.8	90.5	97.6	108.6	115.2	114.4	105.4	89.8	70.0	58.1	51.2
AT0041R	Haunsberg	58.9	71.6	74.0	87.0	91.5	99.2	89.8	81.2	71.0	52.3	47.1	35.4
AT0042R	Heidenreichstein	51.2	61.9	68.1	81.0	82.9	87.4	84.6	79.8	61.2	48.5	38.4	31.6
AT0043R	Forsthof	49.6	61.0	71.2	81.8	87.4	95.3	95.1	86.9	73.8	48.8	41.3	29.3
AT0044R	Graz Platte	48.4	63.8	89.0	95.3	106.4	115.2	108.4	97.5	83.8	56.8	44.3	28.2
AT0045R	Dunkelsteinerwald	38.7	54.5	65.7	78.6	77.8	76.8	80.9	69.3	57.4	37.4	28.9	23.7
AT0046R	Gänserndorf	32.0	48.7	64.0	74.2	76.3	79.0	85.6	76.8	60.8	25.6	34.6	26.2
AT0047R	Stixneusiedl	36.3	50.9	64.6	80.8	83.4	84.3	88.0	75.8	62.1	38.7	35.3	28.1
BE0001R	Offagne	41.5	58.3	60.3	79.1	72.2	71.4	67.3	64.2	54.8	44.9	44.9	33.9
BE0032R	Eupen	55.2	73.0	58.3	73.3	71.3	74.1	67.2	62.4	48.3	44.2	45.0	31.3
BE0035R	Vezin	36.0	54.7	43.3	58.3	61.3	56.5	57.0	48.2	36.5	34.1	30.3	22.8
CH0002R	Payerne	26.9	51.9	51.8	70.3	67.7	79.2	73.3	64.9	49.0	39.3	29.2	22.4
CH0003R	Tänikon	30.0	55.6	52.4	70.1	72.3	85.7	76.1	61.3	46.8	38.5	28.8	23.2
CH0004R	Chaumont	75.3	72.0	85.5	98.4	95.0	110.5	97.5	93.2	77.2	70.6	64.5	55.1
CH0005R	Rigi	72.7	70.3	80.6	93.0	94.1	110.4	97.5	92.2	72.9	66.5	61.8	51.0
CZ0001R	Svratouch	51.3	55.5	57.1	82.1	86.9	93.0	92.3	97.7	81.5	52.5	43.7	38.2
CZ0003R	Košetice	51.9	62.5	70.3	80.2	82.1	83.1	80.8	83.7	65.9	52.7	34.5	33.8
DE0001R	Westerland	44.3	76.1	79.2	80.2	81.1	86.9	78.4	82.3	78.7	57.0	39.9	43.4
DE0002R	Langenbrügge	35.7	57.6	59.8	72.8	68.2	70.7	65.5	68.3	51.9	39.4	23.8	26.0
DE0003R	Schauinsland	79.5	73.8	85.1	95.4	93.0	107.6	93.8	93.2	82.6	68.2	66.8	58.9
DE0004R	Deuselbach	48.9	-	70.0	83.5	79.1	82.7	75.2	73.0	62.5	50.0	46.4	34.5
DE0005R	Brotjacklriegel	66.4	68.1	82.0	92.9	94.5	105.6	97.3	94.2	78.9	60.2	56.5	47.7
DE0007R	Neuglobsow	42.1	61.1	63.3	68.3	85.6	66.6	61.7	67.1	56.0	36.1	24.5	29.5
DE0008R	Schmücke	57.6	61.1	77.2	85.2	88.1	93.4	86.6	97.2	74.1	51.4	46.6	35.6
DE0009R	Zingst	38.1	58.5	63.7	75.0	75.1	77.4	67.1	77.3	68.3	49.0	37.4	41.1
DE0012R	Bassum	31.0	52.0	50.3	61.6	53.9	58.5	55.8	56.1	42.3	33.6	17.0	19.1
DE0026R	Ueckermünde	36.3	52.7	60.9	73.6	72.5	73.9	66.4	73.2	56.7	36.2	28.1	32.1

Table 3.1, cont.

Code	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
DE0035R	Lückendorf	38.0	50.8	64.0	75.1	77.7	79.6	74.4	75.5	53.3	46.9	35.9	30.3
DE0039R	Aukrug	28.8	49.1	54.3	58.8	59.3	65.4	60.3	62.1	47.5	32.9	18.4	26.2
DE0042R	Öhringen	-	57.6	59.5	74.9	71.4	74.5	57.0	71.8	53.8	35.5	23.1	21.7
DE0045R	Schorfheide	32.3	48.2	52.2	65.8	75.0	72.1	68.8	73.1	57.0	37.6	26.1	32.2
DE0046R	Raisting	39.3	56.0	51.4	62.2	64.4	70.9	63.9	57.2	46.5	38.8	31.5	23.6
DE0047R	Falkenberg	39.4	58.6	62.3	63.3	72.9	75.1	65.4	65.6	56.7	40.5	23.2	24.8
DK0005R	Keldsnor	37.6	61.6	63.6	68.7	74.1	78.5	75.2	85.1	79.7	55.3	39.3	41.6
DK0031R	Ulborg	42.2	56.4	66.4	74.1	79.2	73.4	64.1	71.2	67.0	51.5	36.4	40.5
DK0041R	Lille Valby	33.8	59.0	62.0	58.7	66.7	68.9	63.3	72.7	60.7	41.8	31.5	33.4
EE0009R	Lahemaa	52.6	62.9	76.5	88.1	77.8	69.5	62.3	60.9	51.9	51.6	43.1	54.2
EE0011R	Vilsandy	52.4	65.6	76.7	89.5	87.0	85.1	79.9	84.5	72.5	59.5	43.4	58.3
ES0007R	Víznar	64.0	71.5	85.1	93.8	92.2	89.6	108.0	90.5	72.4	62.5	58.6	53.8
ES0008R	Niembro	39.8	42.3	45.4	51.6	47.8	40.5	57.9	67.4	68.2	58.6	57.6	56.2
ES0009R	Campisabalos	61.6	61.8	74.5	87.0	86.5	86.2	86.9	85.0	75.1	63.8	63.3	59.9
ES0010R	Cabo de Creus	69.2	72.0	90.5	103.1	98.5	98.5	90.9	92.0	90.4	78.0	67.6	55.1
ES0011R	Barcarrola	45.7	49.4	60.8	63.2	66.6	74.7	76.1	66.7	59.5	55.3	51.8	52.0
ES0012R	Zarra	64.2	68.2	83.0	95.5	92.8	104.1	98.7	91.1	81.7	72.1	62.8	57.6
ES0013R	Penausende	66.2	62.3	59.8	80.1	84.4	96.9	89.5	85.1	75.9	69.3	70.2	67.6
ES0014R	Els Torms	51.8	63.3	78.6	94.1	93.3	99.4	93.9	89.2	87.8	70.4	61.3	51.7
ES0015R	Risco Llamo	74.6	75.4	91.4	106.2	92.8	103.8	114.4	107.1	90.0	79.9	76.5	75.6
ES0016R	O Saviñao	58.4	69.6	78.9	89.2	80.6	71.2	66.8	70.1	72.2	62.7	61.4	61.6
FI0009R	Utö	-	-	-	86.0	84.8	86.0	83.0	88.5	74.9	66.0	51.2	63.0
FI0017R	Virolahti II	48.6	59.0	71.6	79.3	70.8	67.6	61.2	58.6	51.0	50.6	46.6	54.2
FI0022R	Oulanka	70.8	71.9	86.2	95.4	77.1	72.8	59.5	50.7	51.2	61.1	60.1	69.9
FI0037R	Ahtari II	55.9	65.1	79.2	91.7	80.7	69.1	66.9	62.2	55.6	57.6	54.3	60.7
FR0008R	Donon	62.7	70.0	79.7	94.2	95.1	100.5	86.9	85.5	71.1	65.9	63.4	49.7
FR0008R	Donon	63.7	70.6	80.8	95.6	97.4	103.1	89.4	88.6	73.6	67.4	64.9	51.0
FR0008R	Donon	64.2	70.8	81.5	96.2	98.0	103.9	90.0	89.7	74.4	68.0	65.6	51.6
FR0008R	Donon	62.1	69.7	78.9	93.4	94.1	99.3	86.1	84.3	69.5	65.3	63.0	49.5
FR0009R	Revin	39.8	58.4	63.6	81.0	68.7	70.6	66.7	61.1	54.8	49.9	47.2	32.8
FR0010R	Morvan	51.6	58.7	66.3	77.6	66.3	67.1	61.9	58.3	52.2	47.2	44.7	48.0
FR0012R	Iraty	81.7	78.1	96.3	111.7	100.1	95.7	90.9	90.8	93.4	86.6	83.0	81.4
FR0013R	Peyrusse Vieille	47.8	56.7	67.1	76.9	75.0	69.7	66.9	65.2	70.2	58.3	52.1	47.5
FR0014R	Montandon	51.3	57.7	58.1	71.9	65.9	76.6	65.6	55.8	45.1	47.6	43.9	34.1

Table 3.1, cont.

Code	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
FR0015R	La Tardière	43.7	57.6	62.2	76.1	74.7	67.5	65.9	63.3	66.1	51.1	48.9	38.8
FR0016R	Le Casset	82.4	82.5	98.6	106.9	106.1	103.3	102.6	95.5	82.3	82.1	75.2	77.8
GB0002R	Eskdalemuir	43.0	59.2	56.0	60.8	61.8	57.0	40.6	37.1	40.2	41.7	39.5	38.8
GB0006R	Lough Navar	47.4	57.3	48.7	63.8	62.9	52.1	37.1	36.5	34.3	19.6	27.3	24.9
GB0013R	Yarner Wood	55.5	72.0	70.1	74.9	70.1	-	47.8	47.7	52.4	45.6	58.0	37.7
GB0014R	High Muffles	-	65.1	64.9	80.6	71.5	61.6	57.0	54.4	56.2	49.7	34.9	37.7
GB0015R	Strath Vaich Dam	71.9	80.3	78.7	79.8	82.6	72.5	58.3	57.6	69.4	66.9	60.7	52.8
GB0031R	Aston Hill	-	71.9	68.3	79.1	76.4	69.3	54.2	56.0	59.1	48.6	52.3	37.8
GB0032R	Bottesford	37.7	57.7	54.2	60.4	62.7	52.6	50.4	44.0	47.7	36.6	34.9	29.7
GB0033R	Bush	50.7	68.8	64.5	69.5	70.8	63.5	46.5	39.2	50.2	50.5	47.9	39.2
GB0034R	Glazebury	27.2	52.4	46.8	56.8	52.1	44.8	32.5	30.9	31.4	25.6	24.9	28.4
GB0035R	Great Dun Fell	60.0	72.8	72.9	89.8	82.1	-	46.4	-	-	59.8	55.9	49.5
GB0036R	Harwell	44.8	62.6	55.6	69.7	66.0	59.6	49.2	44.8	48.6	37.5	42.9	32.1
GB0037R	Ladybower Res.	42.5	61.3	58.2	70.6	67.0	59.4	47.2	43.7	47.9	40.0	36.2	35.4
GB0038R	Lullington Heath	50.1	67.2	64.1	75.8	74.9	60.8	-	43.1	49.0	46.7	45.3	29.2
GB0039R	Sibton	32.3	55.4	53.1	69.9	64.6	52.7	47.4	50.2	53.9	37.8	36.1	29.9
GB0043R	Narberth	52.0	73.9	70.1	82.3	79.4	66.9	50.1	42.1	41.9	45.6	71.3	50.3
GB0044R	Somerton	52.1	66.8	64.9	70.0	70.6	59.3	48.8	48.8	55.3	46.4	57.2	38.9
GB0045R	Wicken Fen	30.6	52.4	48.2	63.0	62.7	53.1	46.0	43.9	47.2	30.3	29.1	27.1
GR0002R	Finokalia	75.0	84.0	87.5	103.4	115.4	102.1	101.0	86.9	71.8	73.6	67.4	-
HU0002R	K-puszta	38.7	41.7	77.4	90.5	97.5	95.2	96.6	86.7	66.4	47.8	35.6	27.6
IE0031R	Mace Head	74.7	87.4	82.8	87.1	87.1	78.6	62.3	58.2	67.7	65.9	77.2	53.2
IT0001R	Montelibretti	27.8	33.1	48.4	56.7	61.5	75.3	74.3	62.8	45.7	30.9	28.2	20.4
IT0004R	Ispra	10.5	22.3	48.9	70.2	75.0	79.8	69.9	65.0	41.8	34.1	23.0	-
LT0015R	Preila	43.9	58.5	65.5	69.5	77.8	77.2	73.5	70.0	55.5	41.0	36.8	42.9
LV0010R	Rucava	43.8	53.6	61.9	67.0	69.5	65.5	59.0	66.2	48.9	44.4	30.7	41.7
MT0001R	Giordan lighthouse	95.9	93.8	102.6	121.4	110.8	113.5	111.7	97.2	105.2	101.1	91.6	89.7
NL0009R	Kollumerwaard	28.3	51.0	47.6	59.4	55.1	55.1	53.1	54.8	52.1	37.0	19.9	18.0
NL0010R	Vredepeel	22.3	45.3	36.6	49.9	52.1	50.3	48.5	39.8	32.5	25.0	18.7	19.3
NO0001R	Birkenes	45.9	63.8	69.4	67.1	67.2	63.3	52.2	50.6	44.4	51.0	41.5	47.3
NO0015R	Tustervatn	72.3	77.6	88.6	95.0	85.5	72.7	56.7	60.3	60.8	64.9	70.1	70.2
NO0039R	Kårvatn	67.8	81.1	84.8	79.3	79.1	57.5	46.6	38.8	41.8	48.5	54.4	58.2
NO0041R	Osen	47.0	66.7	79.6	75.0	73.1	62.0	49.9	46.2	40.2	48.3	48.8	50.6

Table 3.1, cont.

Code	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
NO0042G	Spitsbergen, Zeppelinfjell	74.6	76.8	74.6	73.7	70.3	69.0	54.7	54.0	63.9	74.4	79.0	75.8
NO0043R	Prestebakke	46.3	67.4	75.4	77.6	78.0	75.4	66.4	67.1	56.7	52.8	42.5	50.3
NO0045R	Jeløya	26.3	56.2	71.1	70.5	71.9	69.8	57.7	59.2	54.7	51.7	42.7	41.5
NO0048R	Voss	57.3	71.5	83.8	85.1	80.2	62.8	48.0	64.0	46.7	55.0	55.5	63.2
NO0052R	Sandve	57.1	71.7	77.4	80.6	83.2	80.5	66.7	70.1	67.2	63.3	53.5	52.3
NO0055R	Karasjok	76.0	71.7	84.1	92.5	73.0	70.2	51.7	49.7	55.7	65.1	72.8	72.0
NO0056R	Hurdal	36.0	59.5	71.5	68.6	74.4	66.9	54.3	57.0	47.0	48.9	45.2	49.1
PL0002R	Jarczew	37.4	54.0	63.5	82.2	78.3	66.4	73.6	78.4	53.3	43.0	33.1	34.4
PL0003R	Sniezka	72.7	69.2	86.3	88.6	100.4	91.9	91.3	99.3	74.1	64.3	60.9	63.9
PL0004R	Leba	51.2	67.4	74.1	77.7	83.3	80.5	75.4	81.1	66.1	52.6	37.8	43.5
PL0005R	Diabla Gora	44.3	60.2	75.4	86.0	89.8	76.3	73.9	79.4	55.3	33.9	20.3	45.3
PT0004R	Monte Velho	57.4	62.2	74.0	85.4	80.0	84.8	65.9	57.3	52.4	56.7	78.8	59.2
RU0016R	Shepeljovo	-	-	59.8	-	41.5	36.0	28.6	33.2	48.1	42.2	-	-
RU0018R	Danki	41.7	48.1	56.6	66.5	58.2	-	-	-	-	-	-	-
SE0011R	Vavihill	39.1	63.8	74.2	89.6	84.4	78.6	71.3	80.5	71.2	55.4	42.5	49.6
SE0012R	Aspvreten	46.9	62.5	75.7	86.8	85.9	77.2	70.8	72.8	62.2	56.3	44.2	56.4
SE0013R	Esrange	74.1	71.3	87.0	90.1	71.5	74.3	55.9	56.2	56.9	63.6	63.7	66.4
SE0014R	Råö	39.4	67.4	73.6	77.5	84.9	91.6	83.3	81.0	72.6	57.0	43.1	47.0
SE0032R	Norra-Kvill	53.8	70.4	76.7	90.6	82.6	77.8	69.4	87.1	72.2	56.6	44.8	55.3
SE0035R	Vindeln	56.6	60.1	76.4	82.0	80.0	61.7	50.0	46.8	45.1	54.9	54.2	61.1
SE0039R	Grimsö	39.4	55.3	67.4	71.0	70.3	63.1	55.2	55.2	45.9	48.2	40.4	48.1
SI0008R	Iskrba	47.9	58.2	68.0	65.4	64.1	65.6	63.0	48.2	39.6	43.6	46.3	29.1
SI0031R	Zarodnje	43.2	58.7	75.2	79.6	87.7	89.6	83.8	76.8	68.0	52.3	47.2	26.3
SI0032R	Krvavec	85.5	84.7	99.1	109.7	113.6	114.4	112.2	107.3	95.0	83.2	76.8	69.6
SI0033R	Kovk	52.7	64.0	77.4	-	-	88.6	83.7	78.9	67.6	51.6	52.6	31.7
SK0002R	Chopok	78.9	87.8	104.3	119.1	108.2	110.3	116.6	117.7	107.4	62.8	60.8	60.5
SK0004R	Stará Lesná	43.3	49.9	67.0	79.4	70.0	63.3	64.6	62.9	45.9	39.3	42.4	40.0
SK0006R	Starina	49.8	61.1	74.4	84.6	75.0	70.4	72.0	76.6	53.9	48.2	48.4	50.3
SK0007R	Topolniky	26.2	35.0	45.2	49.7	43.2	40.7	54.3	81.2	63.5	47.2	40.4	38.3

Table 3.2: Monthly data capture 2002 (μg/m³).

Code	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
AT0002R	Illmitz	96.1	96.3	94.5	96.1	95.8	97.5	95.2	96.9	96.5	96.0	96.0	95.4
AT0004R	St. Koloman	96.2	96.7	96.2	96.7	97.2	96.2	96.4	94.9	96.0	93.8	94.3	95.8
AT0005R	Vorhegg	96.4	96.7	95.7	95.6	96.5	96.0	95.6	95.3	95.0	95.3	94.6	95.3
AT0030R	Pillersdorf bei Retz	96.4	96.6	96.4	95.6	96.6	95.1	94.5	96.2	95.4	94.9	95.3	95.6
AT0032R	Sulzberg	99.6	95.7	100.0	100.0	99.1	99.6	99.6	100.0	100.0	100.0	99.7	99.9
AT0033R	Stolzalpe bei Murau	96.2	96.0	96.2	96.1	96.9	97.2	96.0	95.7	95.7	95.3	94.9	95.4
AT0034G	Sonnblick	97.3	98.1	97.3	96.2	96.1	93.2	94.8	94.2	95.8	95.6	95.1	95.7
AT0037R	Zillertaler Alpen	95.6	94.5	48.9	96.0	95.6	96.1	95.4	96.0	96.0	95.7	96.0	95.2
AT0038R	Gerlitzen	97.0	97.2	96.0	97.2	97.0	97.2	96.2	90.6	96.7	86.0	97.1	93.1
AT0040R	Masenberg	95.4	95.2	95.6	95.4	95.4	95.6	95.4	95.2	95.3	95.7	95.4	95.6
AT0041R	Haunsberg	87.8	55.4	100.0	99.0	100.0	99.9	100.0	100.0	100.0	100.0	99.6	99.9
AT0042R	Heidenreichstein	95.6	95.5	95.7	95.4	95.6	74.4	96.0	95.6	95.7	95.7	95.6	98.9
AT0043R	Forsthof	95.7	95.8	95.8	95.6	92.6	95.8	96.0	95.2	95.8	95.8	95.7	95.8
AT0044R	Graz Platte	95.7	95.2	95.7	95.7	94.1	95.6	95.3	95.3	95.7	87.9	56.1	95.6
AT0045R	Dunkelsteinerwald	95.3	94.6	95.3	95.1	95.6	95.4	95.7	95.6	95.6	95.2	95.7	95.4
AT0046R	Gänserndorf	95.7	95.4	95.6	95.6	95.7	95.6	95.3	95.7	95.4	95.6	95.7	95.4
AT0047R	Stixneusiedl	95.6	95.7	95.6	98.2	97.3	85.4	95.7	95.6	95.7	95.6	95.6	95.6
BE0001R	Offagne	95.7	93.5	82.8	91.4	93.8	95.8	88.3	97.2	97.4	83.9	97.2	95.7
BE0032R	Eupen	96.0	77.4	85.5	96.1	96.0	96.5	97.8	96.9	97.6	84.5	95.6	95.3
BE0035R	Vezin	95.6	95.8	73.9	95.8	95.6	91.8	95.4	95.7	95.0	94.4	64.0	95.7
CH0002R	Payerne	95.4	95.4	95.3	95.3	95.2	95.4	95.0	95.6	96.7	93.3	95.6	95.4
CH0003R	Tänikon	95.3	95.4	94.9	95.3	95.4	94.7	95.6	95.7	94.4	95.2	95.6	95.3
CH0004R	Chaumont	95.4	95.5	95.4	95.4	95.3	94.9	95.4	95.3	95.7	93.4	95.7	95.6
CH0005R	Rigi	95.2	95.2	95.3	95.0	95.6	95.4	95.0	95.6	95.4	93.5	95.6	95.7
CZ0001R	Svratouch	99.9	100.0	98.8	99.6	100.0	99.7	99.3	87.8	91.2	98.1	99.6	99.7
CZ0003R	Košetice	99.7	100.0	100.0	100.0	100.0	100.0	96.4	97.2	99.6	82.3	70.3	89.9
DE0001R	Westerland	98.4	99.0	83.3	93.9	98.5	97.5	98.0	97.8	96.9	93.3	91.7	87.9
DE0002R	Langenbrügge	94.0	95.8	95.8	94.9	95.8	94.3	96.0	96.1	96.1	95.3	95.8	95.6
DE0003R	Schauinsland	92.2	92.0	91.8	91.9	91.9	92.2	95.0	94.5	91.2	65.5	96.1	96.1
DE0004R	Deuselbach	96.0	40.2	95.2	94.3	96.1	95.6	93.1	94.9	95.0	96.0	96.1	96.0
DE0005R	Brotjacklriegel	96.6	97.9	97.3	97.8	97.7	89.4	96.8	98.0	98.1	97.7	93.3	97.2
DE0007R	Neuglobsow	89.0	93.2	92.3	90.7	91.5	79.4	91.0	91.4	91.2	91.1	91.9	91.8
DE0008R	Schmücke	91.7	91.8	91.3	91.1	91.7	90.7	91.5	86.2	91.7	90.7	91.5	91.8
DE0009R	Zingst	96.0	94.8	95.6	95.7	96.0	95.7	96.1	96.0	96.0	94.8	96.0	95.6
DE0012R	Bassum	91.8	91.1	83.2	88.1	91.9	91.8	92.2	91.9	91.9	91.8	92.2	91.9
DE0026R	Ueckermünde	96.0	96.0	88.6	92.2	91.9	87.4	91.1	96.0	84.0	77.7	96.0	96.1

Table 3.2, cont.

