NILU OR: 31/88

NILU OR : 31/88
REFERENCE: O-8535
DATE : MAY 1988
ISBN : 82-7247-925-1

OXIDANT DATA COLLECTION IN OECD-EUROPE 1985-87 (OXIDATE)

Report on ozone, nitrogen dioxide and peroxyacetyl nitrate

October 1985 - March 1986
and
April - September 1986

P. Grennfelt, J. Saltbones and J. Schjoldager

NILU OR : 31/88
REFERENCE: O-8535
DATE : MAY 1988
ISBN : 82-7247-925-1

OXIDANT DATA COLLECTION IN OECD-EUROPE 1985-87 (OXIDATE)

Report on ozone, nitrogen dioxide and peroxyacetyl nitrate

October 1985-March 1986
and
April-September 1986

P. Grennfelt[1)], J. Saltbones[2)] and J. Schjoldager[3)]

---

1) Swedish Environmental Research Institute (IVL)
P.O.Box 47086, S-402 58 Göteborg, Sweden

2) Norwegian Meteorological Institute
P.O.Box 320 Blindern, N-0314 Oslo 3, Norway

3) Norwegian Institute for Air Research (NILU)
P.O.Box 64, N-2001 Lillestrøm, Norway

SUMMARY

OXIDATE is a joint project of European OECD countries to collect and distribute regional data on ozone, nitrogen dioxide and PAN. These data can be of interest to those involved in assessing effects of oxidants, modelling the temporal and spatial distribution of oxidants, and to others who are interested in photochemical oxidants in general. The OXIDATE project was started in 1985 under the OECD programme "Control of Major Air Pollutants (MAP)".

Each country has nominated a contact person and an institution responsible of collecting data. The data have been sent in a specified format to the project secretariat. The data are then redistributed on magnetic tape to all the participating countries. A summary report is made for each year giving a brief overview of the project organisation and the concentration levels.

In the second year of the project, data have been received from 36 measurement stations in these 11 countries: Austria, Belgium, Denmark, Federal Republic of Germany, Finland, France, Netherlands, Norway, Sweden, Switzerland and United Kingdom. Ozone was reported from 34 stations, nitrogen dioxide from nine and PAN from three stations. There has been no centrally organised intercalibration or other data control activity. The measurement methods used were chemiluminescence or UV absorbtion for ozone, chemiluminescence for nitrogen dioxide and gas chromatography with electron capture detection for PAN.

The highest ozone concentrations were measured in the eastern part of Austria and in Switzerland. The concentrations in these two countries were much higher than elsewhere, with hourly concentrations reaching 361 $\mu g/m^3$ (Switzerland) and 348 $\mu g/m^3$ (Austria). The highest concentrations in Austria were lower in 1986 than in 1985 when 446 $\mu g/m^3$ was measured as hourly maximum. The ozone data have indicated a gradient in episodic high concentrations with lower levels in the north-western part and higher levels towards the central and south-eastern parts of Europe. This gradient was similar to that of 1985.

The days with high ozone concentrations were distributed according to the air trajectory sectors. The distribution of sector directions for which high ozone concentrations were measured was in many cases significantly different from the distribution over the total half-year period.

There is a need to include more countries and measurement stations in the project in order to improve the understanding of the oxidant phenomenon. Data from East Europe and the Mediterranean area are of great interest in future European joint measurement programmes.

CONTENTS

		Page
	SUMMARY	1
1	INTRODUCTION	5
2	ORGANISATION	7
3	MONITORING STATIONS	9
4	SUMMARY OF RESULTS	13
	4.1 Extreme concentrations and exceeding of concentration limits	13
	4.2 Monthly mean concentrations	15
	4.3 Cumulative frequency distributions	17
	4.4 Mean diurnal concentration variations	22
	4.5 Trajectory sector distributions	25
	4.6 Ozone episodes	30
	4.6.1 10 June 1986	31
	4.6.2 16 June-4 July 1986	32
	4.6.3 16-17 July 1986	34
5	CONCLUSION	42
6	ACKNOWLEDGEMENT	43
7	REFERENCES	43
	APPENDIX A: Summary of ozone data, October 1985-March 1986	45
	APPENDIX B: Summary of data on nitrogen dioxide and PAN, October 1985-March 1986	69
	APPENDIX C: Summary of ozone data, April-September 1986	81
	APPENDIX D: Summary of data on nitrogen dioxide and PAN, April-September 1986	123
	APPENDIX E: Cumulative frequency distributions of ozone and nitrogen dioxide concentrations, April-September 1986	145
	APPENDIX F: Mean diurnal concentration distributions for ozone, nitrogen dioxide and PAN, October 1985 - March 1986	153
	APPENDIX G: Back trajectory sector distributions, April-September 1986	157

OXIDANT DATA COLLECTION IN OECD-EUROPE 1985-87 (OXIDATE)

Report on ozone, nitrogen dioxide and peroxyacetyl nitrate,
October 1985 - March 1986
and
April - September 1985

1 INTRODUCTION

Episodes of high concentrations of ozone occur over north-western Europe every summer (Cox et al., 1975, Guicherit and van Dop, 1977, Schjoldager et al, 1981, Grennfelt and Schjoldager, 1984). During these episodes the ozone concentrations can reach values above ambient air quality standards over large regions.

The large scale oxidant phenomenon in Europe was first observed from measurements in southern England 1971 (Atkins et al., 1972). During an episode in June/July 1971 ozone concentrations in excess of 200 $\mu g/m^3$ were observed in connection with high concentrations of particulate sulphate. The observations were made in a high pressure situation with light easterly winds. They suggested that the pollutants originated in continental Europe. The first assessment of ozone data from several stations in Europe was made by Guicherit and van Dop (1977). They examined four ozone episodes between 1971 and 1975 using data from the Federal Republic of Germany, France, Italy, Netherlands, Sweden and United Kingdom. A study of ozone episodes in north-western Europe was done for the years 1976-79 by Schjoldager et al. (1981). Data from 24 monitoring stations in 8 countries were collected and evaluated. The relations between photochemical oxidant episodes, large scale weather and air trajectories were analysed.

For data after 1980 Lübkert et al. (1984) have published a report describing episodes with data from several countries. The report was a result of an OECD workshop in Schauinsland, Federal Republic of Germany, in October 1984. Three episodes were described, one from 1980 and two from 1982. The objective was to provide data for model validations. Besides these reports with data from several countries, a

number of publications have appeared presenting and evaluating data from smaller regions.

Because of the regional scale of the photochemical oxidant phenomenon, a successful control of the oxidant problem will only be reached by joint efforts in several countries. At present, several research institutions are involved in modelling work on large scale oxidant formation and transport. Of particular interest is the Dutch-German PHOXA project (Photochemical Oxidant and Acid Deposition Model Application), and the work carried out in Norway within the framework of the European Monitoring and Evaluation Programme (EMEP) (Stern and Builtjes, 1986; Hov et al., 1985).

International bodies, e.g., ECE, EC and OECD, are concerned with abatement strategies. The OECD is currently carrying out a programme on "Control of Major Air Pollutants (MAP)" on an international scale.The programme is concerned with long-range transport of air pollutants and large-scale formation of secondary atmospheric pollutants, particulary photochemical oxidants and their precursors. The programme involves several acitivities; emission inventories, assessment of ambient photochemical concentrations and their effects, implementation and refinement of models for formation and transport of oxidants, and compilation of data on techniques and costs for the control of emissions of nitrogen oxides and volatile organic compounds.

For the assessment of effects and for the model refinement and validation, a comprehensive data base on ambient air concentrations is necessary. Since no permanent or long term (i.e. several years) network have so far existed in Europe for the monitoring of photochemical oxidants, Norway and Sweden offered, during the OECD workshop in 1984, to collect data on ozone, NO_2 and PAN from the European OECD countries, and redistribute the data to the participating countries. The project was presented for the Air Management Policy Group (AMPG) at OECD in March 1985 and received general support. It was agreed to include the OXIDATE project in the OECD MAP programme.

The project is being carried out by the Swedish Environmental Research Institute (IVL) and the Norwegian Institute for Air Research (NILU). In 1985 and 1986, the project has been financed by the Swedish Environmental Protection Board (SNV) and the Norwegian State Pollution Control Authority (SFT). In 1987, economic support is given by the Nordic Council of Ministers (NMR).

The first project report, covering the period from April through September 1985, was issued in April 1987 (Grennfelt et al., 1987). This second report covers the period from October 1985 through September 1986.

2 ORGANISATION

Each country nominates an institution responsible for collecting national data and submitting them to the project secretariat. For measurements from the summer half year (April-September), the deadline for data submission is the end of December. For measurements from the winter half year (October-March), the deadline is the end of June. The costs of national data handling are covered by the individual countries.

All data will be redistributed to the participating institutions at the end of March and September, respectively. The data will thus be redistributed six months after the end of the measurement periods.

At the end of March each year, IVL and NILU will prepare a project report with information on status of stations and measurements, and a summary of the most important episodes during the preceding year.

In the two years of the project, it has not been possible to keep the time schedule given above. The reason for this has partly been limited resources at the responsible institutes, and partly that the data were not always received according to the specifications.

The list of contact persons and institutions is given in Table 1.

Table 1: List of contact persons and institutions, OXIDATE project, 1986.

COUNTRY	NAME, INSTITUTION	TELEPHONE
Austria	Dr. Ruth Baumann Umweltbundesamt Wien Abteilung für Lufthygiene Biberstrasse 11 A-1010 WIEN	43-222-43 2504
Belgium	Dr. J. Beyloos Institute d´Hygiène et d´Epidémiologie 14, Rue Juliette Wytsman B-1050 BRUXELLES	32-2-642 5111
Denmark	Dr. Finn Palmgren Jensen Miljøstyrelsen, Luftforureningslaboratoriet Forsøgsanlæg Risø DK-4000 ROSKILDE	45-2-37 11 37
Federal Republic of Germany	Dr. Rolf Sartorius Umweltbundesamt Bismarckplatz 1 D-1000 BERLIN	49-30-8903 511
	Dr. Wolfgang Grosch Umweltbundesamt, Pilotstation Frankfurt Frankfurter Str. 135 D-6050 OFFENBACH	49-69-88 80 38
Finland	Mr. Heikki Lättilä Finnish Meteorological Institute (FMI) P.O.Box 50 SF-00810 HELSINKI	358-0-119 22
France	Dr. G. Toupance Laboratoire de Physicochimie de l´Environnement Universite Paris Val de Marne Av. du Gal. de Gaulle F-94000 CRETEIL	33-14-898 9144
Netherlands	Dr. W.F. Blom Air Research Laboratory Rijksinstituut vor Volksgezondheid en Milienuhygiene Postbus 1 NL-3720 BA BILTHOVEN	31-30-74 91 11
Norway	Mr. Jørgen Schjoldager Norwegian Institute for Air Research (NILU) P.O.Box 64 N-2001 LILLESTRØM	47-6-81 41 70
Sweden	Mr. Peringe Grennfelt Swedish Environmental Research Institute (IVL) P.O.Box 47086 S-402 58 GOTEBORG	46-31-46 00 80
Switzerland	Dr. R. Gehrig EMPA Uberlandsstrasse 129 CH-8600 DUBENDORF	41-1-823 55 11
United Kingdom	Dr. B. Sweeney Air Pollution Division Warren Spring Laboratory Gunnels Wood Road, Stevenage Herts SG1 2BX, ENGLAND	44-438-74 11 22

These 11 countries have submitted data for the periods described in this report: Austria, Belgium, Denmark, Federal Republic of Germany, France, Finland, Netherlands, Norway, Sweden, Switzerland and United Kingdom.

3 MONITORING STATIONS

The total number of monitoring stations was 36. The stations are given in Tables 2 and 3, and on the map in Figure 1. 34 stations have reported ozone, nine have reported nitrogen dioxide, and three stations have reported PAN data.

The monitoring stations in the project have been selected by the countries. All countries report that they have used either chemiluminescence or UV absorption for ozone monitoring, chemiluminescence for NO_2, and gas chromatography with electron capture detection for PAN.

There have been substantial improvements in both monitoring and calibration techniques for ozone during the last 5-7 years. Most of the ozone data are probably of good quality.

With regard to NO_2 commercially avaliable chemiluminescence instruments have a detection limit in the lower ppb level. PAN instruments need a quite careful inspection and maintenance. This may explain that only three stations have reported PAN.

In the project, no general intercalibration has been performed, nor has there been a general evaluation of the representativity of the stations for the purpose of the project, i.e., to study the regional extent of photochemical oxidants.

Table 2: List of countries, stations and compounds, OXIDATE project, winter half-year 1985-86, and summer half-year 1986.

COUNTRY/STATION	COMPOUNDS			Winter half-year 1985-86	Summer half-year 1986
	O_3	NO_2	PAN		
AUSTRIA					
Illmitz	x			1 Jan-31 Mar	1 Apr-15 Sep
BELGIUM					
Gent, St. Kruiswinkel	x	x		1 Oct-31 Mar	1 Apr-30 Sep
DENMARK					
Risø	x			1 Oct-30 Nov	
Ulborg	x			1 Jan-30 Mar	10 Apr-30 Sep
FED.REP. OF GERMANY					
Brotjacklriegel	x			1 Oct-31 Mar	1 Apr-30 Sep
Deuselbach	x			1 Oct-31 Mar	1 Apr-30 Sep
Langenbrügge-Waldhof	x			1 Oct-31 Mar	1 Apr-30 Sep
Schauinsland	x			1 Oct-31 Mar	1 Apr-30 Sep
Westerland	x			1 Oct-31 Mar	1 Apr-30 Sep
FINLAND					
Utö	x			1 Oct-31 Oct	1 Apr-30 Sep
Utö	x			1 Feb-31 Mar	
FRANCE					
Andrezel	x			1 Oct-31 Mar	1 Apr-30 Sep
Creteil			x	1 Oct-31 Mar	1 Apr-30 Sep
Donon			x		1 Sep-30 Sep
Montagny	x			1 Oct-31 Mar	1 Apr-30 Sep
Pinceloup	x			1 Oct-31 Mar	1 Apr-30 Sep
NETHERLANDS					
Delft			x		12 Jun-30 Sep
Eibergen	x	x			1 Apr-30 Sep
Witteveen	x				8 Apr-30 Sep
Witteveen		x			1 Apr-30 Sep
NORWAY					
Birkenes	x			1 Oct-31 Mar	1 Apr-30 Sep
Jeløya	x				3 Apr-30 Sep
Langesund	x				23 May-22 Sep
SWEDEN					
Aspvreten	x				10 Jun-23 Sep
Norra Kvill	x			17 Dec-31 Mar	1 Apr-11 Sep
Ringamåla-Sännen	x				11 Jun-20 Sep
Rörvik	x			1 Oct-26 Jan	4 Apr-30 Sep
Vavihill	x			1 Oct-31 Mar	1 Apr-30 Sep
Vindeln	x			1 Oct-31 Mar	1 Apr-18 Sep
Ammarnäs	x				5 Jun-30 Sep
Stormyrsberget	x				3 Jun-30 Sep
SWITZERLAND					
Payerne	x	x			1 Apr-30 Sep
Sion	x	x			1 Apr-30 Sep
Tänikon	x	x			1 Apr-30 Sep
UNITED KINGDOM					
Bottesford	x	x		2 Oct-31 Mar	1 Apr-30 Sep
Harwell	x			1 Nov-31 Mar	1 Apr-30 Sep
Harwell		x		7 Oct-31 Mar	1 Apr-30 Sep
Wray (Lancaster)	x			1 Oct-31 Mar	1 Apr-30 Sep
Wray (Lancaster)		x		1 Oct-31 Mar	1 Apr-31 Jul
Sibton	x			1 Oct-31 Mar	2 Apr-23 Sep

Table 3: List of latitude, longitude and altitude of the OXIDATE stations, winter half-year 1985/86 and summer half-year 1986. The station codes refer to Figure 1 only, and are not equivalent to the EMEP station codes.

STATION NAME		LATITUDE	LONGITUDE	ALTITUDE (m)
A1	Illmitz	47 46 N	16 46 E	117
B1	Gent, St. Kruiswinkel	51 9 N	3 49 E	5
DK1	Risø	55 42 N	12 6 E	13
DK2	Ulborg	56 17 N	8 26 E	37
D1	Brotjacklriegel	48 49 10 N	13 13 9 E	1016
D2	Deuselbach	49 45 53 N	7 3 7 E	480
D3	Langenbrügge-Waldhof	52 48 8 N	10 45 34 E	73
D4	Schauinsland	47 54 53 N	7 54 31 E	1205
D5	Westerland	54 55 32 N	8 18 35 E	12
SF1	Utö	59 47 N	21 23 E	10
F1	Andrezel	48 36 39 N	2 49 12 E	115
F2	Creteil	48 47 14 N	2 27 06 E	49
F3	Donon	48 30 23 N	7 9 2 E	750
F4	Montagny	49 11 19 N	2 46 07 E	115
F5	Pinceloup	48 34 55 N	1 52 55 E	175
NL1	Delft	52 0 N	4 23 E	-2
NL2	Eibergen	52 6 N	6 36 E	20
NL3	Witteveen	52 49 N	6 40 E	16
N1	Birkenes	58 23 N	8 15 E	190
N2	Jeløya	59 26 N	10 36 E	3
N3	Langesund	59 1 N	9 45 E	5
S1	Aspvreten	58 48 N	17 23 E	20
S2	Norra Kvill	57 49 N	15 34 E	261
S3	Ringamåla-Sännen	56 20 N	15 20 E	90
S4	Rörvik	57 25 N	11 56 E	10
S5	Vavihill	56 1 N	13 9 E	175
S6	Vindeln	64 15 N	19 46 E	225
S7	Ammarnäs	65 58 N	16 12 E	480
S8	Stormyrsberget	62 14 N	16 16 E	375
CH1	Payerne	46 49 N	6 57 E	500
CH2	Sion	46 13 N	7 20 E	480
CH3	Tänikon	47 29 N	8 54 E	540
UK1	Bottesford	52 56 N	0 49 W	32
UK2	Harwell	51 25 N	1 19 W	137
UK3	Wray (Lancaster)	54 6 N	2 35 W	75
UK4	Sibton	52 18 N	1 28 E	46

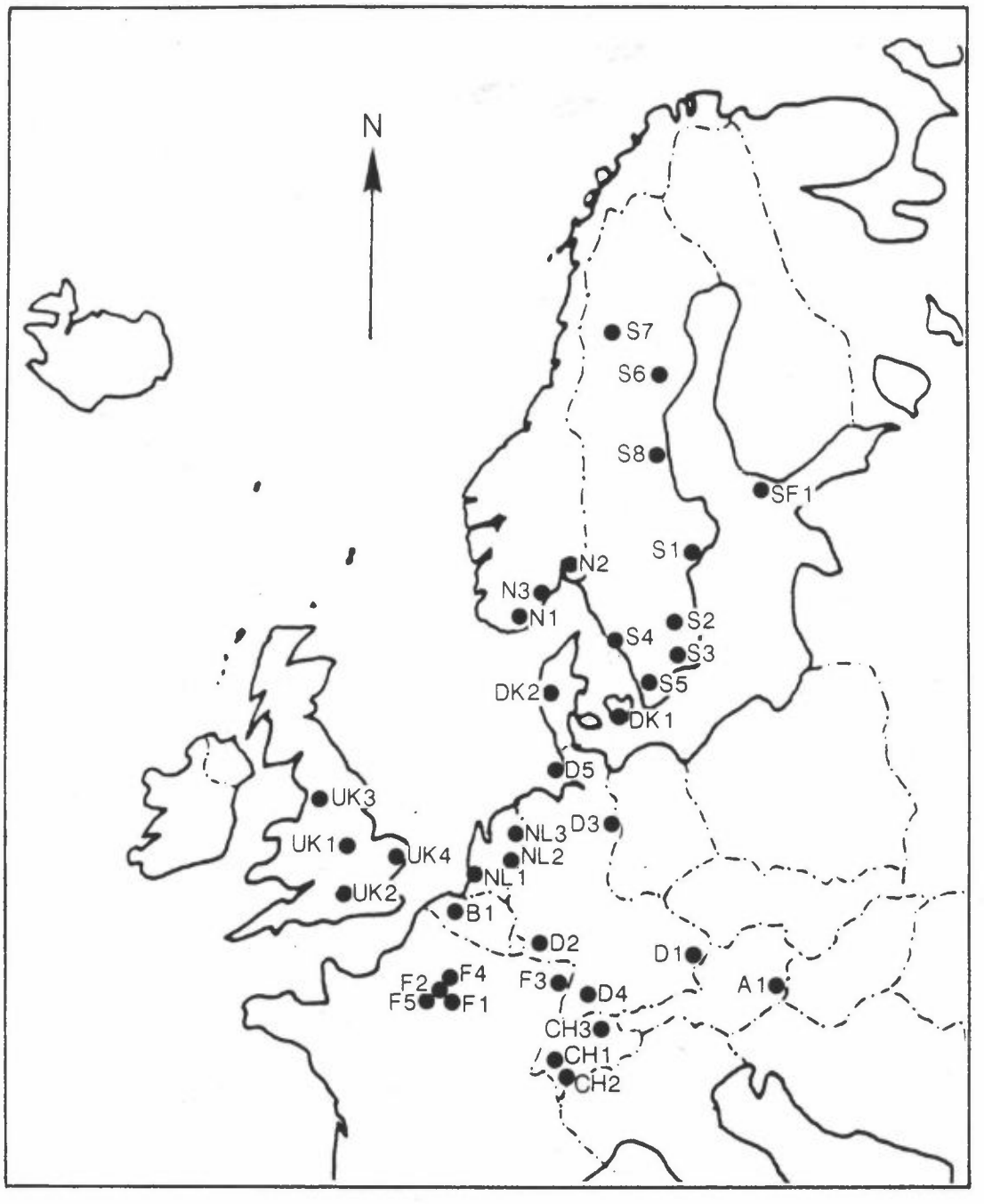


Figure 1: Map of measurement stations in the OXIDATE project, winter half-year 1985-86 and summer half-year 1986.
(Station codes refer to Table 1 only.)

4 SUMMARY OF RESULTS

4.1 EXTREME CONCENTRATIONS AND EXCEEDING OF CONCENTRATION LIMITS

Tables of the dates and the number of days and hours with hourly concentrations above certain limits are given for ozone, nitrogen dioxide and PAN in Appendix A-B for the winter half-year, and in Appendix C-D for the summer half-year.

During the winter half-year the highest hourly ozone concentration was 221 $\mu g/m^3$, and the highest daily ozone concentration was 170 $\mu g/m^3$, measured at Illmitz (Austria) on 25 March 1986 and 6 March 1986, respectively.

The highest hourly NO_2-concentration was 290 $\mu g/m^3$ (Gent St. Kruiswinkel, Belgium, 21 October 1985), and the highest daily NO_2-concentrations was 102 $\mu g/m^3$ (Bottesford, United Kingdom, 11 December 1985).

For the summer half-year table 4 gives the number of hours and days with hourly ozone concentrations exceeding the concentration limits of 120, 160, 200, 240 and 280 $\mu g/m^3$. Two stations, Ammarnäs and Stormyrsberget (Sweden), had no hourly concentrations exceeding 120 $\mu g/m^3$. Seven stations had hourly concentrations above 240 $\mu g/m^3$. These were Illmitz (Austria), Schauinsland (Federal Republic of Germany), Pinceloup (France), Jeløya (Norway), Payerne and Sion (Switzerland), and Harwell (United Kingdom).

During the summer half-year, the highest hourly ozone concentration was 361 $\mu g/m^3$, measured at Sion (Switzerland) on 26 June 1986. The highest daily concentration was 198 $\mu g/m^3$, measured at Illmitz (Austria) on 27 May 1986.

The highest hourly NO_2-concentration was 174 $\mu g/m^3$, and the highest daily concentration was 123 $\mu g/m^3$, both measured at Harwell (United Kingdom) on 28 June 1986. Bottesford (United Kingdom) also recorded 174 $\mu g/m^3$ as hourly maximum on 20 September 1986.

The highest hourly PAN concentration was 104 $\mu g/m^3$, and the highest daily concentration was 34 $\mu g/m^3$, measured on 16 June 1986 at Creteil

(France). These concentrations are among the highest recorded in Europe. Creteil is probably influenced by local emissions in Paris.

Table 4: Number of hours (h) and days (d) with hourly ozone concentrations exceeding 120, 160, 200, 240 and 280 $\mu g/m^3$, and maximum hourly and daily ozone concentration ($\mu g/m^3$), April-September 1986.

	Number of hours and days												Maximum ozone concentrations	
	Total		>120		>160		>200		>240		>280		($\mu g/m^3$)	
STATION	h	d	h	d	h	d	h	d	h	d	h	d	h	d
Illmitz	3449	146	1918	138	892	108	384	56	135	31	28	8	348	198
Gent St. Kruiswinkel	3614	159	54	13	5	2							194	89
Ulborg	3309	139	49	21									140	104
Brotjacklriegel	4253	179	175	32									154	137
Deuselbach	4384	183	170	30	16	7	2	1					222	135
Langenbrügge-Waldhof	4365	183	170	30	73	14	4	3					208	129
Schauinsland	4315	182	1036	81	160	25	37	7	2	1			260	204
Westerland	3594	149	181	28	14	6							198	130
Utö	3373	150	128	22									154	133
Andrezel	4070	171	53	13	8	2	6	2					230	97
Montagny	4111	172	25	9	1	1							167	83
Pinceloup	3927	163	248	41	54	13	9	6	2	2	1	1	285	139
Eibergen	4306	180	218	39	49	11	19	5	6	2			280	130
Witteveen	4038	168	120	21	23	5	3	1					213	106
Birkenes	4090	172	14	4									144	97
Jeløya	4231	177	75	19	13	3	3	1	1	1			268	124
Langesund	2553	107	14	4									149	99
Aspvreten	2359	99	1	1									124	89
Norra Kvill	2636	111	66	8	9	2							176	141
Ringamåla-Sännen	1572	65	21	5									142	99
Rörvik	3769	167	186	32	15	4							191	133
Vavihill	4321	182	144	28	13	3	1	1					202	148
Vindeln	3211	136	21	4									145	114
Ammarnäs	2414	101											114	88
Stormyrsberget	2097	88											104	81
Payerne	4180	179	859	101	277	46	91	23	34	10	17	6	325	191
Sion	4223	179	832	97	377	55	183	30	79	17	32	10	361	193
Tänikon	4359	183	132	29	6	3							174	93
Bottesford	4364	182	93	18	14	4	1	1					206	120
Harwell	4192	175	77	10	27	5	9	2	3	1			272	133
Wray (Lancaster)	4074	173	14	3									150	97
Sibton	3424	146	4	1									136	85

4.2 MONTHLY MEAN CONCENTRATIONS

The monthly mean ozone concentrations are given in Tables 5a and 5b for the winter half-year and the summer half-year, respectively. For the summer half-year, Illmitz (Austria) had monthly mean concentrations above 100 $\mu g/m^3$ for all the months and above 120 $\mu g/m^3$ for the months May-September. The monthly mean concentrations at Sion (Switzerland) and Schauinsland (Federal Republic of Germany) were also relatively high, with some of the monthly mean values above 100 $\mu g/m^3$.

Table 5a: Monthly mean ozone concentrations ($\mu g/m^3$), October 1985 - March 1986.
Number in parenthesis: 10-20 daily values, no numbers: less than 10 daily values.

	1985			1986		
STATION	Oct	Nov	Dec	Jan	Feb	Mar
Illmitz				37	82	102
Gent, St.Kruiswinkel	10	4	19	34	16	34
Risø	35	26				
Ulborg				49	62	55
Brotjacklriegel	67	42	40	43	53	58
Deuselbach	34	23	31	36	35	54
Langenbrügge-Waldhof	36	23	22	28	47	42
Schauinsland	80	52	67	67	70	96
Westerland	53	39	42	51	56	55
Utö	66				66	93
Andrezel	8	7	(10)	30	7	42
Montagny	5	7	16	20	7	19
Pinceloup	23	15	34	48	26	52
Birkenes	38		37	47	59	52
Norra Kvill			(45)	(47)	65	74
Rörvik	57	(41)		(45)		
Vavihill	41	36	34	46	68	62
Vindeln	37		42	38	59	69
Bottesford	24	26	34	39	37	52
Harwell		31	(44)	48	31	40
Wray (Lancaster)	37	46	46	42	55	56
Sibton	45	9	(6)	22	(29)	48

Table 5b: Monthly mean ozone concentrations ($\mu g/m^3$), April - September 1986.
Number in parenthesis: 10-20 daily values, no numbers: less than 10 daily values.

STATION	Apr	May	Jun	Jul	Aug	Sep
Illmitz	114	(145)	125	145	148	(108)
Gent, St.Kruiswinkel	49	54	51	51	41	25
Ulborg	73	76	70	60	53	
Brotjacklriegel	63	66	78	82	80	79
Deuselbach	54	66	78	66	66	44
Langenbrügge-Waldhof	61	65	69	62	59	37
Schauinsland	87	103	118	115	103	86
Westerland		89	93	82	82	75
Utö	81	87	86	95	80	72
Andrezel	53	48	58	44	42	(25)
Montagny	26	26	48	39	41	(32)
Pinceloup	(40)	50	75	64	59	41
Eibergen	50	63	72	54	45	24
Witteveen	51	60	63	45	46	29
Birkenes	66	56	66	54	44	47
Jeløya	52	67	85	79	62	59
Langesund			70	60	48	58
Aspvreten			71	71	55	38
Norra Kvill	79	87	81		47	(51)
Ringamåla-Sännen					64	56
Rörvik	76	87	87	81	74	59
Vavihill	84	81	80	68	64	49
Vindeln	83	74		58	48	(39)
Ammarnäs			63	41	39	37
Stormyrsberget			(56)	(32)	25	47
Payerne	82	109	95	80	83	73
Sion	62	80	109	104	80	36
Tänikon	49	52	63	57	50	35
Bottesford	64	60	71	42	45	28
Harwell	50	65	68	42	46	37
Wray (Lancaster)	69	67	63	45	48	43
Sibton	14	11	19	34	49	(38)

The monthly mean NO_2-concentrations are given in Table 6a and 6b.

Table 6a: Monthly mean NO_2-concentrations ($\mu g/m^3$), October 1985-March 1986.
Numbers in parenthesis: 10-20 daily values, no numbers: less than 10 daily values.

	1985			1986		
STATION	Oct	Nov	Dec	Jan	Feb	Mar
Gent, St. Kruiswinkel	42	(33)	37	24	32	26
Bottesford	44	47	46	37	27	47
Harwell	40	31	13	18	45	24
Wray (Lancaster)	13	10	8	7	8	13

Table 6b: Monthly mean NO_2-concentrations ($\mu g/m^3$), April - September 1986.
Numbers in parenthesis: 10-20 daily values, no numbers: less than 10 daily values.

STATION	Apr	May	Jun	Jul	Aug	Sep
Gent, St. Kruiswinkel	19	22	(15)	16	15	21
Eibergen	22	20	17	24	23	27
Witteveen	14	14	11	16	16	17
Payerne	16	10	12	16	17	22
Sion	20	16	12	(14)	13	17
Tänikon	25	21	24	23	21	24
Bottesford	26	19	18	24	27	56
Harwell	15	8	20	9	12	14
Wray (Lancaster)	(7)	6	9	5		

4.3 CUMULATIVE FREQUENCY DISTRIBUTIONS

The cumulative frequency distributions for ozone and nitrogen dioxide are given in Appendix E for the summer half-year April-September 1986. Many stations show a near log-normal distribution in the higher range of the concentrations indicated by near straight lines in the graphs.