Code	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
DE0035R	Lückendorf	91.8	92.0	91.7	92.1	91.7	91.9	88.2	55.4	59.4	91.5	91.9	92.1
DE0039R	Aukrug	91.8	91.7	91.8	92.2	96.0	96.0	95.6	95.6	96.1	77.4	96.0	96.0
DE0042R	Öhringen	43.4	91.8	91.9	85.1	91.5	93.2	99.9	62.6	98.3	96.0	96.0	96.1
DE0045R	Schorfheide	91.8	93.3	96.1	95.6	95.3	91.9	92.1	92.1	91.9	91.9	91.9	92.2
DE0046R	Raisting	91.9	92.4	92.2	88.6	95.8	95.8	96.0	95.8	96.0	95.8	96.1	96.0
DE0047R	Falkenberg	95.8	96.0	95.4	96.0	95.8	96.0	96.0	95.0	94.3	91.9	91.9	91.9
DK0005R	Keldsnor	100.0	100.0	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
DK0031R	Ulborg	99.7	99.6	95.3	99.7	99.6	99.6	93.4	99.7	99.7	99.6	99.7	99.5
DK0041R	Lille Valby	95.6	98.8	97.6	98.9	99.5	95.3	91.9	94.4	97.9	83.9	93.3	99.9
EE0009R	Lahemaa	93.3	92.4	95.8	99.4	100.0	98.7	99.6	99.6	99.9	100.0	99.2	99.9
EE0011R	Vilsandy	99.1	99.9	96.6	98.6	99.3	99.2	99.5	100.0	98.2	99.6	99.6	98.7
ES0007R	Víznar	96.9	97.5	97.4	94.0	98.7	98.2	98.8	98.0	98.3	97.8	98.5	99.2
ES0008R	Niembro	95.2	97.8	98.7	95.6	97.8	99.2	98.9	98.3	98.9	99.2	99.2	91.5
ES0009R	Campisabalos	98.5	98.7	98.7	98.5	98.4	92.5	94.9	93.8	95.7	91.0	98.8	98.3
ES0010R	Cabo de Creus	97.8	99.3	99.2	95.7	99.2	98.9	99.3	99.3	98.1	95.4	90.6	85.2
ES0011R	Barcarrola	99.3	98.7	98.7	97.9	96.2	98.8	95.2	96.8	98.2	94.8	99.0	98.5
ES0012R	Zarra	91.7	97.0	99.2	99.2	98.9	96.1	98.8	94.6	91.1	98.7	98.9	99.1
ES0013R	Penausende	98.8	94.8	97.2	99.0	95.7	98.9	98.3	98.8	98.2	96.5	98.3	98.0
ES0014R	Els Torms	99.1	98.7	99.2	98.6	98.8	98.6	98.9	96.6	96.9	98.9	99.4	98.8
ES0015R	Risco Llamo	93.4	98.7	95.0	97.8	99.1	98.2	89.2	95.6	97.2	98.3	97.4	96.8
ES0016R	O Saviñao	96.4	96.6	99.2	99.2	98.7	94.6	89.2	85.1	93.3	89.0	86.1	92.7
FI0009R	Utö	27.4	0.0	20.3	57.2	86.6	100.0	99.5	95.7	100.0	100.0	91.2	100.0
FI0017R	Virolahti II	97.8	100.0	100.0	99.4	98.4	100.0	98.8	100.0	99.7	97.2	100.0	100.0
FI0022R	Oulanka	96.4	100.0	96.8	76.1	75.5	99.7	97.8	100.0	96.4	99.9	100.0	96.8
FI0037R	Ahtari II	98.0	100.0	99.7	99.7	97.6	99.3	99.6	100.0	97.4	100.0	100.0	98.1
FR0008R	Donon	97.8	98.7	89.0	94.6	93.1	97.6	94.9	97.4	98.6	97.2	97.4	97.4
FR0008R	Donon	99.7	100.0	90.3	96.0	94.4	99.0	96.1	98.8	100.0	99.1	99.0	98.8
FR0008R	Donon	99.6	100.0	90.1	96.0	94.5	98.8	95.8	98.8	100.0	98.9	99.7	99.1
FR0008R	Donon	98.0	98.7	88.8	94.7	93.1	97.4	94.6	97.4	98.5	97.4	95.1	97.4
FR0009R	Revin	99.5	99.9	99.6	99.4	99.3	99.4	99.3	99.5	98.3	88.6	99.4	97.6
FR0010R	Morvan	99.6	94.3	92.3	96.0	78.9	79.9	94.4	99.1	87.6	99.6	76.1	95.8
FR0012R	Iraty	82.1	80.8	99.5	94.3	52.6	84.0	92.2	99.1	97.6	98.9	88.5	67.2
FR0013R	Peyrusse Vieille	100.0	99.9	100.0	100.0	82.7	99.9	100.0	99.9	99.9	99.9	99.7	100.0
FR0014R	Montandon	96.2	97.6	97.2	96.4	90.2	97.6	98.1	98.4	97.8	97.2	98.2	98.3

Table 3.2, cont.

Code	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
FR0015R	La Tardière	99.7	99.1	99.9	99.4	99.6	99.7	99.9	99.6	99.7	99.3	99.7	86.2
FR0016R	Le Casset	100.0	100.0	100.0	99.0	100.0	100.0	99.6	94.6	93.1	100.0	100.0	100.0
GB0002R	Eskdalemuir	99.9	99.7	100.0	99.9	99.9	99.3	99.5	97.3	100.0	100.0	100.0	97.7
GB0006R	Lough Navar	97.3	61.8	53.6	99.3	79.3	100.0	100.0	99.6	66.9	93.5	99.6	99.2
GB0013R	Yarner Wood	98.9	95.5	99.7	99.9	91.3	19.6	99.2	99.6	99.9	99.9	99.9	99.7
GB0014R	High Muffles	42.7	94.6	99.5	99.9	99.9	96.5	99.9	99.9	94.3	99.9	99.9	99.9
GB0015R	Strath Vaich Dam	99.6	99.7	99.9	56.9	100.0	93.5	99.7	99.3	99.9	99.9	99.7	94.8
GB0031R	Aston Hill	44.0	89.7	82.1	75.3	98.7	91.8	99.9	99.7	99.6	99.6	99.9	99.9
GB0032R	Bottesford	99.1	99.6	99.9	99.3	99.5	99.0	99.3	99.2	99.6	98.0	99.4	99.6
GB0033R	Bush	98.8	99.7	100.0	81.7	94.6	99.6	99.9	96.8	99.9	98.7	99.9	99.2
GB0034R	Glazebury	99.9	96.1	99.3	97.2	99.9	98.7	97.4	97.2	96.9	100.0	99.9	99.6
GB0035R	Great Dun Fell	99.6	97.9	96.9	99.7	99.6	37.9	91.4	0.0	0.0	69.2	99.7	99.9
GB0036R	Harwell	95.7	99.0	99.3	99.0	95.0	99.4	98.4	99.5	98.9	98.3	99.0	84.0
GB0037R	Ladybower Res.	96.9	83.6	96.5	94.3	98.8	99.4	99.3	99.6	99.4	98.9	99.6	99.6
GB0038R	Lullington Heath	92.3	98.8	98.8	99.7	98.7	98.9	47.7	97.8	95.8	99.2	98.5	97.6
GB0039R	Sibton	99.7	99.4	100.0	99.7	96.1	96.5	99.6	98.8	99.7	99.5	100.0	99.9
GB0043R	Narberth	80.1	96.0	87.4	77.9	91.0	95.1	92.3	98.7	97.4	84.1	98.5	91.3
GB0044R	Somerton	99.5	99.1	85.9	99.7	99.6	99.4	99.7	99.2	90.1	98.9	99.6	99.7
GB0045R	Wicken Fen	97.8	98.1	99.7	95.3	99.2	99.3	97.8	99.5	98.8	98.3	99.3	99.1
GR0002R	Finokalia	97.4	78.6	55.5	66.4	73.0	95.7	84.8	81.3	55.7	92.2	66.8	0.0
HU0002R	K-puszta	96.9	95.8	94.0	95.8	95.2	100.0	98.5	96.1	98.1	98.1	98.5	99.9
IE0031R	Mace Head	99.6	99.6	100.0	100.0	99.5	100.0	98.5	84.0	100.0	99.3	100.0	99.6
IT0001R	Montelibretti	77.8	87.6	93.5	96.7	98.1	97.4	64.7	95.6	94.9	100.0	97.1	100.0
IT0004R	Ispra	89.0	99.9	94.8	99.7	96.2	92.8	99.6	71.4	91.8	96.0	58.2	2.8
LT0015R	Preila	100.0	97.9	100.0	96.5	98.9	100.0	98.3	100.0	100.0	100.0	100.0	96.2
LV0010R	Rucava	97.8	85.3	95.3	98.8	97.6	98.3	96.6	98.7	72.6	52.2	99.3	64.5
MT0001R	Giordan lighthouse	89.4	98.2	99.7	97.4	99.7	99.9	73.4	99.6	99.7	94.4	86.8	94.0
NL0009R	Kollumerwaard	93.7	97.8	96.9	97.5	98.4	91.9	97.6	96.4	73.2	97.0	99.7	99.7
NL0010R	Vredepeel	95.4	95.7	97.0	96.5	97.4	97.2	98.3	87.9	89.7	96.5	96.5	66.9
NO0001R	Birkenes	99.3	100.0	100.0	100.0	100.0	97.5	98.9	99.1	98.8	95.8	97.6	99.5
NO0015R	Tustervatn	99.7	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.0	56.9	99.4	99.6
NO0039R	Kårvatn	99.9	100.0	99.7	100.0	97.8	99.6	99.9	99.3	100.0	99.2	97.2	99.6
NO0041R	Osen	100.0	94.2	86.4	100.0	99.2	95.7	98.0	100.0	100.0	100.0	100.0	99.9
NO0042G	Spitsbergen, Zeppelinfjell	99.7	73.4	99.7	99.2	99.7	99.7	99.6	99.7	99.4	99.5	99.7	97.3

Table 3.2, cont.

Code	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
NO0043R	Prestebakke	99.9	100.0	100.0	100.0	100.0	95.1	100.0	100.0	100.0	100.0	100.0	100.0
NO0045R	Jeløya	100.0	100.0	100.0	100.0	99.7	100.0	100.0	100.0	100.0	99.9	100.0	100.0
NO0048R	Voss	100.0	99.7	99.6	100.0	99.7	99.6	99.9	100.0	98.6	100.0	100.0	100.0
NO0052R	Sandve	99.6	99.7	99.7	99.0	99.1	100.0	100.0	100.0	98.8	100.0	100.0	100.0
NO0055R	Karasjok	100.0	100.0	100.0	83.3	100.0	100.0	100.0	98.1	99.4	100.0	98.8	100.0
NO0056R	Hurdal	99.6	100.0	100.0	99.6	99.3	98.5	99.7	100.0	100.0	99.1	100.0	100.0
PL0002R	Jarczew	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PL0003R	Sniezka	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.6	100.0	100.0	100.0
PL0004R	Leba	100.0	100.0	100.0	99.9	100.0	100.0	100.0	100.0	100.0	100.0	99.7	100.0
PL0005R	Diabla Gora	92.3	97.9	84.3	100.0	100.0	99.4	98.0	100.0	99.0	100.0	77.1	100.0
PT0004R	Monte Velho	91.3	91.5	94.8	99.7	99.9	99.6	98.4	96.5	98.1	57.5	70.8	80.2
RU0016R	Shepeljovo	0.0	0.0	86.6	11.0	99.7	98.2	100.0	100.0	96.4	55.1	0.0	0.0
RU0018R	Danki	92.7	89.6	99.6	98.6	96.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SE0011R	Vavihill	99.3	100.0	85.3	99.6	100.0	99.3	100.0	100.0	99.3	100.0	100.0	100.0
SE0012R	Aspvreten	94.2	83.6	95.4	99.2	99.7	100.0	100.0	100.0	100.0	76.1	94.7	100.0
SE0013R	Esrange	100.0	99.6	100.0	100.0	100.0	99.9	99.5	100.0	100.0	100.0	100.0	100.0
SE0014R	Råö	98.7	99.1	100.0	100.0	98.7	99.9	88.8	99.1	99.0	100.0	100.0	99.9
SE0032R	Norra-Kvill	91.9	94.9	100.0	100.0	99.6	99.9	99.9	100.0	100.0	99.7	100.0	100.0
SE0035R	Vindeln	99.9	97.9	100.0	100.0	100.0	96.9	99.3	100.0	100.0	100.0	99.2	99.7
SE0039R	Grimsö	100.0	99.1	99.7	100.0	99.5	99.6	100.0	100.0	100.0	99.6	100.0	100.0
SI0008R	Iskrba	71.4	94.3	90.9	93.8	94.8	91.0	92.3	93.1	94.3	94.2	89.6	95.6
SI0031R	Zarodnje	94.6	95.2	94.8	90.3	92.6	95.6	95.2	88.8	90.8	95.3	94.6	95.0
SI0032R	Krvavec	90.7	98.1	87.1	100.0	100.0	100.0	92.5	94.2	90.0	91.0	83.2	95.6
SI0033R	Kovk	93.8	87.4	89.7	3.6	4.8	95.0	95.3	95.0	94.2	92.5	92.9	80.8
SK0002R	Chopok	99.6	93.5	94.0	93.5	95.0	97.6	95.8	97.8	95.8	96.4	100.0	100.0
SK0004R	Stará Lesná	97.2	100.0	100.0	100.0	99.9	99.4	99.9	100.0	99.7	99.6	100.0	100.0
SK0006R	Starina	100.0	100.0	100.0	99.6	100.0	100.0	99.9	99.2	100.0	98.9	99.3	99.9
SK0007R	Topolniky	97.4	98.1	100.0	100.0	100.0	100.0	96.1	98.8	99.6	99.2	99.7	99.9

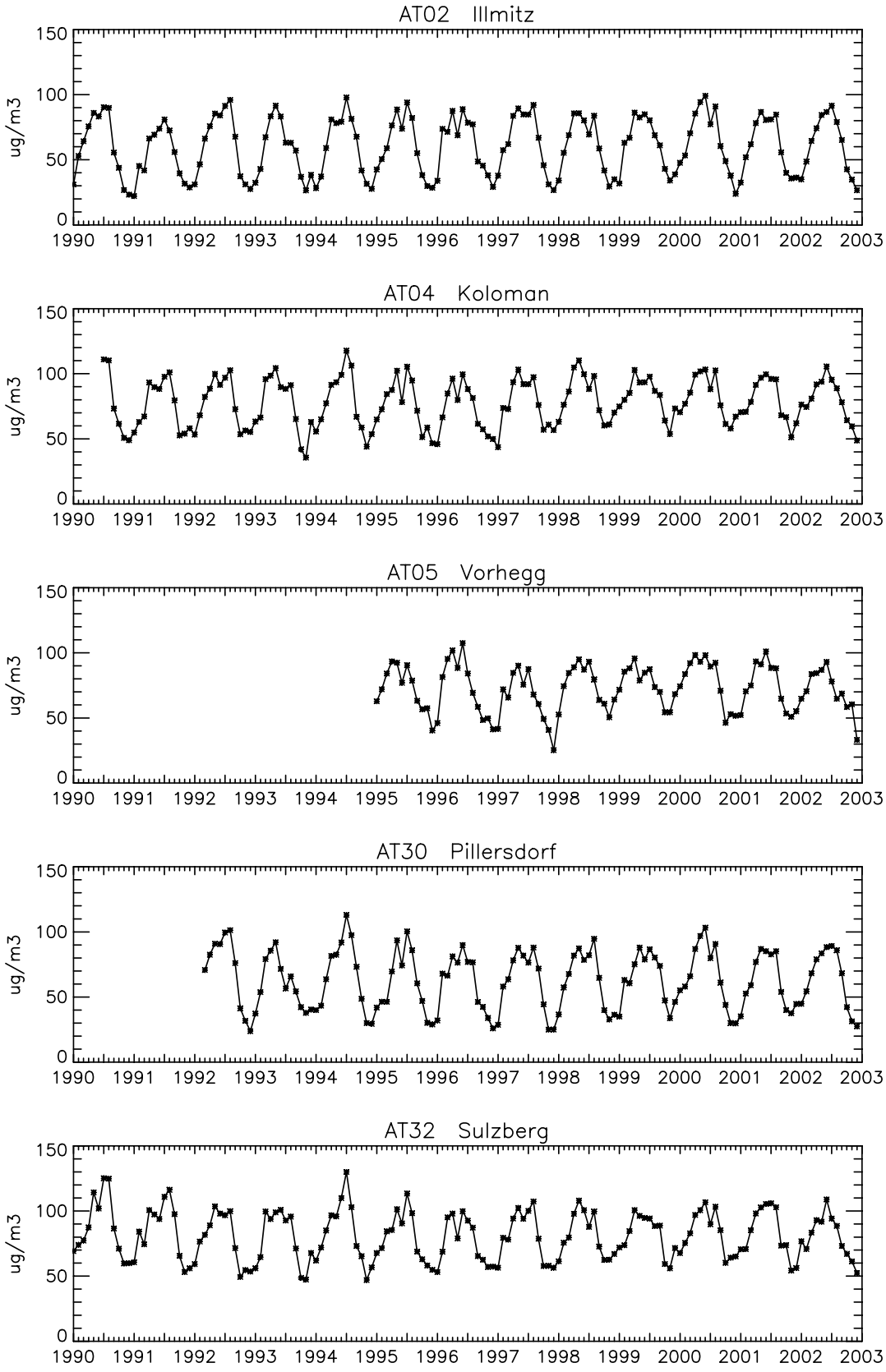


Figure 3.1: Seasonal variation, 1990–2002.

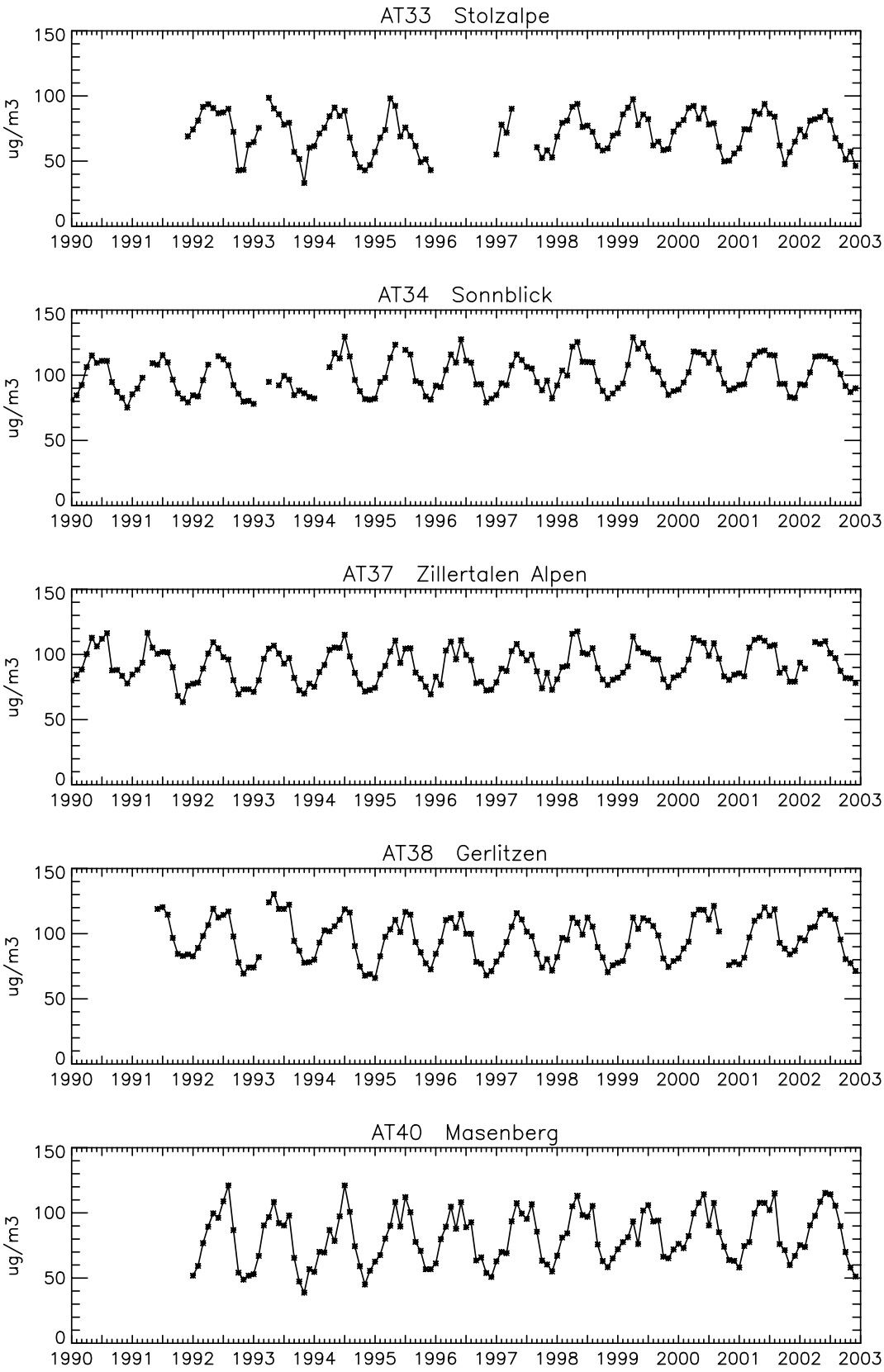


Figure 3.1, cont.

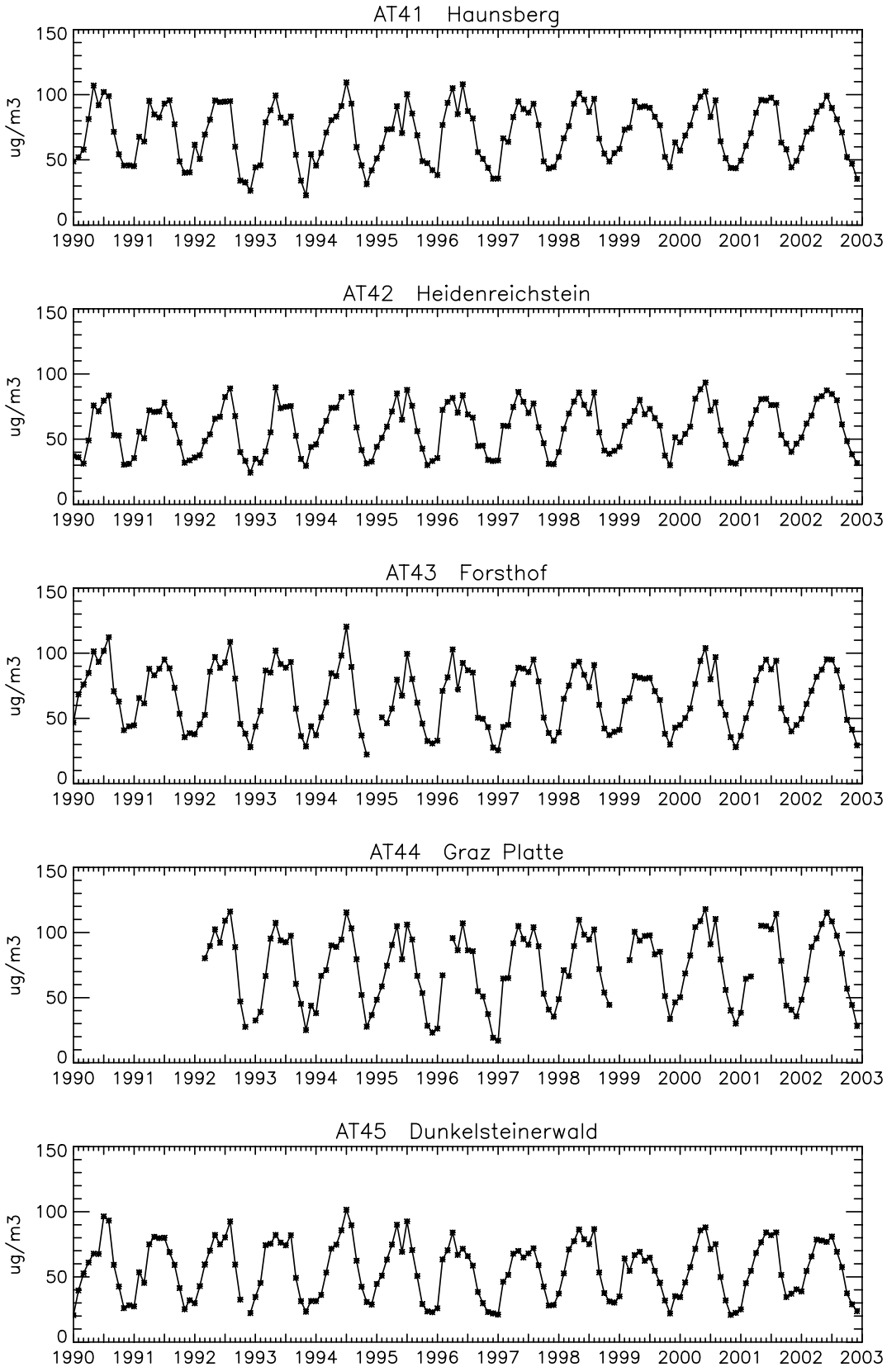


Figure 3.1, cont.

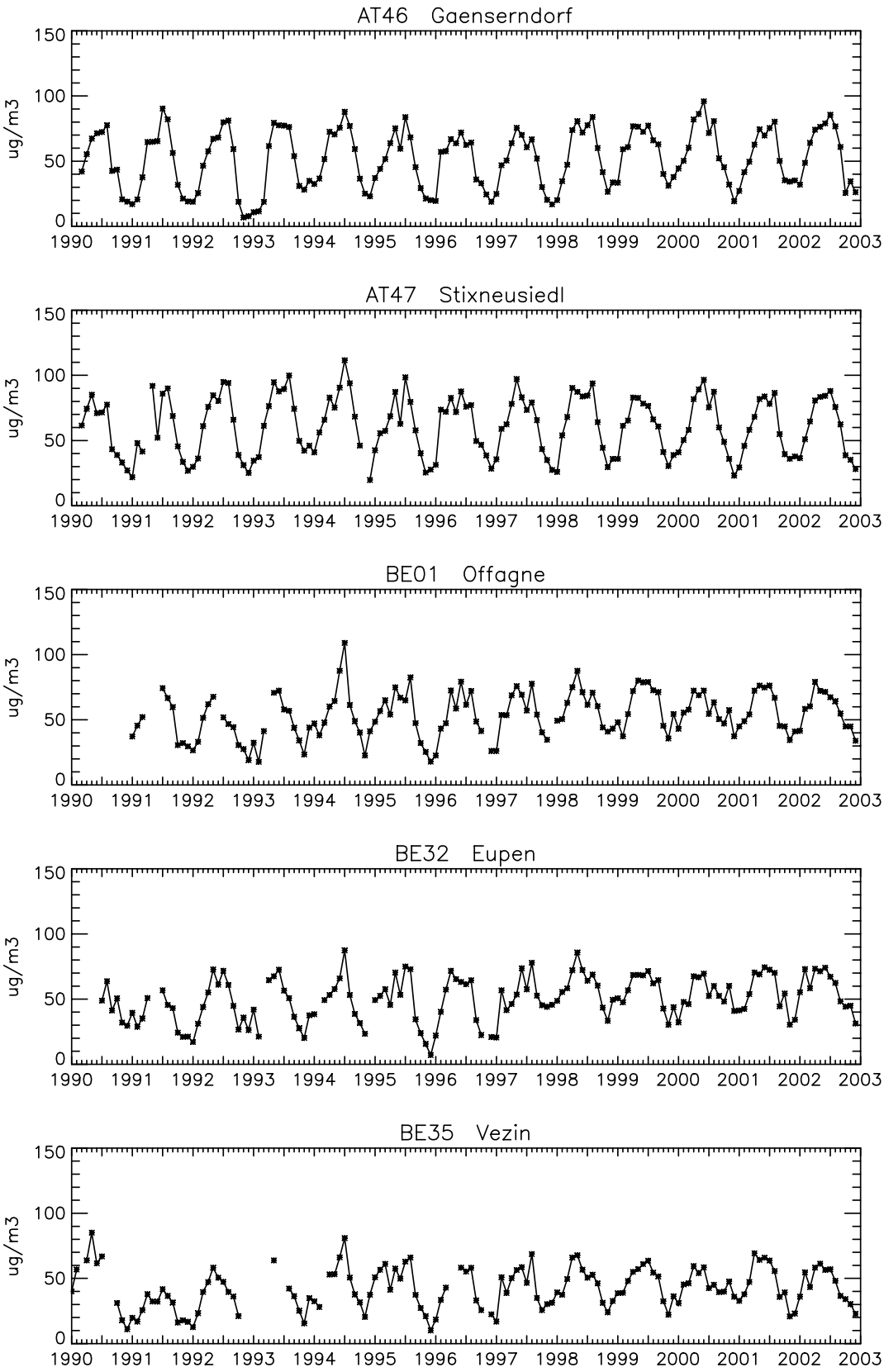


Figure 3.1, cont.

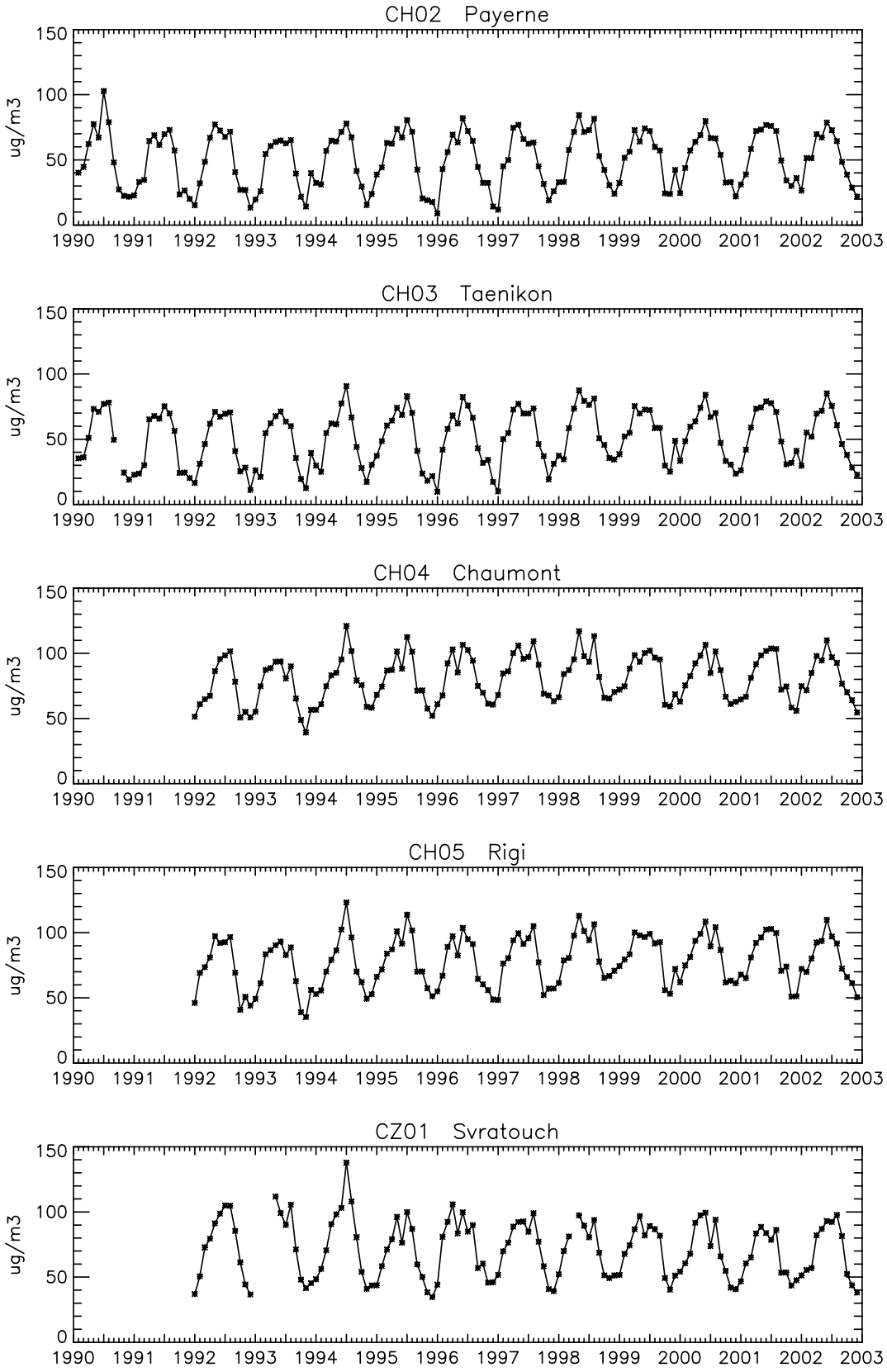


Figure 3.1, cont.

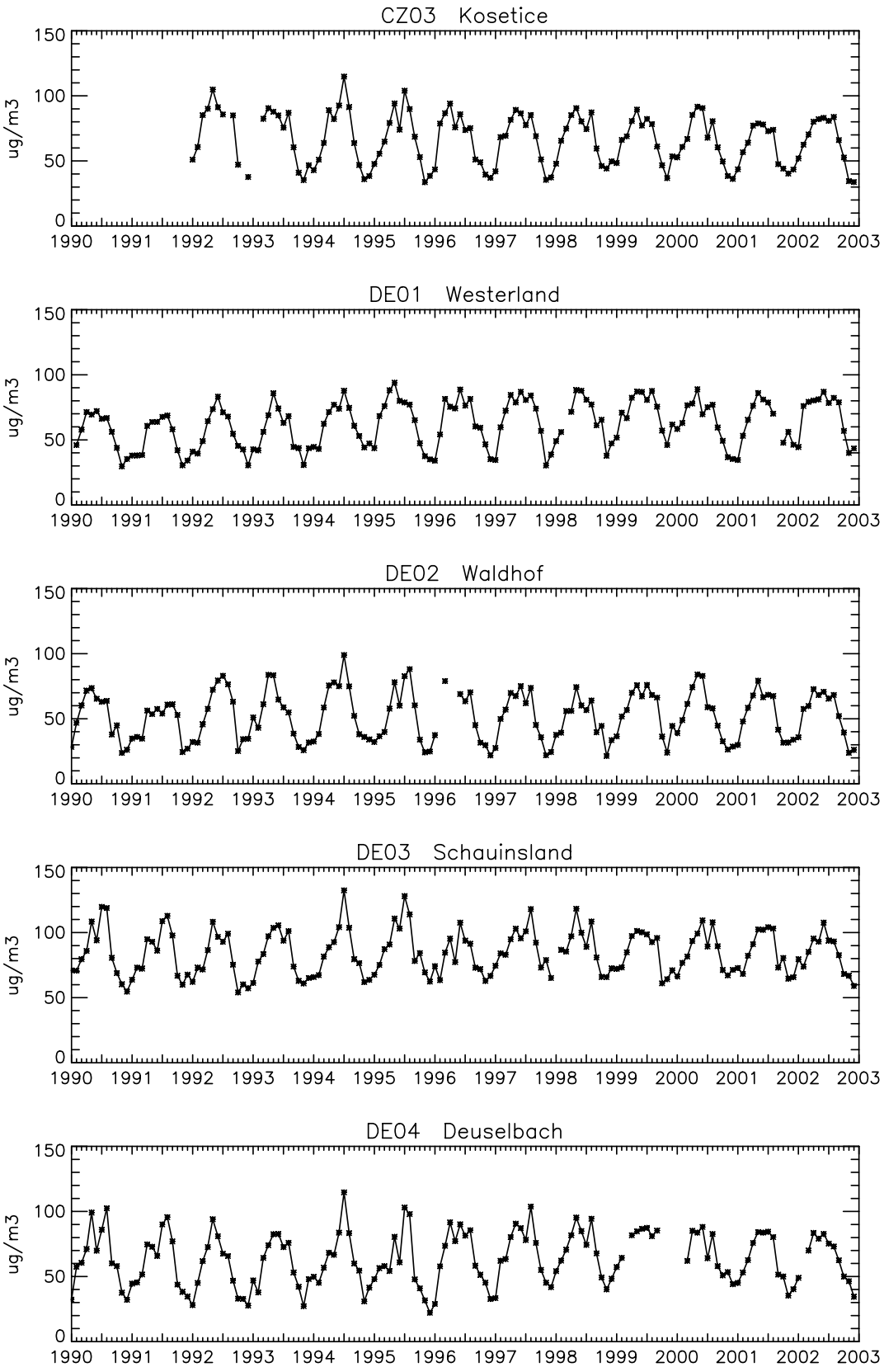


Figure 3.1, cont.

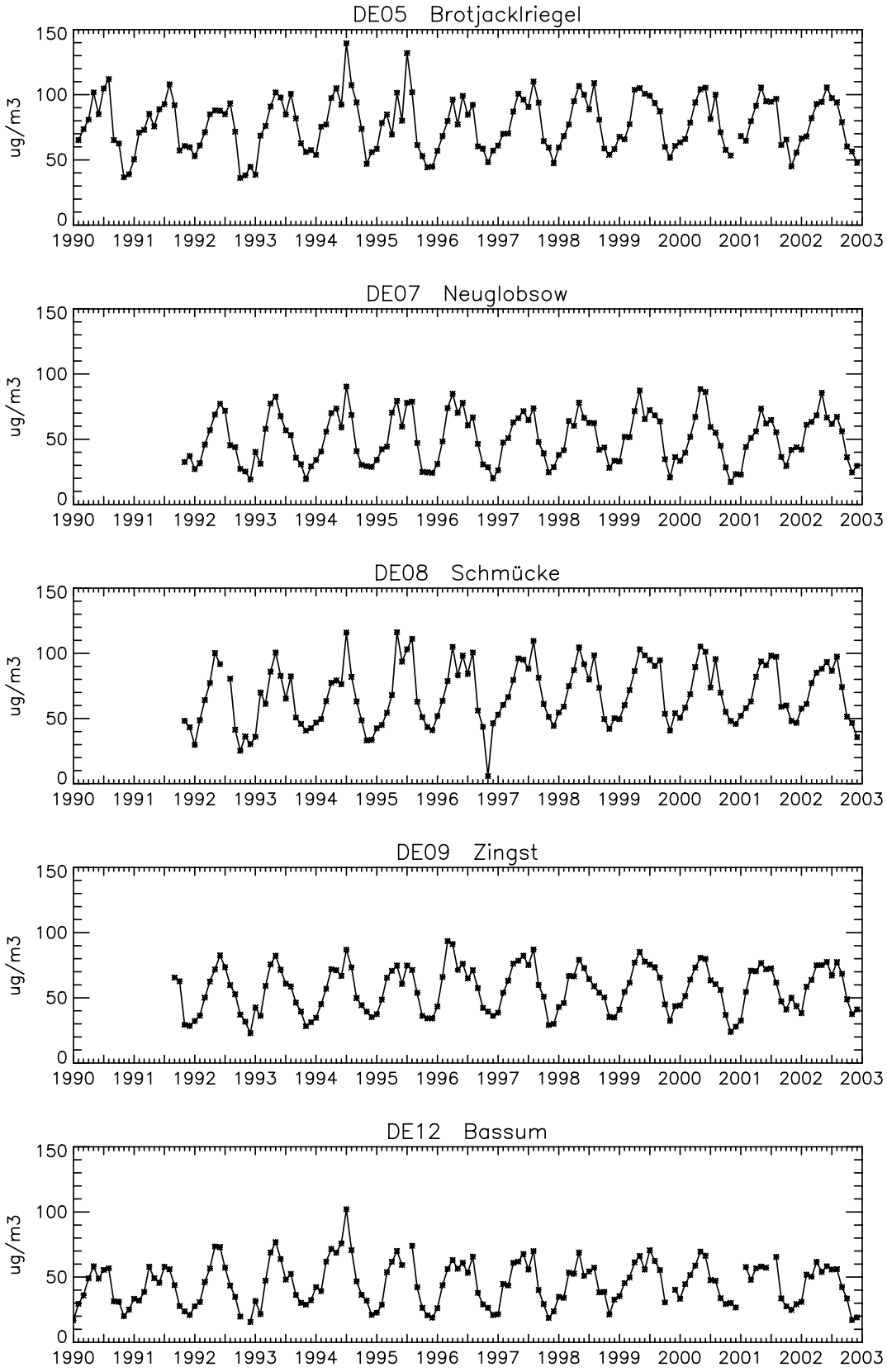


Figure 3.1, cont.

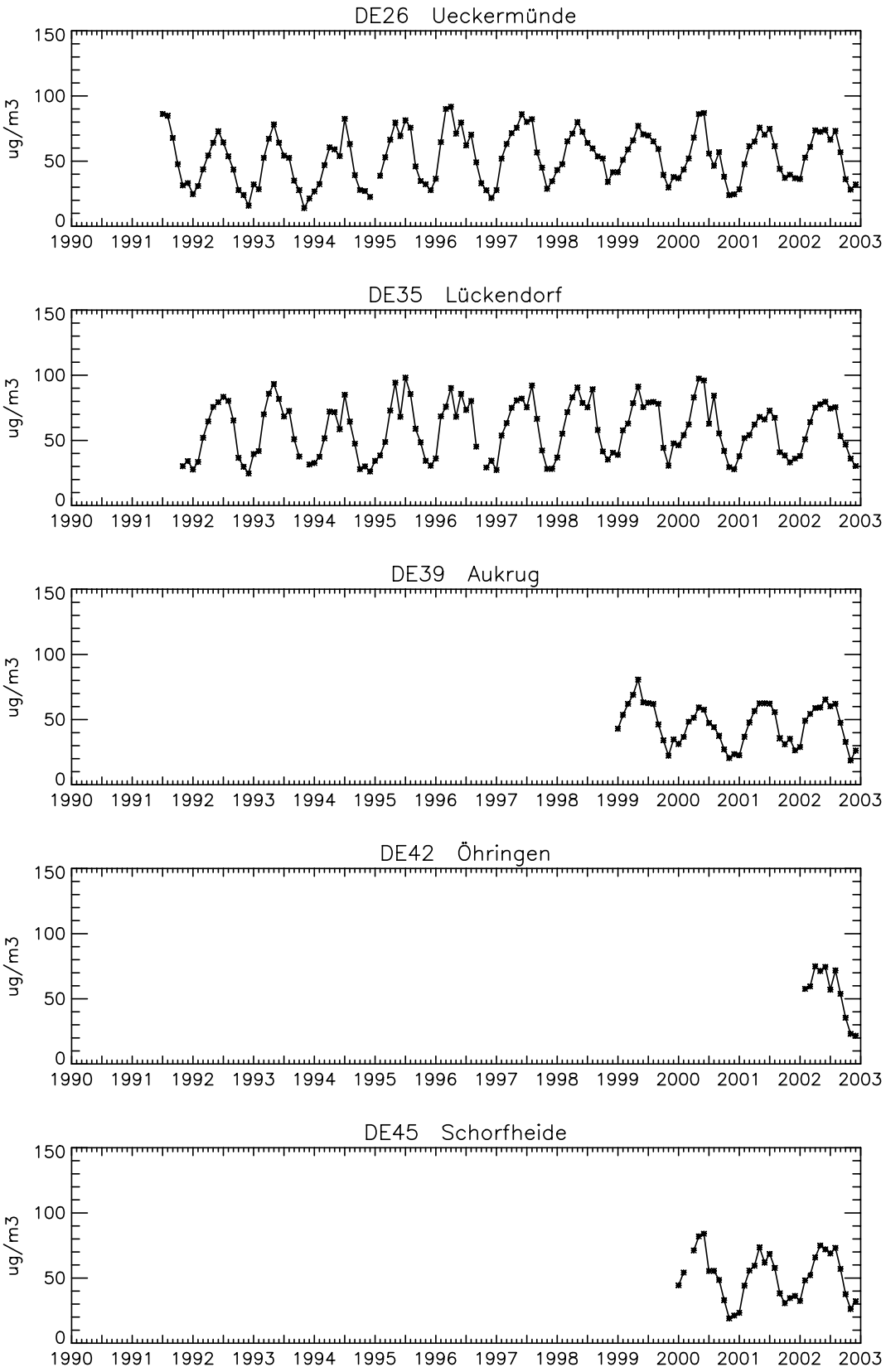


Figure 3.1, cont.

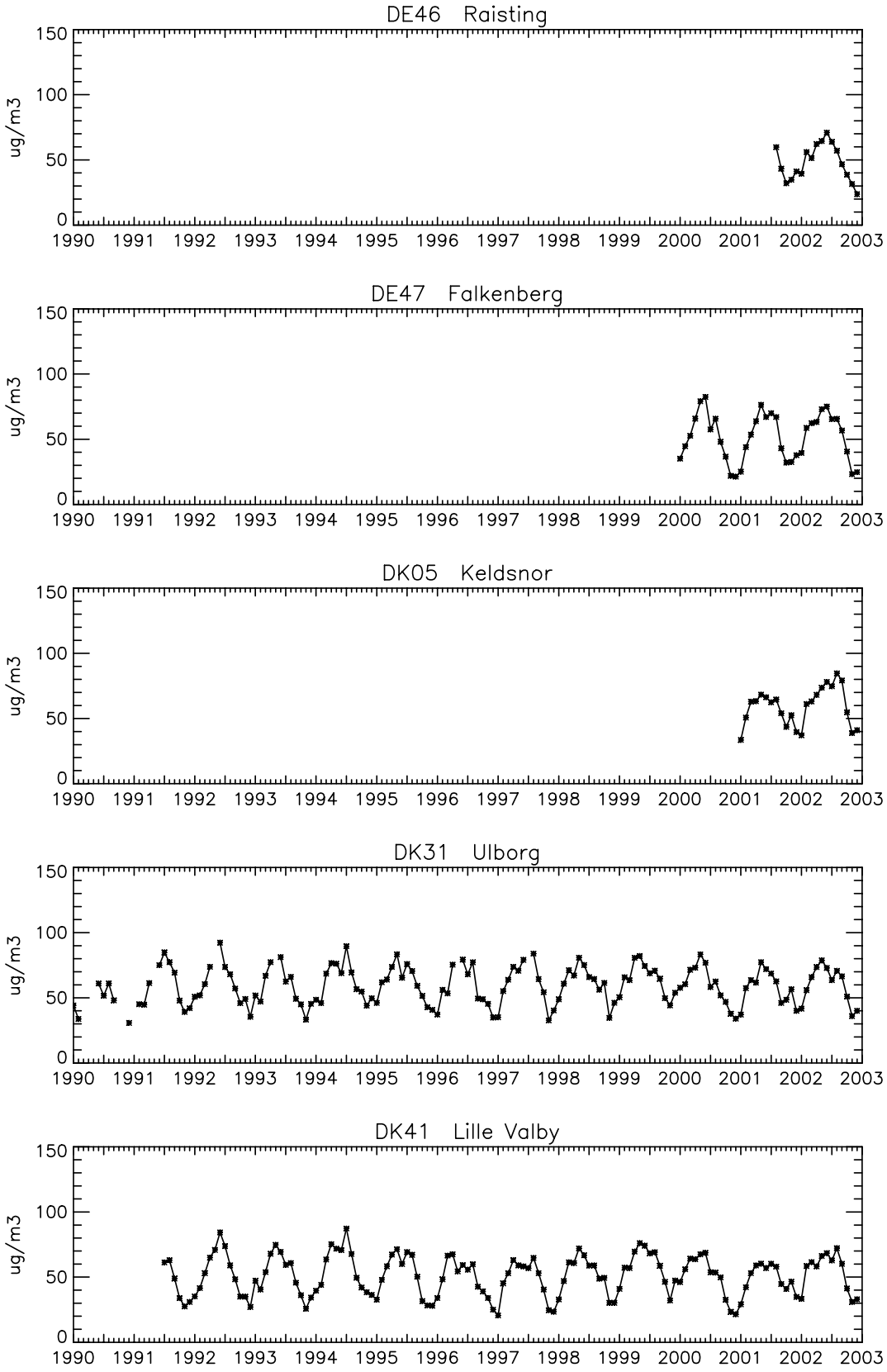


Figure 3.1, cont.