The 90, 95 and 98 percentiles of the summer half-year ozone concentrations are given in Figures 2-4 for the different stations. The highest percentile concentrations were experienced at Illmitz (Austria). Other stations with high concentrations were Sion and Payerne (Switzerland) and Schauinsland (Federal Republic of Germany).

Some "percentile isopleths" are indicated on the maps. These are extremely uncertain, partly because of the limited number of stations. As in the previous report, it has been difficult to determine the eastern and southern ends of the isopleths. Also, two of the stations in Central Europe, Brotjacklriegel and Tänikon, have considerably lower concentrations than the surrounding stations. The same was the case for Sibton, United Kingdom.

The concentration pattern indicates a northwest to southeast ozone concentration gradient in Europe. This is in general agreement with the findings of 1985. The Swiss and French stations were not included in the data base for 1985. The two Swiss stations Payerne and Sion had higher percentile concentrations in 1986 than all other stations except Illmitz (Austria).

The three French stations, Andrezel, Montagny and Pinceloup, have been established to study the metropolitan Paris urban plume. The three stations show different concentration levels which may indicate different influence from the emissions of Paris. For the percentile isopleths it was not clear which of the stations should be selected. An "intermediate" concentration level was chosen, because the highest levels were believed not to represent the regional concentration level.

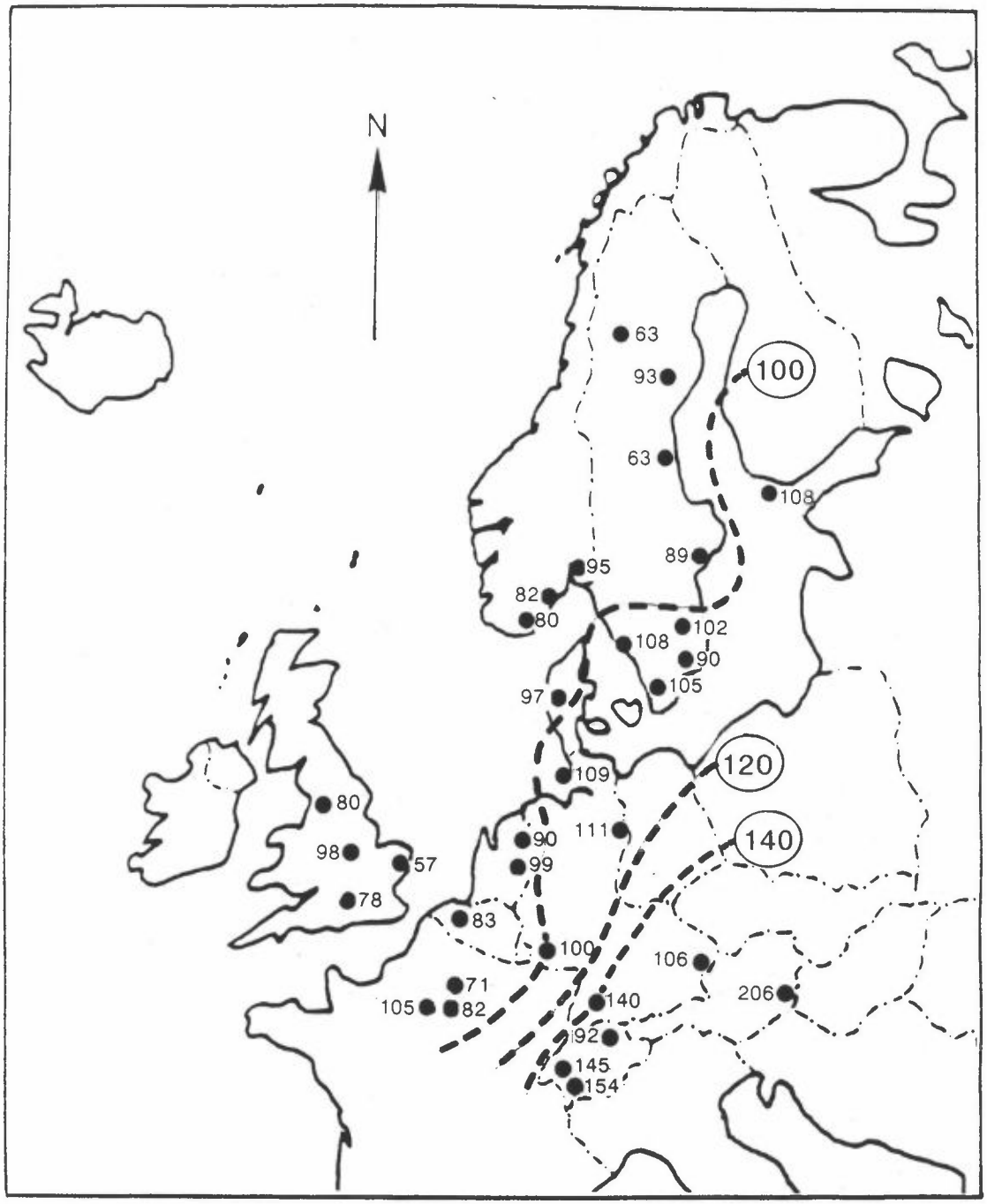


Figure 2: 90 percentile of ozone concentrations ($\mu g/m^3$), April - September 1986.

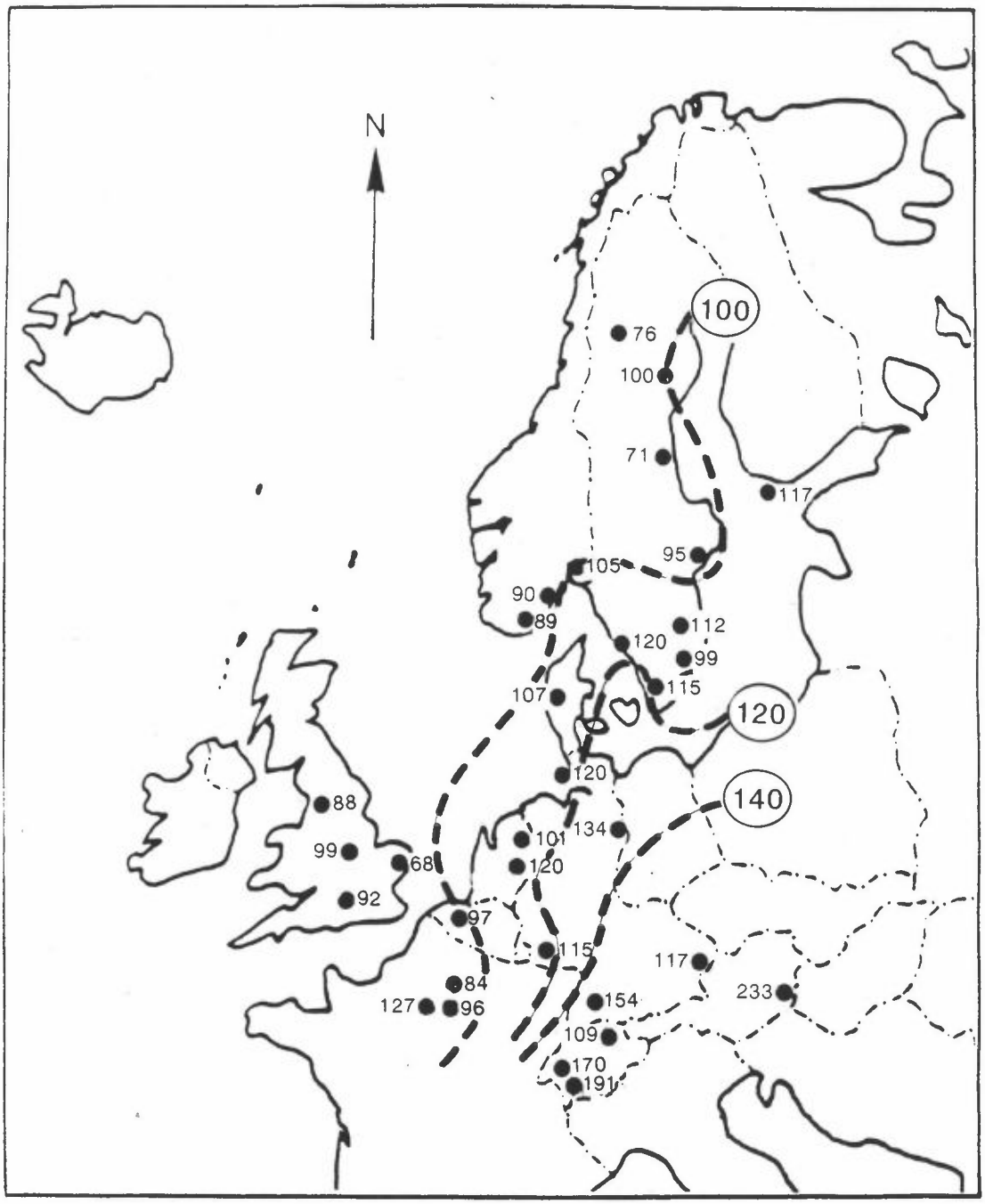


Figure 3: 95 percentile of ozone concentrations ($\mu g/m^3$), April - September 1986.

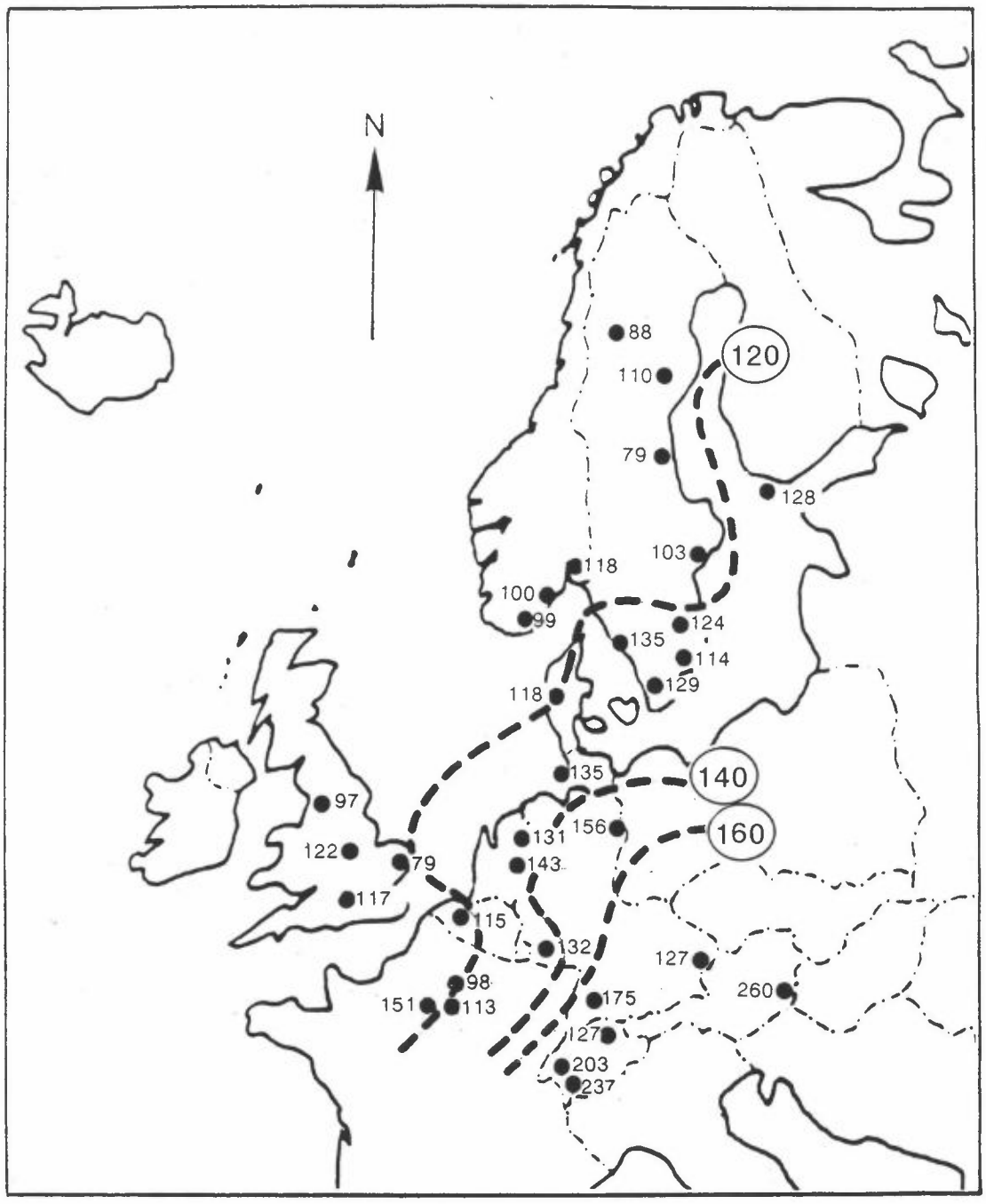


Figure 4: 98 percentile of ozone concentrations ($\mu g/m^3$), April - September 1986.

4.4 MEAN DIURNAL CONCENTRATION VARIATIONS

The mean diurnal concentration distributions of ozone and nitrogen dioxide and PAN for the winter half-year are given in Appendix F.

For the summer half-year the mean diurnal concentration distributions of ozone, nitrogen dioxide and PAN are given in Figures 5-6. For ozone, most stations exhibited the well-documented "unimodal" distribution with lowest concentrations during the night and highest concentrations during the afternoon hours. As for the previous year Illmitz (Austria) had the highest mean concentrations, approaching 180 $\mu g/m^3$ in the afternoon hours.

Also in agreement with the findings of the previous year, there were smaller concentration variations for coastal stations like Westerland (Federal Republic of Germany) and Utö (Finland), and hilltop stations like Schauinsland and Brotjacklriegel (Federal Republic of Germany) than for most other stations.

The diurnal NO_2 concentration variations showed the "bimodal" distribution for most of the stations. Eibergen (Netherlands) had a different distribution with higher concentrations during nighttime than daytime hours.

The diurnal PAN concentration variations at Creteil (France) and Delft (Netherlands) were similar to most of the ozone concentration distributions. The concentrations at Creteil is probably influenced by local emissions in Paris.

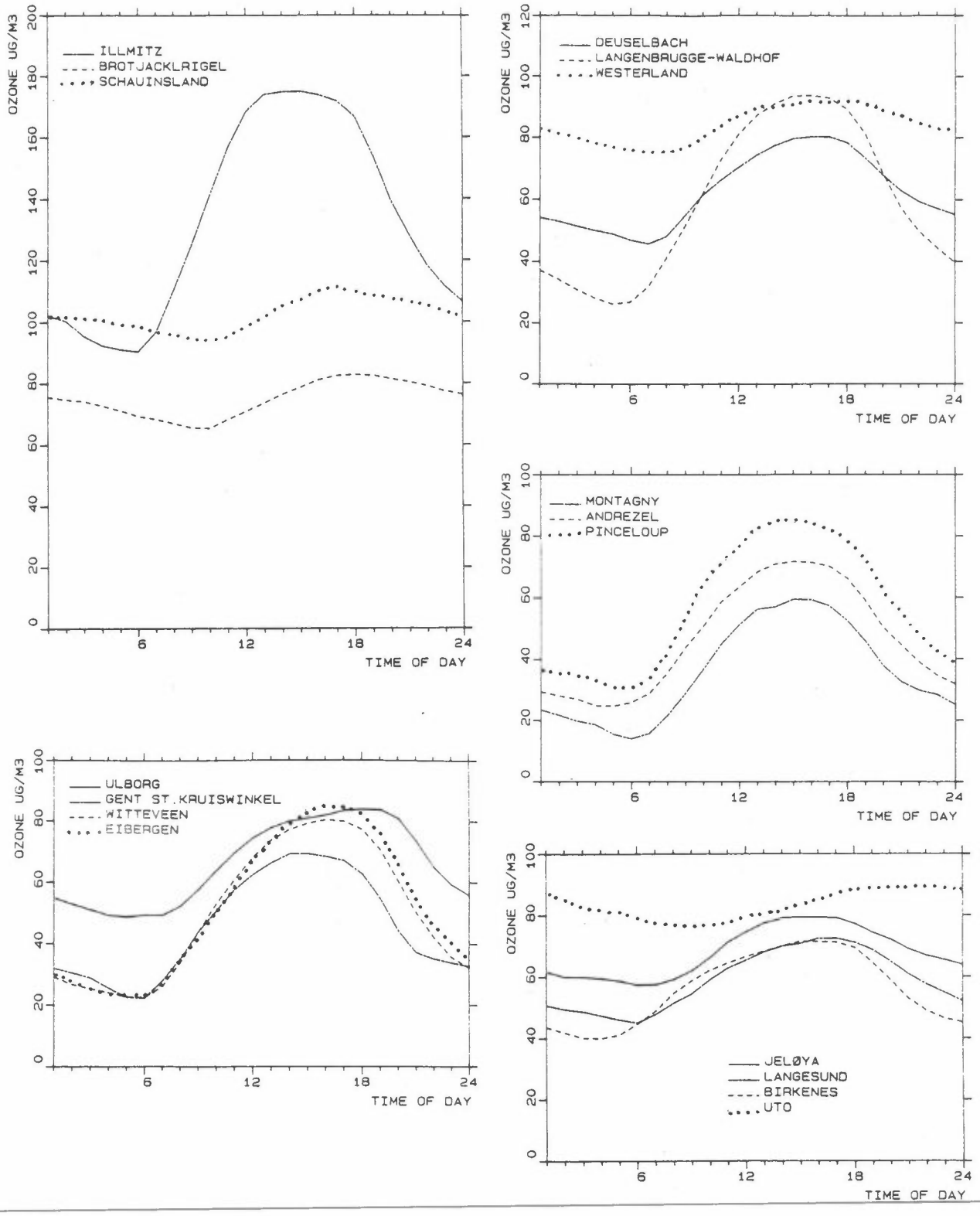


Figure 5: Mean diurnal concentration distributions for ozone, April-September 1986.

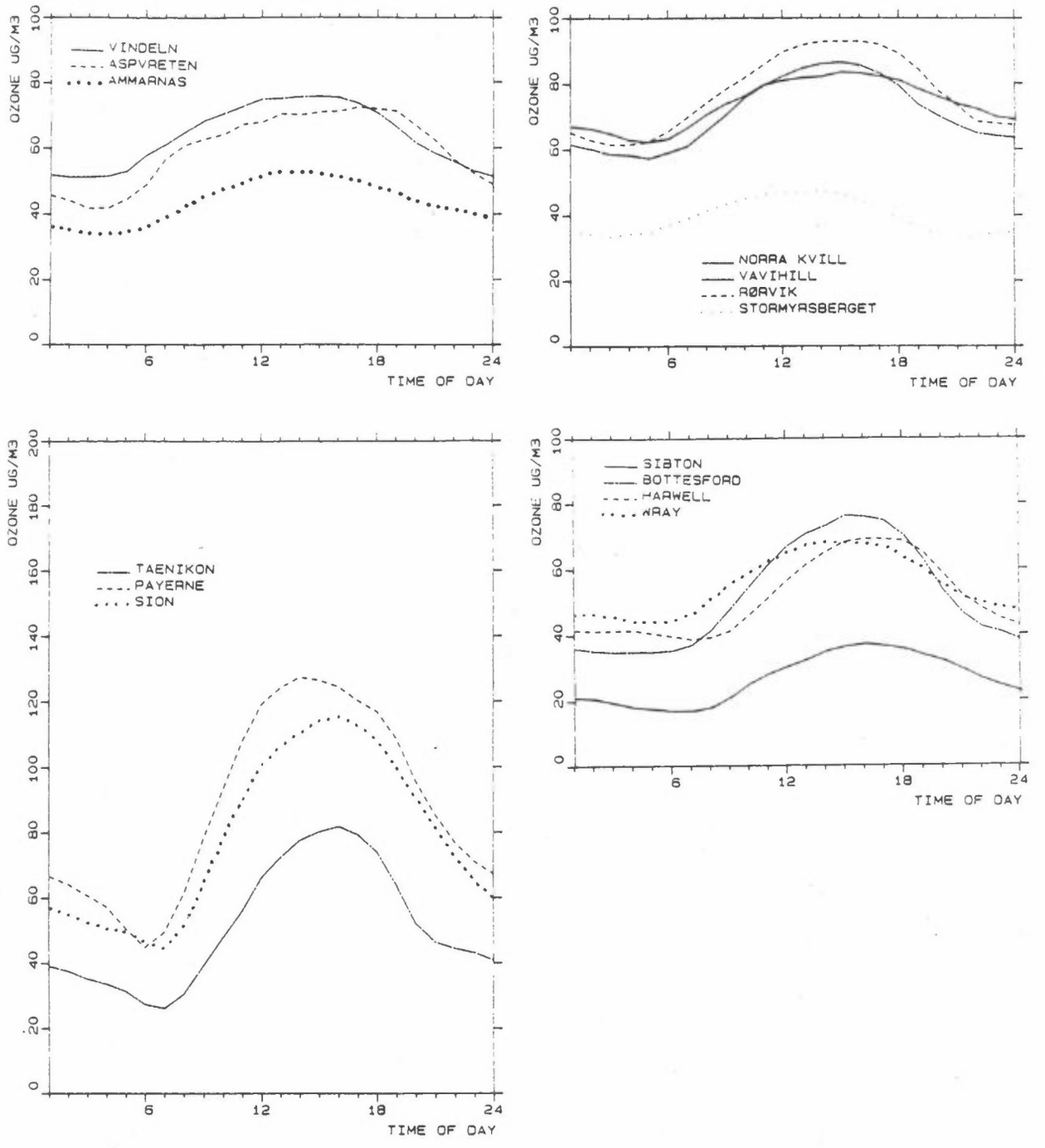


Figure 5 cont.

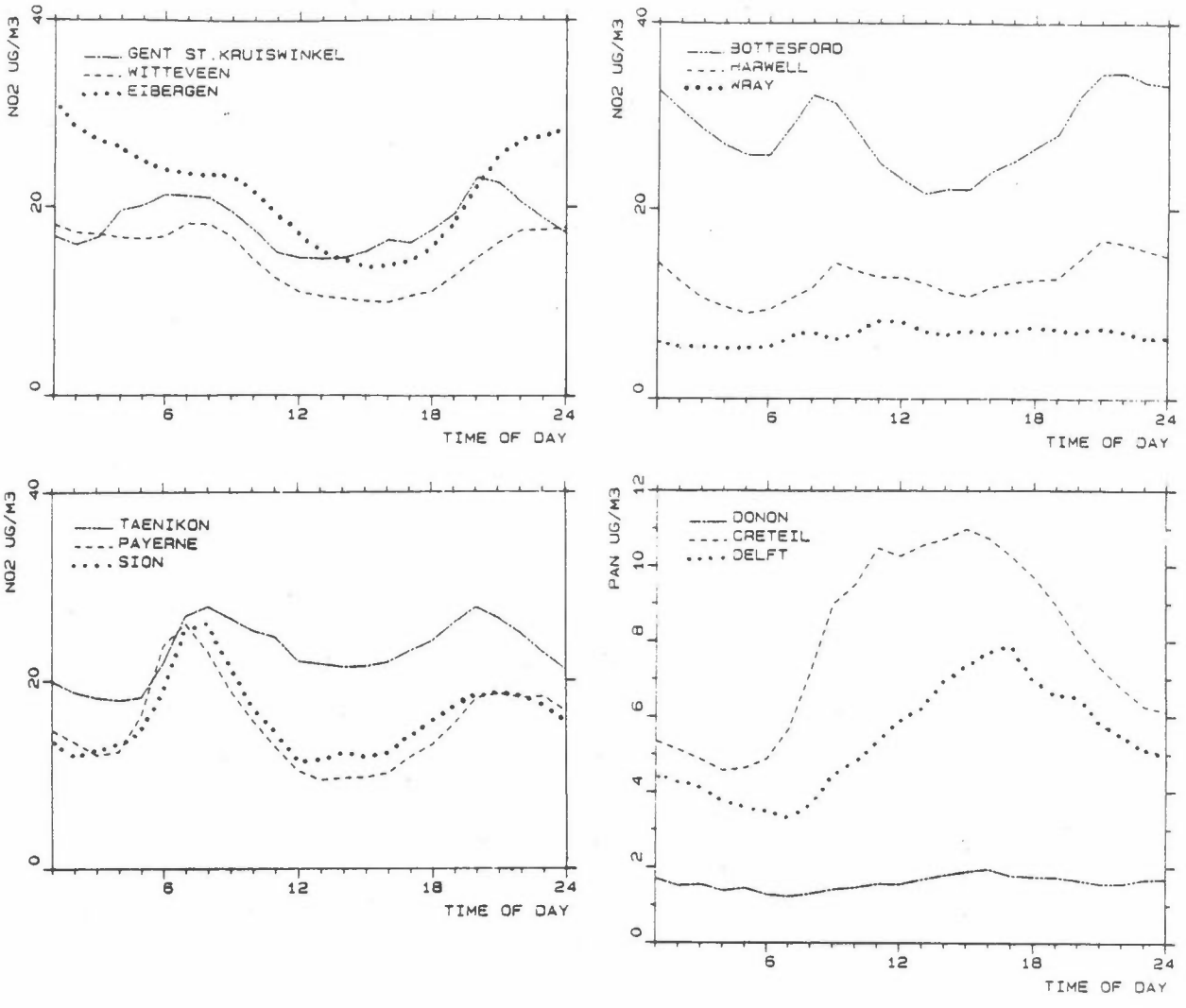


Figure 6: Mean diurnal concentration distributions for nitrogen dioxide and PAN, April-September 1986.

4.5 TRAJECTORY SECTOR DISTRIBUTIONS

The days of the summer half-year period were distributed according to the trajectory sectors. For a certain receptor point, one day is allocated to a 45^0 sector if the positions of the 96-h back trajectories at the 1000-hPa level arriving on that day are within the sector at least 50% of the time. Only trajectory positions between 150 km and 1500 km from the receptor point are considered. If this criterion is not satisfied for any of the eight 45^0 sectors, the day is called "undetermined".

The results are given in Appendix G. "Trajectory roses" are made both for all the days in the half-year period, and for the days on which the maximum 1-h concentration exceeded given limits. The distributions are given as per cent (%) of the number of days meeting the given conditions. For ozone, the concentration limit is 120 $\mu g/m^3$ for all the stations. For Illmitz and Sion trajectory roses are also made with the ozone concentration limit of 240 $\mu g/m^3$, and for Illmitz, Sion, Payerne, Langenbrügge-Waldhof and Schauinsland, also with the ozone concentration limit of 160 $\mu g/m^3$. For most of the stations, there was not a sufficient number of days with high concentrations to use higher limits than 120 $\mu g/m^3$ (see Appendix C).

For NO_2 the concentration limits of 40 $\mu g/m^3$, 80 $\mu g/m^3$ and 120 $\mu g/m^3$ were used. For PAN the concentration limit was 10 $\mu g/m^3$.

It should be noted, that trajectory sector calculations are associated with many uncertainties, and great caution should be used when trying to indicate emission source areas. This is especially the case for high pressure situations often associated with high oxidant concentrations. Many of these days will have "undertermined" trajectory sectors.

The distributions for three stations are shown in Figure 9. For Illmitz the half-year distribution of all trajectories show a dominant transport from the north. The distributions with the limits of 120 $\mu g/m^3$ and 160 $\mu g/m^3$ were similar to the total distribution, while the distribution with the limit of 240 $\mu g/m^3$ had three main directions, southeast, west and north.

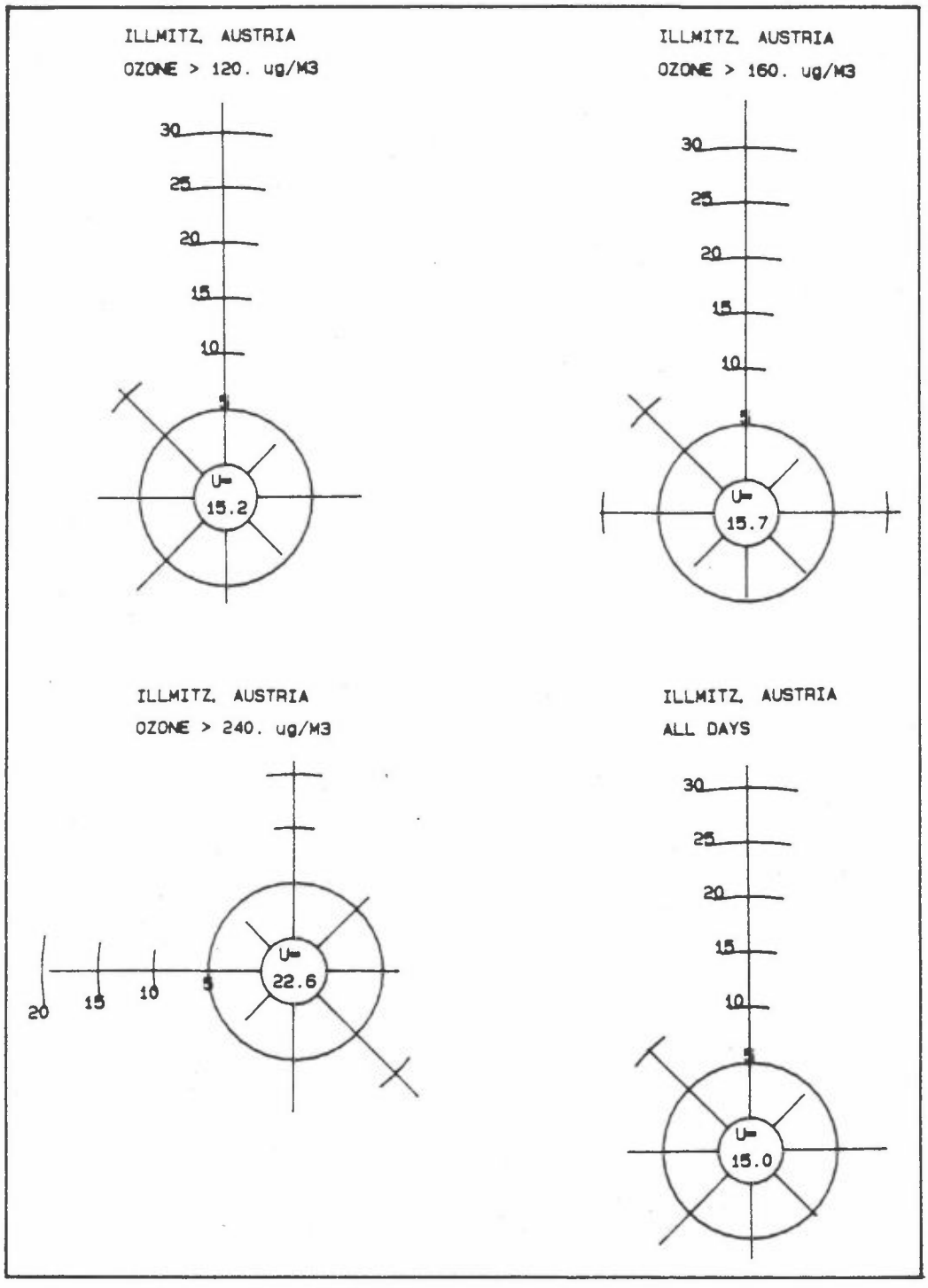


Figure 9: Back trajectory sector distributions (%) for Illmitz (Austria) and Payerne and Sion (Switzerland).