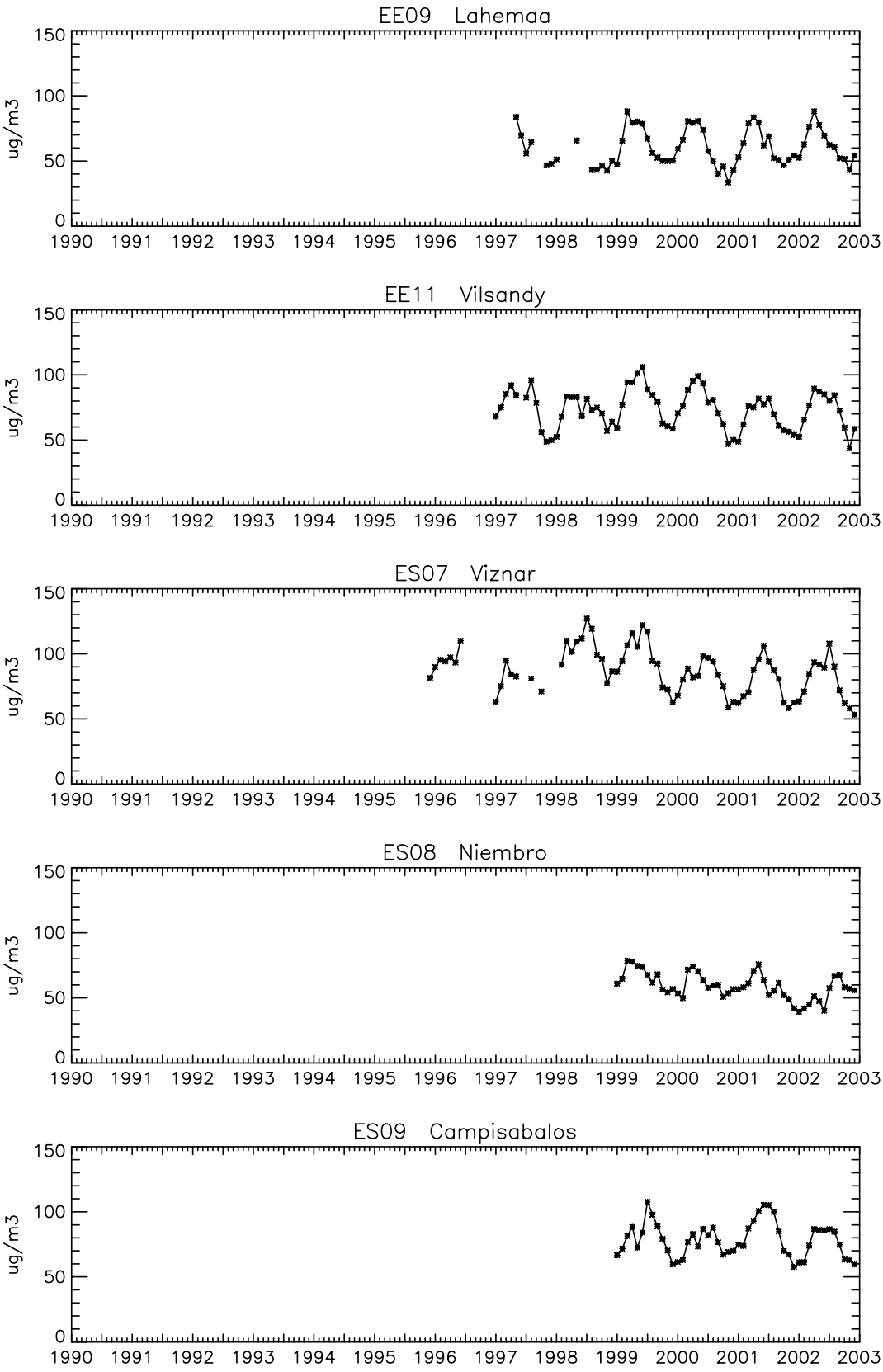


Figure 3.1, cont.

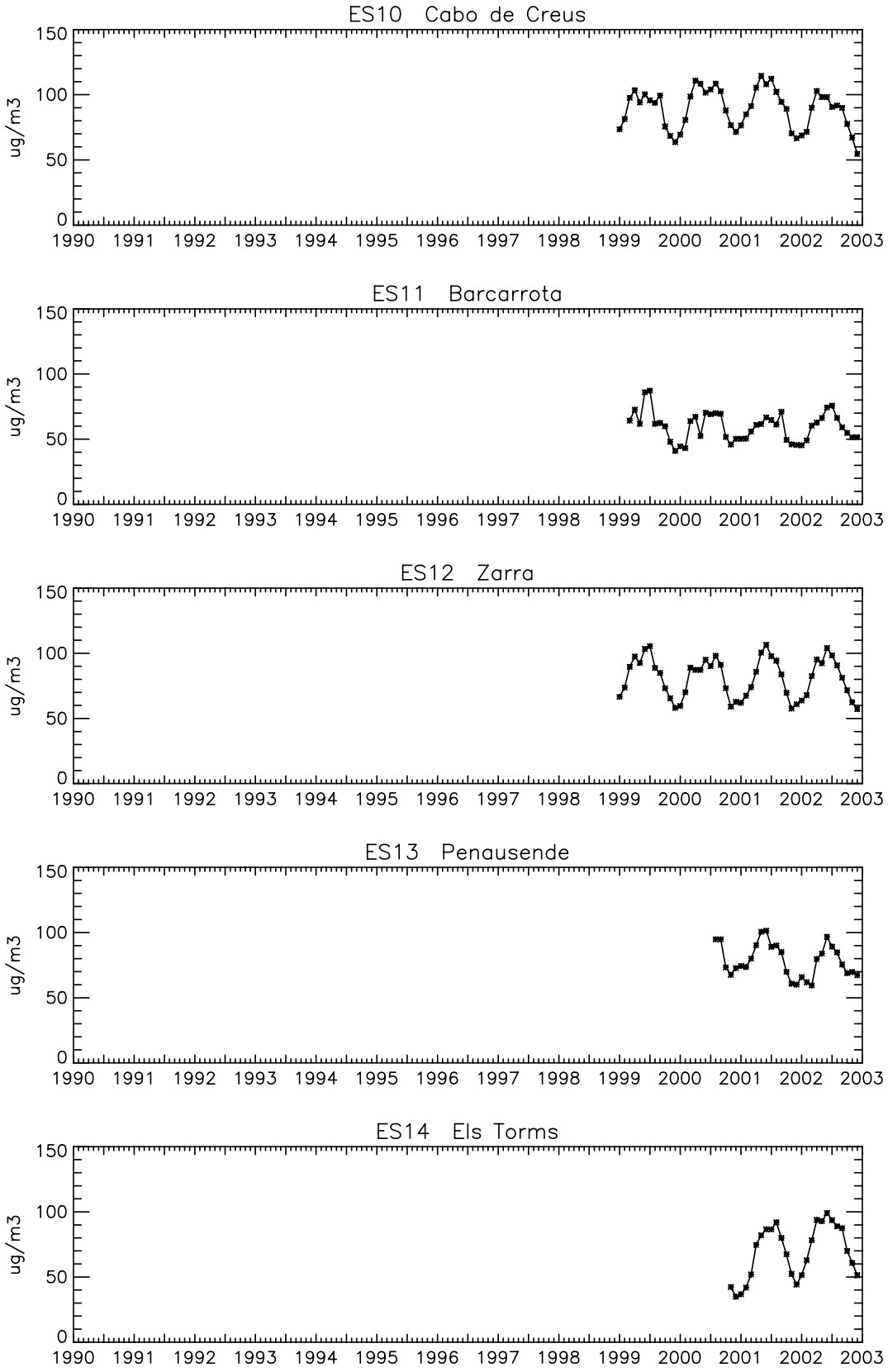


Figure 3.1, cont.

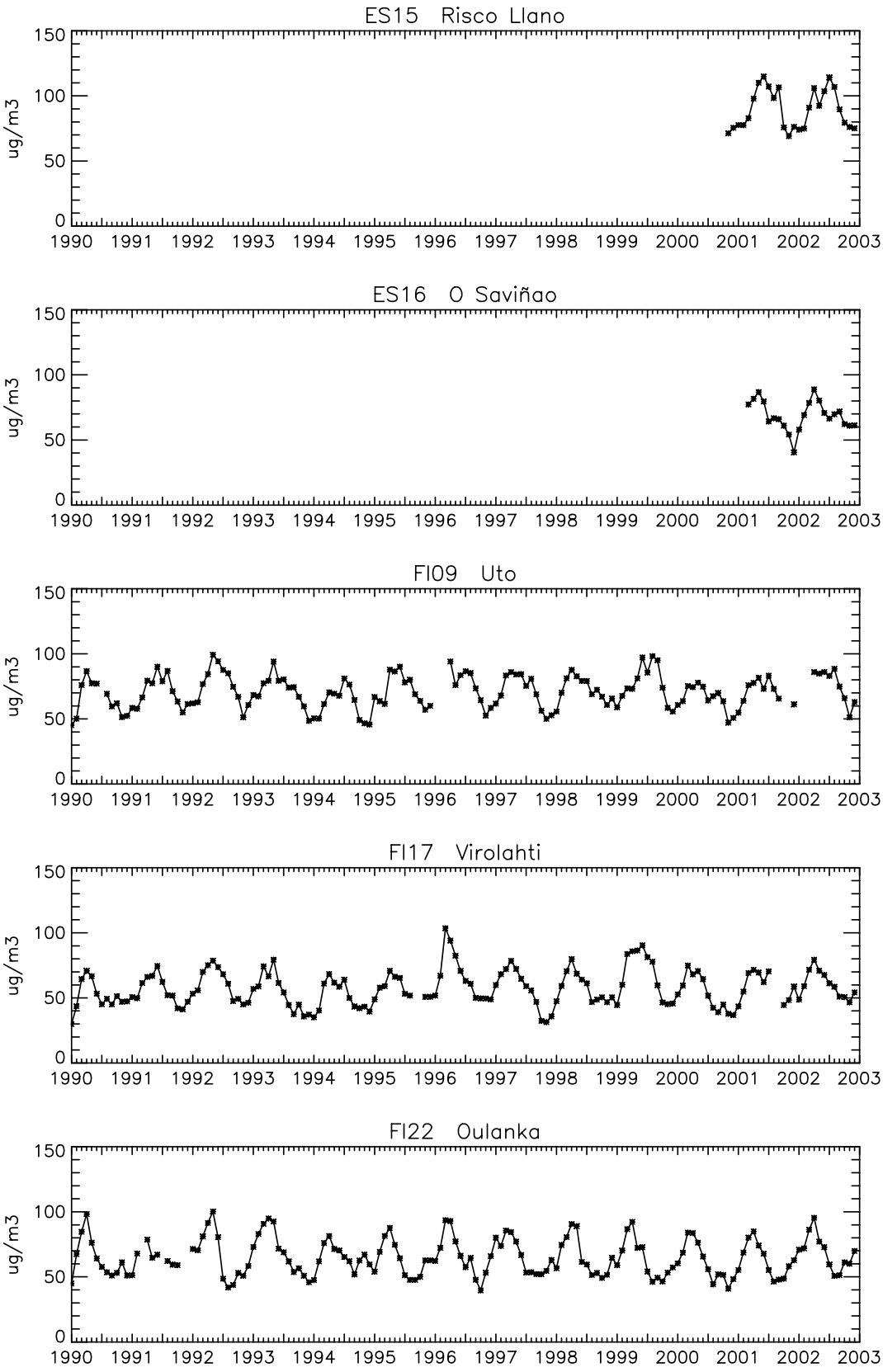


Figure 3.1, cont.

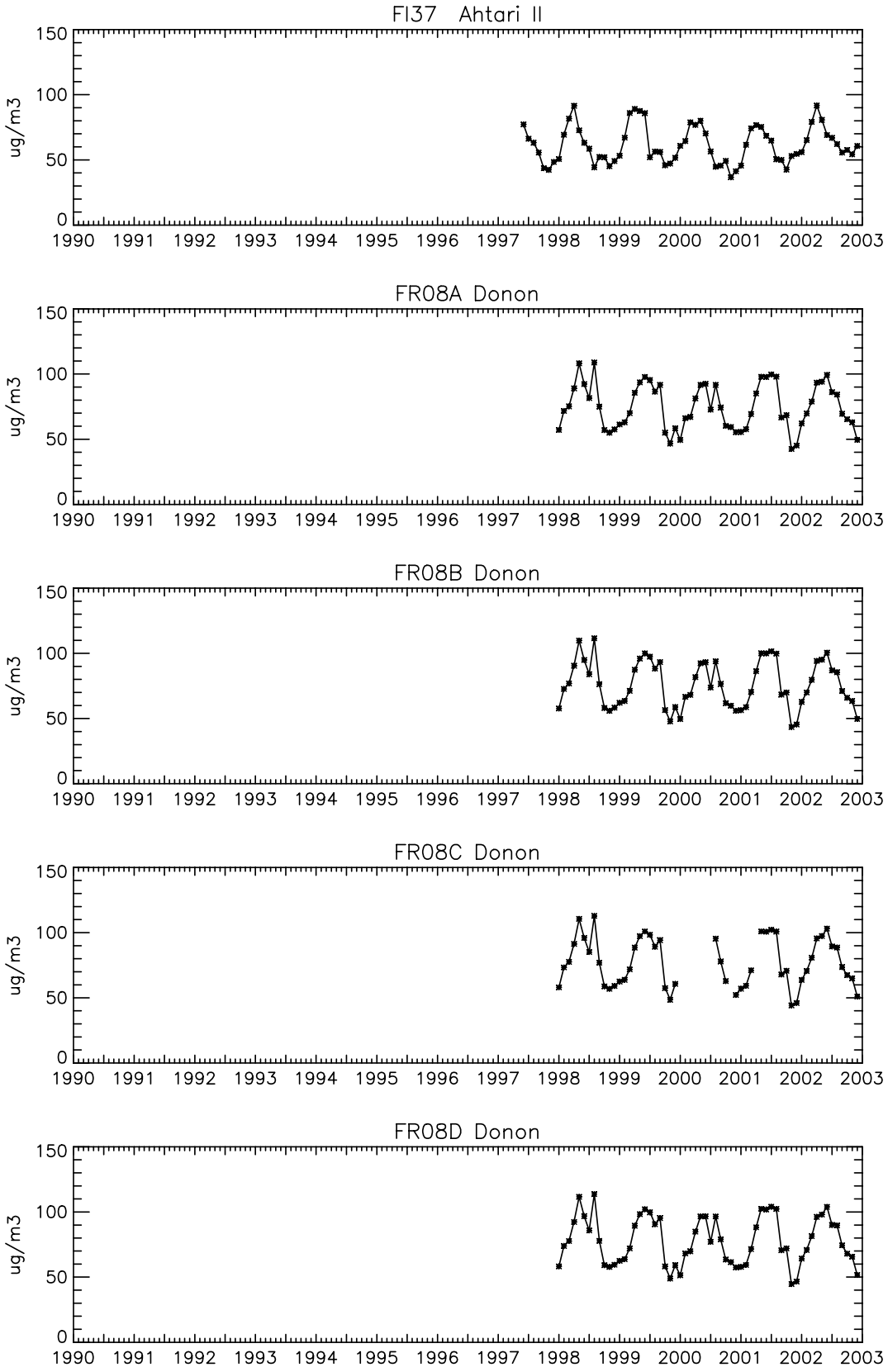


Figure 3.1, cont.

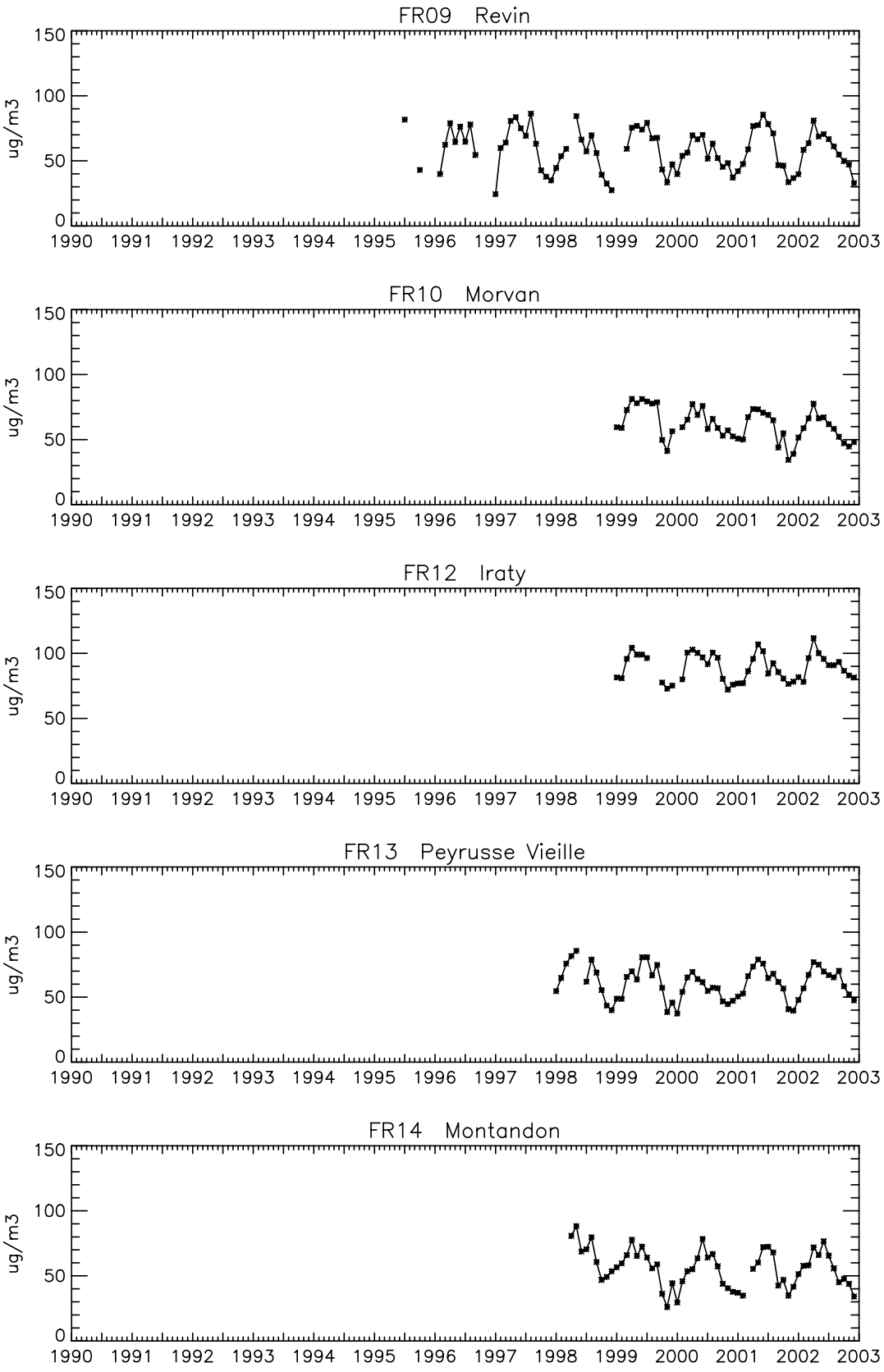


Figure 3.1, cont.

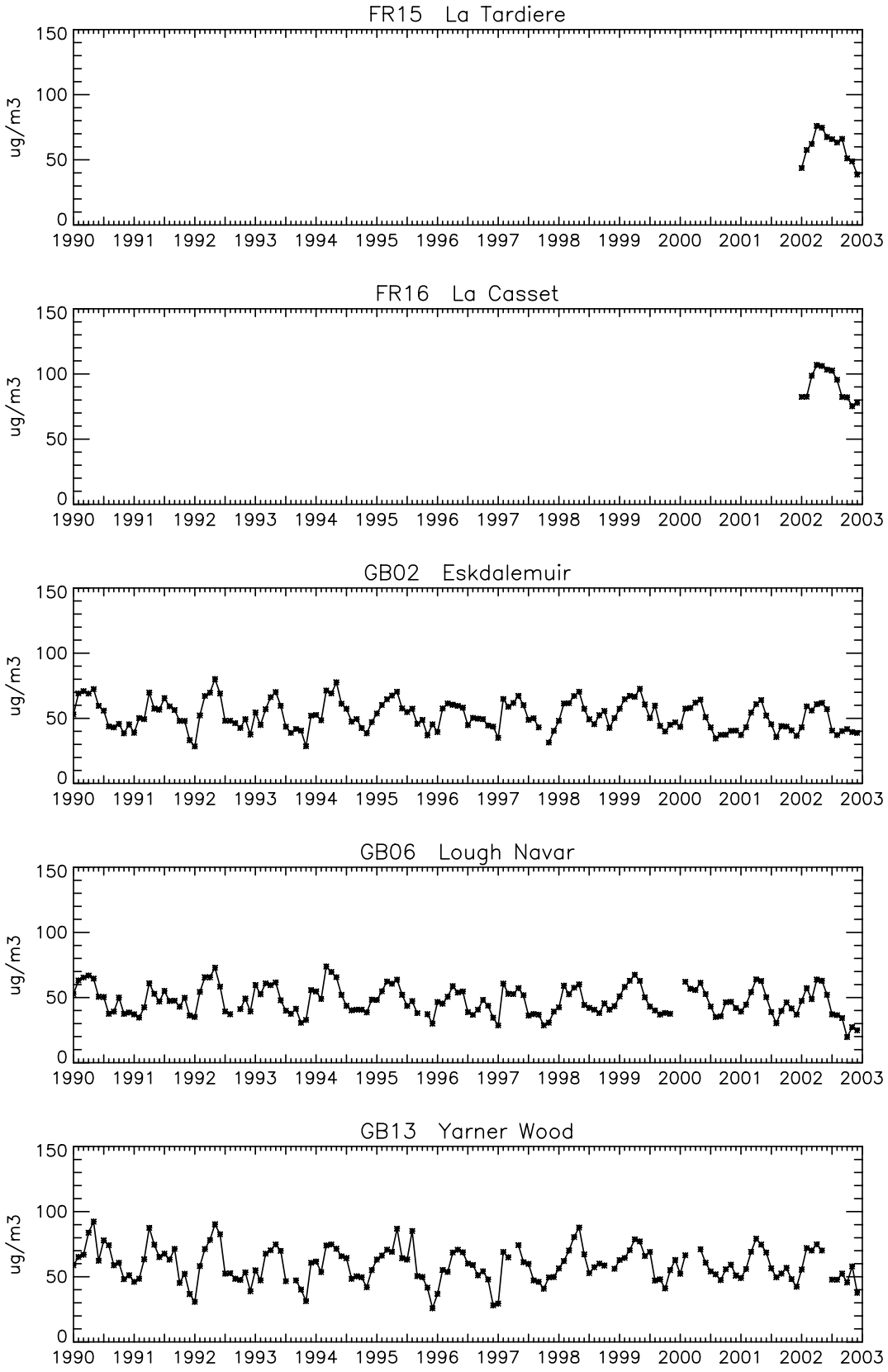


Figure 3.1, cont.

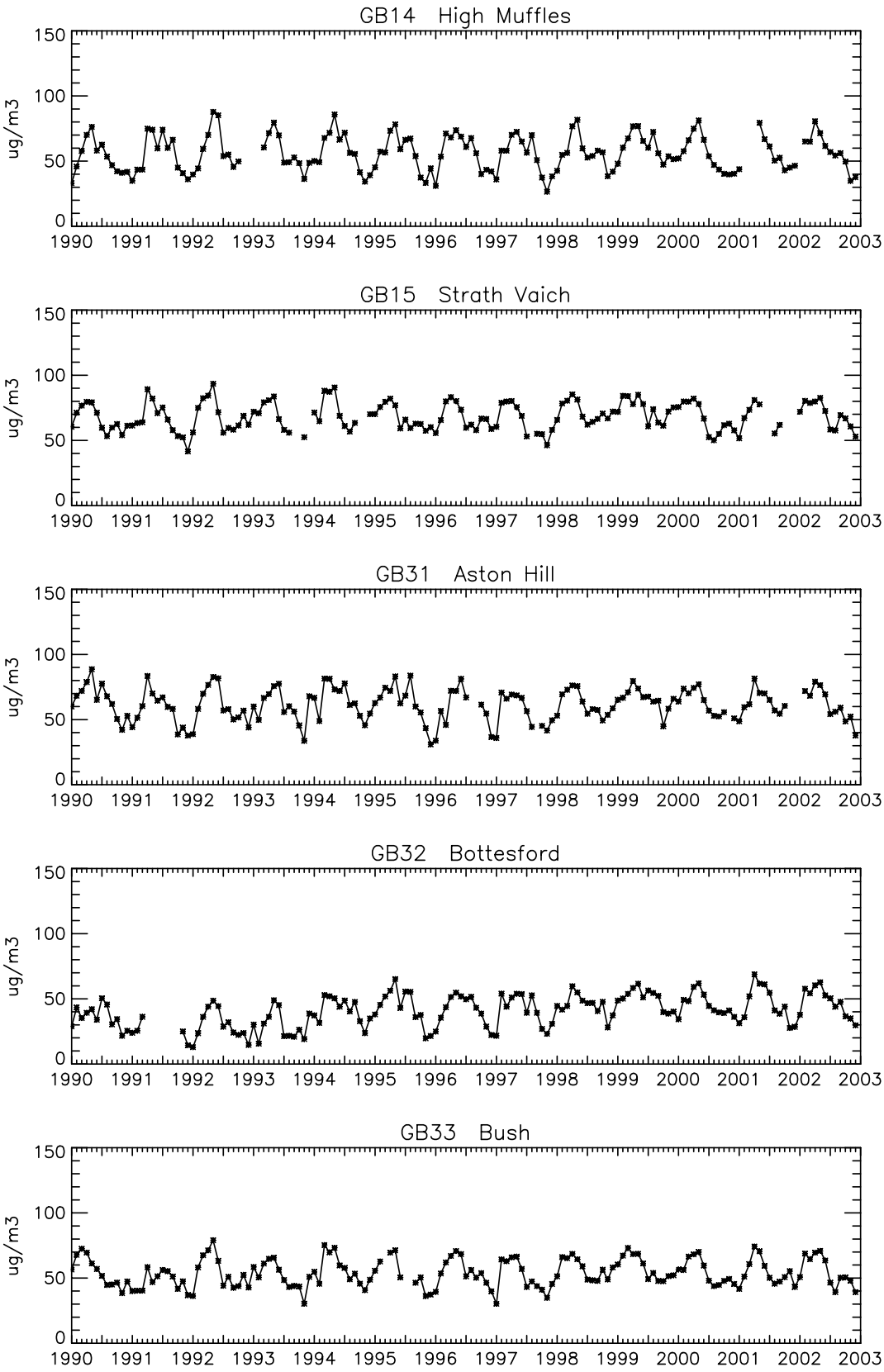


Figure 3.1, cont.

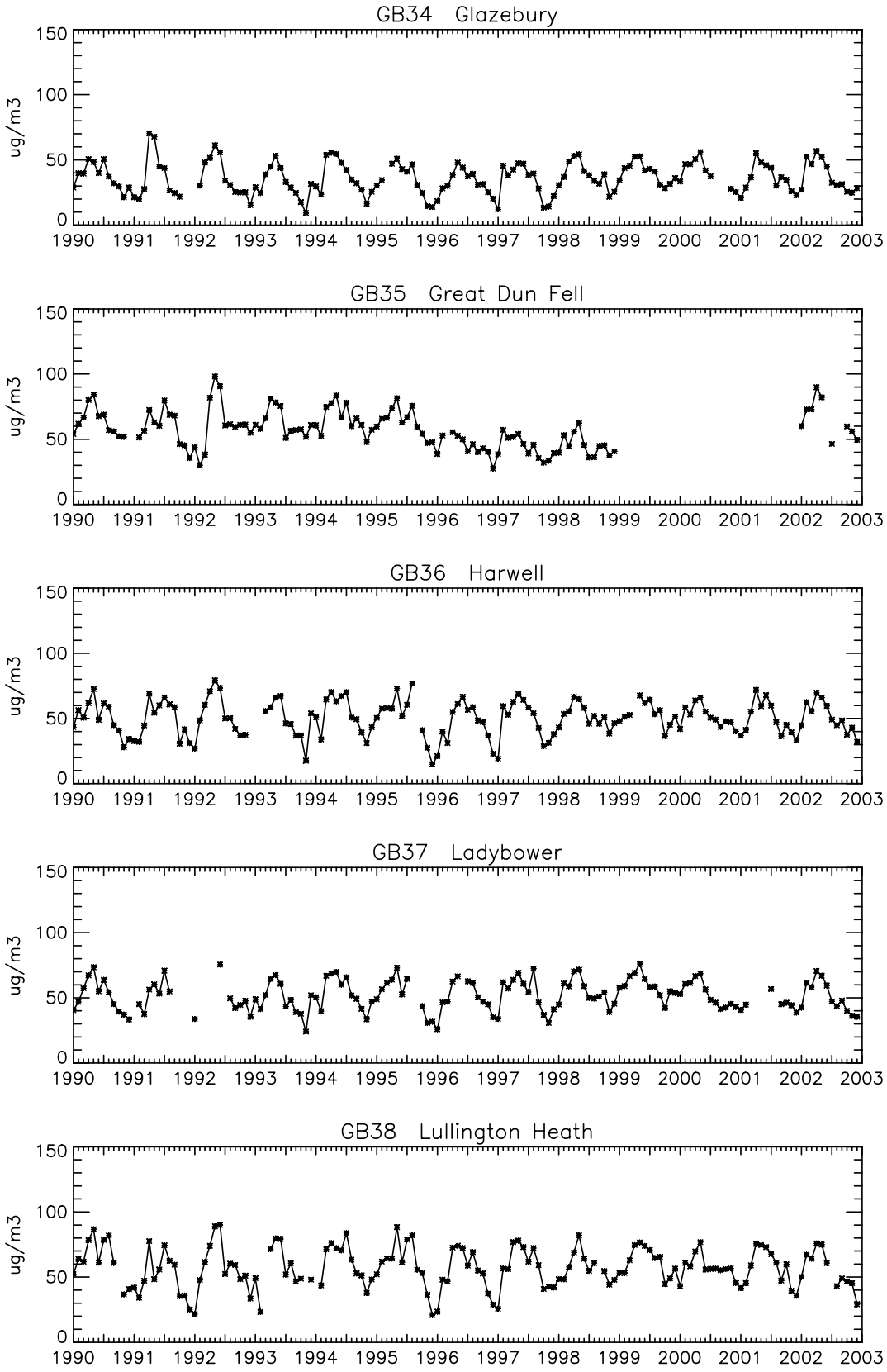


Figure 3.1, cont.

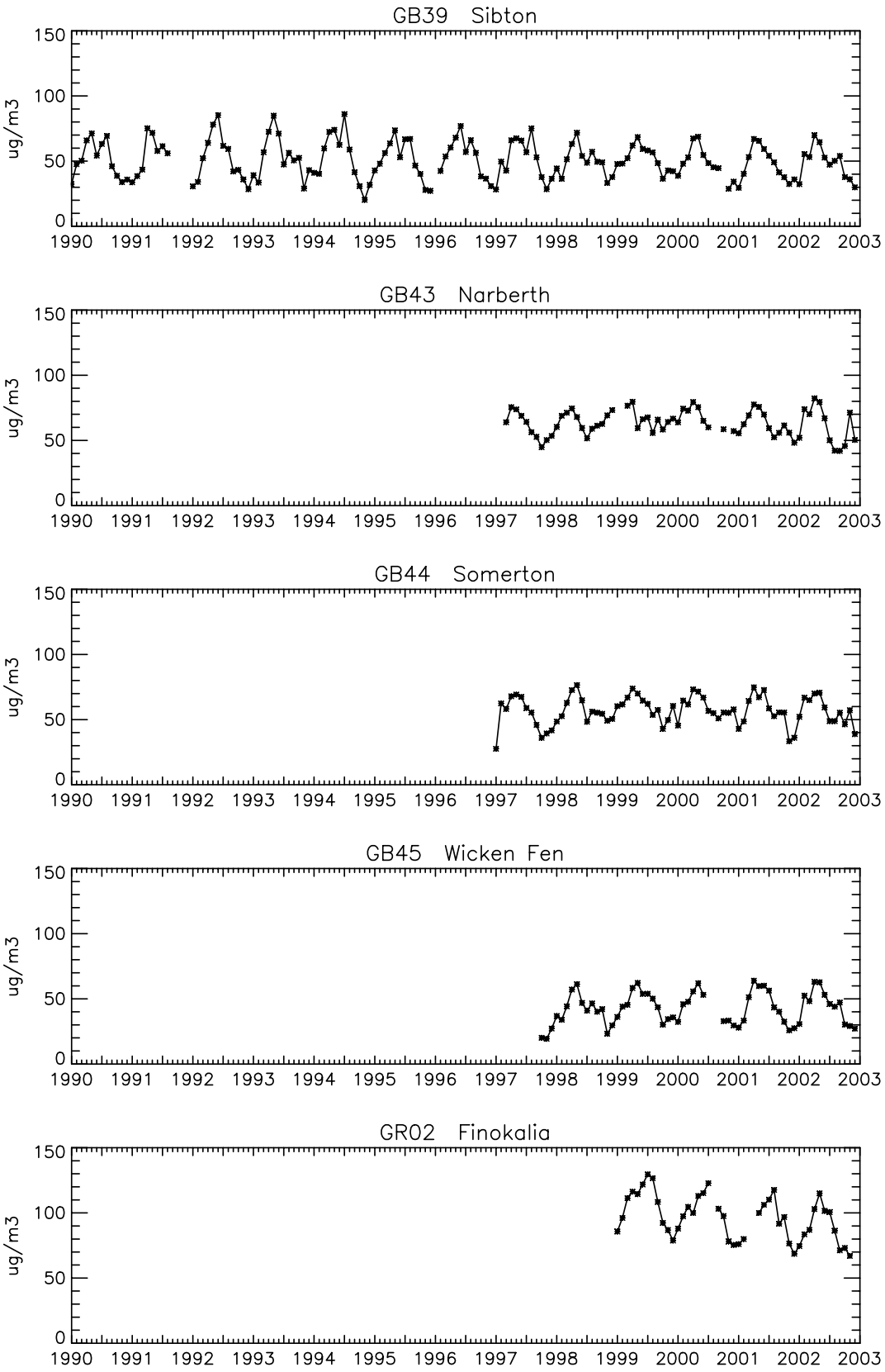


Figure 3.1, cont.

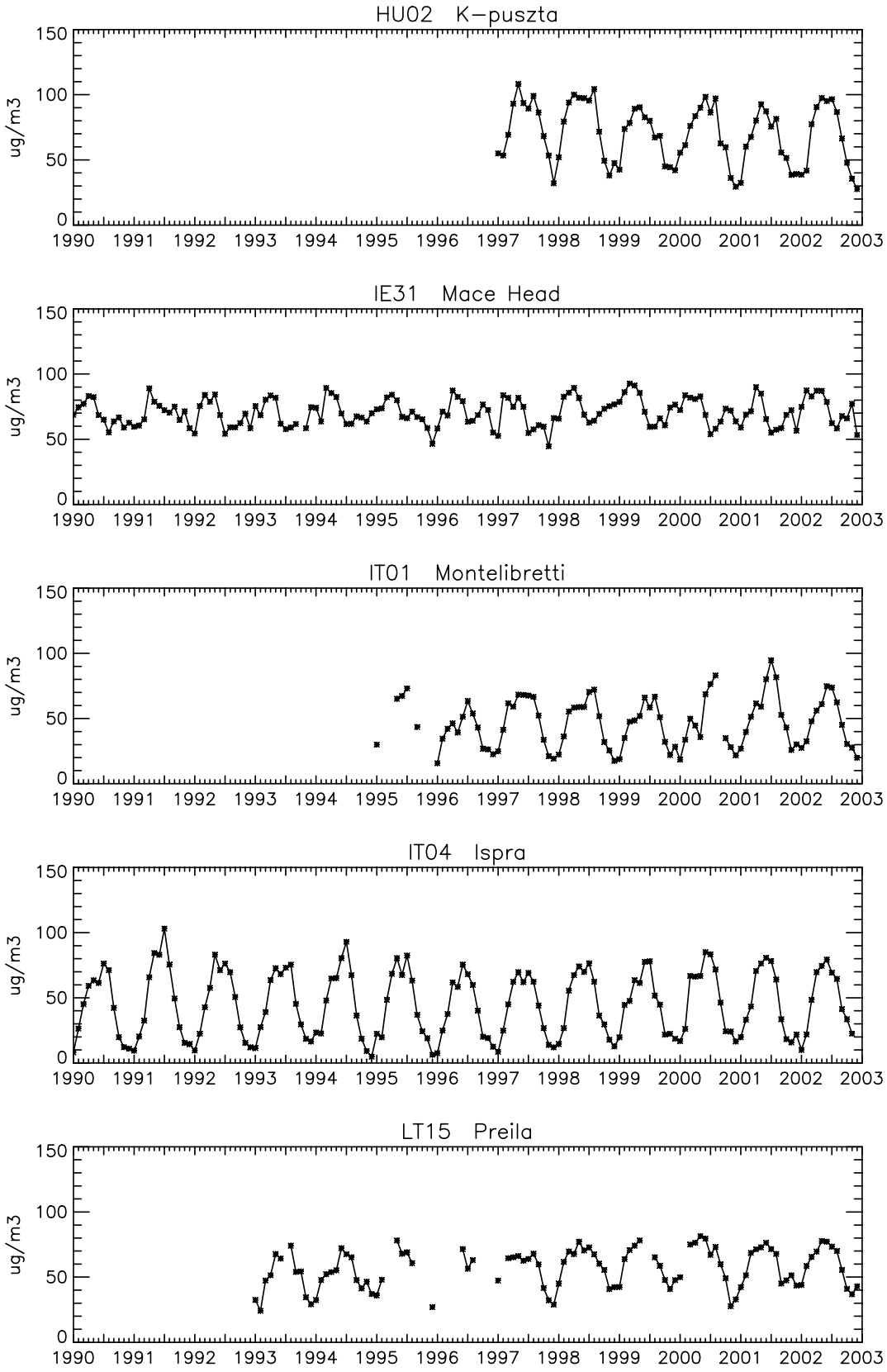


Figure 3.1, cont.

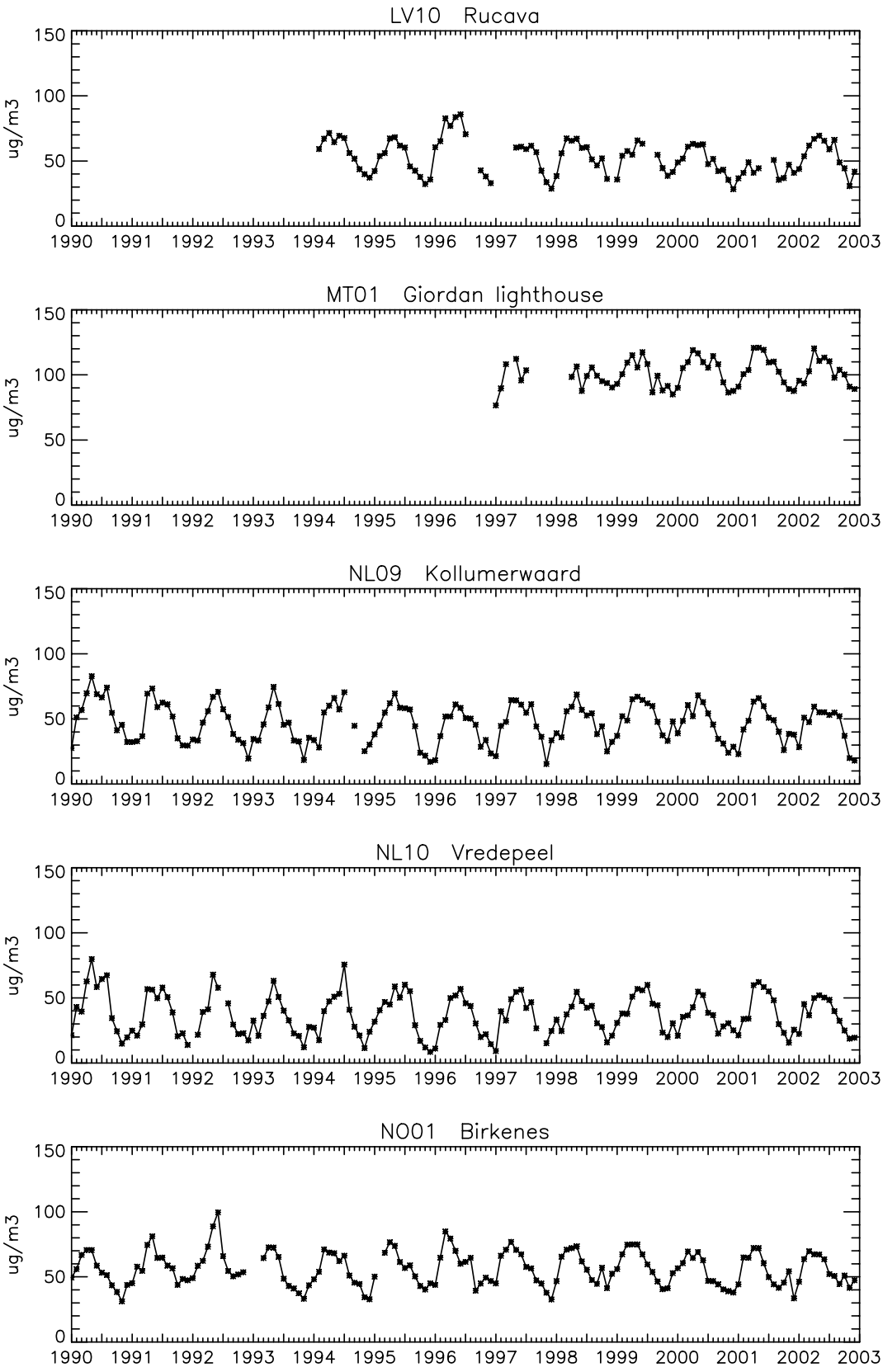
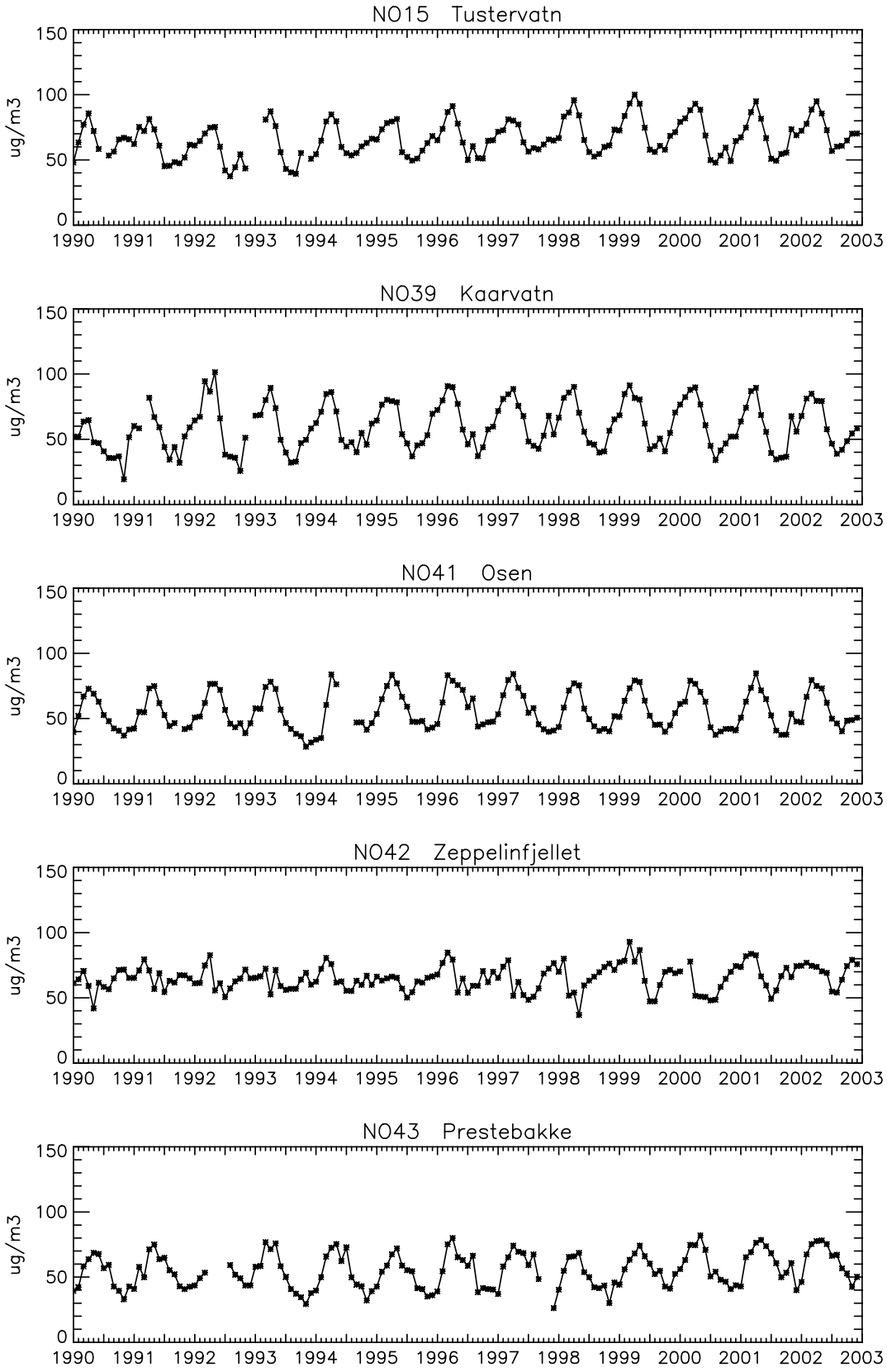


Figure 3.1, cont.