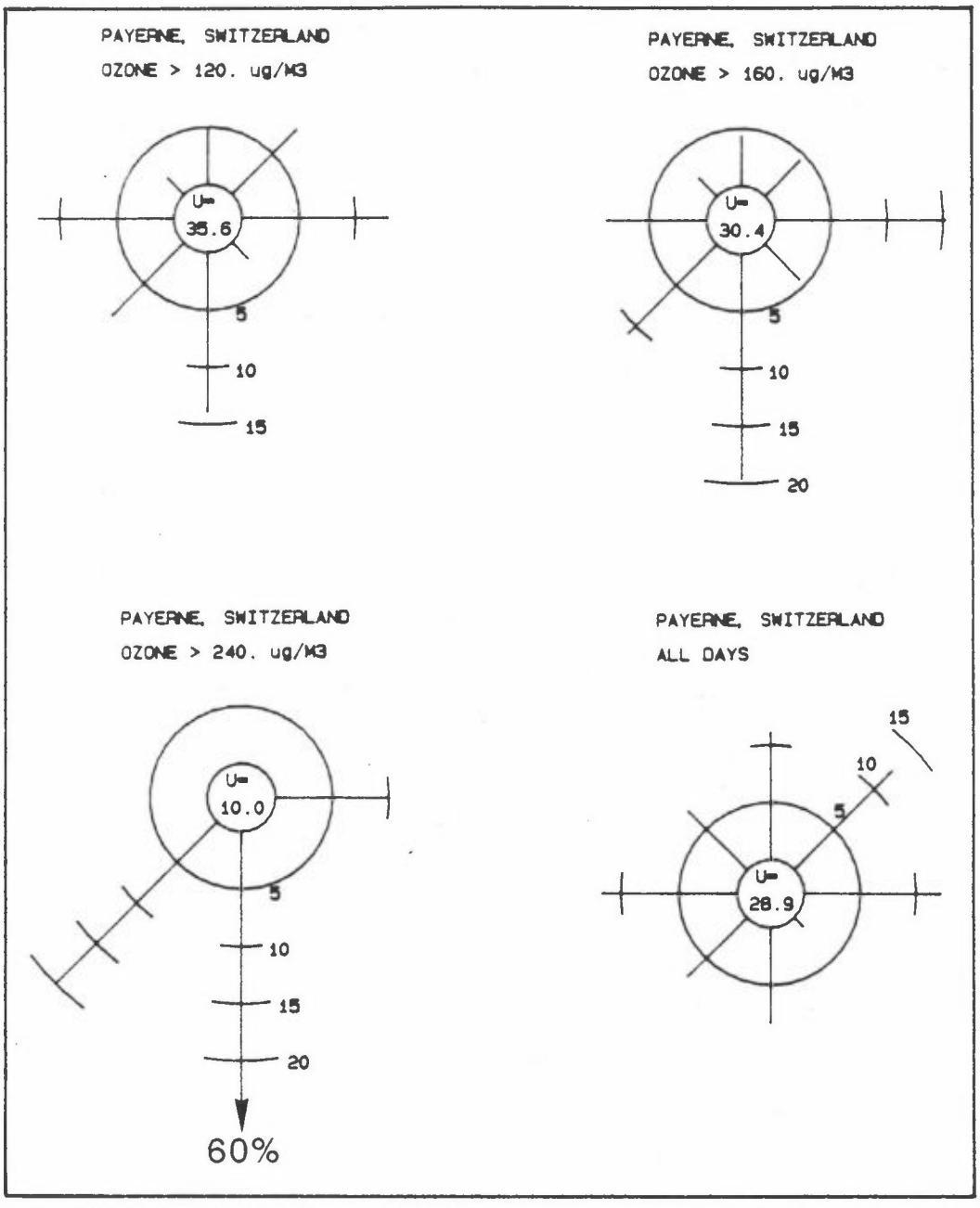


Figure 9 cont.

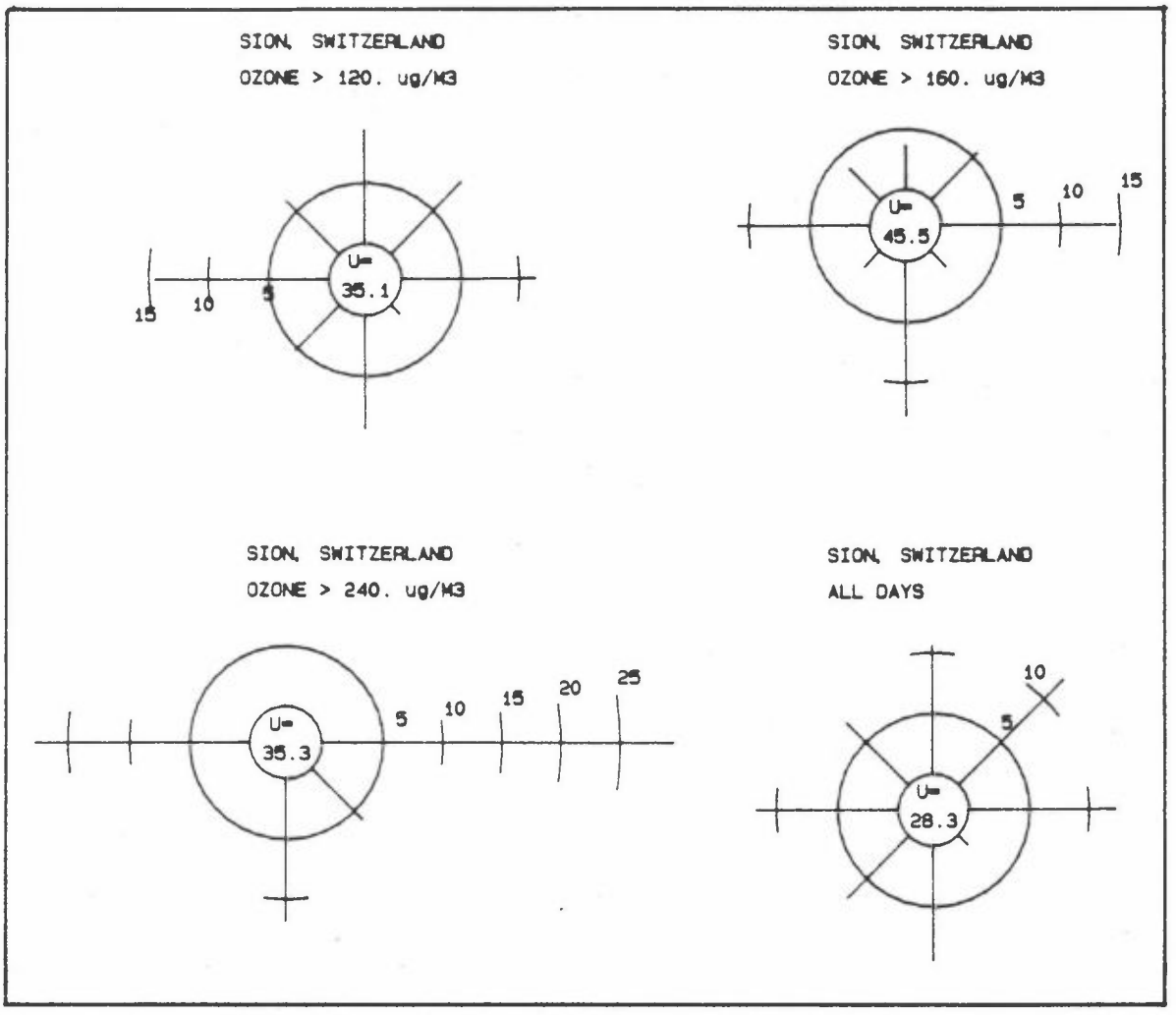


Figure 9 cont.

For Payerne the total distribution did not have one main direction. For the limits of 120 $\mu g/m^3$ and 160 $\mu g/m^3$ there was an increasing frequency of the southern sector, and for 240 $\mu g/m^3$ for southern sector was dominating.

The total distribution for Sion was similar to that of Payerne. With increasing limits of ozone concentrations, the frequencies of the sectors west and east were increasing. It should be noted that when the ozone limits increase, the number of days are reduced. This should be kept in mind when reading Appendix G.

4.6 OZONE EPISODES

In the previous OXIDATE report, the ozone data from 1985 were examined for episodes by using the criterion of an "episode day" as a day when four or more stations recorded a maximum 1-h ozone concentration above 160 $\mu g/m^3$. In 1985, a total of 20 episode days were found distributed in six episodes. By using the same criterion for the summer half-year of 1986, the same number, 20 episode days, were found. Some of the episodes lasted only for one day and some were parts of longer periods with more than one maximum. This was especially the case for the period from 16 June to 4 July when 14 of the 20 episode days occurred.

In Table 7 all episode days are presented. From the table the following episodes are further evaluated: 10 June, 16 June-4 July, and 16-17 July. Back trajectories at the 1000 hPa level are given in Figure 10, and weather maps are given in Figure 11 (Weather Log, 1986).

The maximum hourly ozone concentrations are presented in Table 8.

Table 7: Ozone episodes, April-September 1986.

Time period	No. of days	Number of stations with 1-h ozone conc. ≥160 µg/m^3	≥200 µg/m^3	Maximum 1-h ozone conc. µg/m^3
26 May	1	6	5	242 Illmitz
10 June	1	7	0	195 Sion
16-17 June	2	11	6	325 Payerne
19 June	1	5	2	226 Payerne
22-23 June	2	6	1	273 Sion
25-29 June	5	13	9	361 Sion
1-4 July	4	17	9	337 Sion
16-17 July	2	13	4	342 Illmitz
31 July	1	4	2	262 Illmitz
3 August	1	8	3	333 Sion

4.6.1 10 June 1986

The episode on 10 June was very short but seven stations monitored increased ozone concentrations.

There was a high pressure ridge from Finland across Central Europe to the western part of the Mediterranean Sea. Trajectories for 10 June indicate a very complex transport situation. The major transport pattern for the stations in Central Europe and Scandinavia showed air masses originating over the British Isles and the North Sea and after a transport southeast over Europe moving to their receptor points.

Ozone concentrations above 160 µg/m^3 were recorded at seven sites, two of them in Scandinavia; Jeløya, Norway (160 µg/m^3) and Rørvik, Sweden (179 µg/m^3); two sites in the Federal Republic of Germany, Westerland (174 µg/m^3) and Langenbrügge-Waldhof (168 µg/m^3); the remaining three were Sion (195 µg/m^3) and Payerne (158 µg/m^3) in Switzerland and Illmitz, Austria (178 µg/m^3). No increase in ozone concentrations was observed in England and the northern stations in Scandinavia.

4.6.2 16 June - 4 July 1986

15-18 June

A high pressure area over Great Britain and the North Sea moved eastward and was located over the Baltic Sea on 16-17 June. Trajectory analysis indicates three transport situations. To the stations in southern Scandinavia the air masses were coming from west. To the stations in northern Germany, Netherlands and southern England air masses were coming from east, while to the stations in southern Germany, Switzerland and Austria the air was coming from southeast.

The highest concentration was monitored at Payerne, 325 $\mu g/m^3$ (16 June). High concentrations were also monitored at other stations in the region; at Schauinsland 196 $\mu g/m^3$ (16 and 19 June), at Illmitz also 196 $\mu g/m^3$ (18 June), at Sion 220 $\mu g/m^3$ and 226 $\mu g/m^3$ (16 and 18 June, respectively), and at Andrezel 230 $\mu g/m^3$ (16 June).

In northern Germany and southern England increased concentrations were also monitored. At Harwell, high ozone concentration was measured already on 14 June (172 $\mu g/m^3$) and on 16 June the maximum concentration was 162 $\mu g/m^3$. On 16 June Bottesford had 206 $\mu g/m^3$. The highest ozone concentration in northern Europe was measured at Eibergen, Netherlands, with 241 $\mu g/m^3$ on 17 June. In southern Scandinavia ozone concentrations were only slightly increased. The highest ozone concentration was 141 $\mu g/m^3$.

18-30 June

From 18 June to 24 June there were very small pressure variations over northwestern Europe with no pronounced high pressure or low pressure areas. From 25 June until 30 June a high pressure area persisted over the North Sea and northern Germany.

Trajectory analysis for the period 18-20 June showed short trajectories with variable directions. From 21 to 23 June they were more defined, indicating a transport from the north to all sites except the most southern ones. On 23-24 June the air masses were coming from

east/northeast to all the stations except Scandinavia which had transport from the north.

During the periode 19-24 June, the highest ozone concentration was monitored at Sion, Switzerland (273 $\mu g/m^3$, 22 June). High concentrations were also measured at Payerne, Switzerland (191 $\mu g/m^3$), Illmitz, Austria (199 $\mu g/m^3$) and at Schauinsland and Deuselbach, Federal Republic of Germany (both 184 $\mu g/m^3$). Further north, ozone concentrations were also increased and Eibergen had 161 $\mu g/m^3$. In Great Britain and Scandinavia the concentrations were low.

During the last days in June, when the high pressure was stable over north Europe, trajectories show a slow, mostly clockwise motion over north Europe. All stations seemed to be influenced by the same weather system. Stations in Scandinavia got air mostly from the sector northwest-northeast, while the stations on the continent were mostly influenced by air from northeast and southeast.

Ozone concentrations rose during this period to as most 361 $\mu g/m^3$ (Sion, 26 June). At eight sites ozone concentrations above 200 $\mu g/m^3$ were recorded. Besides Sion (Switzerland), these were Harwell, United Kingdom (272 $\mu g/m^3$, 28 June), Payerne, Switzerland (213 $\mu g/m^3$, 27 June), Pinceloup, France (226 $\mu g/m^3$, 28 June), in the Federal Republic of Germany, Deuselbach (222 $\mu g/m^3$, 28 June), Schauinsland (260 $\mu g/m^3$, 28 June) and Langenbrügge-Waldhof (208 $\mu g/m^3$, 27 June). Scandinavia was still very little influenced by high ozone concentrations; as situated north and east of the high pressure center, few oxidant precursor sources were located upwind.

2-4 July

In the beginning of July, there was a high pressure ridge extending from northern Italy to southern Scandinavia.

Trajectories from the first days in July show a transport of air from north and northeast to all sites. From 3 July, the trajectories were shorter and more irregular indicating a more stagnant situation. The

stations in United Kingdom and western Scandinavia had air transport from west.

High ozone concentrations (> 160 $\mu g/m^3$) were recorded at 15 sites, out of 28 running stations during this period. The stations not having high ozone concentrations were those in United Kingdom and Scandinavia. The highest ozone concentration was measured at Sion (337 $\mu g/m^3$, 2 July). Ozone concentrations above 200 $\mu g/m^3$ were also monitored at the two stations in the Netherlands, Eibergen and Witteveen (213 $\mu g/m^3$ and 280 $\mu g/m^3$ on 2 July, respectively), Vavihill, Sweden (202 $\mu g/m^3$, 2 July), Schauinsland (226 $\mu g/m^3$, 2 July) and Waldhof (206 $\mu g/m^3$, 2 July) in the Federal Republic of Germany, Illmitz, Austria (255 $\mu g/m^3$, 5 July), and Pinceloup, France (210 $\mu g/m^3$, 2 July).

4.6.3 16-17 July 1986

The weather during this episode was characterized by a high pressure ridge over France and Germany. Trajectories for 16 July show transport from the west to the stations in United Kingdom, Netherlands, northern Germany and southern Scandinavia. To the stations in Switzerland, Austria and the southern Germany, the trajectories were mostly coming from the north, making a clockwise turn over central Europe. On 17 July the trajectories were much shorter indicating an almost stagnant situation over the northern Germany and adjacent areas.

Ozone concentrations were high at most of the stations on the European Continent. Only Westerland and Brotjacklriegel had maximum concentrations below 160 $\mu g/m^3$. All stations in United Kingdom and Scandinavia also had concentrations below 160 $\mu g/m^3$. The highest concentrations were measured at Illmitz (342 $\mu g/m^3$, 16 July), Schauinsland (208 $\mu g/m^3$, 16 July), Sion (257 $\mu g/m^3$, 17 July) and Eibergen (237 $\mu g/m^3$, 16 July).

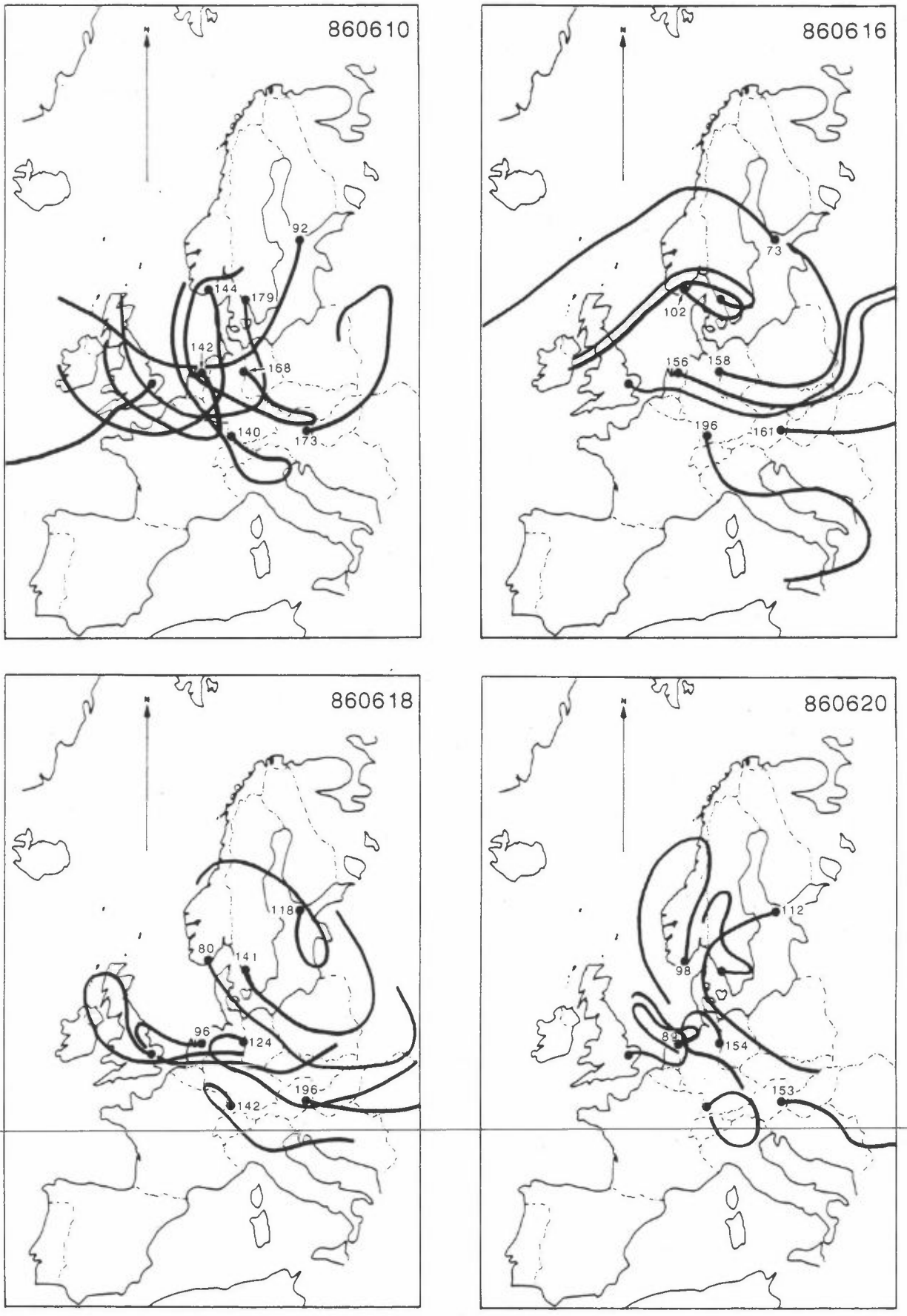


Figure 10: Back trajectories at the 1000 hPa level for June 10, 16, 18, 20, 22, 24, 26, 28, 30, and July 2, 4, 16, 17.

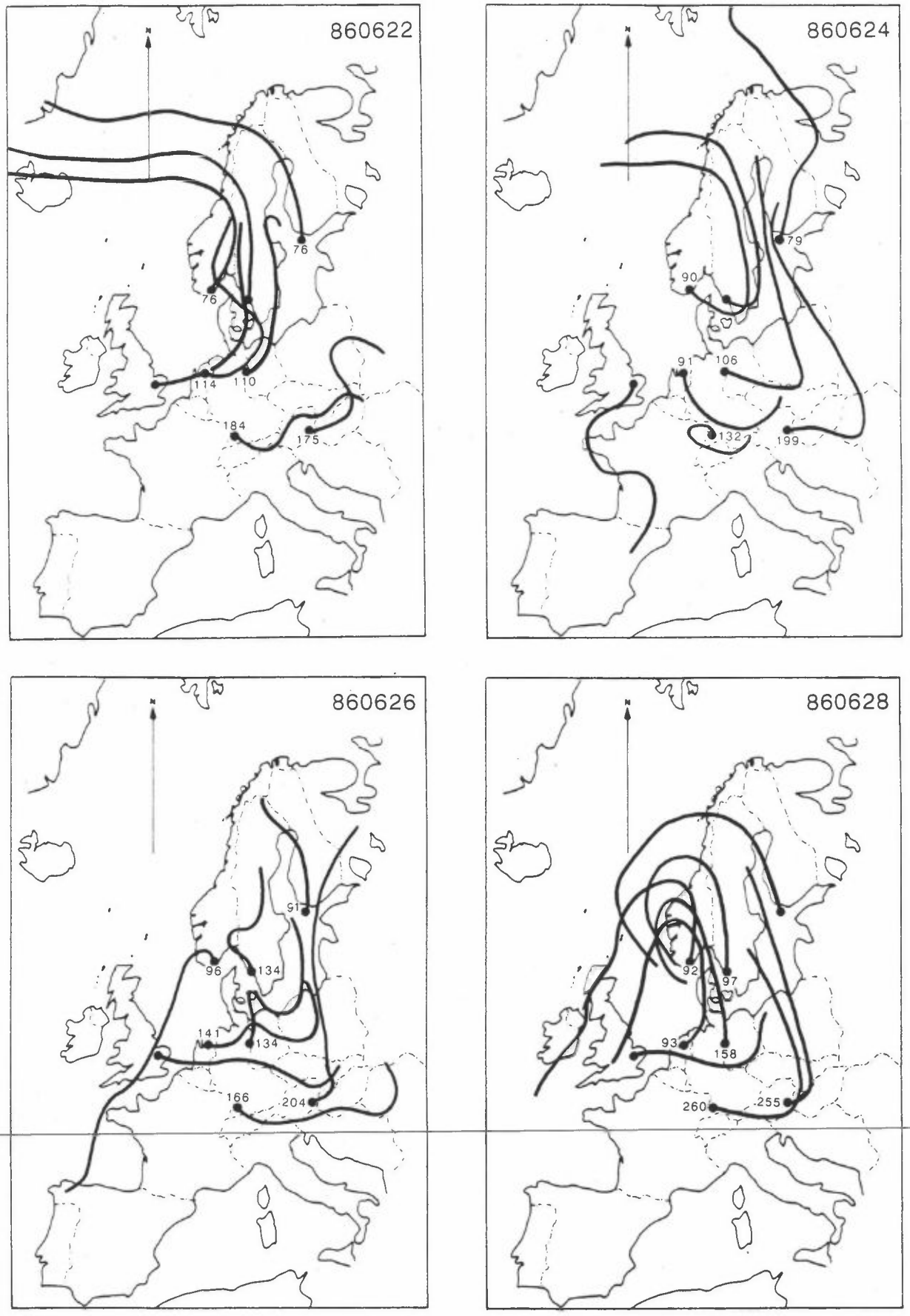


Figure 10 cont.

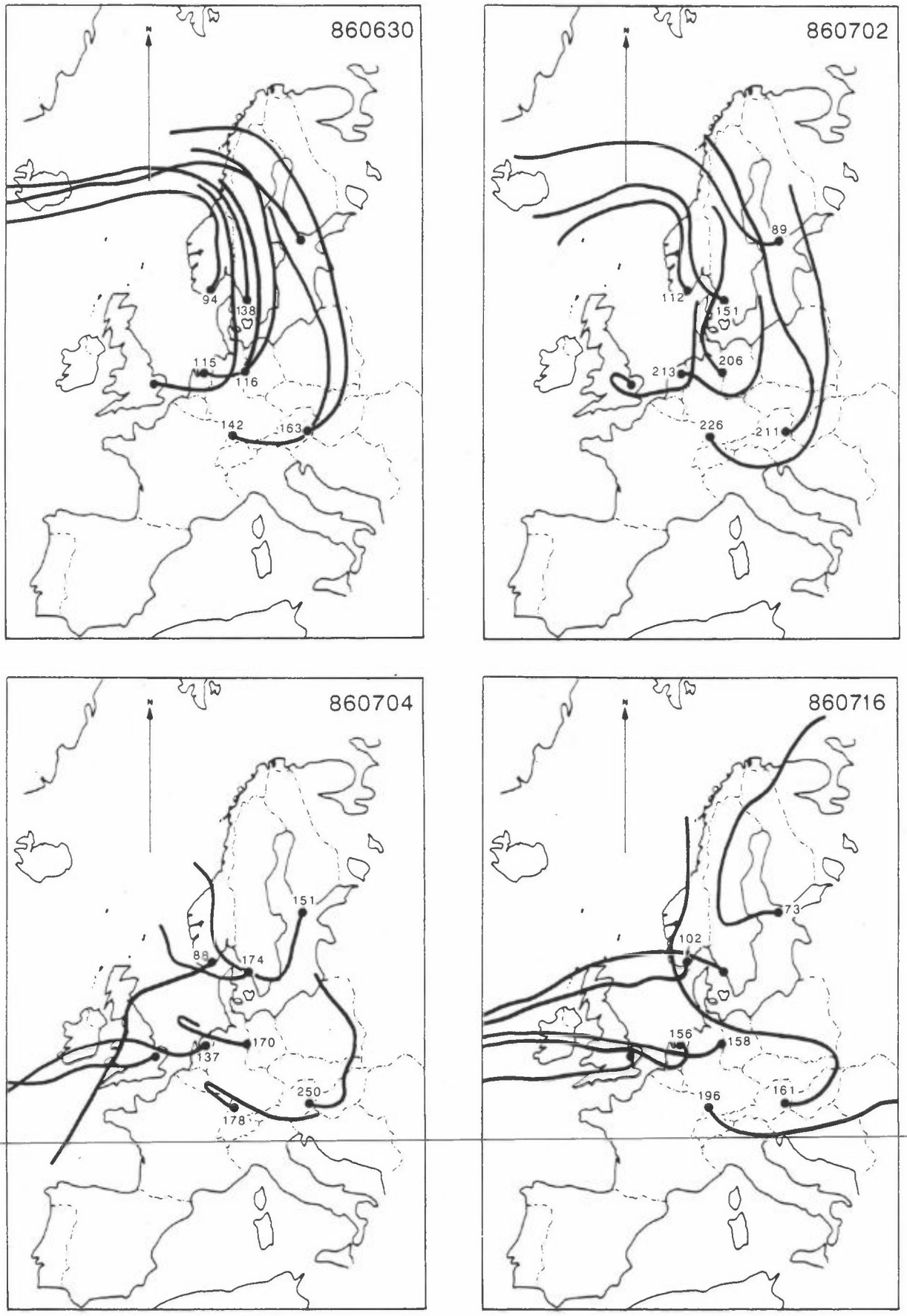


Figure 10 cont.

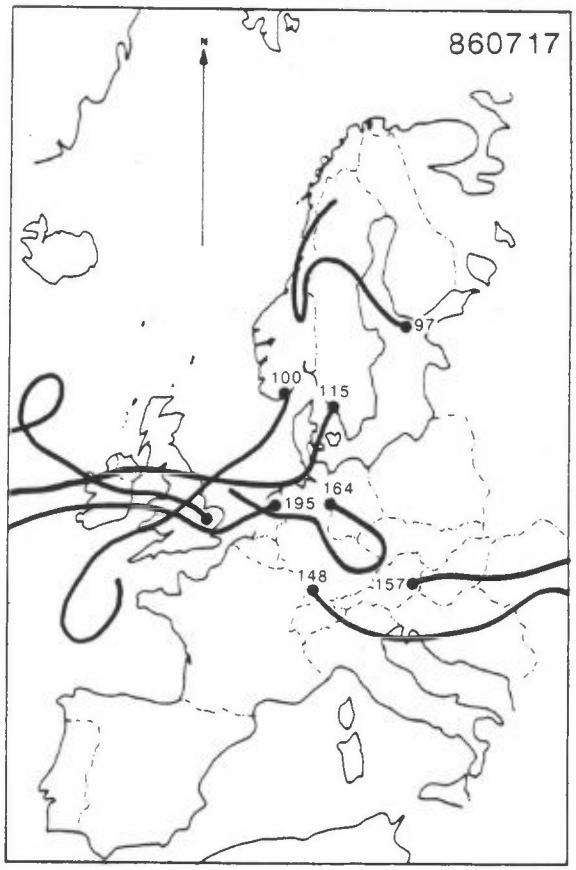


Figure 10 cont.

Figure 11: Weather maps for June 10, 16, 18, 20, 22, 24, 26, 28, 30, and July 2, 4, 16, 17 (Weather Log, 1986).

Table 8: Maximum hourly ozone concentrations ($\mu g/m^3$) during episodes in 1986.
Numbers in parenthesis: less than 12 hourly values.

	June			June										
	8	9	10	15	16	17	18	19	20	21	22	23	24	25
Illmitz	160	159	173	166	161	157	196	177	153	189	175	165	199	193
Gent, St.Kruiswinkel	91	156	102			158	(28)	81	49	62	150	112	47	86
Ulborg	84	118	132	96	118	128	98	66	72	94	66	100	104	136
Brotjacklriegel	62	72	78			112	116	120	114	118	124	112	108	136
Deuselbach	68	98	134	124	124	106	110	162	140	122	138	164	76	154
Langenbrügge-Waldhof	60	124	168	116	158	164	124	152	154	84	110	138	106	132
Schauinsland	96	130	140	158	196	148	142	196	160	174	184	174	132	210
Westerland	98	126	174	(108)					(98)	102	90	102	106	164
Utö	103	93	92	110	73	97	118	129	112	(75)	(76)	(73)	79	92
Andrezel	68	77	97	89	230	130	130	131	130	127	80	75	75	148
Montagny	68	92	98	91	151	124	116	113	78	60	43	45	58	72
Pinceloup	67	102	83	127	85	131	140	152	171	153	93	82	83	148
Eibergen	81	114	139	142	174	241	130	145	137	74	127	161	75	135
Witteveen	67	103	142	116	156	195	96	112	89	67	114	136	91	111
Birkenes	76	94	144	78	102	100	80	98	98	92	76	70	90	122
Jeløya	96	124	164	97	124	108	141	125	130	150	90	90	119	136
Langesund	81	93	149	74	93	81								
Aspvreten				86	80	106	92	90	82	70	80	100	100	86
Norra Kvill	92	104	112	88	84	92	140	120	84	80	72	84	84	84
Ringamåla-Sännen				94	92	88	(54)					(66)		
Rørvik	89	127	179			115	141	115				(105)		
Vavihill	69	120	146	134	109	102	123	93	74	83	83	86	110	122
Vindeln														86
Ammarnäs	88	76	68	62	58	70	92	90	72	62	64	60	74	
Stormyrsberget	78	78	80	60	48	60	58	50	56	58	54			
Payerne	101	133	185	242	325	211	179	205	181	191	189	152	127	154
Sion	152	185	195	160	220	187	199	226	179	283	273	179	257	331
Tänikon	88	100	158	89	119	122	111	116	155	137	140	116	89	124
Bottesford	94	72	98	138	206	132	122	156	96	96	108	84	100	126
Harwell	82	60	72	140	162	112	110	146	86	90	38	38	76	112
Wray	82	66	82	116	96	(66)	88	110	96	80	84	70	95	88
Sibton	16	8	16	30	46	78	26	30	24	26	30	30	20	50

Table 8 cont.