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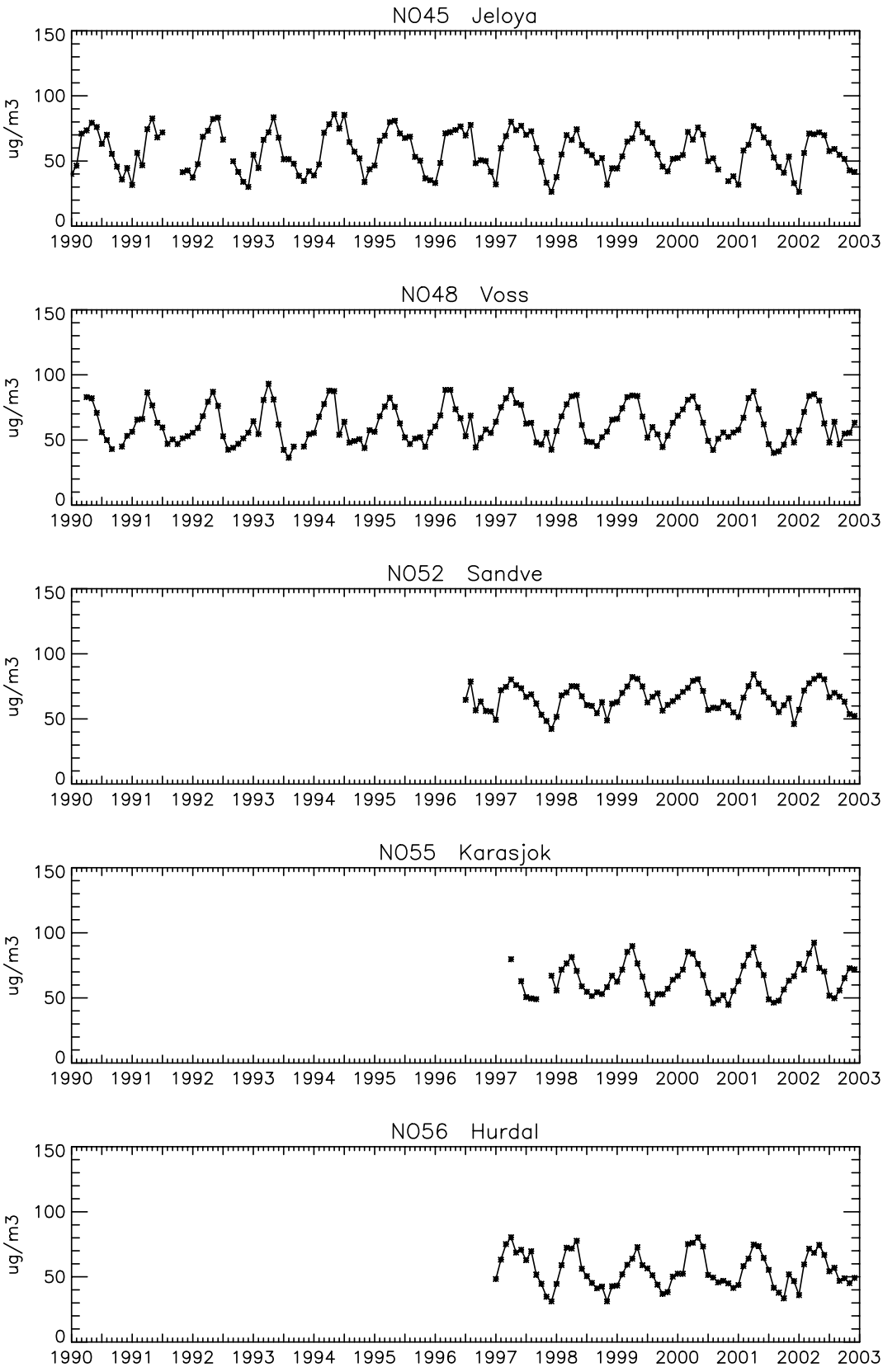

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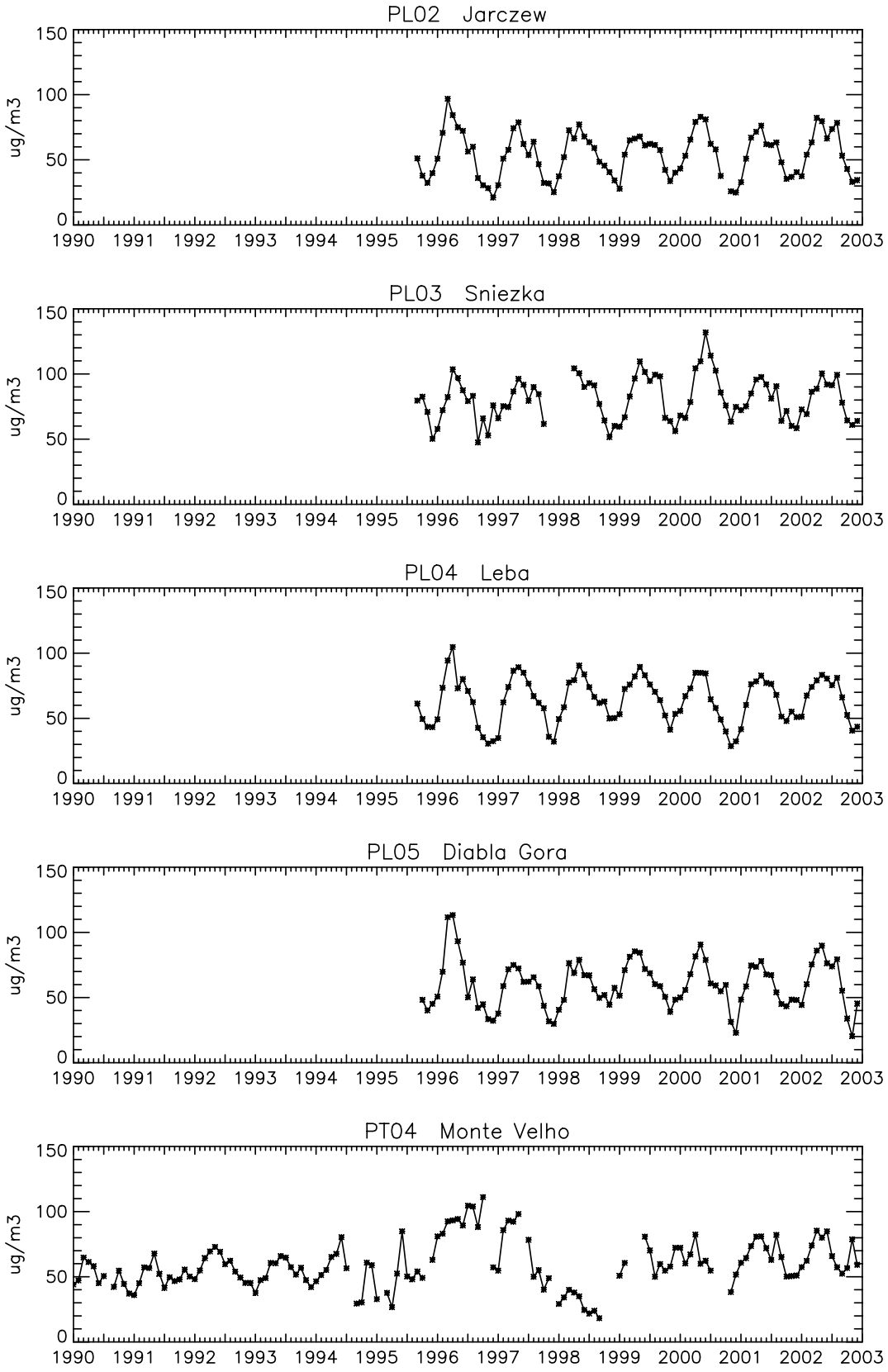

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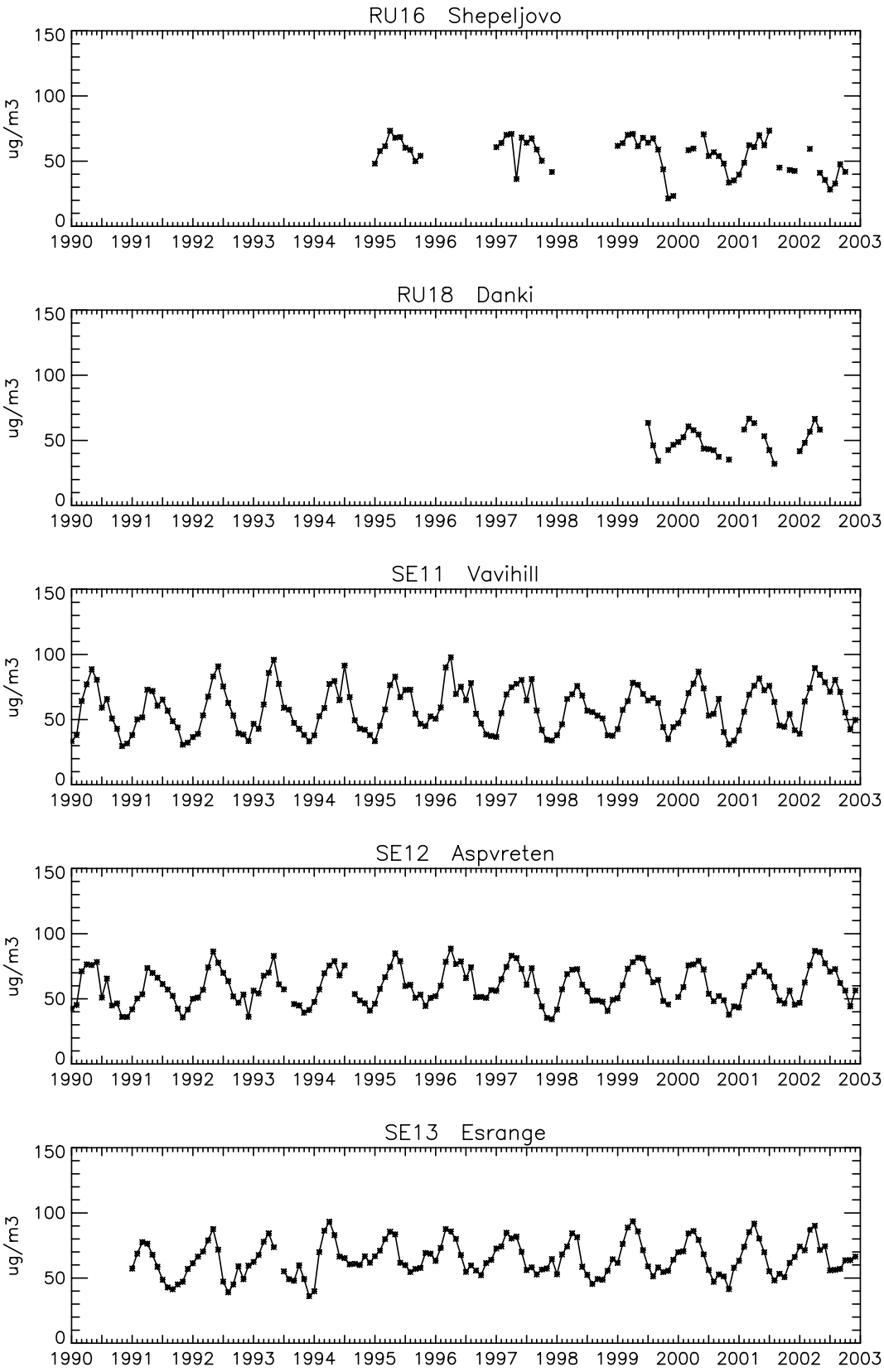

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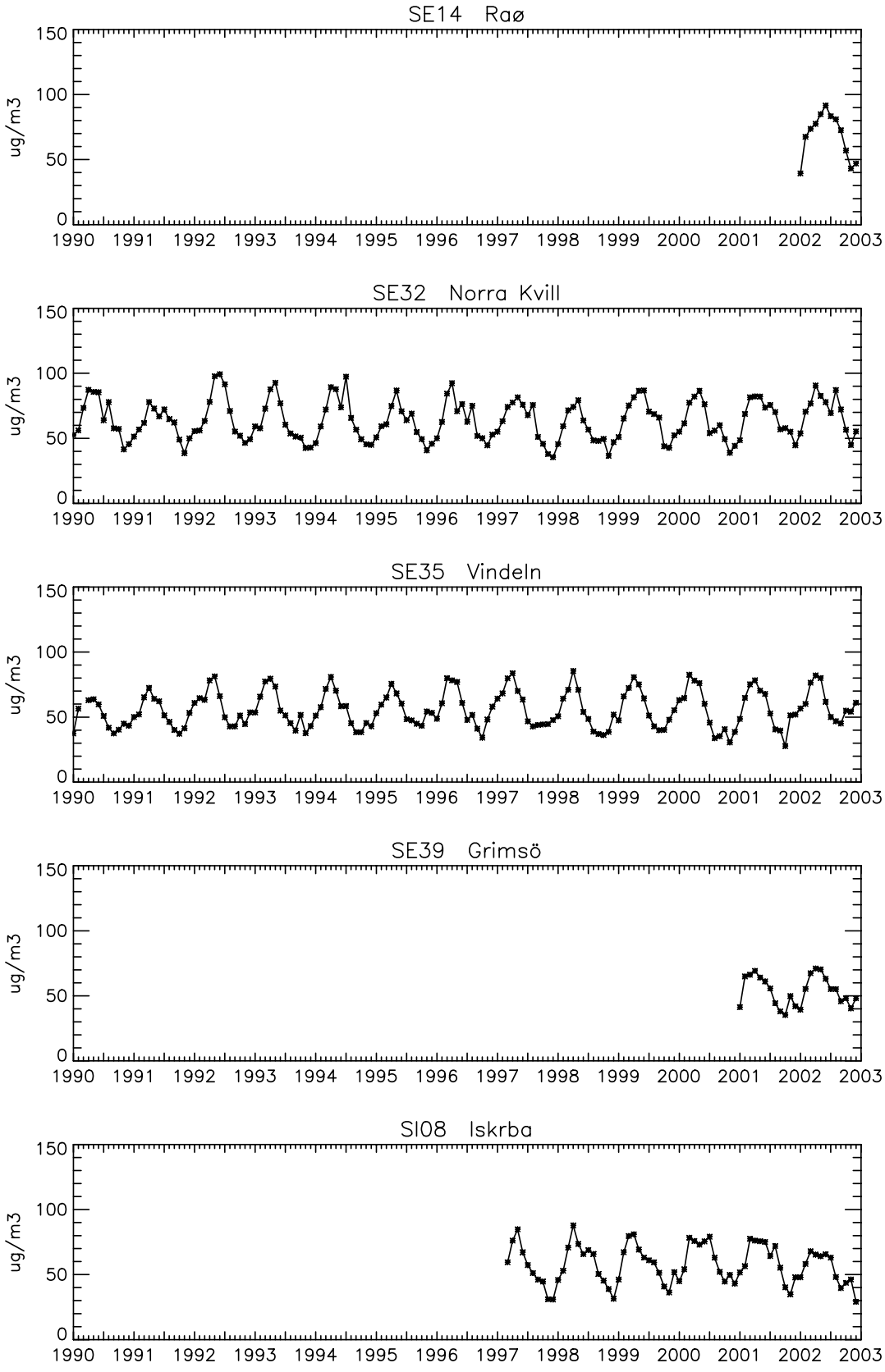

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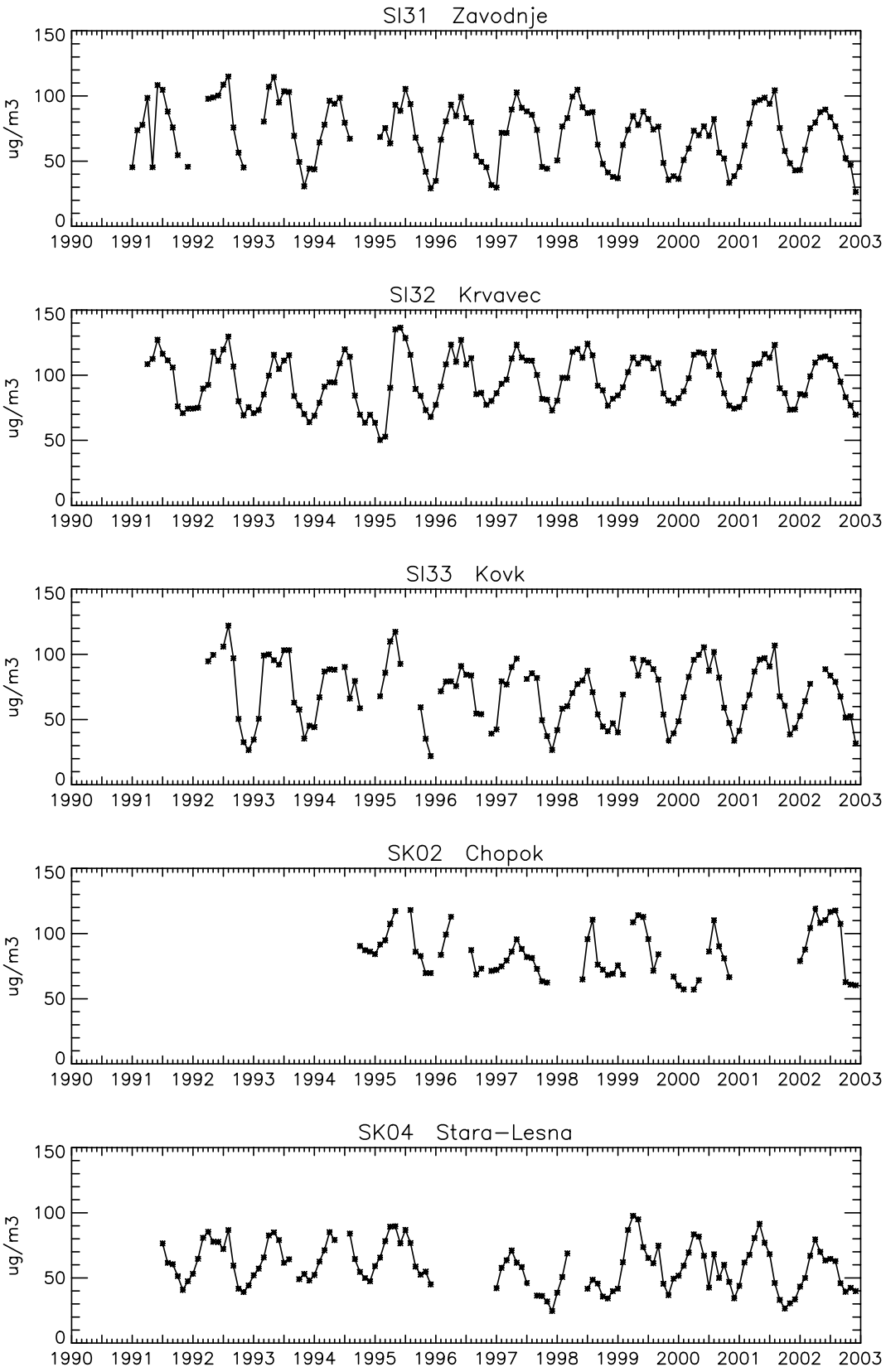

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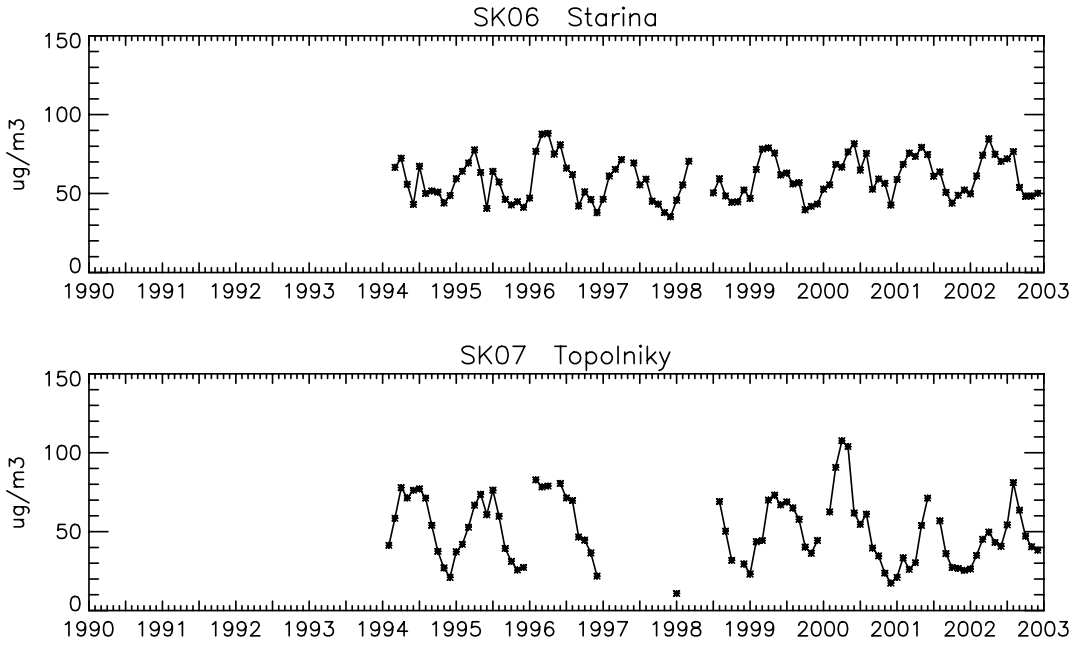


Figure 3.1, cont.

Annex 4

Diurnal variation, April–September 2002

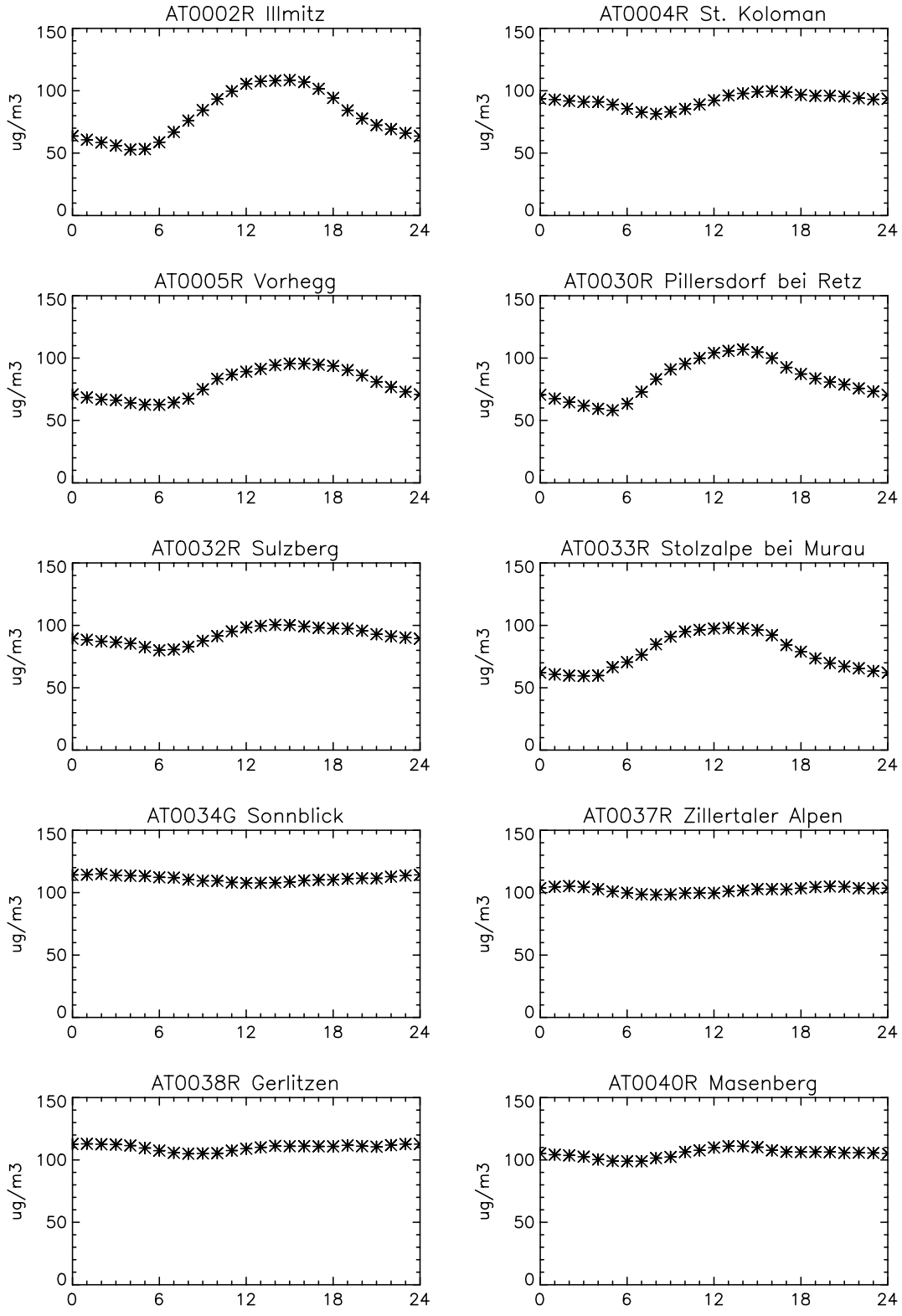
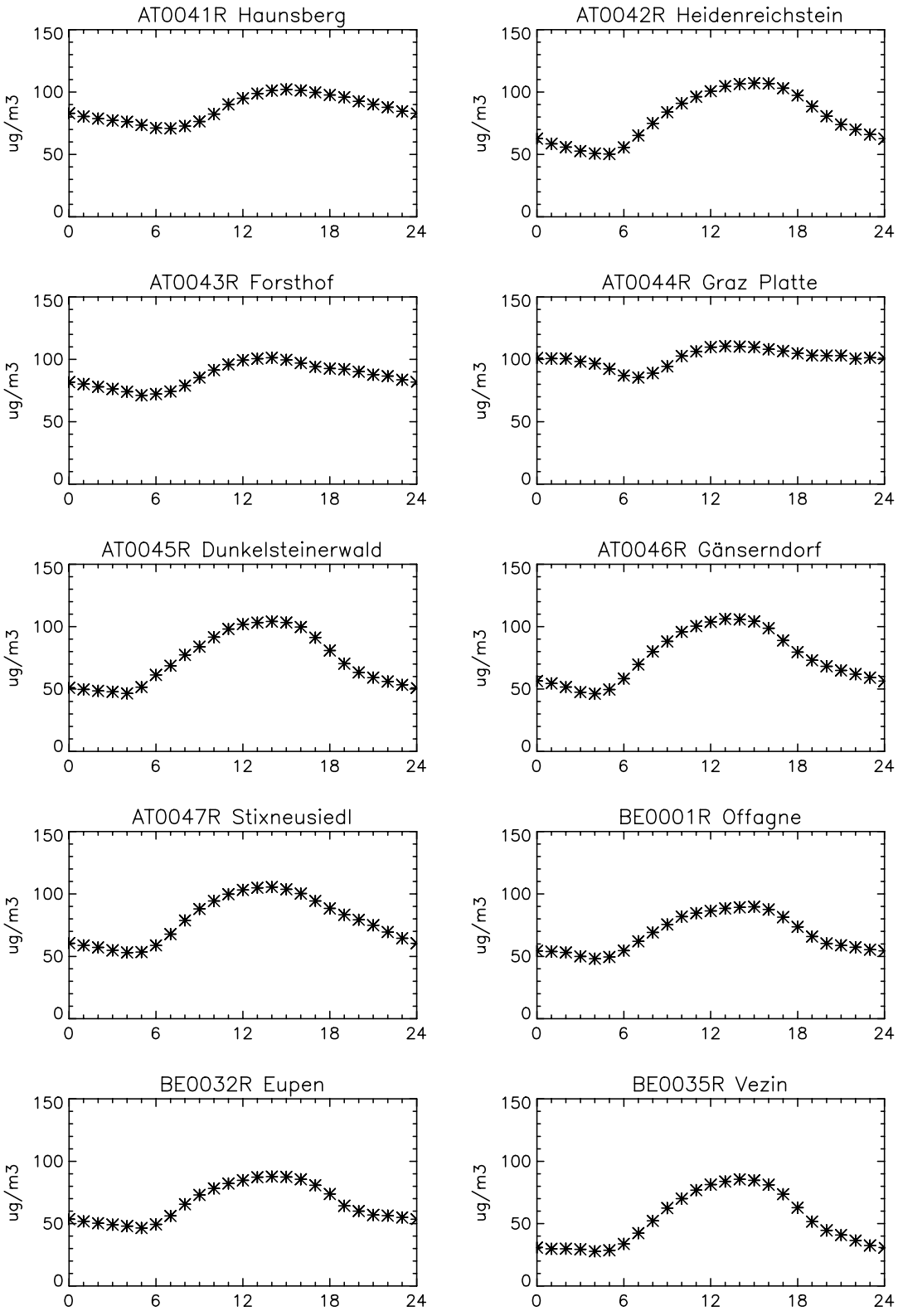


Figure 4.1: Diurnal variation, April–September 2002.



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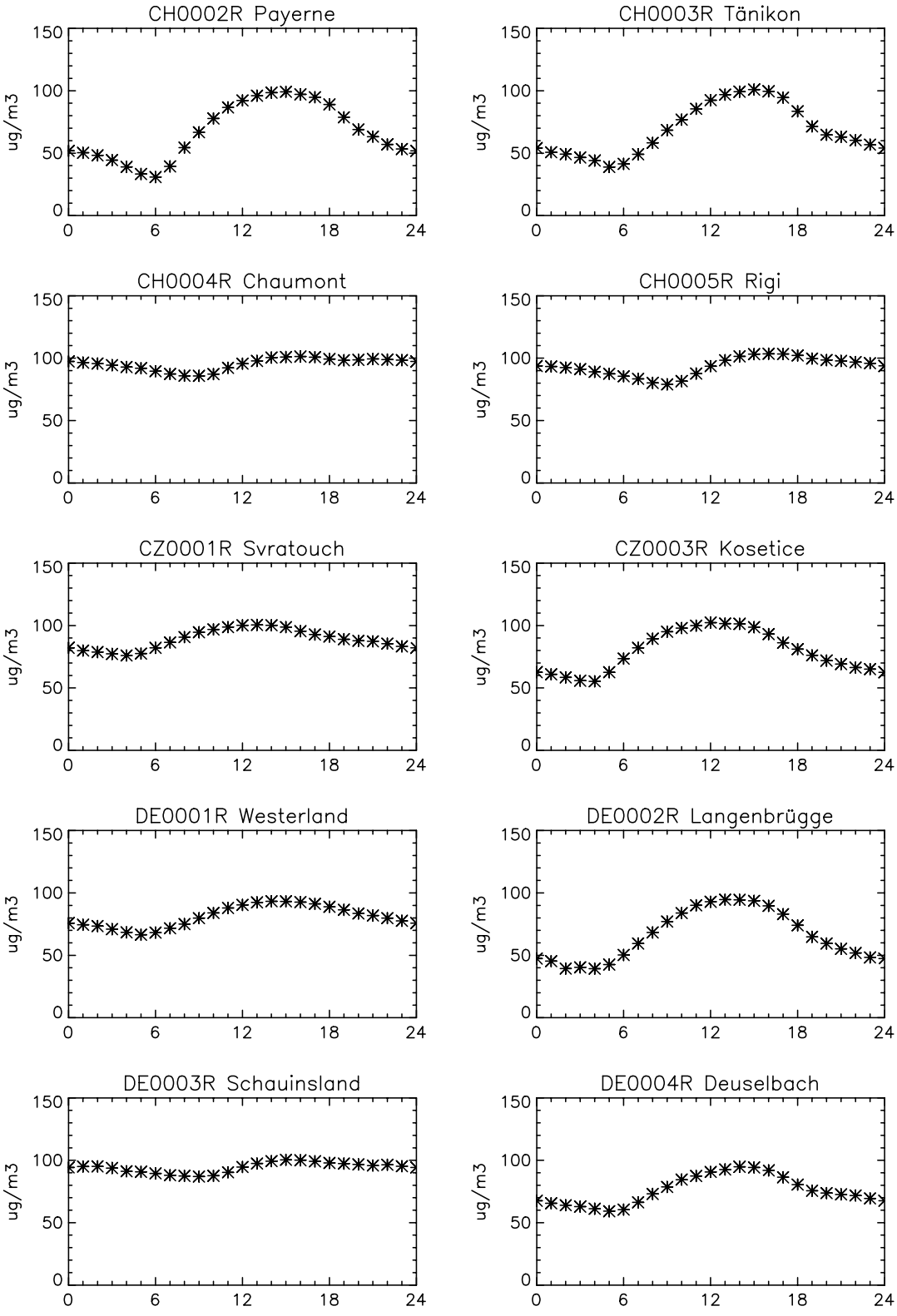

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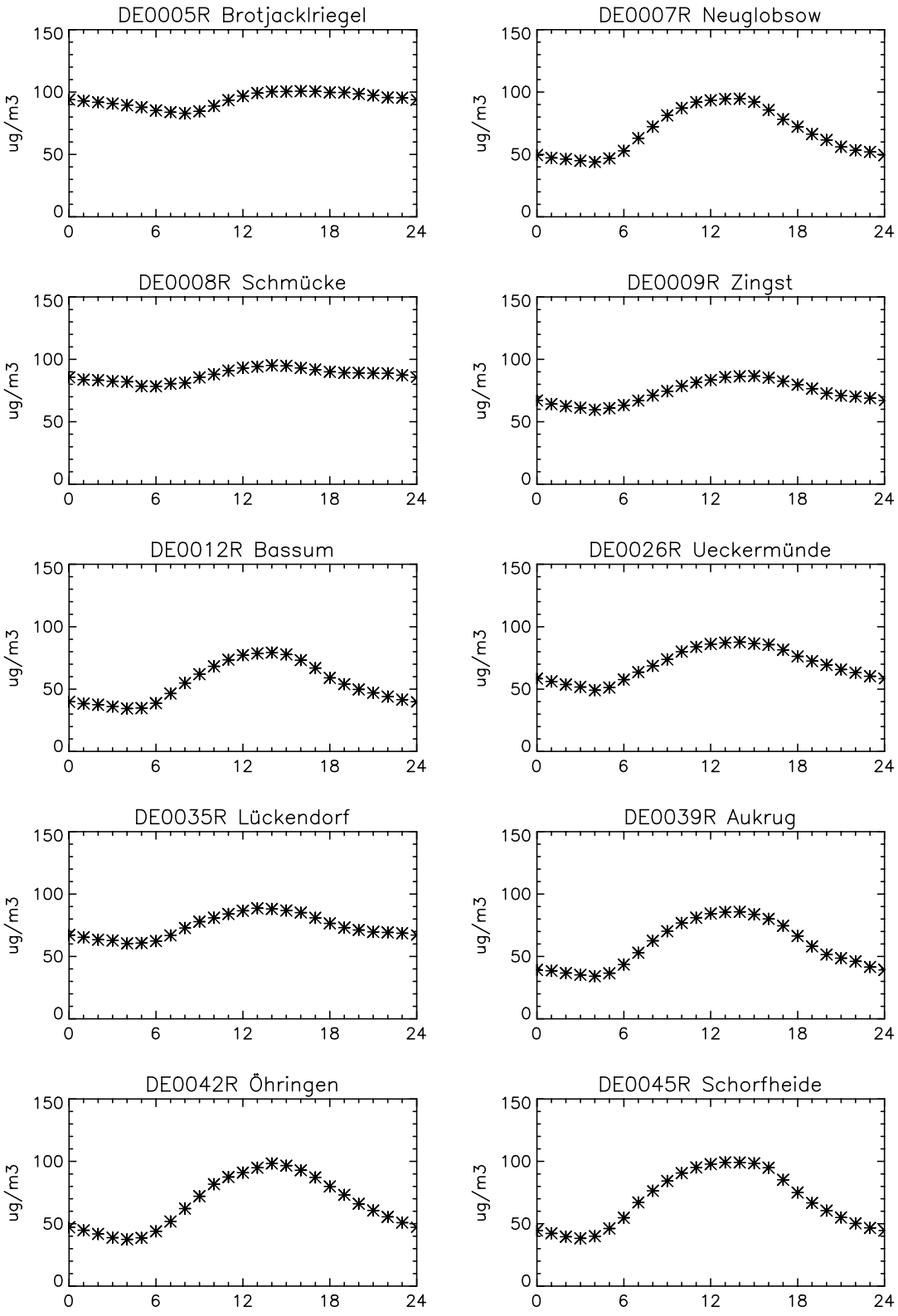

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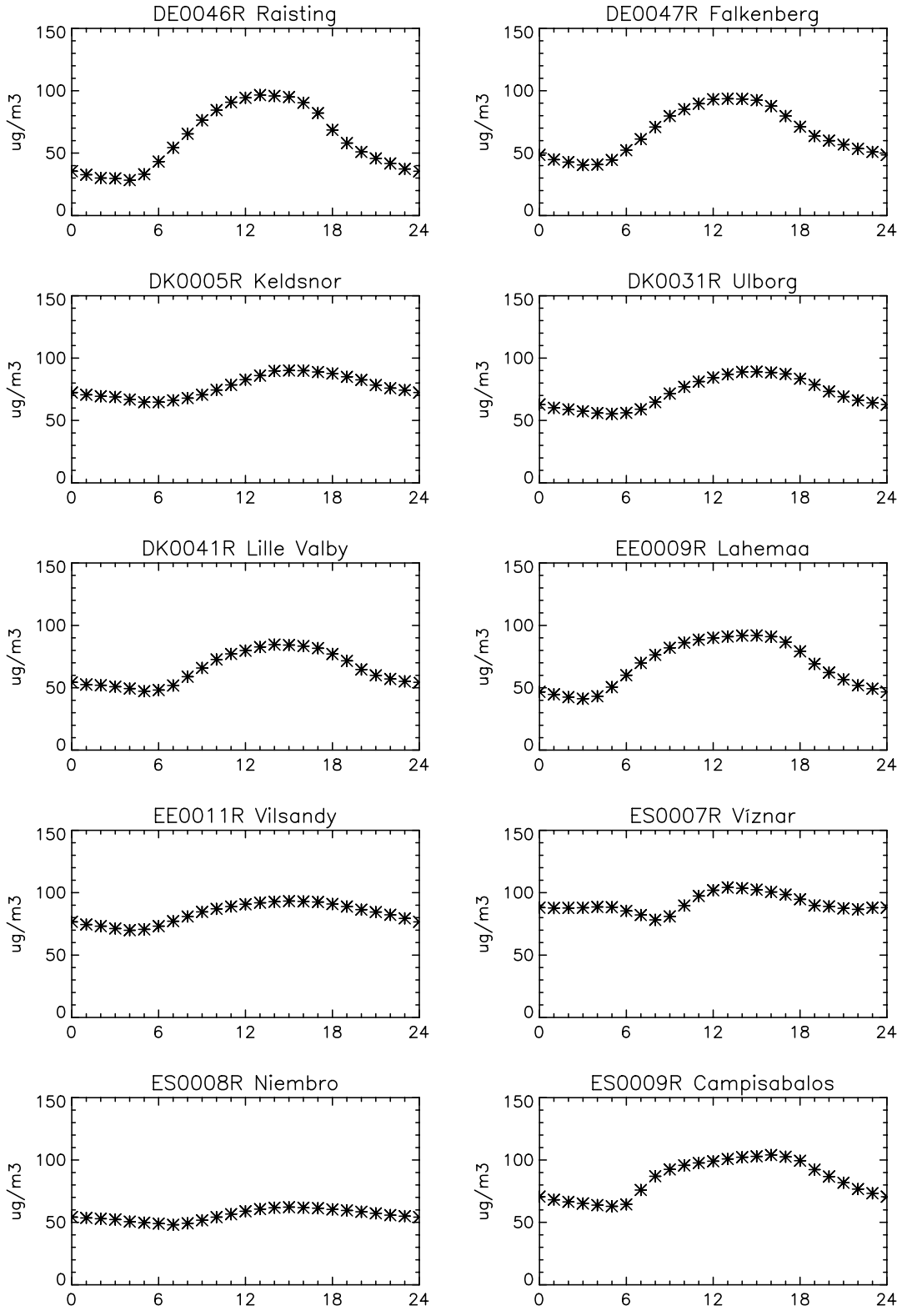

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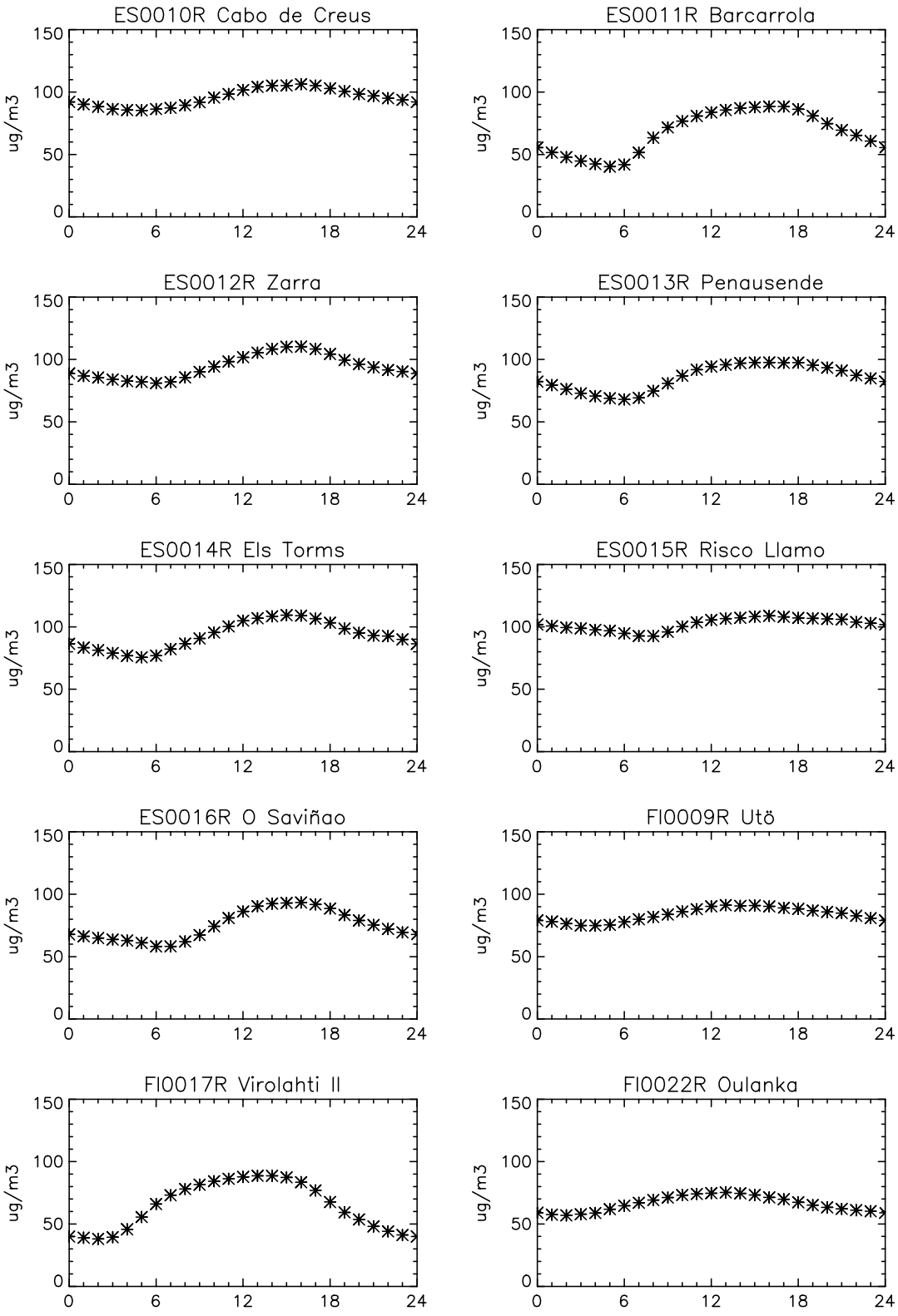

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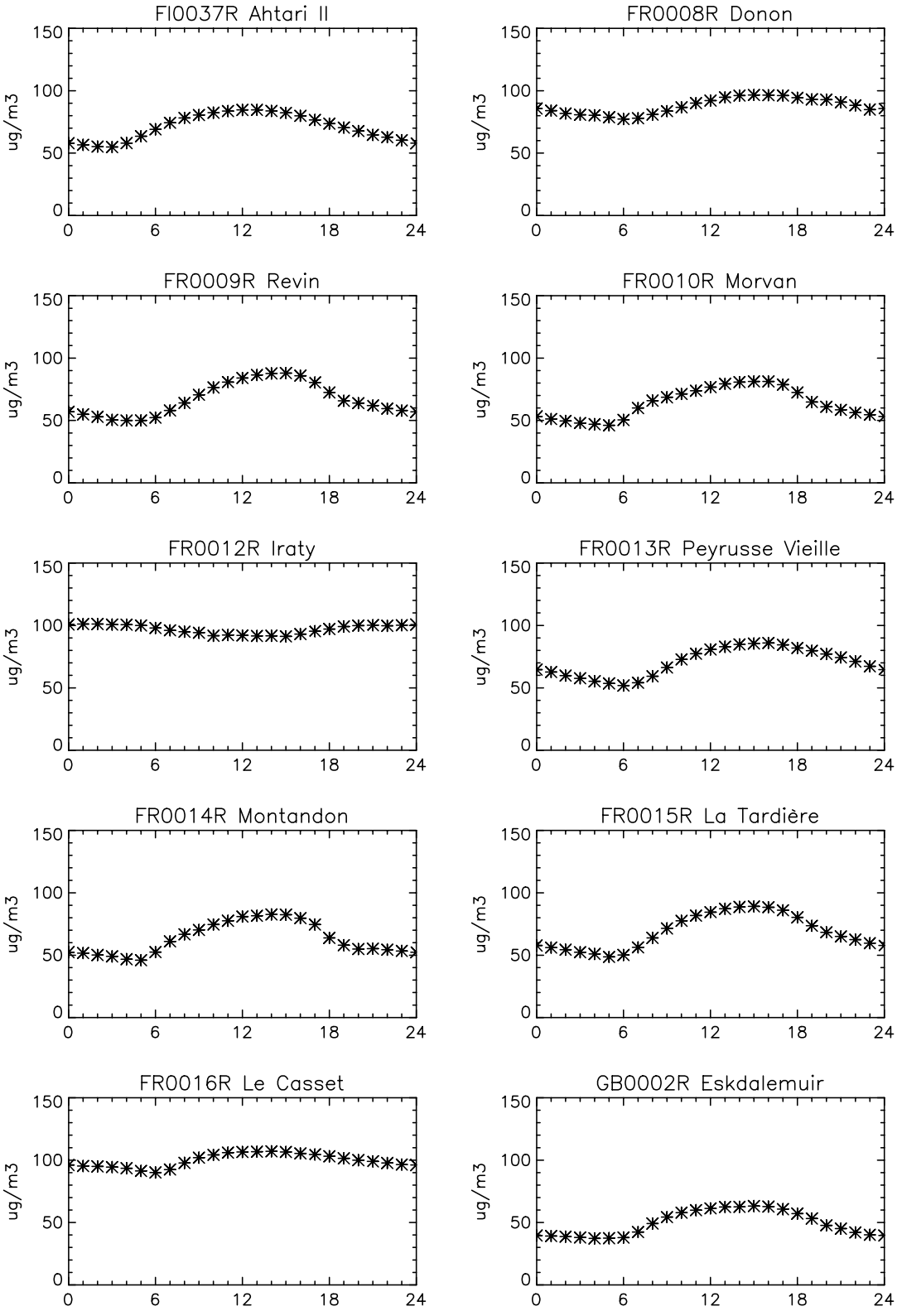