	June					July					July			
	26	27	28	29	30	1	2	3	4	5	15	16	17	18
Illmitz	204	200	255	203	163	180	211	235	250	255	236	342	307	300
Gent, St.Kruiswinkel	126	106	116			(107)	168	102			142	194	74	78
Ulborg	134	114	122	100	88	(112)	124	132	140	76	96	114	138	66
Brotjacklriegel	128	132	132	128	94	120	126	124	142	150	102	108	120	126
Deuselbach	146	164	222	122	142	164	172	148	122	118	100	160	160	60
Langenbrügge-Waldhof	134	208	158	96	116	184	206	192	170	118	122	156	186	74
Schauinsland	166	230	260	222	142	214	226	162	178	148	174	186	208	126
Westerland	148	152	128	116	98	122	144	198	154	96	110	126	162	82
Utö	(91)	(77)					(89)	94	151	136	87	(84)	97	97
Andrezel	137	137	128	145	95	92	110	76	70	64	109	121	71	79
Montagny	92	86	91	98	74	80	95	92	76	80	99	138	73	76
Pinceloup	168	172	226	209	167	147	210	163	103	103	153	193	93	100
Eibergen	177	180	128	111	129	226	280	215	152	115	138	237	140	81
Witteveen	141	149	93	94	115	162	213	183	137	77	84	173	105	64
Birkenes	96	102	92	102	94	86	112	138	88	70	68	66	84	58
Jeløya	137	116	100	88	113	93	97	183	140	103	106	89	142	120
Langesund		115	93	90	100	84	81	130	90	74	68	65	100	53
Aspvreten	90	102	100	100	88	98	74	90	98	106	98	88	78	80
Norra Kvill	132	133	98	71	82	118	145	176	(161)					
Ringamåla-Sännen														
Rørvik	134	120	97	85	138	100	151	172	174	90	125	96	132	80
Vavihill	126	112	109	88	94	126	139	202	187	90	101	78	94	61
Vindeln	90	94	82	106	82	110	86	71	78	65	67	63	64	68
Ammarnäs											56	44	50	46
Stormyrsberget													(50)	44
Payerne	193	213	203	172	152	156	174	136	166	150	133	172	185	158
Sion	361	351	316	277	222	308	337	125	125	127	209	246	257	164
Tänikon	147	132	153	162	104	119	129	170	153	148	110	143	174	116
Bottesford	166	192	148	122	120	104	126	106	48	68	102	138	76	64
Harwell	174	208	272	118	146	106	94	96	54	66	80	82	60	58
Wray	112	146	150	106	82	74	94	64	66	56	54	76	72	58
Sibton	48	48	36	42	46	50	62	44	22	14	84	136		

5 CONCLUSION

Hourly data on photochemical oxidants from October 1985 to September 1986 are presented from 36 regional stations in Europe. These 11 countries are represented: Austria, Belgium, Denmark, Federal Republic of Germany, Finland, France, Netherlands, Norway, Sweden, Switzerland and United Kingdom.

34 stations have reported ozone, nine have reported nitrogen dioxide and three stations have reported PAN.

The individual countries have selected the monitoring stations, and they have also been responsible for the quality assurance of the data. No centralised intercalibration or other data quality control has been carried out.

During the summer half-year (April-September 1986), the highest ozone concentrations were 361 $\mu g/m^3$, hourly mean (Sion, Switzerland) and 198 $\mu g/m^3$, daily mean (Illmitz, Austria). The highest concentrations of nitrogen dioxide were 174 $\mu g/m^3$, hourly mean, and 123 $\mu g/m^3$, daily mean (Harwell, United Kingdom). The highest concentrations of PAN were 104 $\mu g/m^3$, hourly mean, and 34 $\mu g/m^3$, daily mean (Creteil, France). A complete set of data have been submitted on magnetic tapes to all the participating countries.

The magnitude and extension of the episodes with high ozone concentrations are not clear from the data. Illmitz (Austria), and Sion and Payerne (Switzerland), which generally had the highest ozone concentrations, are located at the southeastern and southwestern ends of the monitoring area.

The highest ozone concentrations have been recorded in the eastern part of Austria and in Switzerland. The concentrations in Norway, northern Sweden, United Kingdom and the western part of continental Europe were generally lower than in central continental Europe. The gradient through Europe with increasing concentrations from northwest to southeast were in general similar to that of 1985.

The air trajectory sector distributions showed that certain trajectory directions in many cases were strongly associated with high ozone concentrations. These directions varied considerably between different regions in Europe and were generally not the same as the main directions for the whole half-year period.

The examination of the data reveals in many cases large variations of concentration levels and patterns between the stations. Further work is needed in order to explain these variations. Local and mesoscale concentration variations of oxidant concentrations are well known and must be taken into account when data from different stations are compared.

There is a definite need to include more countries and measurement stations, in order to improve the understanding of the oxidant phenomenon. Data from East Europe and the Mediterranean area are of great interest in future joint European measurement programmes.

6 ACKNOWLEDGEMENT

We will thank the contact persons from the different countries, given in Table 1, for their interest in the project and the submission of data. We also thank the secretariat of the OECD Environment Directorate for valuable support. Finally we thank Kari Arnesen, Kari Hoem and Audun Harstad of the NILU staff for the necessary and valuable programming work, and the handling of the data.

7 REFERENCES

Atkins, D.H.F., Cox, R.A. and Eggleton, A.J.E. (1972) Photochemical ozone and sulphuric acid aerosol formation in the atmosphere over southern England. Nature, 235, 372-376.

Cox, R.A., Eggleton, A.E.J., Derwent, R.G., Lovelock, J.E. and Pack, D.H. (1975) Long range transport of photochemical ozone in north-western Europe. Nature, 255, 118-121.

Eliassen, A. and Saltbones, J. (1983) Modelling of long-range transport of sulphur over Europe: Two year model run and some model experiments. Atmos. Environ., 17, 1457-1473.

Grennfelt,P. and Schjoldager, J. (1984) Photochemical oxidants in the troposphere: A mounting menace. AMBIO, 13, 61-67.

Grennfelt, P., Saltbones, S. and Schjoldager, J. (1987) Oxidant data collection in OECD-Europe 1985-87 (OXIDATE), April-September 1985. Lillestrøm, Norwegian Institute for Air Research (NILU OR 22/87).

Guicherit, R. and van Dop, H. (1977) Photochemical production of ozone in Western Europe (1971-1975) and its relation to meteorology. Atmos. Environ., 11, 145-155.

Hov, Ø., F. Stordal and Eliassen, A. (1985) Photochemical oxidant control strategies in Europe: A 19 days case study using a Lagrangian model with chemistry. Norwegian Institute for Air Research (NILU TR 5/85).

Lübkert, B., Lieben, P., Grosch, W., Jost, D. and Weber, E. (1984) Oxidant monitoring networks. Oxidant monitoring data. Report from an International Workshop, 23-25 October 1984, Schauinsland, Federal Republic of Germany. OECD Environment Directorate, Umweltbundesamt.

Schjoldager, J., Dovland, H., Grennfelt, P. and Saltbones, J. (1981) Photochemical oxidants in north-western Europe 1976-79. A pilot project. Lillestrøm, Norwegian Institute for Air Research (NILU OR 19/81).

Stern, R.M. and Builtjes, P.J.H. (1896) Long range modelling of the formation, transport and deposition of photochemical photochemical oxidants and acidifying pollutants. In: Fourth European Symposium on Physicochemical behaviour of atmospheric pollutants, Stresa 23-25 September 1986.

Weather Log (1986) Bracknell, Berkshire. British Meteorological Office.

APPENDIX A

Summary of ozone data,
October 1985 - March 1986

The tables give the number of hours per day, and the number of days, with hourly concentrations exceeding given limits.

Site : ILLMITZ, AUSTRIA
Parameter: OZONE, UG/M3
Period : 1 JANUARY - 31 MARCH 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>100	>120	>160	>200	Maximum 1-h concentration
030286	4				105.
040286	4				115.
050286	6				117.
060286	3				109.
070286	1				103.
080286	3				104.
170286	3	2			142.
180286	17	13			140.
190286	1				103.
200286	8				110.
210286	13	2			122.
220286	5				119.
230286	11	8			155.
240286	17	5			135.
250286	12	10			159.
260286	11				118.
270286	13	12			151.
280286	24	24	8		194.
010386	24	24	7		168.
020386	24	19			158.
030386	8	6			146.
040386	9	7			144.
050386	14	13	12	5	209.
060386	23	23	16	3	212.
070386	17	7	4		176.
100386	6	6	4		195.
110386	24	10			146.
120386	3				112.
160386	9	2			127.
170386	13	10			134.
180386	14	11			148.
190386	17	12			150.
200386	14	8	1		162.
210386	10	6			149.
220386	6				106.
230386	15	14	7		175.
240386	24	21	10		190.
250386	24	24	10	4	221.
260386	15	5	1		168.
270386	19	15	2		166.
280386	22	15	3		167.
290386	16	6			134.
300386	13	9			156.
310386	20	13	1		170.
Total number of hours	559	362	86	12	
Total number of days	44	32	14	3	

Site : GENT,ST.KRUISWINKEL, BELGIUM
Parameter: OZONE, UG/M3
Period : 1 OCTOBER 1985 - 31 MARCH 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>100	>120	Maximum 1-h concentration
131085	1	1	129.
090386	2		112.
100386	1		110.
180386	3	3	138.
310386	2		102.
Total number of hours	9	4	
Total number of days	5	2	

Site : RISØ, DENMARK
Parameter: OZONE, UG/M3
Period : 1 OCTOBER - 30 NOVEMBER 1985

Number of hours per day with 1-h concentration exceeding given limits

Date	>100	>120	Maximum 1-h concentration
011085	11	5	134.
021085	3	1	140.
Total number of hours	14	6	
Total number of days	2	2	

Site : ULBORG, DENMARK
Parameter: OZONE, UG/M3
Period : 1 JANUARY - 31 MARCH 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>100	Maximum 1-h concentration
270286	4	104.
030386	6	110.
230386	2	106.

Total number of hours 12

Total number of days 3

Site : BROTJACKLRIEGEL, FED.REP. OF GERMANY
Parameter: OZONE, UG/M3
Period : 1 OCTOBER 1985 - 31 MARCH 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>100	>120	Maximum 1-h concentration
011085	5		108.
021085	14	6	124.
031085	24	8	138.
041085	17	4	126.
051085	15		118.
061085	3		104.
071085	10	1	122.
081085	5		106.
311085	4		106.
Total number of hours	97	19	
Total number of days	9	4	

Site : DEUSELBACH, FED.REP. OF GERMANY
Parameter: OZONE, UG/M3
Period : 1 OCTOBER 1985 - 31 MARCH 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>100	>120	>160	Maximum 1-h concentration
011085	15	8	1	172.
031085	4			106.
041085	1			104.
160386	10	2		128.
170386	7			114.
180386	4			112.
Total number of hours	41	10	1	
Total number of days	6	2	1	

Site : LANGENBRUGGE-WALDHOF, FED.REP. OF GERMANY
Parameter: OZONE, UG/M3
Period : 1 OCTOBER 1985 - 31 MARCH 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>100	>120	>160	Maximum 1-h concentration
011085	4	3		156.
031085	5	3		130.
041085	6	4		142.
270286	7	4		144.
280286	2			106.
020386	11	2		132.
030386	15	9	1	162.
040386	2	1		122.
170386	6	2		126.
180386	7	4		144.
190386	7			120.
200386	5	2		124.
Total number of hours	77	34	1	
Total number of days	12	10	1	

Site : SCHAUINSLAND, FED.REP. OF GERMANY
Parameter: OZONE, UG/M3
Period : 1 OCTOBER 1985 - 31 MARCH 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>100	>120	Maximum 1-h concentration
011085	19	15	154.
021085	9	1	122.
031085	17		120.
041085	13	3	144.
051085	1		104.
111085	2		106.
121085	5		108.
141085	1		102.
171085	3		112.
181085	17		112.
261085	2		104.
271085	14		106.
281085	16		118.
291085	6		116.
301085	15		118.
311085	2		102.
040286	1		102.
130286	2		104.
140286	10		106.
150286	12		112.
170286	3		108.
210286	3		114.
220286	14		116.
230286	7		104.
240286	2		104.
250286	5		106.
260286	2		102.
270286	13		112.
020386	13	8	154.
030386	24	19	148.
040386	22	4	150.
060386	16		116.
090386	3		112.
100386	11		110.
110386	19	6	130.
120386	3		102.
130386	14	4	134.
140386	15	6	146.
150386	21	16	152.
160386	24	22	150.
170386	24	24	140.
180386	24	24	152.
190386	17	7	146.
240386	3		112.
250386	1		102.
Total number of hours	470	159	
Total number of days	45	14	

Site : WESTERLAND, FED.REP. OF GERMANY
Parameter: OZONE, UG/M3
Period : 1 OCTOBER 1985 - 31 MARCH 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>100	>120	Maximum 1-h concentration
011085	2		104.
190386	5	2	124.
230386	1		102.
Total number of hours	8	2	
Total number of days	3	1	

Site : UTO, FINLAND
Parameter: OZONE, UG/M3
Period : 1-31 OCTOBER 1985
1 FEBRUARY - 31 MARCH 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>100	>120	Maximum 1-h concentration
041085	3		113.
271085	3	1	123.
020386	2		103.
040386	8	4	131.
050386	7	5	133.
140386	20		112.
150386	11		106.
160386	19	4	126.
170386	23	9	125.
180386	23	17	131.
190386	23	21	139.
200386	23	22	148.
210386	22	5	137.
220386	15		115.
230386	23	5	124.
240386	6	1	121.
270386	1		105.
280386	5		107.
290386	11		108.
300386	2		102.
310386	4		109.
Total number of hours	254	94	
Total number of days	21	11	

Site : ANDREZEL, FRANCE
Parameter: OZONE, UG/M3
Period : 1 OCTOBER 1985 - 31 MARCH 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>100	>120	Maximum 1-h concentration
010386	4		115.
100386	4	1	120.
Total number of hours	8	1	
Total number of days	2	1	

Site : MONTAGNY, FRANCE
Parameter: OZONE, UG/M3
Period : 1 OCTOBER 1985 - 31 MARCH 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>100	Maximum 1-h concentration
240386	1	105.

Total number of hours	1
Total number of days	1

Site : PINCELOUP, FRANCE
Parameter: OZONE, UG/M3
Period : 1 OCTOBER 1985 - 31 MARCH 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>100	>120	Maximum 1-h concentration
011085	6	5	142.
021085	4		111.
031085	1		101.
111085	2		105.
141085	1		114.
060186	1	1	151.
260286	4		111.
010386	4	1	128.
040386	3		107.
140386	2		103.
150386	1		104.
160386	4		108.
230386	1		101.
Total number of hours	34	7	
Total number of days	13	3	

Site : BIRKENES, NORWAY
Parameter: OZONE, UG/M3
Period : 1 OCTOBER 1985 - 31 MARCH 1986

Number of hours per day with 1-h concentration exceeding given limits

No hourly values exceeding 100

Site : NORRA KVILL, SWEDEN
Parameter: OZONE, UG/M3
Period : 17 DECEMBER 1985 - 31 MARCH 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>100	>120	Maximum 1-h concentration
280286	6		108.
010386	3		108.
020386	4		108.
030386	3		108.
040386	11		116.
170386	3		108.
180386	12		120.
190386	18	6	136.
200386	24	12	140.
210386	2		112.
Total number of hours	86	18	
Total number of days	10	2	

Site : RORVIK, SWEDEN
Parameter: OZONE, UG/M3
Period : 1 OCTOBER 1985 - 26 JANUARY 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>100	Maximum 1-h concentration
021085	3	105.

Total number of hours	3
Total number of days	1

Site : VAVIHILL, SWEDEN
Parameter: OZONE, UG/M3
Period : 1 OCTOBER 1985 - 31 MARCH 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>100	>120	Maximum 1-h concentration
011085	2		112.
021085	5	3	140.
141085	1		116.
040386	6		114.
170386	7		107.
180386	9		118.
190386	16	7	138.
200386	19	9	130.
210386	2		112.
300386	2		106.
Total number of hours	69	19	
Total number of days	10	3	

Site : VINDELN, SWEDEN
Parameter: OZONE, UG/M3
Period : 1 OCTOBER 1985 - 31 MARCH 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>100	>120	Maximum 1-h concentration
200386	14	2	124.
210386	18		116.
240386	1		108.
Total number of hours	33	2	
Total number of days	3	1	

Site : BOTTESFORD, UNITED KINGDOM
Parameter: OZONE, UG/M3
Period : 2 OCTOBER 1985 - 31 MARCH 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>100	>120	Maximum 1-h concentration
160386	4	2	130.
230386	2		108.
Total number of hours	6	2	
Total number of days	2	1	

Site : HARWELL, UNITED KINGDOM
Parameter: OZONE, UG/M3
Period : 1 NOVEMBER 1985 - 31 MARCH 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>100	>120	>160	Maximum 1-h concentration
080286	1	1	1	174.
Total number of hours	1	1	1	
Total number of days	1	1	1	

Site : WRAY, UNITED KINGDOM
Parameter: OZONE, UG/M3
Period : 1 OCTOBER 1985 - 31 MARCH 1986

Number of hours per day with 1-h concentration exceeding given limits

No hourly values exceeding 100

Site : SIBTON, UNITED KINGDOM
Parameter: OZONE, UG/M3
Period : 1 OCTOBER 1985 - 31 MARCH 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>100	>120	>160	Maximum 1-h concentration
011085	11	8	1	166.
030386	1			104.
Total number of hours	12	8	1	
Total number of days	2	1	1	

APPENDIX B

Summary of data on nitrogen dioxide and PAN,
October 1985 - March 1986

The tables give the number of hours per day, and the number of days, with hourly concentrations exceeding given limits.

APPENDIX 13

Site : GENT,ST.KRUISWINKEL, BELGIUM
Parameter: NITROGEN DIOXIDE, UG/M3
Period : 1 OCTOBER 1985 - 31 MARCH 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	> 40	> 80	>120	>160	>200	>240	>280	Maximum 1-h concentration
011085	3							59.
021085	7							56.
041085	6	1						102.
051085	7							65.
061085	6							53.
071085	13	2						98.
081085	8	2	1					141.
091085	3							62.
101085	6							77.
111085	10	2						88.
121085	10							74.
131085	10	3						107.
141085	13	6	1	1				176.
151085	14	3						114.
161085	7							72.
171085	13	1						86.
181085	17	7	2					132.
191085	9	2	1					135.
201085	11	3	1					122.
211085	17	6	3	3	3	2	2	290.
221085	12	3	1	1				196.
231085	2							67.
271085	4	3						97.
281085	4	1						91.
291085	14							79.
301085	20	8						90.
311085	21							77.
011185	6							48.
021185	2	1						81.
031185	19	1						86.
041185	13	4						116.
061185	10	2						91.
071185	8							76.
081185	4							46.
091185	2							42.
211185	1							52.
281185	10							69.
291185	23							79.
301185	16							74.
011285	13							60.
021285	23							63.
031285	9							56.
041285	16	11	6					141.
051285	7	7	1					124.
061285	14	1						81.
071285	20							80.
081285	8	1						82.

Site : GENT,ST.KRUISWINKEL, BELGIUM
Parameter: NITROGEN DIOXIDE, UG/M3
Period : 1 OCTOBER 1985 - 31 MARCH 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	> 40	> 80	>120	>160	>200	>240	>280	Maximum 1-h concentration
091285	12							75.
101285	18	8	2					126.
111285	5	4						85.
121285	14							67.
131285	13							61.
141285	8							58.
151285	1							43.
161285	2							41.
171285	4							56.
181285	9							53.
231285	4							48.
281285	9							55.
291285	8							54.
301285	2							41.
060186	4							42.
070186	14							74.
080186	23							69.
090186	10							63.
100186	11							58.
110186	4							64.
130186	1							42.
300186	6							46.
030286	13							63.
040286	13							65.
130286	9							54.
140286	10							49.
150286	3							45.
220286	15							60.
230286	1							42.
260286	9							61.
270286	15							56.
280286	12							49.
030386	2							44.
080386	3							42.
100386	1							49.
110386	24	2						84.
120386	18							55.
130386	15							49.
140386	2							43.
150386	7							53.
160386	8							51.
170386	16							53.
180386	6							54.
Total number of hours	875	95	19	5	3	2	2	
Total number of days	90	27	10	3	1	1	1	

Site : BOTTESFORD, UNITED KINGDOM
Parameter: NITROGEN DIOXIDE, UG/M3
Period : 1 OCTOBER 1985 - 31 MARCH 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	> 40	> 80	>120	>160	Maximum 1-h concentration
021085	5				78.
031085	2				67.
071085	2				48.
081085	5				76.
091085	11	1			90.
101085	2				55.
111085	9	2			90.
121085	17	3			103.
131085	8	1			82.
141085	23	5			113.
151085	15	6	1		126.
161085	12	8			111.
171085	24	14			113.
181085	24	2			82.
191085	5				49.
201085	12				76.
211085	13	1			82.
221085	4				61.
231085	15	3			90.
241085	24	13			92.
251085	17	1			86.
261085	7				61.
271085	9	3			92.
281085	20	7	1		130.
291085	17	1			82.
301085	24				78.
311085	22	5			94.
011185	14	1			82.
021185	7				72.
031185	13				72.
041185	13	7			109.
051185	5				78.
061185	6				57.
071185	8	4			96.
081185	4	1			82.
091185	6				61.
101185	7				67.
111185	12	5			94.
121185	17	9			107.
131185	24	16	5		132.
141185	11	3			88.
151185	12	4			96.
161185	12				76.
171185	12				69.
181185	9				71.
191185	1				42.
201185	11				59.
211185	8				71.

Site : BOTTESFORD, UNITED KINGDOM
Parameter: NITROGEN DIOXIDE, UG/M3
Period : 1 OCTOBER 1985 - 31 MARCH 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	> 40	> 80	>120	>160	Maximum 1-h concentration
221185	20	5			97.
231185	11				59.
241185	7				69.
251185	17	4			101.
261185	24	8			90.
271185	19	1			84.
281185	17	9			119.
291185	23	13			111.
301185	17	1			84.
011285	3				78.
031285	6	3			94.
041285	8				51.
051285	9	2			109.
061285	14	1			84.
071285	10	2			107.
081285	11	1			90.
091285	23	17	1		122.
101285	22	14	7		136.
111285	23	19	4		132.
121285	21	10	1		128.
131285	10	4			103.
141285	13				78.
151285	18				72.
161285	16	8	2		140.
171285	14	8	3		128.
181285	18	4			96.
191285	13	9	2		122.
201285	6				69.
221285	8				74.
231285	6				53.
241285	12	5			107.
251285	7				74.
271285	17	7			107.
281285	18	7			115.
291285	19	6			109.
301285	19	7			103.
010186	2	1			82.
020186	3				51.
030186	14	6			92.
040186	15	6			94.
050186	17	2			88.
060186	18				74.
070186	8				71.
080186	24	5			92.
090186	24	7			92.
100186	8	1			88.
110186	11				74.
120186	5				72.

Site : BOTTESFORD, UNITED KINGDOM
Parameter: NITROGEN DIOXIDE, UG/M3
Period : 1 OCTOBER 1985 - 31 MARCH 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	> 40	> 80	>120	>160	Maximum 1-h concentration
130186	5	1			96.
140186	10				69.
150186	14				74.
160186	14	4			88.
170186	23	2			86.
180186	9				71.
200186	4				53.
210186	9				63.
220186	5	1			90.
230186	6				51.
250186	9				72.
260186	17	1			86.
270186	13	2			94.
280186	5				67.
300186	4	1			97.
050286	8	5			97.
070286	1				51.
090286	4				74.
100286	16	5	1		124.
110286	11	5			113.
120286	2				55.
130286	16	3			86.
150286	9				71.
190286	10	1			86.
200286	12				71.
210286	24	14	7		155.
220286	18	5	4		142.
230286	6	4			101.
240286	13	6			103.
250286	4	1			94.
270286	3				61.
020386	1				44.
030386	14	11	9	3	170.
040386	17	2	1		145.
050386	5	3			94.
060386	10				72.
070386	21	6			117.
080386	9	4			109.
090386	8	1			92.
100386	20	9			103.
110386	20	4			105.
120386	23	15			119.
130386	24	8	6	5	190.
140386	23	8	7	1	167.
150386	7				74.
160386	24	3			101.
170386	16	3			94.
180386	19	10	3		138.

Site : BOTTESFORD, UNITED KINGDOM
Parameter: NITROGEN DIOXIDE, UG/M3
Period : 1 OCTOBER 1985 - 31 MARCH 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	> 40	> 80	>120	>160	Maximum 1-h concentration
190386	22	12			120.
200386	10	2			97.
210386	16	2			101.
230386	4	1			90.
240386	5				61.
250386	15	1			90.
260386	8				59.
270386	8	1			97.
300386	5				55.
Total number of hours	1886	496	65	9	
Total number of days	153	96	18	3	

Site : HARWELL, UNITED KINGDOM
Parameter: NITROGEN DIOXIDE, UG/M3
Period : 7 OCTOBER 1985 - 31 MARCH 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	> 40	> 80	>120	>160	Maximum 1-h concentration
111085	3				48.
121085	21				61.
131085	17				76.
141085	14	3			88.
151085	20	1			119.
161085	8				46.
171085	16				65.
181085	21	1			119.
191085	14				65.
201085	16				69.
211085	13				67.
221085	9				71.
231085	15	5	1		147.
241085	23	3			111.
251085	24				71.
261085	5				48.
271085	7				49.
281085	12				71.
291085	16	1			119.
301085	8				61.
311085	16	3			120.
011185	10	1			82.
031185	7	2			90.
061185	1	1			88.
071185	6				44.
121185	15				63.
131185	13				80.
141185	24	6			84.
151185	3				57.
161185	4				46.
181185	6				46.
211185	3				44.
221185	19				65.
231185	10				57.
241185	15				55.
251185	17				74.
261185	14				65.
271185	1				51.
281185	5				59.
291185	21	7	1		124.
301185	20				59.
051285	2				51.
081285	3				51.
091285	15				76.
101285	20				61.
030186	9				57.

Site : HARWELL, UNITED KINGDOM
Parameter: NITROGEN DIOXIDE, UG/M3
Period : 7 OCTOBER 1985 - 31 MARCH 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	> 40	> 80	>120	>160	Maximum 1-h concentration
040186	2				48.
060186	9				61.
070186	12				65.
080186	9				55.
090186	16				65.
160186	8				65.
170186	16				63.
260186	9				69.
270186	1				61.
290186	4				46.
300186	17				67.
310186	2				49.
010286	7	1			96.
020286	8	4			111.
040286	14				51.
050286	8				61.
060286	15				61.
070286	11	4	1		124.
080286	3				61.
090286	17				76.
100286	17	11	7	7	193.
110286	24	15	12	8	190.
120286	7	4	2		153.
130286	5	5			97.
140286	15	3			86.
150286	23	1			94.
160286	11				59.
170286	4				44.
180286	1				42.
190286	2				51.
200286	16	3			86.
210286	1				80.
260286	7				61.
270286	6				48.
280286	6				46.
030386	6				48.
070386	5				74.
080386	3				61.
100386	1				55.
110386	9	3			88.
120386	20	6	4		159.
130386	24	11	3	2	167.
140386	5				78.
150386	1				59.
160386	1				42.
170386	5				67.
180386	13	4			90.
190386	2				57.
Total number of hours	989	109	31	17	
Total number of days	94	26	8	3	

Site : WRAY, UNITED KINGDOM
Parameter: NITROGEN DIOXIDE, UG/M3
Period : 1 OCTOBER 1985 - 31 MARCH 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	> 40	> 80	Maximum 1-h concentration
151085	3		53.
161085	1		57.
231085	4		51.
241085	7		57.
301085	1		44.
241285	3		59.
251285	3		53.
010186	1		48.
260186	2		48.
100286	8		69.
110286	10		74.
120286	6		46.
130286	1		46.
110386	11		67.
120386	24	3	88.
130386	10	1	82.
140386	1		46.
Total number of hours	96	4	
Total number of days	17	2	

Site : CRETEIL, FRANCE
Parameter: PEROXYACETYL NITRATE, UG/M3
Period : 1 OCTOBER 1985 - 31 MARCH 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	> 10	> 20	> 30	> 40	Maximum 1-h concentration
211085	7				20.
221085	3				13.
231085	9				15.
251085	9	3			27.
261085	15	6	3	1	45.
271085	17	1			23.
281085	6				14.
311085	8				16.
020286	3				11.
060286	4				12.
070286	5				11.
090286	6				11.
100286	6				11.
120286	13				15.
130286	7				12.
140286	24	8	3		31.
150286	24				20.
160286	24	11	2		34.
170286	24	8			23.
190286	13				14.
210286	5				14.
230286	9				17.
250286	1				10.
140386	14	11	4	1	44.
150386	22	7			25.
160386	24	10	3		38.
170386	21	8			28.
180386	12				14.
Total number of hours	335	73	15	2	
Total number of days	28	10	5	2	

APPENDIX C

Summary of ozone data,
April - September 1986

The table gives the number of hours per day, and the number of days, with hourly concentrations exceeding given limits.

Appendix E

Site : ILLMITZ, AUSTRIA
Parameter: OZONE, UG/M3
Periode : 1 APRIL - 15 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>120	>160	>200	>240	>280	>320	Maximum 1-h concentration
010486	11	6					175.
020486	2						126.
030486	16						159.
040486	3						156.
070486	4	1					175.
090486	3						137.
100486	12						153.
110486	17						152.
120486	22	3					164.
130486	24	6					172.
140486	24	7					192.
150486	20	4					170.
160486	22	5					172.
170486	5						157.
180486	20						153.
190486	22	13	1				211.
200486	24	22	6				240.
210486	16	2					182.
220486	17	2					168.
230486	19						155.
240486	7						139.
250486	1						124.
260486	2						126.
270486	3						138.
200586	7	1					163.
210586	9	6					200.
220586	20	9					191.
230586	15	10	9				240.
240586	18	12	4				235.
250586	22	12	6				225.
260586	17	14	9	1			242.
270586	24	19	13	5			250.
280586	18	12	9	3			265.
290586	12						145.
300586	22	3					165.
310586	10						156.
010686	16	10					194.
020686	18	5					178.
030686	14	4					174.
040686	8						159.
050686	9						143.
060686	11						156.
070686	15	2					162.
080686	21						160.
090686	16						159.
100686	15	6					173.
110686	18	4					178.

Site : ILLMITZ, AUSTRIA
Parameter: OZONE, UG/M3
Periode : 1 APRIL - 15 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>120	>160	>200	>240	>280	>320	Maximum 1-h concentration
120686	4						136.
140686	8	1					164.
150686	9	1					166.
160686	13	1					161.
170686	8						157.
180686	12	3					196.
190686	13	3					177.
200686	11						153.
210686	15	8					189.
220686	12	2					175.
230686	11	2					165.
240686	14	6					199.
250686	13	9					193.
260686	17	12	1				204.
270686	22	12					200.
280686	19	15	11	2			255.
290686	22	13	2				203.
300686	14	2					163.
010786	16	10					180.
020786	17	14	6				211.
030786	14	11	8				235.
040786	13	11	10	5			250.
050786	17	14	10	2			255.
060786	24	17	11	4			252.
070786	16	1					176.
080786	15	4					187.
090786	10	6					194.
100786	22	6					192.
110786	10						131.
120786	12	8	4				215.
130786	17	11					192.
140786	18	10	3				207.
150786	16	12	9				236.
160786	16	13	9	8	6	2	342.
170786	17	13	10	9	6		307.
180786	18	14	10	5	3		300.
210786	13	8					185.
220786	11	9	7				238.
230786	16	16	11	4			254.
240786	13	4	2				215.
250786	14	6					194.
260786	11	7					190.
270786	12	8	4				217.
280786	11	9	6				228.
290786	15	11	9	7	1		285.
300786	12	10	8	7	3		300.
310786	11	8	5	2			262.
010886	21	14	8	6	1		300.

Site : ILLMITZ, AUSTRIA
Parameter: OZONE, UG/M3
Periode : 1 APRIL - 15 SEPTEMBE ;

Number of hours per day with 1-h concentration exceeding given limits

Date	>120	>160	>200	>240	>280	>320	Maximum 1-h concentration
020886	14	11	8				238.
030886	13	11	9	1			243.
040886	14	12	10	5			252.
050886	19	10	3				208.
060886	22	13	9	6	2		281.
070886	16	10	8	6			263.
080886	14	12	9	7	6	3	348.
090886	22	14	10	7			280.
100886	16	11	10	6			277.
110886	12	10	9	4			279.
120886	13	10	4	1			245.
130886	14	3					181.
140886	14	10	8	3			255.
150886	16	12	10	8			272.
160886	22	15	10	5			250.
170886	14	11	5	2			254.
180886	12	10	6	1			244.
190886	17	8	3				233.
200886	20	6					194.
210886	16	10	6				240.
220886	15	13	7				232.
230886	19	6	4	1			250.
240886	5						136.
250886	10	1					163.
260886	15	9					193.
270886	12						143.
290886	15						152.
300886	11	7					183.
310886	12	8					193.
010986	7						157.
020986	13	6	2				211.
030986	14	10	4				215.
040986	6	1					169.
050986	10	6	2				208.
060986	14	7					197.
070986	10	6	4	2			253.
080986	8	7	3				220.
090986	10	4					175.
110986	8	5					189.
120986	10	5					170.
130986	7						160.
140986	10	7					197.
150986	1						155.
Total number of hours	1918	892	384	135	28	5	
Total number of days	138	108	56	31	8	2	

Site : GENT,ST.KRUISWINKEL, BELGIUM
Parameter: OZONE, UG/M3
Period : 1 APRIL - 30 SEPT 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>120	>160	Maximum 1-h concentration
010586	3		139.
020586	8		149.
190586	4		135.
090686	4		156.
170686	3		158.
220686	4		150.
260686	4		126.
020786	6	2	168.
140786	1		126.
150786	2		142.
160786	4	3	194.
030886	4		135.
100886	7		153.
Total number of hours	54	5	
Total number of days	13	2	

Site : ULBORG, DENMARK
Parameter: OZONE, UG/M3
Periode : 10 APRIL - 30 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>120	Maximum 1-h concentration
250486	1	122.
260486	4	130.
300486	2	124.
010586	2	134.
020586	1	122.
030586	4	138.
040586	4	136.
050586	3	124.
060586	1	128.
200586	2	128.
010686	1	124.
100686	2	132.
110686	1	124.
170686	3	128.
250686	3	136.
260686	3	134.
280686	1	122.
020786	1	124.
030786	2	132.
040786	4	140.
170786	4	138.

Total number of hours 49

Total number of days 21

Site : BROTJACKLRIEGEL, FED.REP. OF GERMANY
Parameter: OZONE, UG/M3
Period : 1 APRIL - 30 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>120	Maximum 1-h concentration
220686	2	124.
250686	3	136.
260686	4	128.
270686	3	132.
280686	21	132.
290686	4	128.
020786	3	126.
030786	3	124.
040786	13	142.
050786	22	150.
060786	3	140.
180786	1	126.
210786	8	134.
220786	6	128.
230786	2	134.
300786	3	124.
310786	3	128.
040886	6	146.
070886	2	126.
090886	4	138.
100886	4	134.
140886	4	128.
150886	7	130.
160886	3	126.
170886	7	134.
030986	2	124.
060986	12	154.
070986	2	124.
120986	2	126.
220986	1	126.
230986	13	140.
240986	2	126.
Total number of hours	175	
Total number of days	32	

Site : DEUSELBACH, FED.REP. OF GERMANY
Parameter: OZONE, UG/M3
Period : 1 APRIL - 30 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>120	>160	>200	Maximum 1-h concentration
020586	2			124.
100686	2			134.
150686	1			124.
160686	1			124.
190686	9	1		162.
200686	7			140.
210686	1			122.
220686	5			138.
230686	6	1		164.
250686	8			154.
260686	10			146.
270686	9	2		164.
280686	13	6	2	222.
290686	1			122.
300686	5			142.
010786	9	2		164.
020786	11	2		172.
030786	6			148.
040786	1			122.
160786	12			160.
170786	8			160.
280786	3			128.
290786	1			122.
310786	2			124.
030886	13			160.
060886	7			144.
090886	4			136.
100886	3			130.
140886	8	2		164.
150886	2			124.
Total number of hours	170	16	2	
Total number of days	30	7	1	

Site : LANGENBRUGGE-WALDHOF, FED.REP. OF GERMANY
Parameter: OZONE, UG/M3
Period : 1 APRIL - 30 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>120	>160	>200	Maximum 1-h concentration
270486	1			124.
280486	6			136.
290486	7			142.
010586	5			128.
020586	4			130.
030586	8			152.
040586	3			156.
050586	5			158.
060586	9	2		170.
170586	4			142.
180586	1			122.
190586	6			128.
200586	7			142.
230586	7			148.
260586	9			160.
270586	8	5		180.
030686	3			136.
090686	3			124.
100686	13	5		168.
160686	9			158.
170686	8	2		164.
180686	2			124.
190686	9			152.
200686	6			154.
230686	1			138.
250686	4			132.
260686	9			134.
270686	12	6	2	208.
280686	8			158.
010786	10	7		184.
020786	10	7	1	206.
030786	15	11		192.
040786	9	1		170.
150786	1			122.
160786	9			156.
170786	13	9		186.
280786	7			144.
290786	7			152.
310786	6	4		180.
020886	9			144.
030886	11	4		176.
040886	8			148.
060886	8			146.
070886	6	5	1	202.
090886	2			124.

Site : LANGENBRUGGE-WALDHOF, FED.REP. OF GERMANY
Parameter: OZONE, UG/M3
Period : 1 APRIL - 30 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>120	>160	>200	Maximum 1-h concentration
100886	2			130.
110886	9	5		182.
120886	1			124.
140886	5			136.
150886	1			122.
200986	6			146.
210986	3			138.
Total number of hours	335	73	4	
Total number of days	52	14	3	

Site : SCHAUINSLAND, FED.REP. OF GERMANY
Parameter: OZONE, UG/M3
Period : 1 APRIL - 30 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>120	>160	>200	>240	Maximum 1-h concentration
080486	5				132.
150486	1				122.
010586	9				134.
020586	19				140.
030586	22				150.
040586	1				122.
050586	1				122.
060586	6				144.
130586	5				126.
170586	1				126.
190586	1				122.
200586	11				142.
210586	1				128.
230586	5				126.
250586	4				130.
260586	16				144.
270586	11				146.
010686	4				128.
030686	11				142.
090686	4				130.
100686	17				140.
150686	10				158.
160686	24	2			196.
170686	12				148.
180686	11				142.
190686	22	4			196.
200686	20				160.
210686	24	4			174.
220686	24	9			184.
230686	13	3			174.
240686	8				132.
250686	12	7	5		210.
260686	24	5			166.
270686	24	12	7		230.
280686	24	24	11	2	260.
290686	24	15	2		222.
300686	13				142.
010786	24	7	2		214.
020786	24	13	8		226.
030786	23	1			162.
040786	22	4			178.
050786	24				148.
060786	4				130.
120786	9				150.
130786	9				142.
140786	8				144.

Site : SCHAUINSLAND, FED.REP. OF GERMANY
Parameter: OZONE, UG/M3
Period : 1 APRIL - 30 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>120	>160	>200	>240	Maximum 1-h concentration
150786	14	3			174.
160786	23	7			186.
170786	24	21	2		208.
180786	3				126.
200786	7				140.
210786	24	9			188.
220786	22	1			164.
230786	17				156.
270786	6				134.
280786	13	4			168.
290786	21	1			164.
300786	10				160.
310786	22				158.
020886	13				146.
030886	13	1			162.
040886	6				142.
060886	10				160.
070886	14				152.
080886	11				146.
090886	18	1			162.
100886	19				140.
110886	20	1			162.
130886	6				130.
140886	16				146.
150886	13				146.
160886	10				140.
170886	5				136.
210886	9				152.
220886	20				148.
020986	3				124.
060986	14	1			172.
070986	9				144.
110986	5				130.
120986	4				130.
220986	1				124.
Total number of hours	1036	160	37	2	
Total number of days	81	25	7	1	

Site : WESTERLAND, FED.REP. OF GERMANY
Parameter: OZONE, UG/M3
Period : 1 APRIL - 30 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>120	>160	Maximum 1-h concentration
010586	5		142.
020586	9		150.
030586	9	2	164.
040586	2		146.
080586	1		122.
090586	2		128.
190586	2		124.
200586	7		142.
020686	9		130.
030686	11		134.
090686	3		126.
100686	13	3	174.
250686	12	2	164.
260686	17		148.
270686	18		152.
280686	2		128.
010786	1		122.
020786	10		144.
030786	10	5	198.
040786	7		154.
160786	1		126.
170786	5	1	162.
310786	4	1	164.
030886	2		134.
060886	3		126.
130886	6		132.
140886	8		142.
280986	2		126.
Total number of hours	181	14	
Total number of days	28	6	

Site : UTO, FINLAND
Parameter: OZONE, UG/M3
Period : 1 APRIL - 30 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>120	Maximum 1-h concentration
280486	8	144.
290486	3	125.
270586	1	121.
050686	2	122.
110686	2	132.
190686	4	129.
040786	9	151.
050786	1	136.
210786	6	127.
220786	13	136.
230786	8	144.
240786	4	133.
260786	8	138.
270786	21	154.
280786	2	139.
290786	9	138.
300786	1	121.
020886	5	124.
030886	3	139.
040886	16	146.
160886	1	122.
170886	1	130.
Total number of hours	128	
Total number of days	22	

1-28 hr
29-30 gr -
31-56 hr -
57-52 gr -
53-58 hr
59-60 gr -
61-62 hr -
63-64 gr -
65-82 hr
83-84 gr -

Site : ANDREZEL, FRANCE
Parameter: OZONE, UG/M3
Period : 1 APRIL - 30 SEPT 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>120	>160	>200	Maximum 1-h concentration
260586	5	2	1	200.
160686	8	6	5	230.
170686	6			129.
180686	2			129.
190686	3			130.
200686	1			129.
210686	3			127.
250686	5			148.
260686	7			137.
270686	5			136.
280686	1			128.
290686	6			145.
160786	1			120.
Total number of hours	53	8	6	
Total number of days	13	2	2	

Site : MONTAGNY, FRANCE
Parameter: OZONE, UG/M3
Period : 1 APRIL - 30 SEPT 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>120	>160	Maximum 1-h concentration
140686	1		122.
160686	5		151.
170686	1		124.
160786	8		137.
030886	3		129.
060886	3		130.
130886	2		124.
280886	1	1	167.
290886	1		128.
Total number of hours	25	1	
Total number of days	9	1	

Øvrige sider:
S. 27
S. 49
S. 57
S. 61
S. 81
(82 sider)

Site : PINCELOUP, FRANCE
Parameter: OZONE, UG/M3
Period : 1 APRIL - 30 SEPT 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>120	>160	>200	>240	>280	Maximum 1-h concentration
060586	1	1	1			214.
140586	2	2	1	1	1	285.
050686	2	2	1	1		248.
130686	11					145.
140686	7					143.
150686	7					127.
170686	3					130.
180686	14					140.
190686	5					152.
200686	11	1				170.
210686	8					153.
250686	7					148.
260686	14	7				167.
270686	12	6				172.
280686	12	8	2			226.
290686	12	7	2			208.
300686	9	2				166.
010786	6					147.
020786	11	8	2			210.
030786	10	1				162.
120786	5					143.
130786	1					154.
140786	1					122.
150786	5					153.
160786	12	8				192.
200786	3					127.
300786	6					156.
030886	9	1				166.
060886	2					122.
080886	7					150.
090886	1					125.
100886	1					121.
110886	4					124.
160886	1					123.
040986	4					147.
050986	1					120.
060986	6					140.
110986	5					139.
200986	1					127.
210986	6					154.
280986	3					126.
Total number of hours	248	54	9	2	1	
Total number of days	41	13	6	2	1	

Site : EIBERGEN, NETHERLANDS
Parameter: OZONE, UG/M3
Period : 1 APRIL - 30 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>120	>160	>200	>240	Maximum 1-h concentration
010586	6				132.
020586	7				144.
030586	3				139.
120586	3				130.
170586	2				125.
190586	5				128.
250586	2				122.
260586	6	2			185.
270586	2				128.
020686	3				124.
100686	6				139.
150686	7				142.
160686	9	3			174.
170686	9	4	2	1	241.
180686	2				130.
190686	7				145.
200686	3				137.
220686	4				127.
230686	9	1			161.
250686	7				135.
260686	11	5			177.
270686	9	3			180.
280686	4				128.
300686	7				129.
010786	9	6	4		226.
020786	10	9	7	5	280.
030786	12	6	2		215.
040786	10				152.
140786	1				123.
150786	6				138.
160786	12	9	4		237.
170786	1				140.
280786	2				128.
030886	2	1			164.
060886	4				136.
090886	1				121.
100886	5				126.
110886	5				148.
140886	5				148.
Total number of hours	218	49	19	6	
Total number of days	39	11	5	2	

Site : WITTEVEEN, NETHERLANDS
Parameter: OZONE, UG/M3
Periode : 8 APRIL - 30 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>120	>160	>200	Maximum 1-h concentration
010586	1			121.
020586	8			154.
030586	5			152.
170586	5			138.
200586	7			140.
260586	5			147.
100686	5			142.
140686	1			129.
160686	7			156.
170686	6	5		195.
230686	6			136.
260686	7			141.
270686	6			149.
010786	7	1		162.
020786	9	7	3	213.
030786	11	5		183.
040786	1			137.
160786	9	5		173.
030886	5			147.
060886	1			121.
140886	8			152.
Total number of hours	120	23	3	
Total number of days	21	5	1	

Site : BIRKENES, NORWAY
Parameter: OZONE, UG/M3
Period : 1 APRIL - 30 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>120	Maximum 1-h concentration
060686	1	122.
100686	6	144.
250686	2	122.
030786	5	138.
Total number of hours	14	
Total number of days	4	

Site : JELØYA, NORWAY
Parameter: OZONE, UG/M3
Periode : 3 APRIL - 30 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>120	>160	>200	>240	Maximum 1-h concentration
060686	1				122.
090686	3				124.
100686	11	3			164.
110686	1				121.
160686	1				124.
180686	4				141.
190686	2				125.
200686	2				130.
210686	1				150.
250686	5				136.
260686	13				137.
030786	8	6			183.
040786	6				140.
170786	5				142.
180786	1				120.
240786	1				132.
290786	4				137.
050886	5	4	3	1	268.
080886	1				130.
Total number of hours	75	13	3	1	
Total number of days	19	3	1	1	

Site : LANGESUND, NORWAY
Parameter: OZONE, UG/M3
Periode : 23 MAY - 22 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>120	Maximum 1-h concentration
070686	1	121.
100686	6	149.
110686	3	136.
030786	4	130.

Total number of hours 14

Total number of days 4

Site : ASPVRETEN, SWEDEN
Parameter: OZONE, UG/M3
Periode : 10 JUNE - 23 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>120	Maximum 1-h concentration
080786	1	124.

Total number of hours 1

Total number of days 1

Site : NORRA KVILL, SWEDEN
Parameter: OZONE, UG/M3
Periode : 1 APRIL - 11 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>120	>160	Maximum 1-h concentration
070586	9		132.
080586	15		144.
180686	9		140.
260686	5		132.
270686	2		133.
020786	8		145.
030786	16	8	176.
040786	2	1	161.
Total number of hours	66	9	
Total number of days	8	2	

Site : SENNEN, SWEDEN
Parameter: OZONE, UG/M3
Periode : 11 JUNE - 20 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>120	Maximum 1-h concentration
260786	4	134.
180886	3	124.
020986	1	124.
030986	6	142.
040986	7	136.

Total number of hours 21

Total number of days 5

Site : RORVIK, SWEDEN
Parameter: OZONE, UG/M3
Periode : 4 APRIL - 30 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>120	>160	Maximum 1-h concentration
250486	1		124.
260486	4		138.
290486	3		129.
020586	7		157.
030586	9		154.
040586	4		129.
050586	8		130.
060586	9		146.
070586	5		135.
210586	2		124.
270586	3		134.
020686	3		133.
090686	5		127.
100686	14	6	179.
130686	1		130.
140686	3		140.
180686	2		141.
260686	5		134.
300686	5		138.
020786	16		151.
030786	18	1	172.
040786	12	2	174.
150786	1		125.
170786	2		132.
240786	1		123.
280786	2		126.
290786	13		141.
020886	7		154.
030886	6		133.
040886	10	6	191.
060886	4		139.
070886	1		121.
Total number of hours	186	15	
Total number of days	32	4	

Site : VAVIHILL, SWEDEN
Parameter: OZONE, UG/M3
Period : 1 APRIL - 30 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>120	>160	>200	Maximum 1-h concentration
140486	1			123.
150486	6			142.
160486	4			123.
180486	1			122.
280486	6			126.
020586	1			122.
030586	9			136.
050586	5			130.
060586	9			136.
070586	5			131.
260586	5			134.
020686	1			123.
100686	10			146.
140686	6			155.
150686	4			134.
180686	1			123.
250686	1			122.
260686	3			126.
010786	2			126.
020786	8			139.
030786	18	10	1	202.
040786	10	1		187.
210786	2			125.
290786	4			141.
020886	8			147.
030886	2			125.
040886	11	2		163.
070886	1			123.
Total number of hours	144	13	1	
Total number of days	28	3	1	

Site : VINDELN, SWEDEN
Parameter: OZONE, UG/M3
Periode : 1 APRIL - 18 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>120	Maximum 1-h concentration
250486	10	132.
280486	4	124.
110586	6	132.
250786	1	145.
Total number of hours	21	
Total number of days	4	

110

Site : AMMARNÆS, SWEDEN
Parameter: OZONE, UG/M3
Periode : 5 JUNE - 30 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

No hourly values exceeding 120

Site : STORMYRSBERGET, SWEDEN
Parameter: OZONE, UG/M3
Periode : 3 JUNE - 30 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

No hourly values exceeding 120

Site : PAYERNE, SWITZERLAND
Parameter: OZONE, UG/M3
Period : 1 APRIL - 30 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>120	>160	>200	>240	>280	>320	Maximum 1-h concentration
020486	6						138.
030486	4						137.
080486	10	6					177.
210486	3						121.
250486	6						138.
260486	5						148.
300486	4						127.
010586	11	8					195.
020586	12	7	4				234.
030586	10	5					191.
040586	11						160.
050586	14	3					166.
060586	12	9	6				215.
070586	14						150.
080586	2						125.
100586	9						148.
110586	11	3					179.
120586	9	2	1				208.
150586	9						142.
160586	11						156.
170586	19	11	7	3			263.
180586	10	7	5	4	3		308.
190586	14	11	9	7	5	1	324.
200586	16	11	8	5	2		288.
210586	6						133.
220586	7						133.
230586	11	5	2				216.
250586	6						142.
260586	9	3	2				212.
270586	12	5					185.
090686	6						133.
100686	10	2					185.
150686	12	9	7	1			242.
160686	14	5	3	2	1	1	325.
170686	12	5	2				211.
180686	13	5					179.
190686	13	10	1				205.
200686	12	5					181.
210686	11	5					191.
220686	10	8					189.
230686	8						152.
240686	3						127.
250686	11						154.
260686	11	9					193.
270686	11	9	5				213.
280686	12	9	3				203.
290686	14	5					172.

Site : PAYERNE, SWITZERLAND
Parameter: OZONE, UG/M3
Period : 1 APRIL - 30 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>120	>160	>200	>240	>280	>320	Maximum 1-h concentration
300686	9						152.
010786	9						156.
020786	11	5					174.
030786	7						136.
040786	10	1					166.
050786	15						150.
060786	10						138.
110786	5						138.
130786	3						125.
150786	7						133.
160786	10	4					172.
170786	10	5					185.
180786	8						158.
210786	1						121.
220786	4						154.
230786	6						131.
280786	8						138.
290786	3						129.
300786	7						137.
010886	2						136.
020886	11	7					191.
030886	11	7	1				209.
040886	12						158.
060886	8						154.
070886	5						133.
090886	7	1					166.
100886	4						138.
110886	9						152.
120886	8	2					181.
130886	4						138.
140886	1						121.
180886	15	13	5	4	3		302.
190886	7	6					183.
210886	7						154.
220886	8						137.
230886	5	3	2				232.
260886	6	4	1				203.
030986	1						121.
060986	7	1					162.
080986	3						138.
110986	5						144.
120986	7						152.
130986	1						121.
140986	17	9	8	2			275.
150986	13	6	4	2			269.
160986	16	9	1				218.
170986	20	11	4	4	3		316.

Site : PAYERNE, SWITZERLAND
Parameter: OZONE, UG/M3
Period : 1 APRIL - 30 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>120	>160	>200	>240	>280	>320	Maximum 1-h concentration
180986	4	1					169.
210986	5						146.
220986	6						142.
230986	5						142.
240986	2						123.
290986	3						133.
300986	5						144.
Total number of hours	859	277	91	34	17	2	
Total number of days	101	46	23	10	6	2	

Site : SION, SWITZERLAND
Parameter: OZONE, UG/M3
Period : 1 APRIL - 30 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>120	>160	>200	>240	>280	>320	>360	Maximum 1-h concentration
060486	1							123.
300486	4							133.
010586	9	5						174.
020586	8							146.
030586	9							133.
040586	2							125.
060586	2							123.
070586	7							138.
080586	9							142.
090586	6							135.
100586	10	3						166.
110586	3							136.
120586	8							160.
130586	5							152.
140586	6							127.
170586	8	2						164.
180586	9	4						181.
190586	8							144.
200586	8	4	1					228.
220586	8	4						176.
230586	7							148.
250586	9							158.
260586	9	6	2					207.
270586	4							129.
300586	4							125.
310586	8							144.
010686	15							160.
030686	10							144.
070686	1							121.
080686	9							152.
090686	10	5						185.
100686	13	8						195.
130686	3							123.
140686	5							138.
150686	8							160.
160686	9	3	1					220.
170686	11	7						187.
180686	12	6						199.
190686	10	8	4					226.
200686	9	5						179.
210686	13	12	7	4	1			283.
220686	15	11	6	2				273.
230686	8	5						179.
240686	10	9	6	2				257.
250686	15	12	9	7	4	2		331.
260686	16	14	11	10	7	4	1	361.
270686	12	9	7	6	3	2		351.

Site : SION, SWITZERLAND
Parameter: OZONE, UG/M3
Period : 1 APRIL - 30 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>120	>160	>200	>240	>280	>320	>360	Maximum 1-h concentration
280686	16	12	10	5	3			316.
290686	17	15	12	7				277.
300686	9	5	4					222.
010786	12	9	8	5	3			308.
020786	12	10	8	6	4	2		337.
030786	2							125.
040786	2							125.
050786	3							127.
060786	3							133.
100786	5							152.
110786	5							138.
130786	9							158.
140786	11	4						168.
150786	12	8	5					209.
160786	13	11	9	2				246.
170786	15	14	11	7				257.
180786	14	1						164.
200786	9							148.
210786	11	6						189.
220786	10	7	2					240.
230786	11	3						187.
240786	3							127.
250786	8	2						172.
260786	13	6						185.
270786	12	7						199.
280786	12	9	5					234.
290786	9	7	5	2				259.
300786	9	7	6	4	1			293.
310786	10	8	6	1				244.
010886	9	7	2					209.
020886	13	10	7	4	3			312.
030886	17	13	10	5	3	2		333.
050886	10	8	5					224.
060886	13	10	7					224.
070886	10	3						170.
080886	9	7	4					211.
090886	9							156.
100886	11	7						185.
120886	2							131.
130886	2							125.
140886	10	1						168.
150886	7	4						185.
160886	8	3						170.
170886	7	5	3					214.
180886	5							146.
200886	8							136.
210886	8	2						162.
220886	7	4						177.

Site : SION, SWITZERLAND
Parameter: OZONE, UG/M3
Period : 1 APRIL - 30 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>120	>160	>200	>240	>280	>320	>360	Maximum 1-h concentration
060986	3							127.
070986	2							121.
Total number of hours	832	377	183	79	32	12	1	
Total number of days	97	55	30	17	10	5	1	

Site : TAENIKON, SWITZERLAND
Parameter: OZONE, UG/M3
Period : 1 APRIL - 30 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>120	>160	Maximum 1-h concentration
060586	2		121.
230586	5		138.
260586	4		133.
030686	1		123.
100686	8		158.
170686	1		122.
200686	3		155.
210686	5		137.
220686	5		140.
250686	2		124.
260686	9		147.
270686	7		132.
280686	7		153.
290686	7	1	162.
020786	5		129.
030786	4	3	170.
040786	8		153.
050786	5		148.
160786	3		143.
170786	8	2	174.
220786	3		137.
290786	1		124.
300786	3		138.
020886	4		155.
070886	8		138.
090886	2		127.
150886	2		138.
060986	5		147.
070986	5		137.
Total number of hours	132	6	
Total number of days	29	3	

Site : BOTTESFORD, UNITED KINGDOM
Parameter: OZONE, UG/M3
Period : 1 APRIL - 30 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>120	>160	>200	Maximum 1-h concentration
260486	2			126.
010586	4			158.
020586	5	2		164.
120686	2			124.
140686	5			160.
150686	12			138.
160686	8	6	1	206.
170686	6			132.
180686	1			122.
190686	11			156.
250686	2			126.
260686	11	2		166.
270686	10	4		192.
280686	5			148.
290686	1			122.
020786	4			126.
160786	3			138.
100886	1			122.
Total number of hours	93	14	1	
Total number of days	18	4	1	

Site : HARWELL, UNITED KINGDOM
Parameter: OZONE, UG/M3
Period : 1 APRIL - 30 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>120	>160	>200	>240	Maximum 1-h concentration
010586	4				138.
020586	6				136.
140686	7	3			172.
150686	7				140.
160686	7	1			162.
190686	8				146.
260686	13	5			174.
270686	13	10	3		208.
280686	10	8	6	3	272.
300686	2				146.
Total number of hours	77	27	9	3	
Total number of days	10	5	2	1	

Site : WRAY, UNITED KINGDOM
Parameter: OZONE, UG/M3
Period : 1 APRIL - 30 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>120	Maximum 1-h concentration
020586	5	138.
270686	3	146.
280686	6	150.

Total number of hours 14

Total number of days 3

Site : SIBTON, UNITED KINGDOM
Parameter: OZONE, UG/M3
Periode : 2 APRIL - 23 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	>120	Maximum 1-h concentration
160786	4	136.

Total number of hours	4
Total number of days	1

APPENDIX D

Summary of data on nitrogen dioxide and PAN,
April - September 1986

The tables give the number of hours per day, and the number of days, with hourly concentrations exceeding given limits.

APPENDIX B

Site : GENT,ST.KRUISWINKEL, BELGIUM
Parameter: NITROGEN DIOXIDE, UG/M3
Period : 1 APRIL - 30 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	> 40	> 80	Maximum 1-h concentration
180486	3		46.
210486	1		41.
260486	3		46.
270486	1		43.
300486	10		61.
010586	4		48.
140586	4		52.
160586	7		59.
190586	3		80.
200586	3		49.
210586	3		51.
220586	6		56.
230586	2		49.
250586	2		45.
260586	4		63.
020686	1		42.
030686	6		55.
240686	4		54.
250686	1		41.
260686	1		42.
270686	1		45.
300686	2		55.
010786	1		41.
020786	3	1	82.
030786	3		61.
040786	1		44.
140786	1		57.
180786	1		44.
210786	1		49.
030886	1		58.
090886	2		52.
110886	1		45.
310886	1		41.
050986	1		45.
060986	1		46.
100986	5		59.
110986	2		47.
120986	2		42.
130986	6		54.
200986	1		42.
210986	3		68.
220986	5		48.
300986	1		42.
Total number of hours	115	1	
Total number of days	43	1	

Site : EIBERGEN, NETHERLANDS
Parameter: NITROGEN DIOXIDE, UG/M3
Period : 1 APRIL - 30 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	> 40	> 80	Maximum 1-h concentration
020486	3		53.
030486	4		50.
120486	4		63.
130486	10		66.
140486	13		61.
150486	10		63.
160486	2		52.
170486	1		42.
180486	1		43.
210486	3		47.
230486	9		67.
240486	12		60.
250486	2		51.
270486	4		54.
280486	3		46.
290486	3		46.
010586	2		44.
020586	1		45.
030586	4		56.
050586	3		45.
120586	2		48.
140586	1		41.
150586	10		64.
170586	5		50.
180586	6		51.
190586	1		42.
200586	2		50.
230586	6		69.
250586	1		45.
260586	7		68.
270586	2		52.
010686	1		43.
020686	1		44.
030686	3		58.
090686	5		69.
100686	8		64.
170686	6		61.
240686	2		47.
250686	1		43.
270686	2		49.
300686	3		53.
010786	9		59.
020786	6		63.
030786	9	1	82.
080786	5		62.
090786	6		53.