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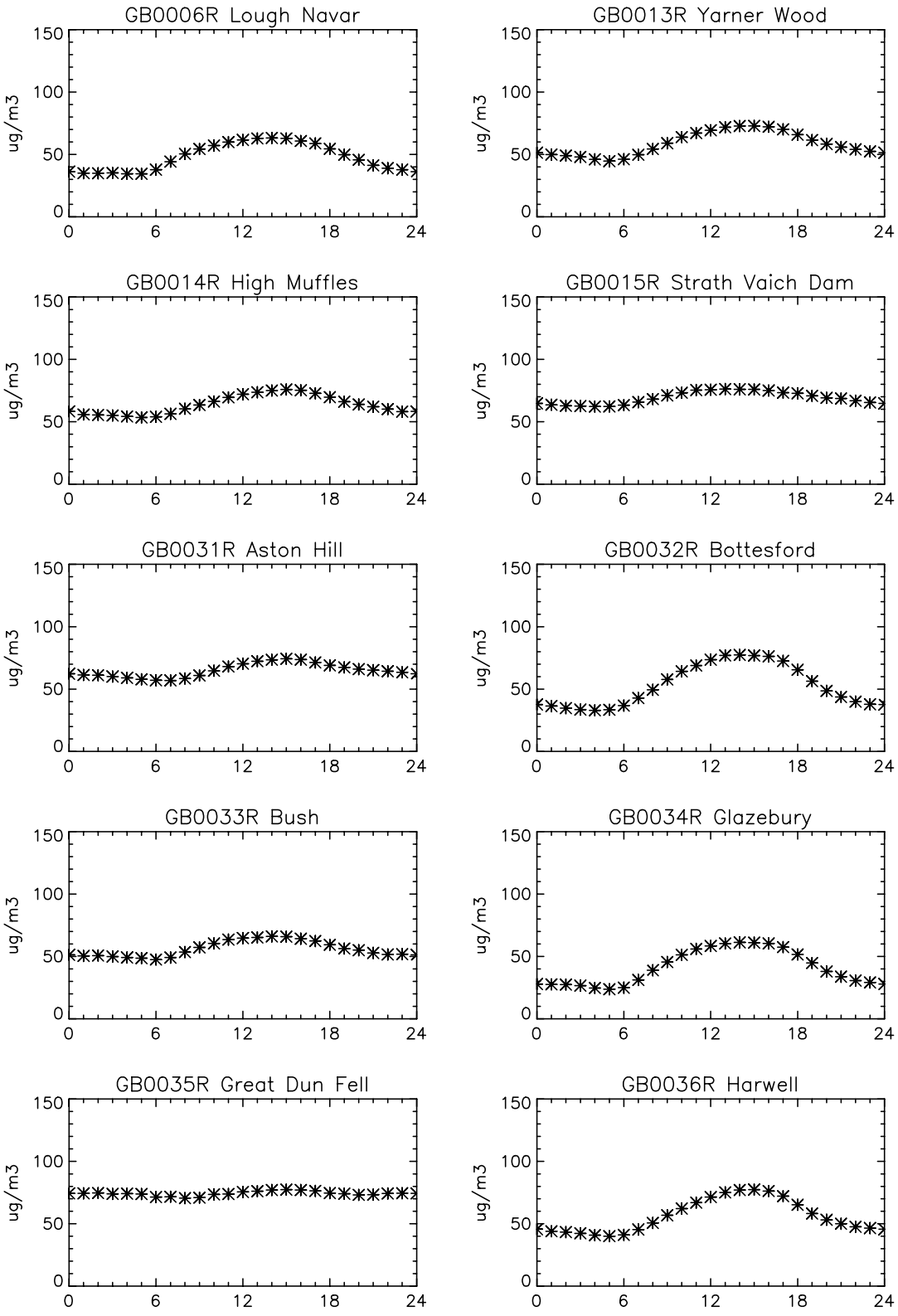
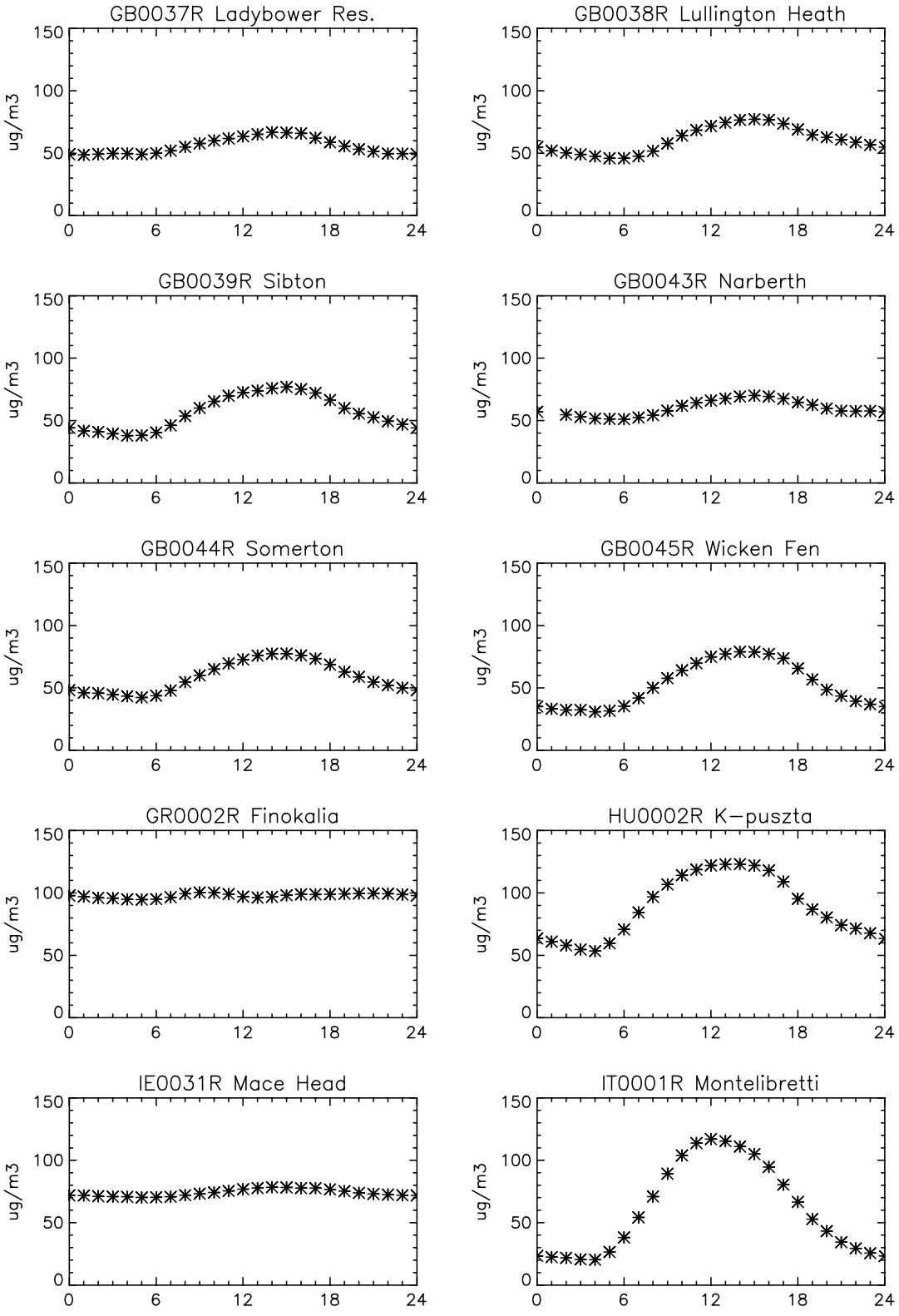


Figure 4.1, cont.



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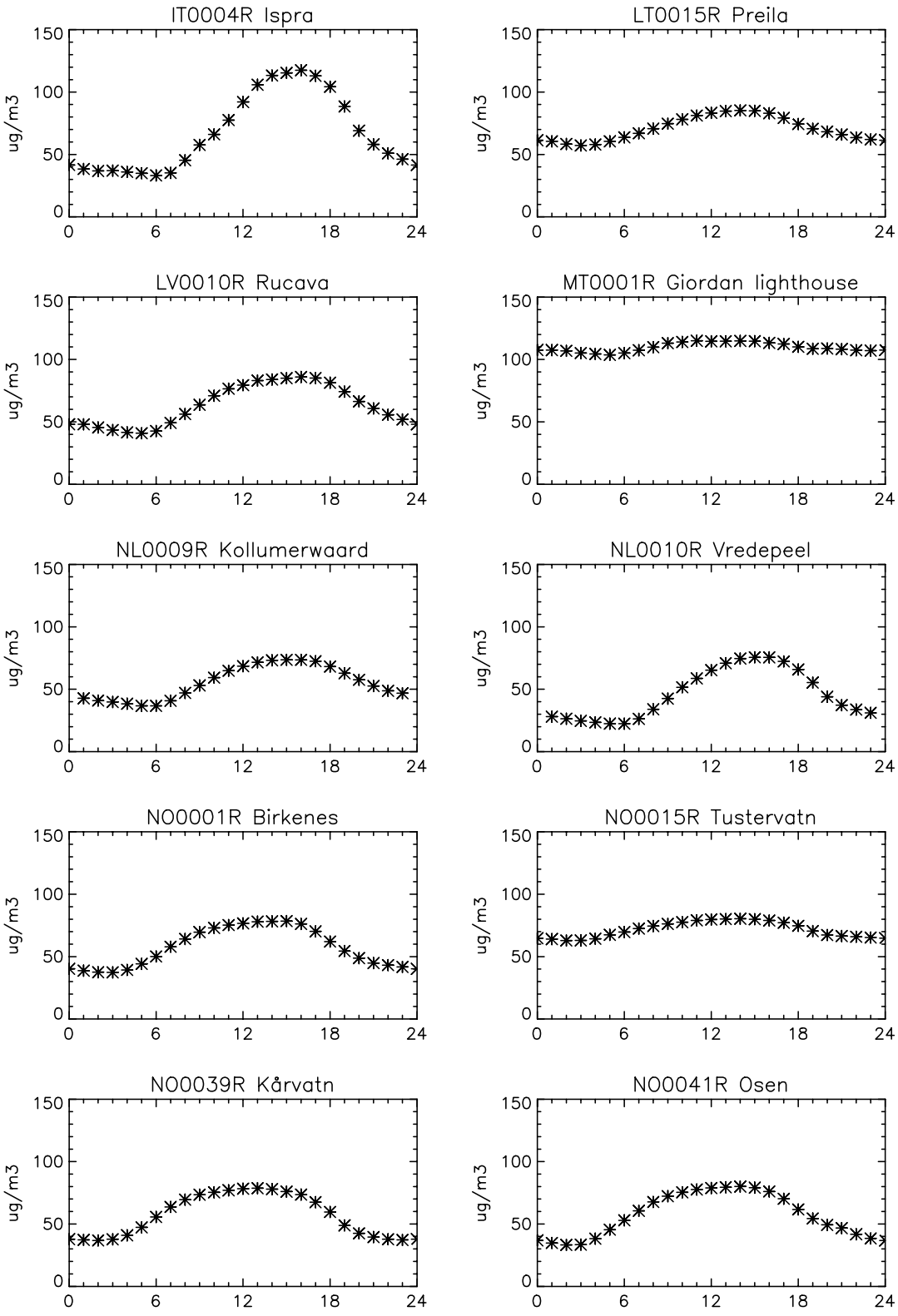

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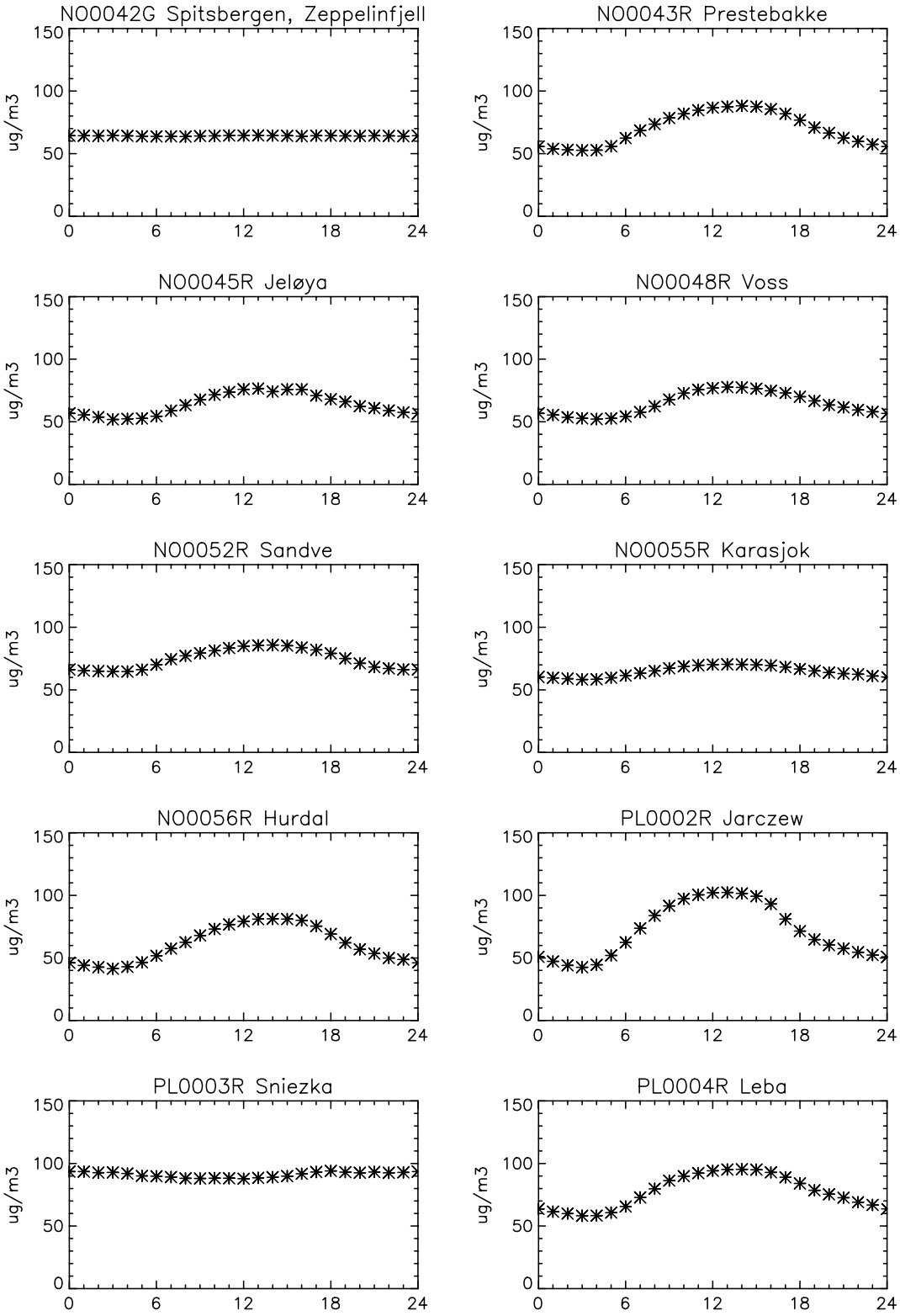

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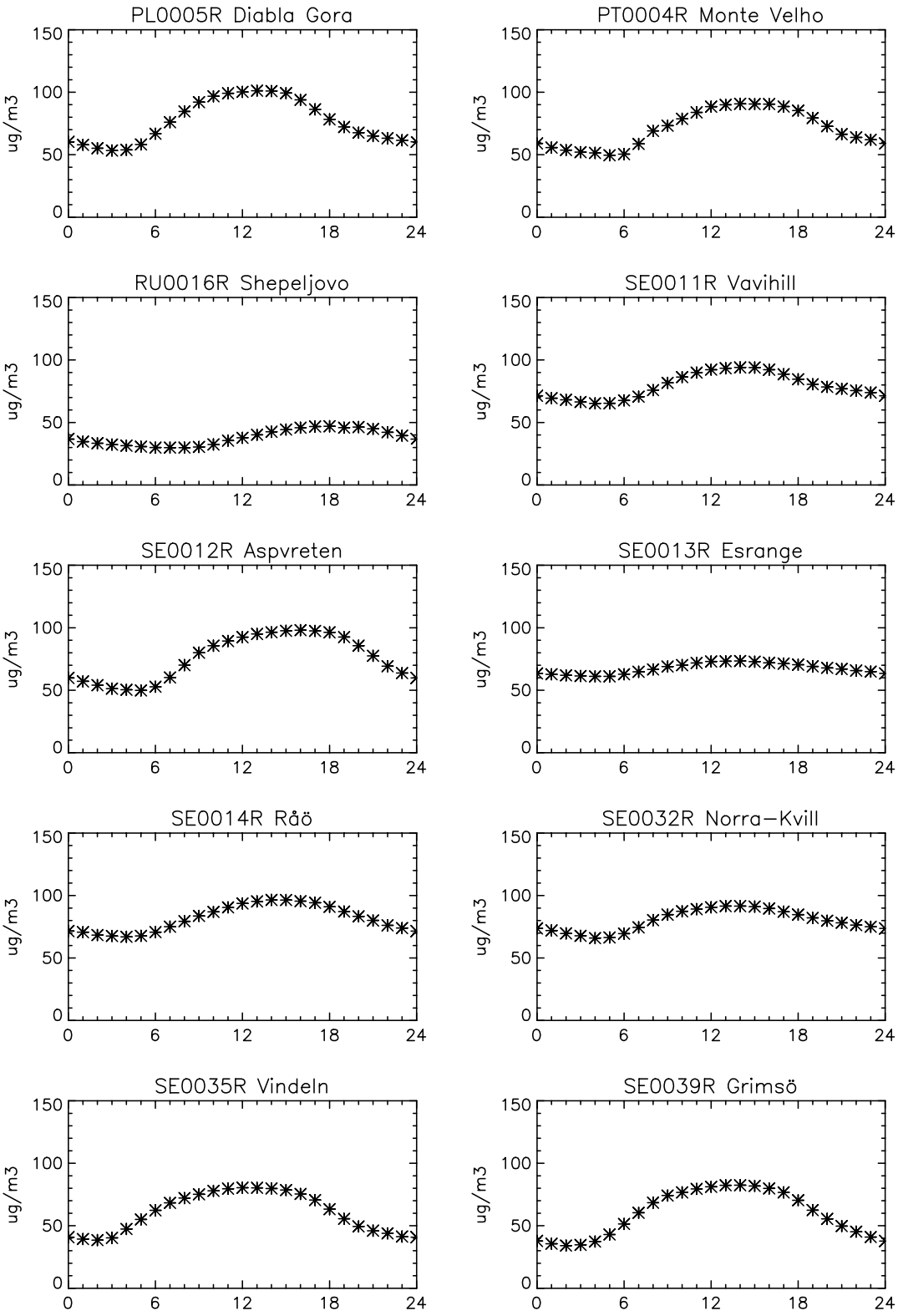

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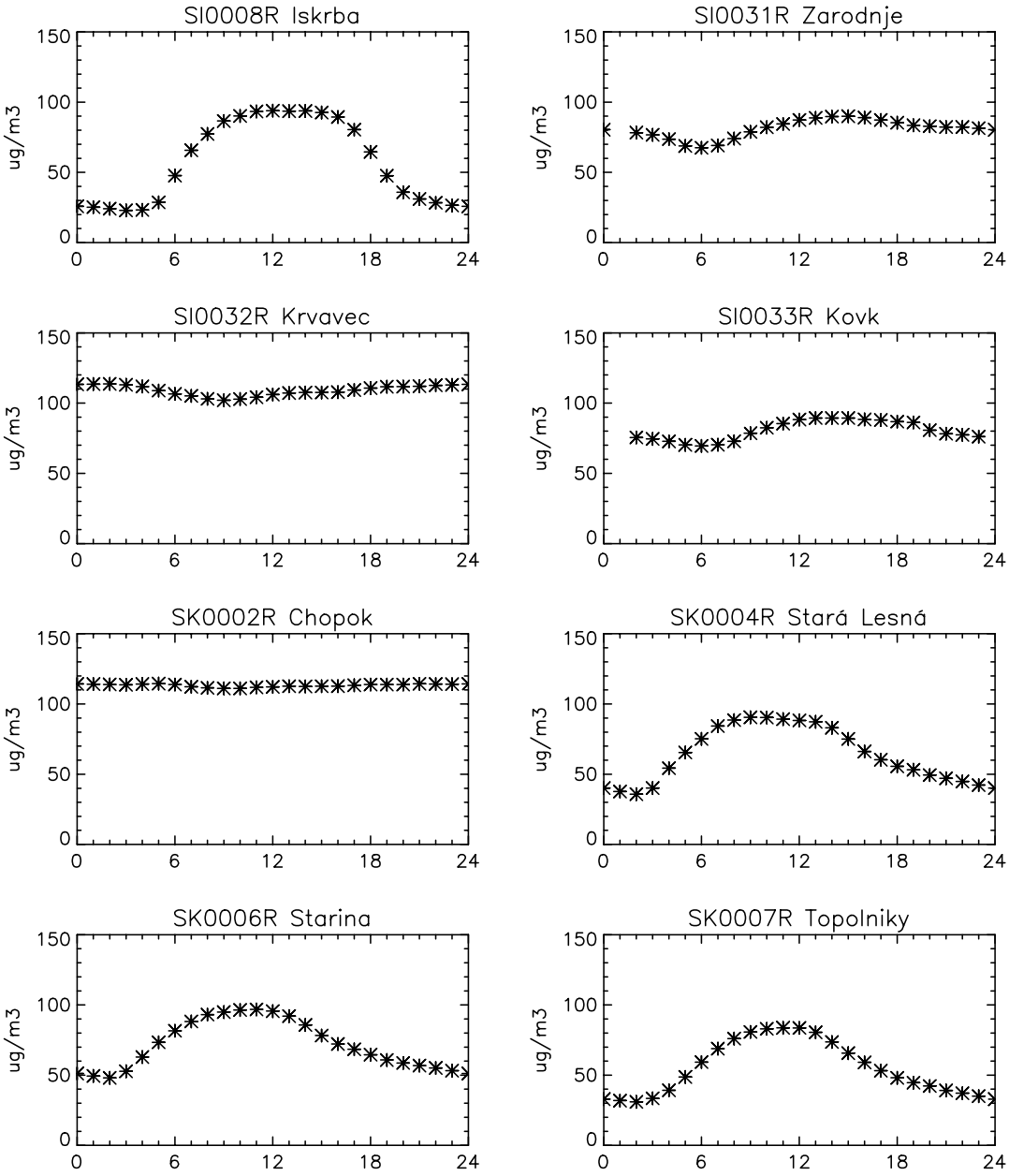

Figure 4.1, cont.

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.

Ozone measurements January 1986–December 1986. Report no. 2.
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.
EMEP/CCC-Report 2/93 by U. Pedersen and I.M. Kvalvågnes.
Lillestrøm, Norwegian Institute for Air Research, 1993.

Ozone measurements 1990–1992.
EMEP/CCC-Report 4/95 by A.-G. Hjellbrekke.
Kjeller, Norwegian Institute for Air Research, 1995.

Ozone measurements 1993–1994.
EMEP/CCC-Report 1/96 by A.-G. Hjellbrekke.
Kjeller, Norwegian Institute for Air Research, 1996.

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EMEP/CCC-Report 3/97 by A.-G. Hjellbrekke.
Kjeller, Norwegian Institute for Air Research, 1997.

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EMEP/CCC-Report 3/98 by A.-G. Hjellbrekke.
Kjeller, Norwegian Institute for Air Research, 1998.

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Kjeller, Norwegian Institute for Air Research, 1999.

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EMEP/CCC-Report 5/2000 by A.-G. Hjellbrekke.
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EMEP/CCC-Report 1/2001 by A.-G. Hjellbrekke and S. Solberg.
Kjeller, Norwegian Institute for Air Research, 2001.

Ozone measurements 2000.
EMEP/CCC-Report 5/2002 by A.-G. Hjellbrekke and S. Solberg.
Kjeller, Norwegian Institute for Air Research, 2002.

Ozone measurements 2001.
EMEP/CCC-Report 4/2003 by A.-G. Hjellbrekke and S. Solberg.
Kjeller, Norwegian Institute for Air Research, 2003.

Ozone measurements 2002.
EMEP/CCC-Report 2/2004 by A.-G. Hjellbrekke and S. Solberg.
Kjeller, Norwegian Institute for Air Research, 2004.