Site : EIBERGEN, NETHERLANDS
Parameter: NITROGEN DIOXIDE, UG/M3
Period : 1 APRIL - 30 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	> 40	> 80	Maximum 1-h concentration
100786	2		47.
140786	4		59.
150786	3		51.
160786	8		74.
170786	9		71.
190786	3		53.
200786	3		45.
210786	2		50.
270786	2		47.
280786	13		72.
290786	8	3	84.
070886	8		64.
080886	2		52.
090886	2		46.
130886	7	1	85.
140886	17	1	97.
150886	5	1	87.
170886	2		43.
200886	3		43.
210886	6		71.
220886	12		79.
250886	5		67.
260886	13		65.
280886	2		55.
050986	9		50.
060986	10		57.
070986	1		53.
080986	6		51.
100986	7		54.
110986	5		56.
120986	6		48.
130986	1		42.
140986	4		61.
190986	1		50.
200986	5		55.
210986	7		64.
220986	14		55.
230986	17		66.
270986	2		45.
280986	7		60.
290986	21	1	82.
300986	4		49.
Total number of hours	472	8	
Total number of days	88	6	

Site : WITTEVEEN, NETHERLANDS
Parameter: NITROGEN DIOXIDE, UG/M3
Period : 1 APRIL - 30 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	> 40	Maximum 1-h concentration
130486	5	45.
140486	14	57.
150486	1	41.
230486	6	56.
280486	3	50.
290486	1	45.
150586	8	65.
230586	3	49.
030686	2	44.
090686	2	56.
100686	1	42.
030786	2	54.
290786	4	49.
300786	1	43.
310786	3	49.
060886	1	45.
210886	2	44.
220886	8	53.
240886	1	41.
250886	3	51.
260886	5	53.
010986	1	41.
140986	2	51.
200986	1	46.
210986	2	44.
220986	1	41.
290986	2	46.
Total number of hours	85	
Total number of days	27	

Site : PAYERNE, SWITZERLAND
Parameter: NITROGEN DIOXIDE, UG/M3
Period : 1 APRIL - 30 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	> 40	Maximum 1-h concentration
020486	1	43.
140486	1	41.
150486	5	57.
220486	6	61.
140586	1	48.
160686	1	43.
180686	1	42.
190686	1	41.
230686	1	42.
250686	1	42.
260686	3	48.
270686	2	58.
300686	1	41.
010786	2	54.
020786	3	56.
030786	3	67.
040786	2	45.
130786	1	41.
160786	3	59.
170786	3	45.
210786	1	41.
220786	4	45.
290786	3	52.
300786	2	44.
310786	2	59.
030886	2	52.
040886	3	63.
070886	3	60.
180886	1	52.
200886	1	46.
220886	3	52.
280886	2	43.
030986	3	46.
050986	1	43.
080986	4	54.
090986	6	52.
110986	1	50.
120986	5	50.
160986	1	43.
210986	1	42.
220986	1	43.
230986	2	50.
240986	4	50.
250986	6	46.

Site : PAYERNE, SWITZERLAND
Parameter: NITROGEN DIOXIDE, UG/M3
Period : 1 APRIL - 30 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	> 40	Maximum 1-h concentration
300986	2	61.

Total number of hours	106
Total number of days	45

Site : SION, SWITZERLAND
Parameter: NITROGEN DIOXIDE, UG/M3
Period : 1 APRIL - 30 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	> 40	Maximum 1-h concentration
020486	3	51.
030486	4	65.
060486	4	56.
080486	2	47.
140486	2	51.
150486	3	74.
160486	2	60.
170486	3	51.
210486	6	56.
220486	2	56.
230486	2	42.
240486	10	51.
280486	7	74.
290486	9	74.
010586	2	47.
020586	3	60.
050586	2	65.
060586	3	60.
070586	1	42.
090586	2	51.
120586	2	42.
130586	4	51.
140586	3	56.
150586	2	47.
160586	2	47.
170586	1	42.
190586	2	51.
200586	2	47.
210586	2	51.
230586	1	42.
260586	2	47.
270586	3	56.
020686	1	47.
040686	1	42.
090686	1	42.
100686	2	47.
180686	2	56.
190686	2	47.
210686	1	46.
220686	2	51.
160786	1	47.
170786	2	51.
180786	2	60.
220786	2	42.
070886	1	42.

Site : SION, SWITZERLAND
Parameter: NITROGEN DIOXIDE, UG/M3
Period : 1 APRIL - 30 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	> 40	Maximum 1-h concentration
080886	1	47.
090886	1	47.
120886	4	69.
160886	1	51.
220886	4	51.
300886	1	51.
050986	1	42.
110986	2	47.
120986	5	51.
180986	1	42.
200986	1	42.
240986	5	51.
280986	1	42.
290986	3	51.
300986	5	56.

Total number of hours 154

Total number of days 60

Site : TAENIKON, SWITZERLAND
Parameter: NITROGEN DIOXIDE, UG/M3
Period : 1 APRIL - 30 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	> 40	> 80	Maximum 1-h concentration
050486	1		44.
080486	10		50.
090486	3		46.
100486	13		48.
150486	2		54.
170486	1		41.
220486	1		42.
230486	1		41.
240486	8		69.
250486	3		48.
280486	14		69.
290486	18		69.
300486	21		69.
010586	1		58.
050586	2		44.
060586	3		46.
130586	1		43.
210586	2		46.
230586	2		43.
260586	4		63.
040686	1		43.
060686	1		41.
090686	3		58.
100686	4		55.
110686	1		54.
120686	2		48.
130686	4		52.
140686	4		56.
170686	2		67.
180686	1		41.
190686	2		50.
200686	2		57.
230686	3		50.
260686	1		41.
270686	1		50.
300686	1		41.
010786	2		54.
020786	2		48.
030786	2		61.
040786	1		50.
080786	3		54.
110786	2		41.
130786	3		48.
150786	2		41.
160786	1		46.
170786	2		54.

Site : TAENIKON, SWITZERLAND
Parameter: NITROGEN DIOXIDE, UG/M3
Period : 1 APRIL - 30 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	> 40	> 80	Maximum 1-h concentration
230786	1		41.
290786	1		43.
310786	2		69.
050886	1		65.
060886	1		41.
100886	1		42.
110886	1		41.
140886	3		46.
150886	2		59.
190886	1		48.
210886	1		48.
220886	1		54.
260886	6		65.
030986	1		54.
120986	7		59.
180986	4		50.
220986	5		52.
230986	3		41.
240986	6		48.
250986	9		58.
260986	3		43.
280986	5	1	82.
290986	3		56.
300986	3		55.
Total number of hours	235	1	
Total number of days	70	1	

Site : BOTTESFORD, UNITED KINGDOM
Parameter: NITROGEN DIOXIDE, UG/M3
Period : 1 APRIL - 30 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	> 40	> 80	>120	>160	Maximum 1-h concentration
010486	1				51.
020486	9				59.
030486	13				72.
040486	18	2			88.
050486	10				76.
110486	9				72.
120486	1				76.
140486	1				42.
160486	4				48.
170486	3				57.
180486	11				65.
190486	10				74.
220486	1				44.
240486	5				48.
260486	6	1			92.
270486	13				72.
280486	9	2			103.
290486	14	1			82.
300486	2				46.
010586	5				61.
020586	4				61.
030586	8				59.
060586	3				48.
080586	2	1			84.
090586	2				78.
130586	2				49.
160586	1				51.
170586	2				42.
200586	3				48.
230586	1				44.
290586	2				49.
310586	2				48.
010686	2				44.
030686	2				48.
050686	1				51.
060686	2				63.
070686	2				44.
110686	1				42.
120686	3				59.
130686	9				55.
140686	3				72.
170686	2				44.
180686	8				69.
190686	8				76.
230686	1				57.
240686	9				72.
250686	2				59.

Site : BOTTESFORD, UNITED KINGDOM
Parameter: NITROGEN DIOXIDE, UG/M3
Period : 1 APRIL - 30 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	> 40	> 80	>120	>160	Maximum 1-h concentration
260686	3				61.
010786	8	1			84.
020786	6				59.
030786	2				42.
040786	3				53.
050786	10				57.
060786	1				42.
080786	4				55.
100786	4				51.
130786	5				59.
140786	1				51.
150786	7				59.
160786	4				72.
180786	7				53.
190786	4				65.
200786	3				46.
210786	5				55.
220786	4				51.
230786	6				48.
240786	8				61.
250786	1				46.
260786	5				48.
270786	1				46.
290786	1				44.
010886	6	1			113.
030886	1				42.
040886	12	2			97.
050886	7	3			101.
060886	2				48.
070886	3				49.
080886	14				57.
090886	11	3	2		126.
120886	1				42.
130886	9				61.
150886	1				55.
160886	4				55.
170886	1				46.
180886	2				65.
200886	4				53.
210886	14	1			84.
230886	4				51.
240886	3				46.
260886	2				48.
270886	4				57.
280886	11				69.
290886	16				72.
300886	14	1			84.
310886	10	2			90.

Site : BOTTESFORD, UNITED KINGDOM
Parameter: NITROGEN DIOXIDE, UG/M3
Period : 1 APRIL - 30 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	> 40	> 80	>120	>160	Maximum 1-h concentration
010986	6				57.
020986	3				63.
030986	11	1			90.
040986	13	3			88.
050986	17	5			115.
060986	9	3			105.
070986	13	6			109.
080986	24	8	1		130.
090986	20	12	1		128.
100986	19	7	3		132.
110986	23	14	1		126.
120986	15	7	3		130.
130986	11	8	3	1	167.
140986	13	3			92.
150986	20	6	2	1	168.
160986	20	6			107.
170986	24	7	1		126.
180986	10	3			90.
190986	11	8	3	1	172.
200986	21	7	3	1	174.
210986	12	4			111.
220986	15				71.
230986	15	1			103.
240986	6				71.
250986	14	4			117.
260986	24	4			113.
270986	18	2			84.
280986	6				55.
290986	9				63.
300986	22	5			94.
Total number of hours	935	155	23	4	
Total number of days	125	37	11	4	

Site : HARWELL, UNITED KINGDOM
Parameter: NITROGEN DIOXIDE, UG/M3
Period : 1 APRIL - 30 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	> 40	> 80	>120	>160	Maximum 1-h concentration
030486	13				69.
040486	5				53.
050486	4				59.
070486	2				74.
080486	5				71.
090486	2				55.
100486	2				63.
250486	1				44.
260486	10				51.
270486	2				76.
010586	3				61.
020586	16	6			107.
060586	4				69.
070586	1				44.
160586	2				46.
170586	1				42.
200586	1				42.
250686	1				57.
260686	8				67.
270686	16	8	6	2	165.
280686	23	20	12	5	174.
290686	23	16			109.
300686	14	2			96.
110786	6				55.
090886	2				63.
120886	4				72.
130886	1				63.
170886	1				72.
180886	11				53.
190886	2				42.
210886	6				59.
230886	2				49.
240886	1				48.
250886	3				46.
300886	1				42.
100986	8	1			88.
110986	16	2			111.
120986	1	1			90.
130986	1				44.
170986	5				80.
190986	1				53.
230986	3				71.
240986	1				42.
250986	2				46.

Site : HARWELL, UNITED KINGDOM
Parameter: NITROGEN DIOXIDE, UG/M3
Period : 1 APRIL - 30 SEPTEMBER 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	> 40	> 80	>120	>160	Maximum 1-h concentration
260986	6	1			88.
300986	7				55.
Total number of hours	250	57	18	7	
Total number of days	46	9	2	2	

140

Site : WRAY, UNITED KINGDOM
Parameter: NITROGEN DIOXIDE, UG/M3
Periode : 1 APRIL - 31 JULY 1986

Number of hours per day with 1-h concentration exceeding given limits

Date	> 40	Maximum 1-h concentration
240486	1	53.
250486	1	42.
020586	6	71.
260686	3	55.
270686	9	59.
280686	4	67.
290686	7	65.
300686	3	69.
Total number of hours	34	
Total number of days	8	

Stasjon : CRETEIL, FRANCE
Parameter: PEROXYACETYL NITRATE, UG/M3
Periode : 1 APRIL - 30 SEPT 1986

Antall timer pr døgn med 1 h-konsentrasjon over gitte grenser

Dato	> 10	> 20	> 30	> 40	> 60	> 80	>100	Maksimum 1-h konsentrasjon
020486	2							13.
060486	9							12.
080486	6							14.
130486	1							10.
180486	2							12.
250486	2							13.
270486	1							11.
280486	4							14.
300486	9							16.
010586	16	4						22.
020586	10							16.
130586	1							12.
230586	7	1						21.
250586	9							15.
260586	14	8	4	2				49.
270586	2							19.
300586	4							12.
310586	11							20.
020686	3							13.
030686	1							11.
120686	13	1						21.
130686	23	12	1					34.
140686	23	7						30.
150686	20	4						29.
160686	17	16	11	10	3	2	1	104.
170686	17	6	4	2	1			68.
180686	18	15	8	3				47.
190686	21	1						22.
200686	19	2	2	1				44.
210686	17	1						20.
220686	12	7	4	2				49.
230686	5							16.
240686	3							12.
250686	15							17.
260686	24	6						25.
270686	22	6						23.
280686	22	10	2					35.
290686	21	9						28.
300686	23	9	4	2	1			69.
010786	14	10	7	3				47.
020786	19	7	4	2				44.
030786	17	11	9	4	1			74.
040786	7							12.
050786	6							15.
060786	4							13.
090786	5							13.

Stasjon : CRETEIL, FRANCE
Parameter: PEROXYACETYL NITRATE, UG/M3
Periode : 1 APRIL - 30 SEPT 1986

Antall timer pr døgn med 1 h-konsentrasjon over gitte grenser

Dato	> 10	> 20	> 30	> 40	> 60	> 80	>100	Maksimum 1-h konsentrasjon
120786	12							16.
130786	21	4						30.
140786	10	5						29.
180786	3							13.
200786	15	7						25.
210786	7							20.
220786	10							19.
230786	14	3						23.
280786	6							14.
300786	13	6						25.
310786	2							11.
010886	9	1						21.
020886	3							11.
040886	3							11.
050886	11	6						26.
060886	9	1						20.
080886	6							12.
090886	16	7						26.
100886	24	6	2					31.
110886	18	7	4	2				59.
120886	15	2						21.
130886	19	10						23.
140886	13							19.
150886	7							18.
160886	7							14.
170886	9							17.
180886	16	11	7	5	1			65.
190886	5							14.
200886	9							13.
210886	21	3						24.
220886	2							19.
240886	1							10.
010986	11							16.
050986	10							17.
060986	15	11	6	4				58.
070986	8							19.
080986	2							13.
100986	11							15.
110986	24	8						28.
120986	12							16.
190986	1							10.
200986	10							18.
210986	12	10	7	5	2			67.
220986	9	2	1	1				42.
230986	1							10.
270986	8							15.
280986	8							18.
290986	1							11.
Totalt antall timer	1000	263	87	48	9	2	1	

Totalt

Site : DONON, FRANCE
Parameter: PEROXYACETYL NITRATE, UG/M3
Period : 1 - 30 SEPT 1986

Number of hours per day with 1-h concentration exceeding given limits

No hourly values exceeding 10

APPENDIX

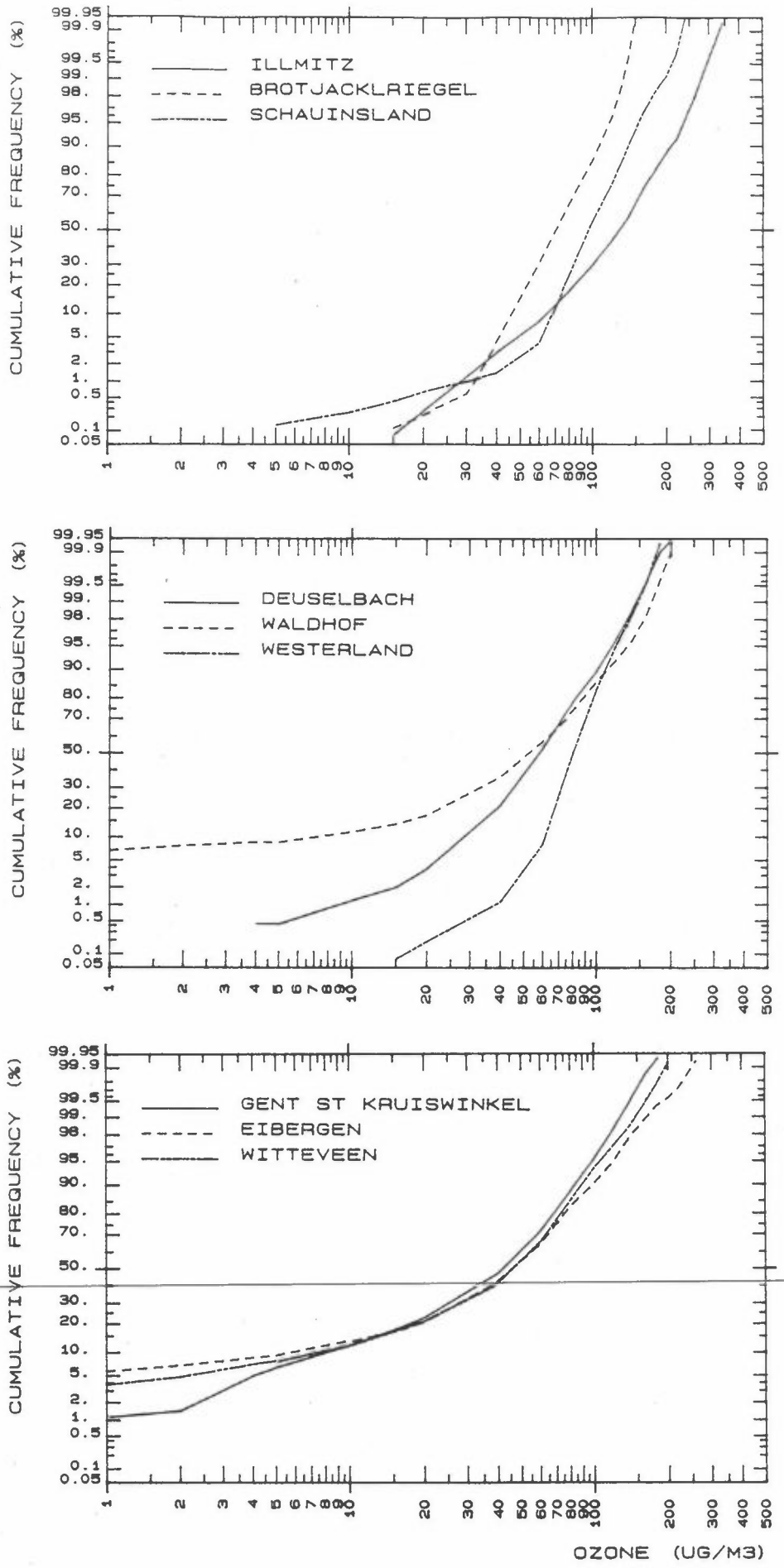
Site : DELFT, NETHERLANDS
Parameter: PEROXYACETYL NITRATE, UG/M3
Periode : 12 JUNE - 30 SEPTEMBER 1986

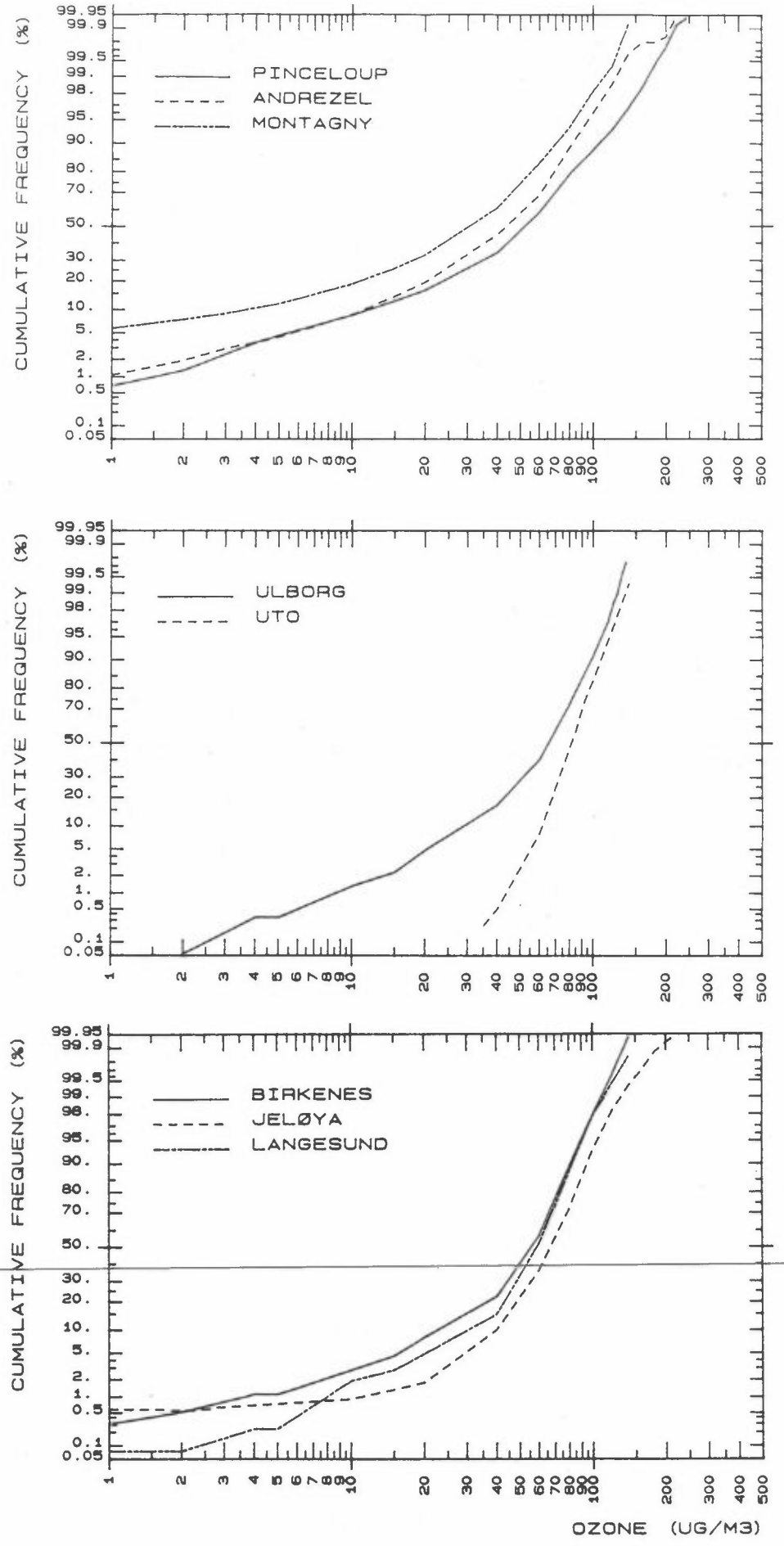
Number of hours per day with 1-h concentration exceeding given limits

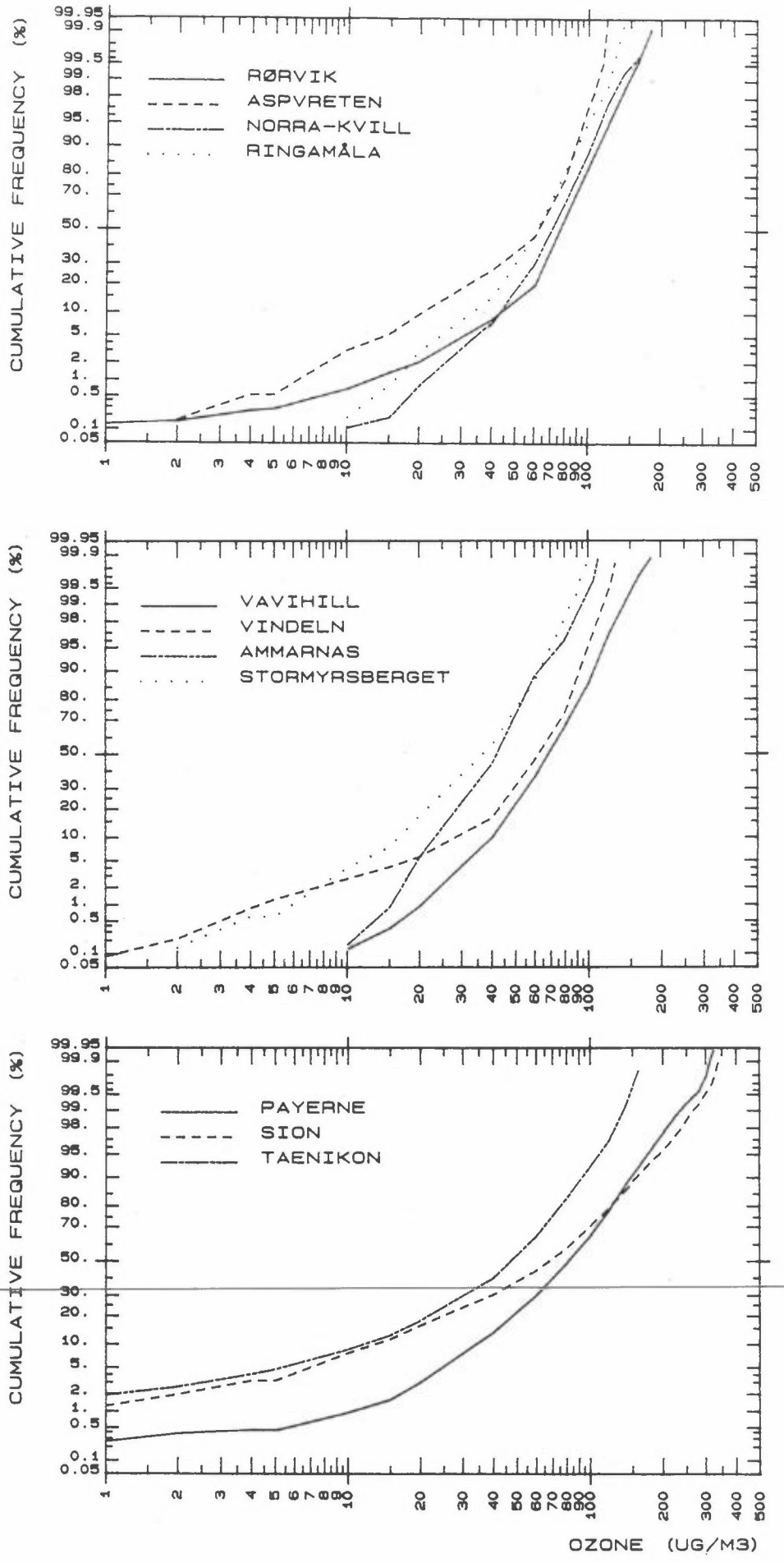
Date	> 10	> 20	> 30	> 40	> 50	Maximum 1-h concentration
160686	6					14.6
170686	7					16.1
190686	9					14.6
220686	4					11.5
230686	9	2				22.1
250686	15					18.1
260686	10					17.6
270686	5					16.1
010786	14	2	1			30.2
020786	11	4				24.6
030786	5					14.6
080786	1					13.1
140786	15	4				24.1
150786	9	1				24.6
160786	16	9	3	2	1	52.4
170786	3					16.6
200786	2					13.1
280786	6					18.6
300786	10					18.1
010886	10	8	2			34.2
020886	10	6				24.1
060886	7	1				22.6
090886	11	1				26.7
100886	8					17.1
130886	1					19.1
140886	6	2				29.7
210886	15					17.1
220886	4					15.1
050986	15					19.6
060986	3					13.1
070986	1					10.5
100986	4	1				22.6
130986	6					18.6
140986	9					13.1
200986	14	9	4	2		49.3
210986	24	15	3			33.7
220986	12	2				26.2
230986	6	4	1			30.2
270986	4	2				25.7
280986	16	9	5			34.2
Total number of hours	343	82	19	4	1	
Total number of days	40	18	7	2	1	

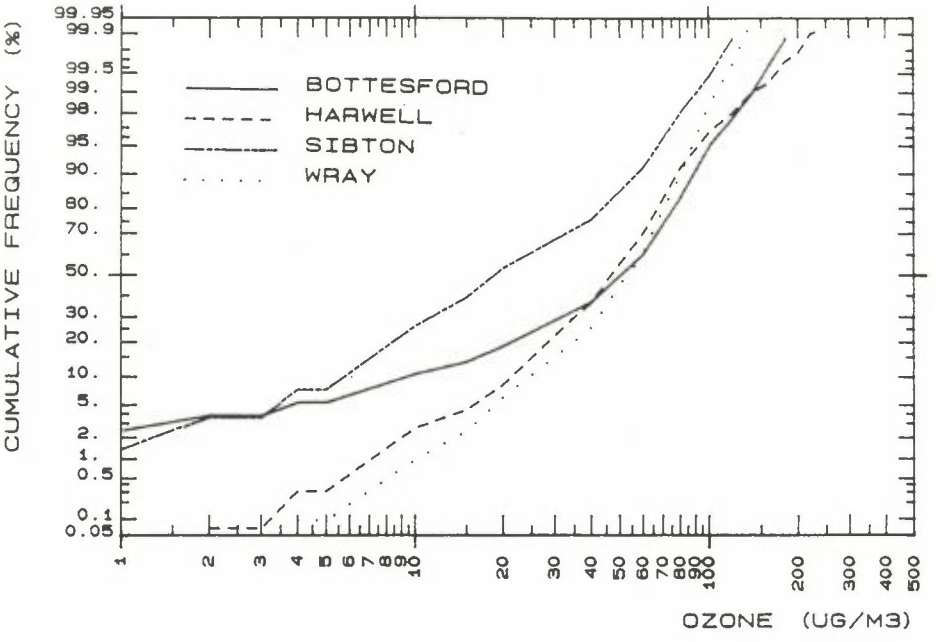
APPENDIX E

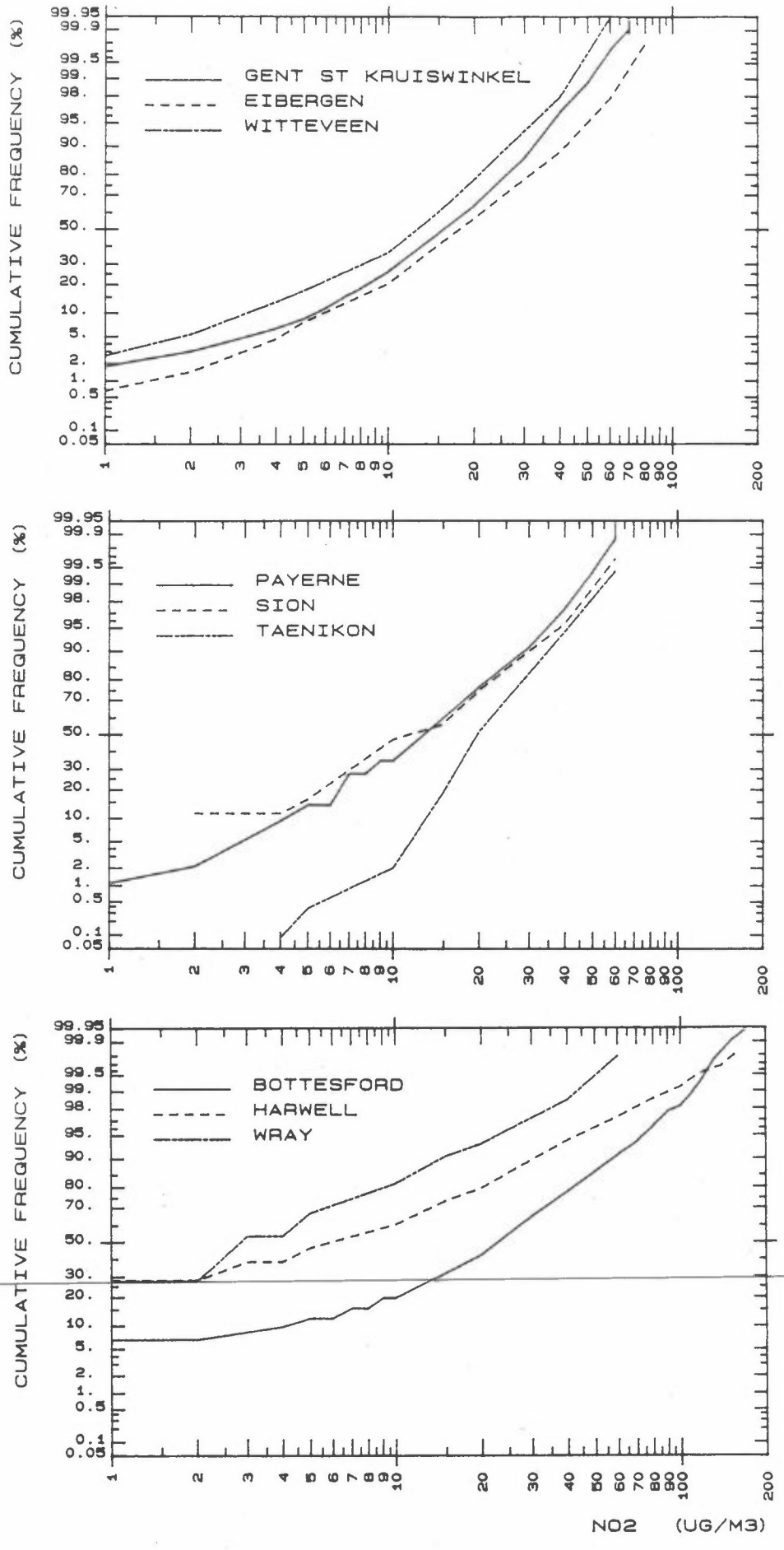
Cumulative frequency distributions of ozone and nitrogen dioxide concentrations, April - September 1986


CUMULATIVE FREQUENCY (%)
99.95
99.9
99.5
99.
98.
95.
90.
80.
70.
50.
30.
20.
10.
5.
2.
1.
0.5
0.1
0.05
ILLMITZ
BROTJACKLRIEGEL
SCHAUINSLAND
DEUSELBACH
WALDHOF
WESTERLAND
GENT ST KRUISWINKEL
EIBERGEN
WITTEVEEN
1
2
3
4
5
6
7
8
9
10
20
30
40
50
60
70
80
90
100
200
300
400
500
OZONE (UG/M3)


CUMULATIVE FREQUENCY (%)
99.95
99.9
99.5
99.
98.
95.
90.
80.
70.
50.
30.
20.
10.
5.
2.
1.
0.5
0.1
0.05
PINCELOUP
ANDREZEL
MONTAGNY
ULBORG
UTO
BIRKENES
JELØYA
LANGESUND
1
2
3
4
5
6
7
8
9
10
20
30
40
50
60
70
80
90
100
200
300
400
500
OZONE (UG/M3)

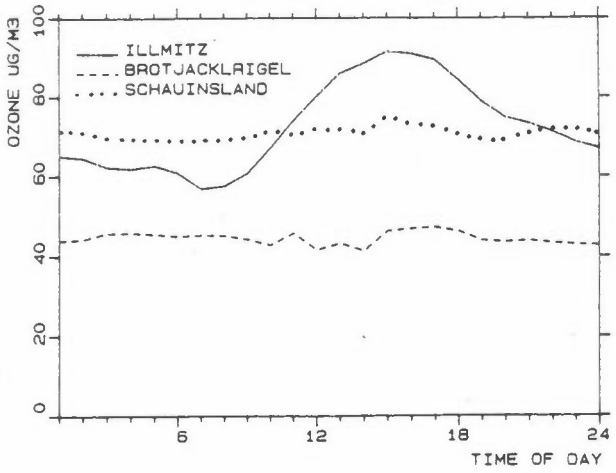

CUMULATIVE FREQUENCY (%)
99.95
99.9
99.5
99.
98.
95.
90.
80.
70.
50.
30.
20.
10.
5.
2.
1.
0.5
0.1
0.05
RØRVIK
ASPVRETEN
NORRA-KVILL
RINGAMÅLA
VAVIHILL
VINDELN
AMMARNAS
STORMYRSBERGET
PAYERNE
SION
TAENIKON
1
2
3
4
5
6
7
8
9
10
20
30
40
50
60
70
80
90
100
200
300
400
500
OZONE (UG/M3)

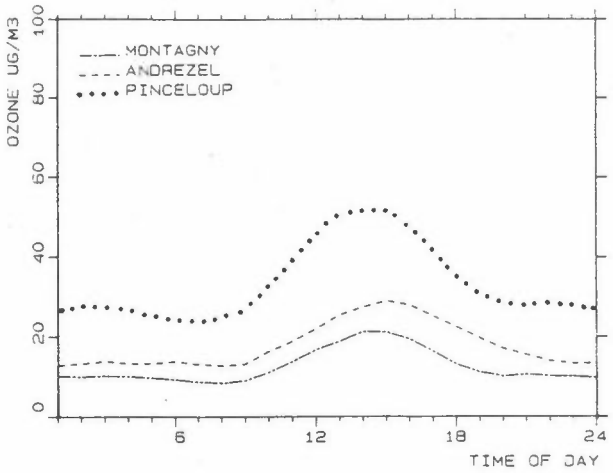

CUMULATIVE FREQUENCY (%)
99.95
99.9
99.5
99.
98.
95.
90.
80.
70.
50.
30.
20.
10.
5.
2.
1.
0.5
0.1
0.05
BOTTESFORD
HARWELL
SIBTON
WRAY
1
2
3
4
5
6
7
8
9
10
20
30
40
50
60
70
80
90
100
200
300
400
500
OZONE (UG/M3)

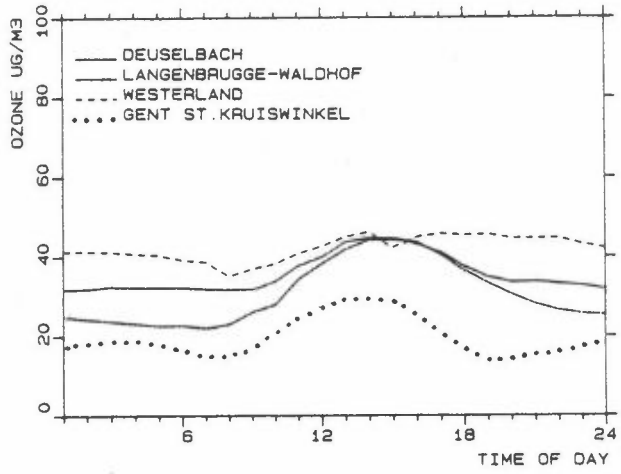

CUMULATIVE FREQUENCY (%)
GENT ST KRUISWINKEL
EIBERGEN
WITTEVEEN
PAYERNE
SION
TAENIKON
BOTTESFORD
HARWELL
WRAY
NO2 (UG/M3)

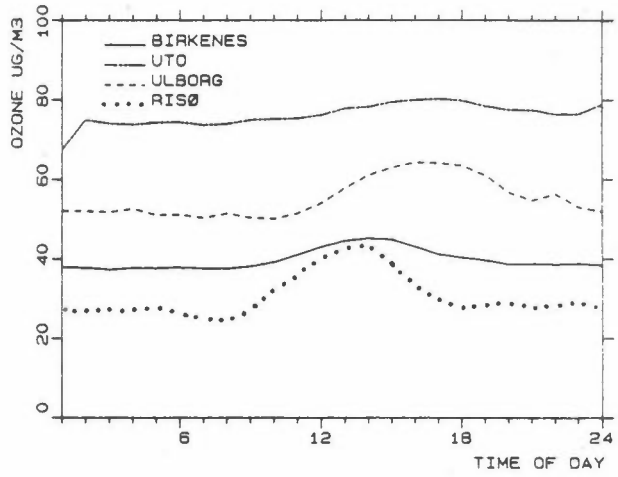
APPENDIX F

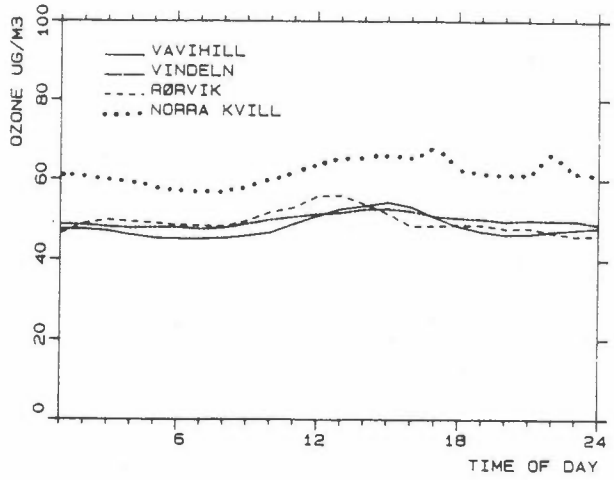
Mean diurnal concentration distribution for ozone,
nitrogen dioxide and PAN
October 1985 - March 1986

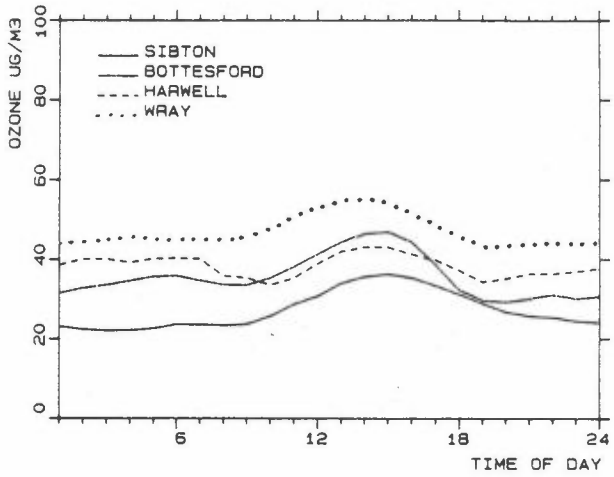

ILLMITZ
BROTJACKLRIGEL
SCHAUINSLAND
OZONE UG/M3
TIME OF DAY

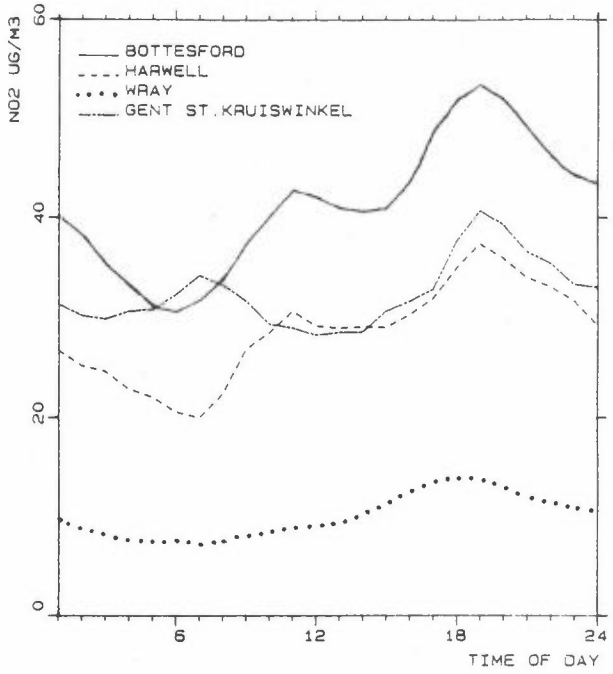

MONTAGNY
ANDREZEL
PINCELOUP
OZONE UG/M3
TIME OF DAY

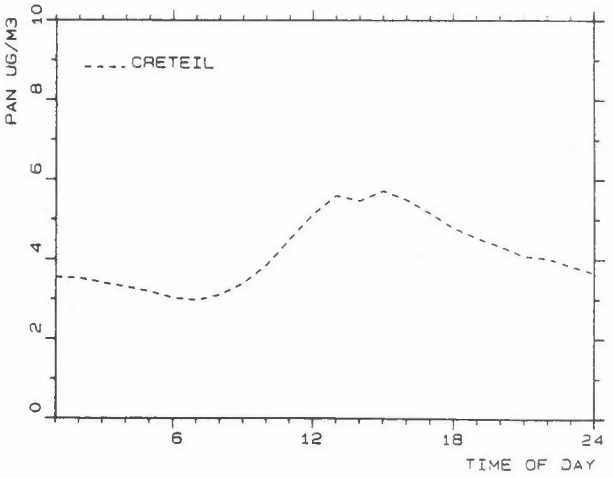

DEUSELBACH
LANGENBRUGGE-WALDHOF
WESTERLAND
GENT ST.KRUISWINKEL
OZONE UG/M3
TIME OF DAY


BIRKENES
UTO
ULBORG
RISØ
OZONE UG/M3
TIME OF DAY


OZONE UG/M3
VAVIHILL
VINDELN
RØRVIK
NORRA KVILL
0
20
40
60
80
100
6
12
18
24
TIME OF DAY


OZONE UG/M3
SIBTON
BOTTESFORD
HARWELL
WRAY
0
20
40
60
80
100
6
12
18
24
TIME OF DAY


NO2 UG/M3
BOTTESFORD
HARWELL
WRAY
GENT ST.KRUISWINKEL
0
20
40
60
6
12
18
24
TIME OF DAY


PAN UG/M3
CRETEIL
0
2
4
6
8
10
6
12
18
24
TIME OF DAY

APPENDIX G

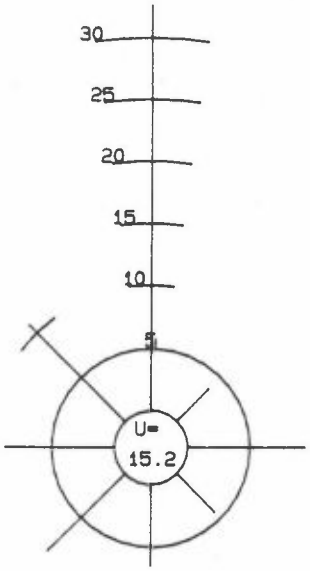
Back trajectory sector distributions (unit: per cent)
April - September 1986

Ozone concentration limit: 120 $\mu g/m^3$
For Illmitz, Payerne and Sion: also 160 $\mu g/m^3$ and 240 $\mu g/m^3$
For Langenbrügge-Waldhof and Schauinsland: also 160 $\mu g/m^3$

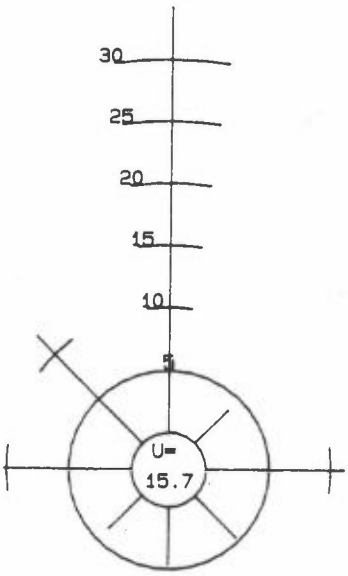
NO_2-concentration limits: 40 $\mu g/m^3$, 80 $\mu g/m^3$ and 120 $\mu g/m^3$

PAN concentration limit: 10 $\mu g/m^3$

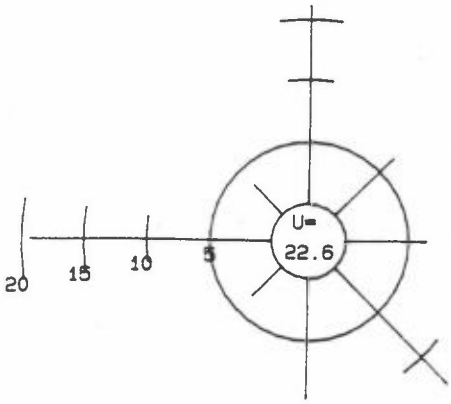
ILLMITZ, AUSTRIA
OZONE > 120. ug/M3



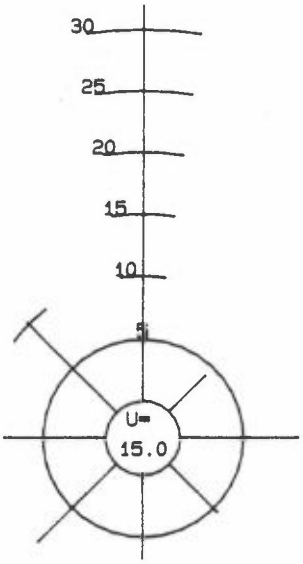
ILLMITZ, AUSTRIA
OZONE > 160. ug/M3



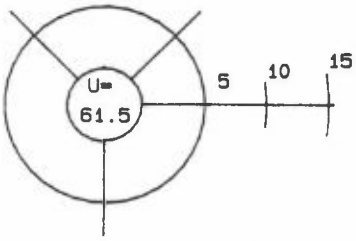
ILLMITZ, AUSTRIA
OZONE > 240. ug/M3



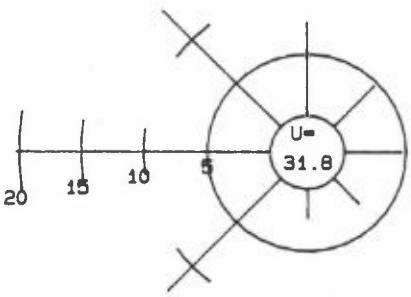
ILLMITZ, AUSTRIA
ALL DAYS



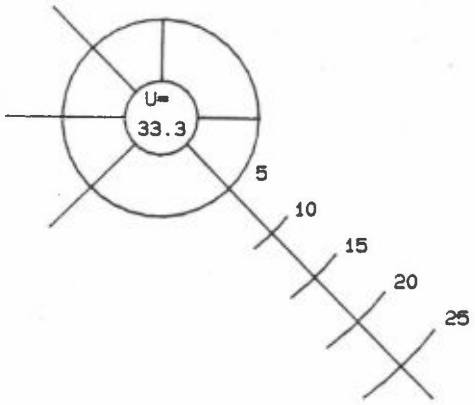
GENT, ST.KRUISWINKEL, BELGIUM
OZONE > 120. ug/M3



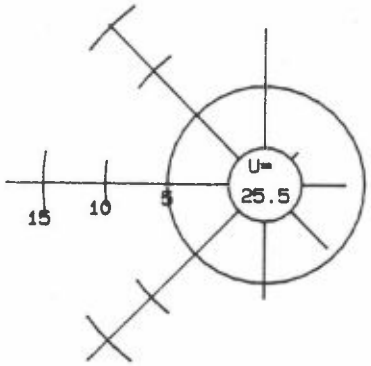
GENT, ST.KRUISWINKEL, BELGIUM
ALL DAYS



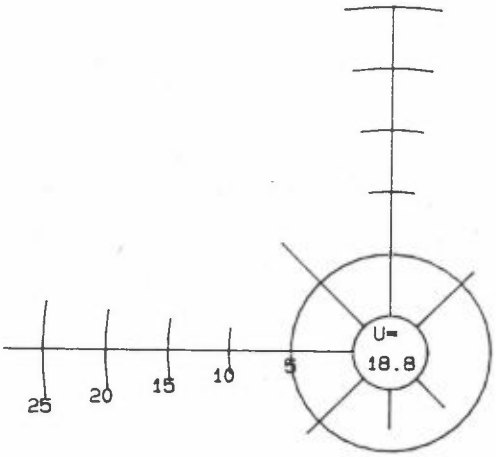
ULBORG, DENMARK
OZONE > 120. ug/M3



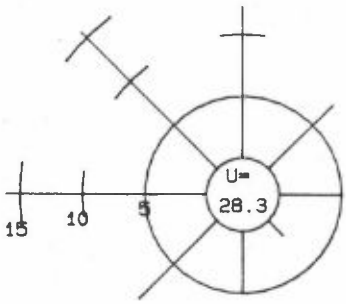
ULBORG, DENMARK
ALL DAYS



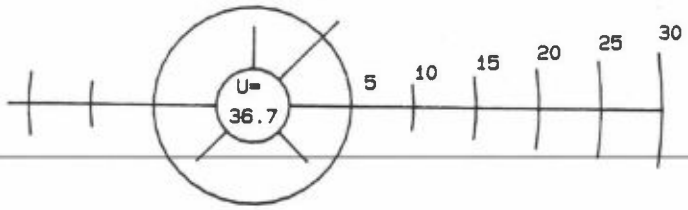
BROTJACKLRIEGEL, FED.REP. OF GERMANY
OZONE > 120. ug/M3



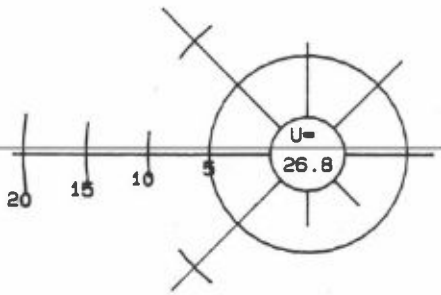
BROTJACKLRIEGEL, FED.REP. OF GERMANY
ALL DAYS



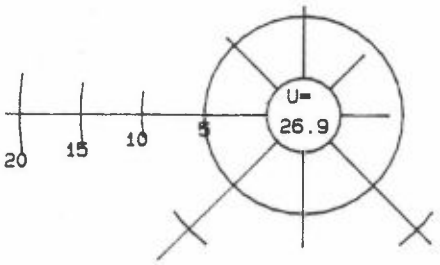
DEUSELBACH, FED.REP. OF GERMANY
OZONE > 120. ug/M3



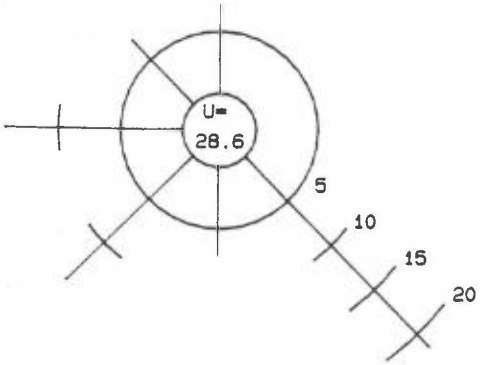
DEUSELBACH, FED.REP. OF GERMANY
ALL DAYS



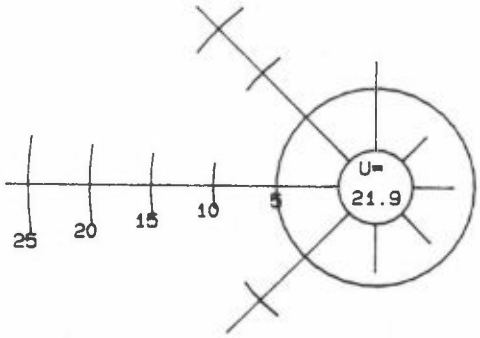
LANGENBRUGGE-WALDHOF, FED.REP. OF GERMANY
OZONE > 120. ug/M3



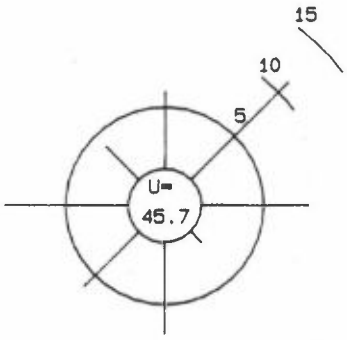
LANGENBRUGGE-WALDHOF, FED.REP. OF GERMANY
OZONE > 160. ug/M3



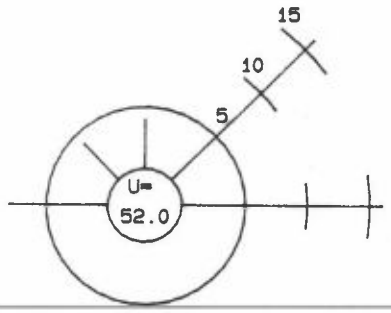
LANGENBRUGGE-WALDHOF, FED.REP. OF GERMANY
ALL DAYS



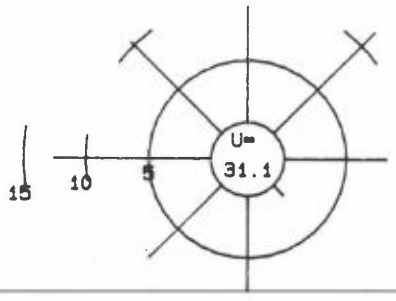
SCHAUINSLAND, FED.REP.OF GERMANY
OZONE > 120. ug/M3



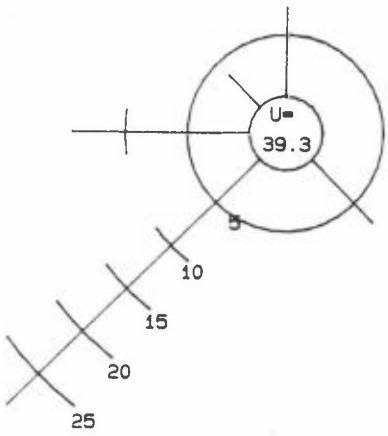
SCHAUINSLAND, FED.REP.OF GERMANY
OZONE > 160. ug/M3



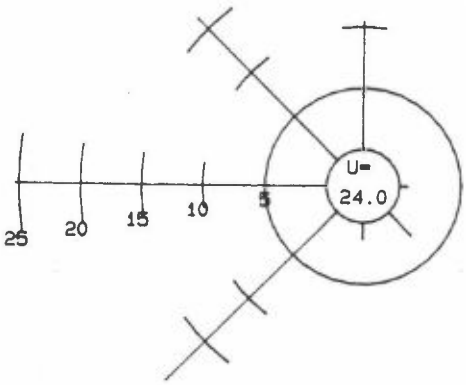
SCHAUINSLAND, FED.REP.OF GERMANY
ALL DAYS



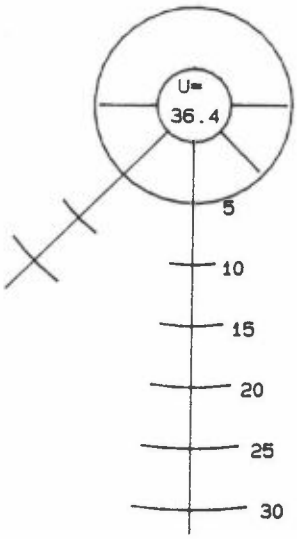
WESTERLAND, FED.REP.OF GERMANY
OZONE > 120. ug/M3



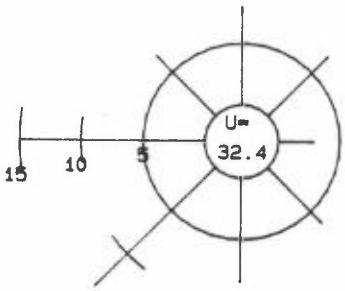
WESTERLAND, FED.REP.OF GERMANY
ALL DAYS



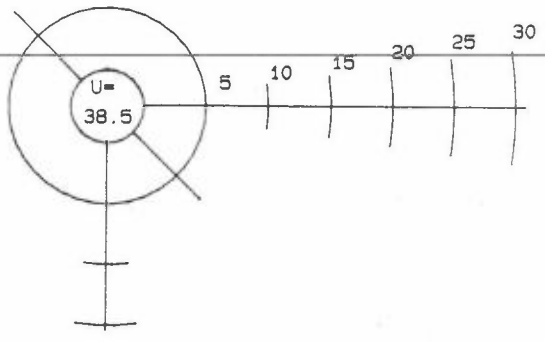
UTO, FINLAND
OZONE > 120. ug/M3



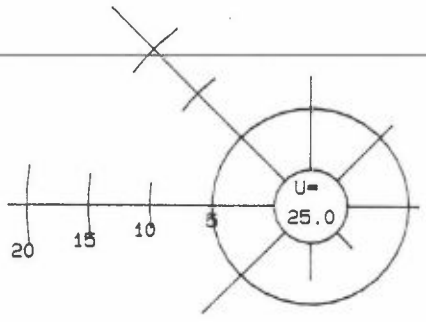
UTO, FINLAND
ALL DAYS



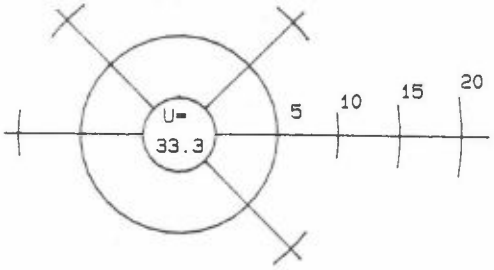
ANDREZEL, FRANCE
OZONE > 120. ug/M3



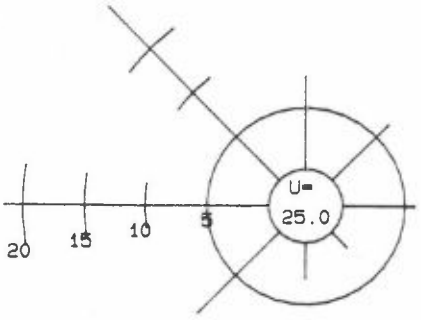
ANDREZEL, FRANCE
ALL DAYS



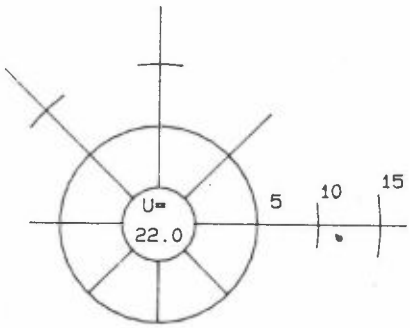
MONTAGNY, FRANCE
OZONE > 120. ug/M3



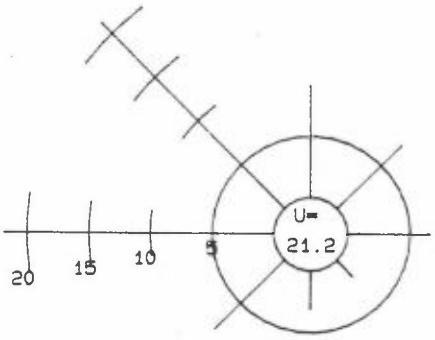
MONTAGNY, FRANCE
ALL DAYS



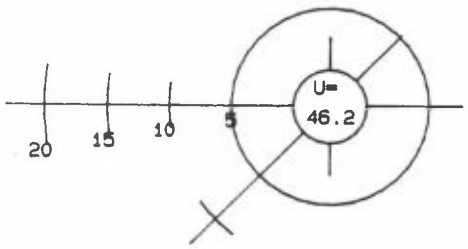
PINCELOUP, FRANCE
OZONE > 120. ug/M3



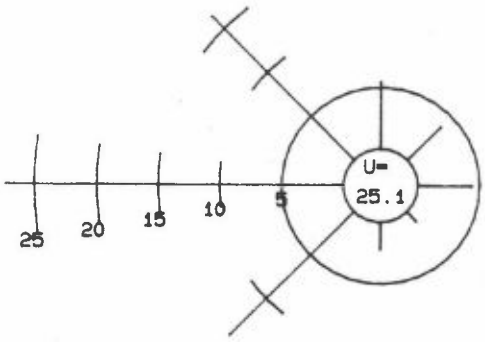
PINCELOUP, FRANCE
ALL DAYS



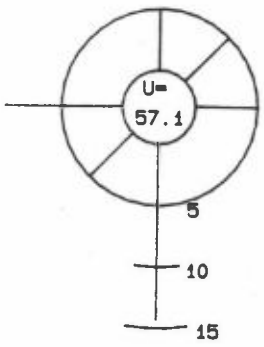
EIBERGEN, NETHERLANDS
OZONE > 120. ug/M3



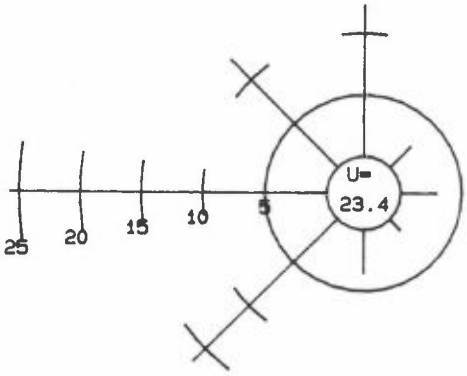
EIBERGEN, NETHERLANDS
ALL DAYS



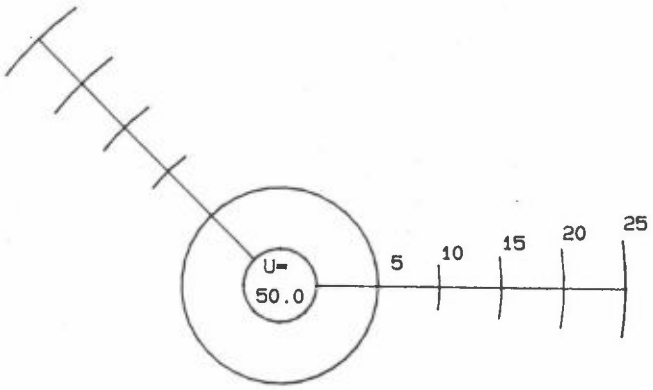
WITTEVEEN, NETHERLANDS
OZONE > 120. ug/M3



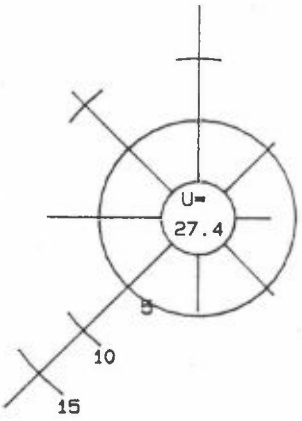
WITTEVEEN, NETHERLANDS
ALL DAYS



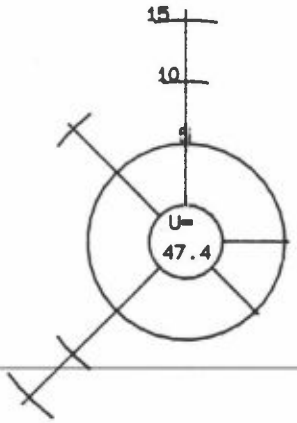
BIRKENES, NORWAY
OZONE > 120. ug/M3



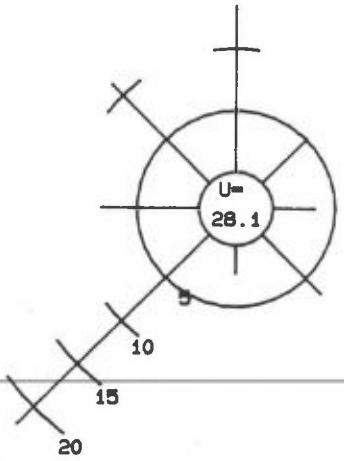
BIRKENES, NORWAY
ALL DAYS



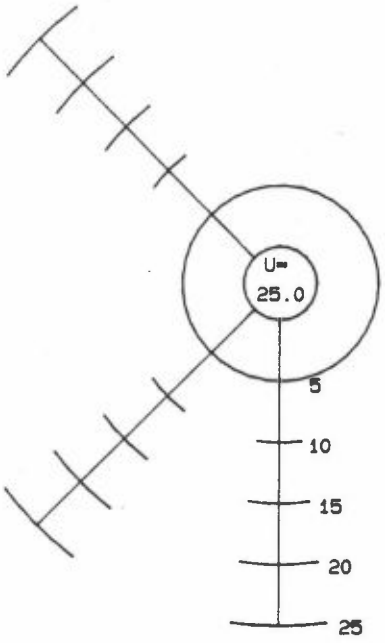
JELØYA, NORWAY
OZONE > 120. ug/M3



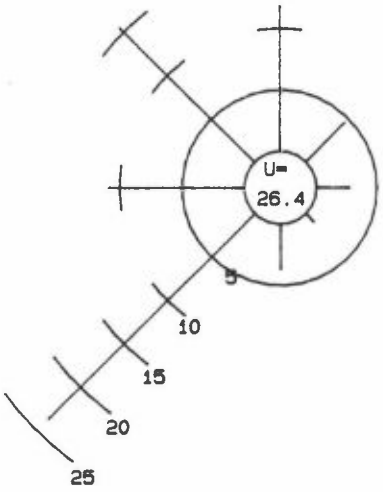
JELØYA, NORWAY
ALL DAYS



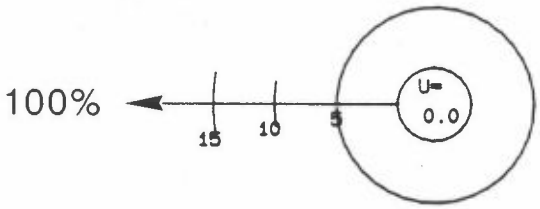
LANGESUND, NORWAY
OZONE > 120. ug/M3



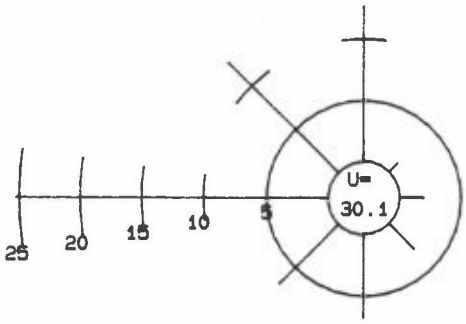
LANGESUND, NORWAY
ALL DAYS



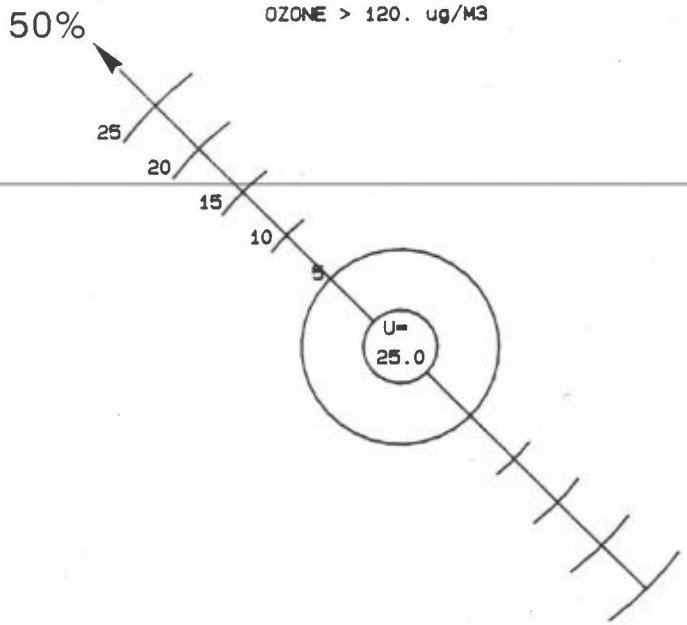
ASPVRETEN, SWEDEN
OZONE > 120. ug/M3



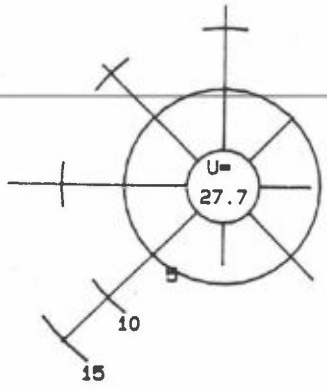
ASPVRETEN, SWEDEN
ALL DAYS



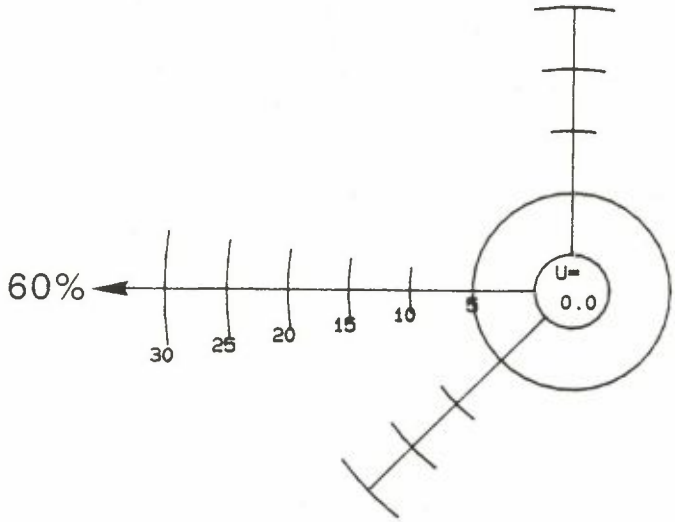
NORRA KVILL, SWEDEN
OZONE > 120. ug/M3



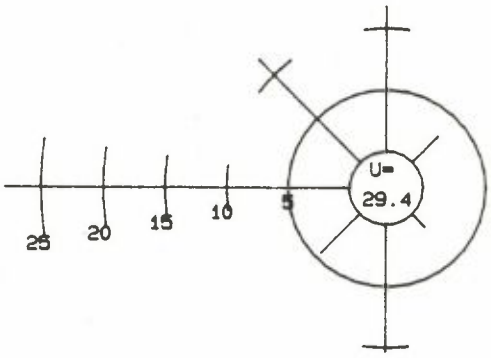
NORRA KVILL, SWEDEN
ALL DAYS



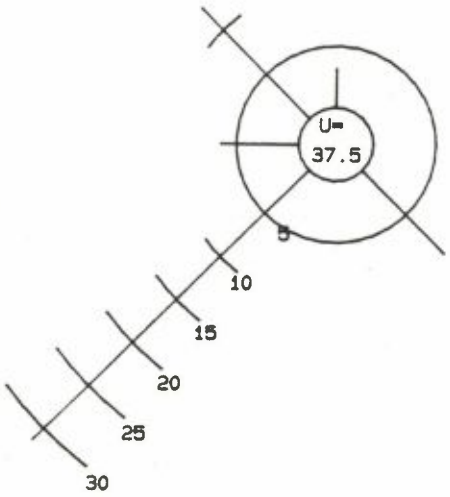
RINGAMÅLA-SANNEN, SWEDEN
OZONE > 120. ug/M3



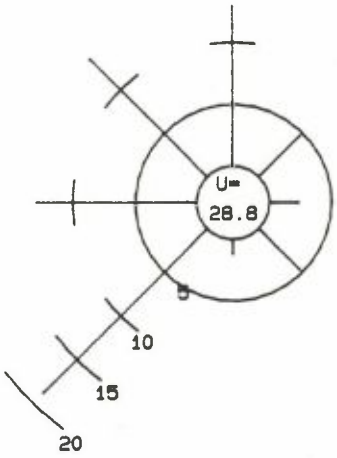
RINGAMÅLA-SANNEN, SWEDEN
ALL DAYS



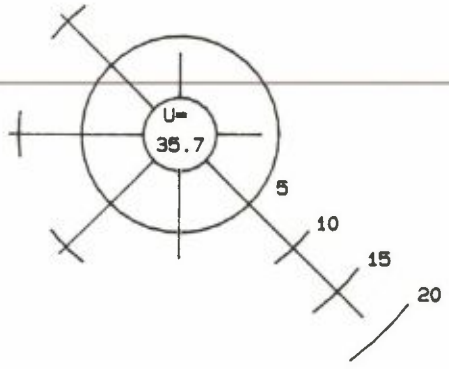
RORVIK, SWEDEN
OZONE > 120. ug/M3



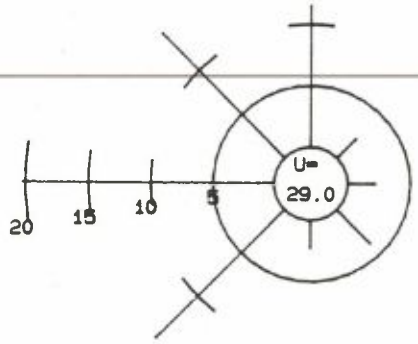
RORVIK, SWEDEN
ALL DAYS



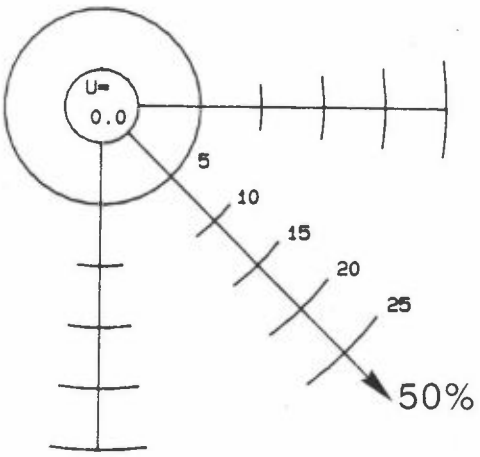
VAVIHILL, SWEDEN
OZONE > 120. ug/M3



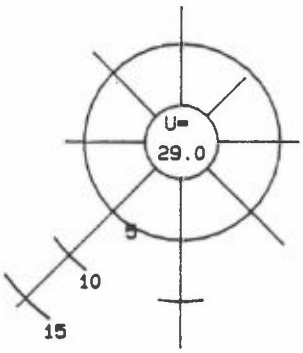
VAVIHILL, SWEDEN
ALL DAYS



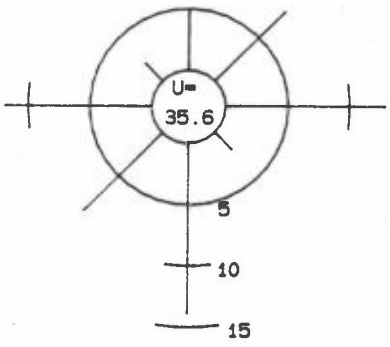
VINDELN, SWEDEN
OZONE > 120. ug/M3



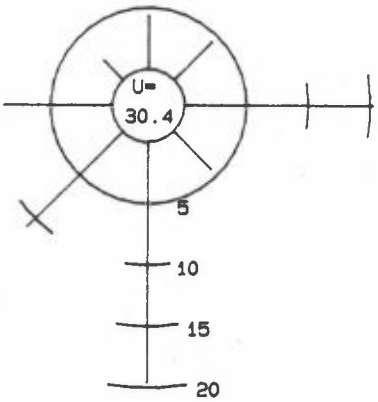
VINDELN, SWEDEN
ALL DAYS



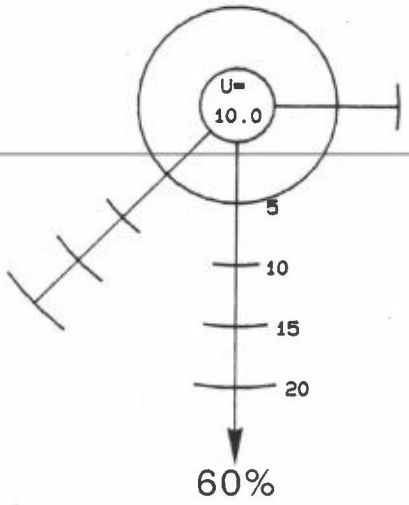
PAYERNE, SWITZERLAND
OZONE > 120. ug/M3



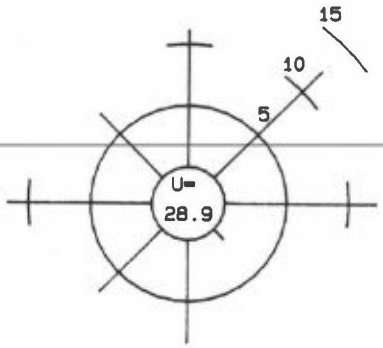
PAYERNE, SWITZERLAND
OZONE > 160. ug/M3



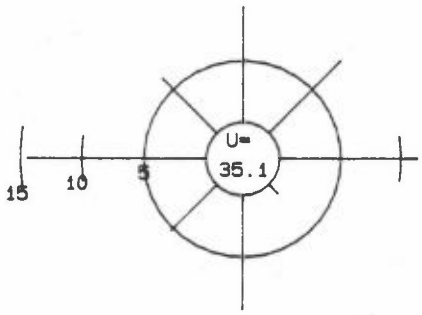
PAYERNE, SWITZERLAND
OZONE > 240. ug/M3



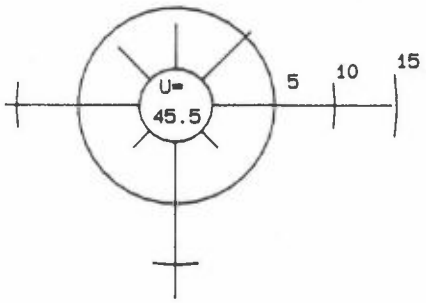
PAYERNE, SWITZERLAND
ALL DAYS



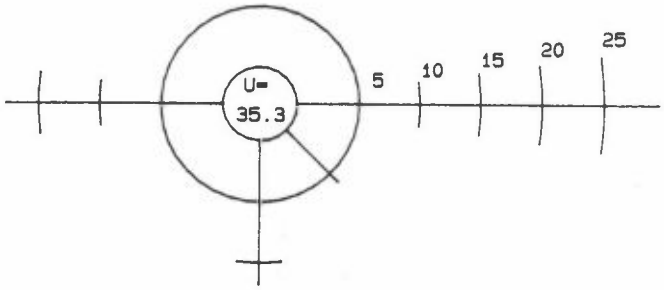
SION, SWITZERLAND
OZONE > 120. ug/M3



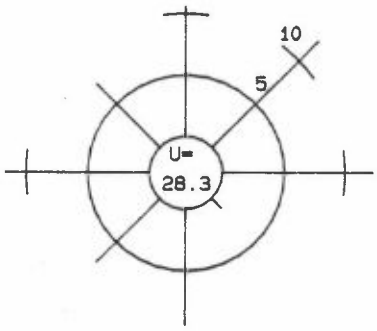
SION, SWITZERLAND
OZONE > 160. ug/M3



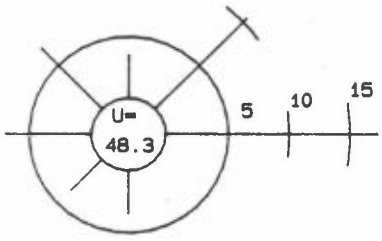
SION, SWITZERLAND
OZONE > 240. ug/M3



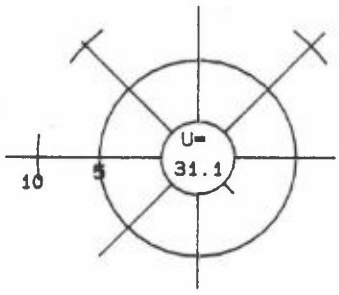
SION, SWITZERLAND
ALL DAYS



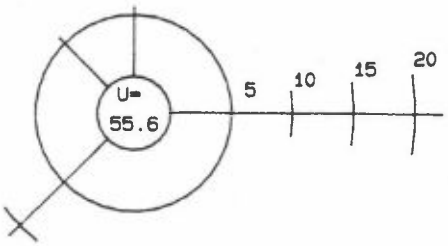
TAENIKON, SWITZERLAND
OZONE > 120. ug/M3



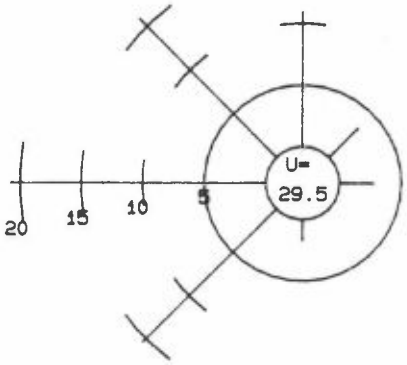
TAENIKON, SWITZERLAND
ALL DAYS



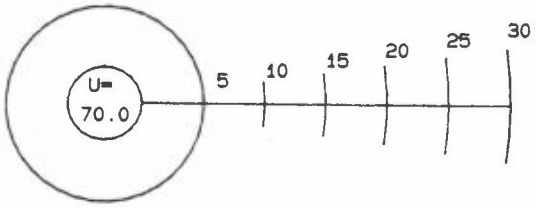
BOTTESFORD, UNITED KINGDOM
OZONE > 120. ug/M3



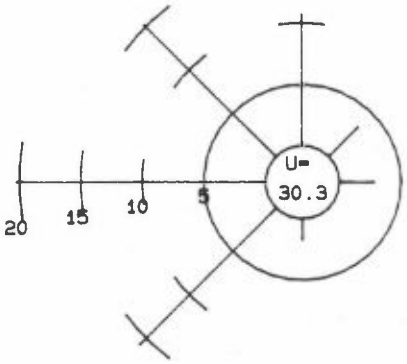
BOTTESFORD, UNITED KINGDOM
ALL DAYS



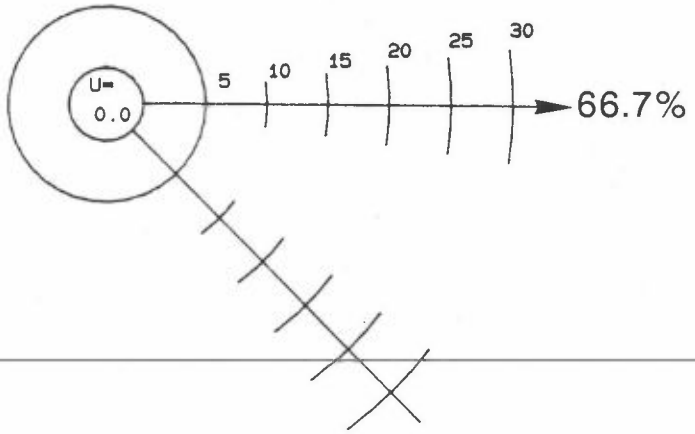
HARWELL, UNITED KINGDOM
OZONE > 120. ug/M3



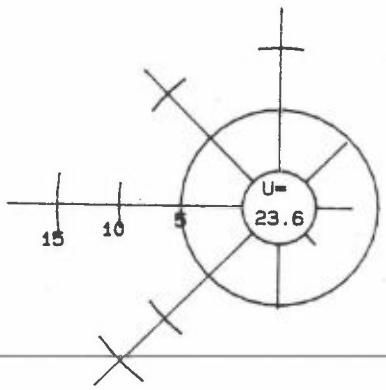
HARWELL, UNITED KINGDOM
ALL DAYS



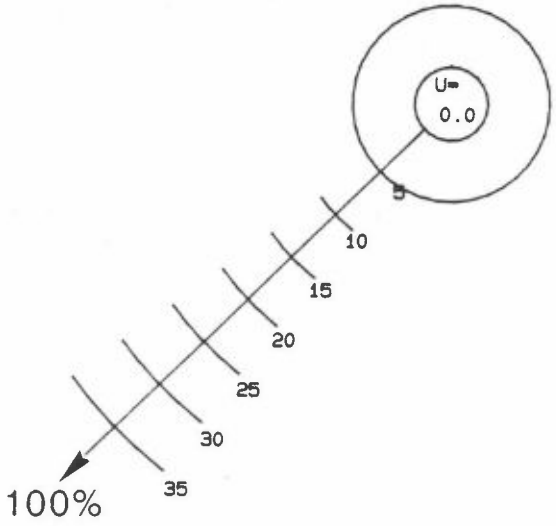
WRAY, UNITED KINGDOM
OZONE > 120. ug/M3



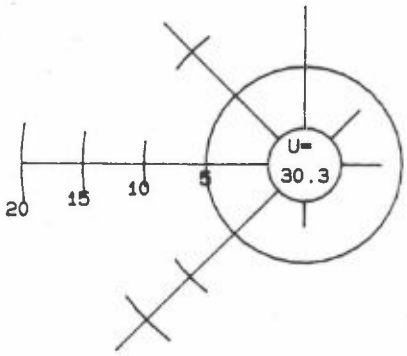
WRAY, UNITED KINGDOM
ALL DAYS



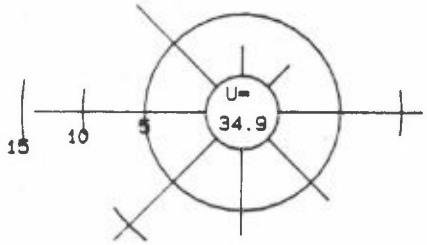
SIBTON, UNITED KINGDOM
OZONE > 120. ug/M3



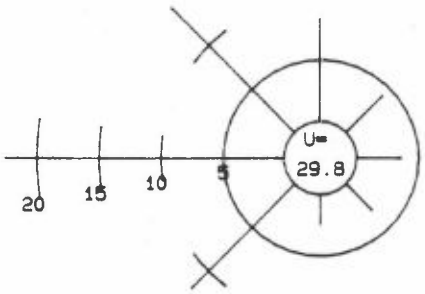
SIBTON, UNITED KINGDOM
ALL DAYS



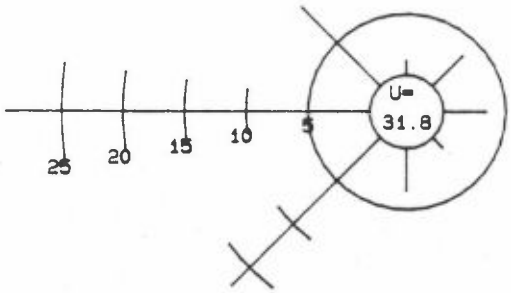
GENT, ST.KRUISWINKEL, BELGIUM
NO2 > 40. ug/M3



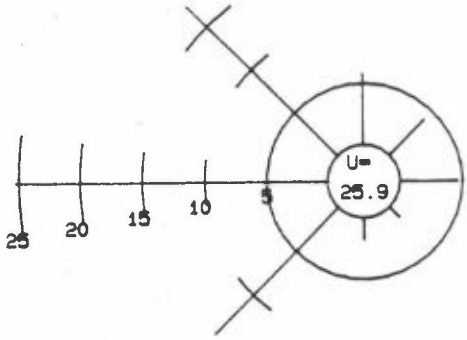
GENT, ST.KRUISWINKEL, BELGIUM
ALL DAYS



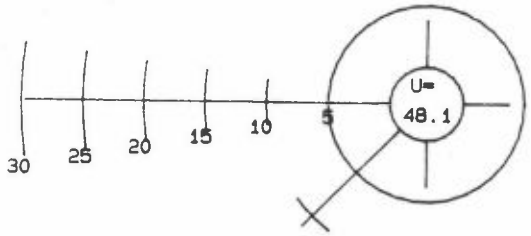
EIBERGEN, NETHERLANDS
NO2 > 40. ug/M3



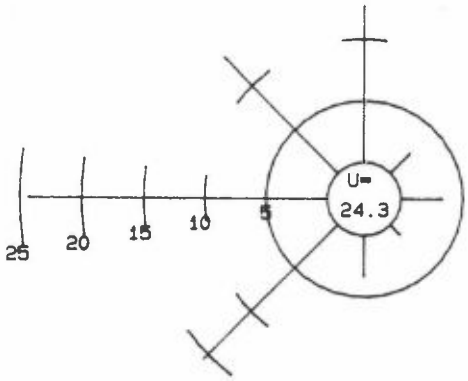
EIBERGEN, NETHERLANDS
ALL DAYS



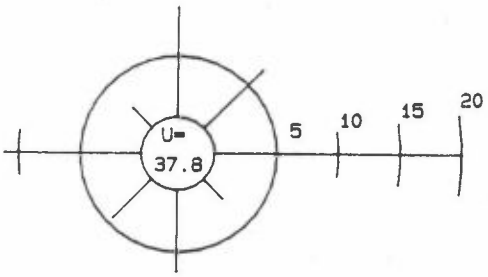
WITTEVEEN, NETHERLANDS
NO2 > 40. ug/M3



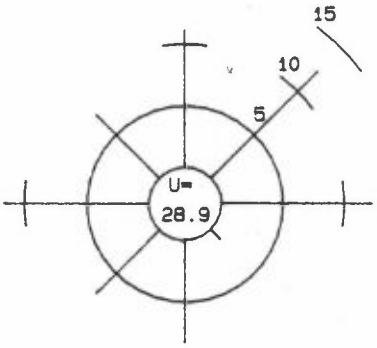
WITTEVEEN, NETHERLANDS
ALL DAYS



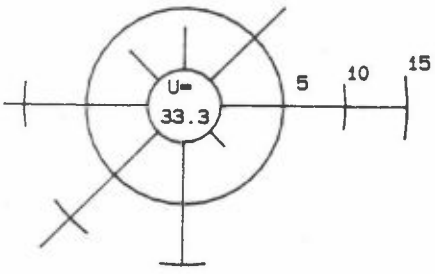
PAYERNE, SWITZERLAND
NO2 > 40. ug/M3



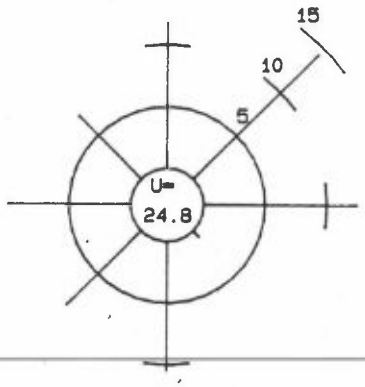
PAYERNE, SWITZERLAND
ALL DAYS



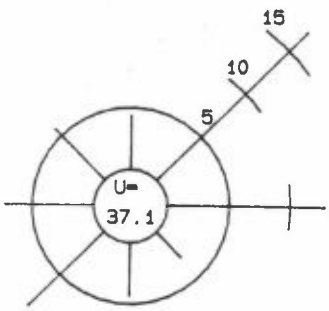
SION, SWITZERLAND
NO2 > 40. ug/M3



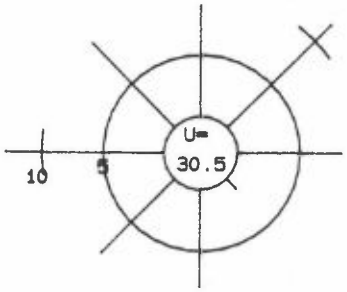
SION, SWITZERLAND
ALL DAYS



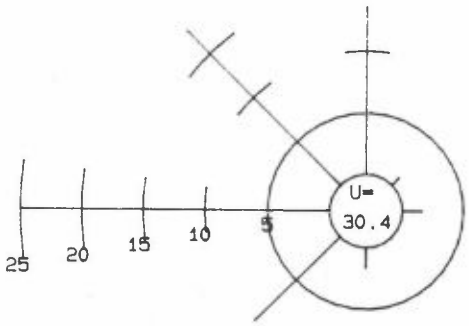
TAENIKON, SWITZERLAND
NO2 > 40. ug/M3



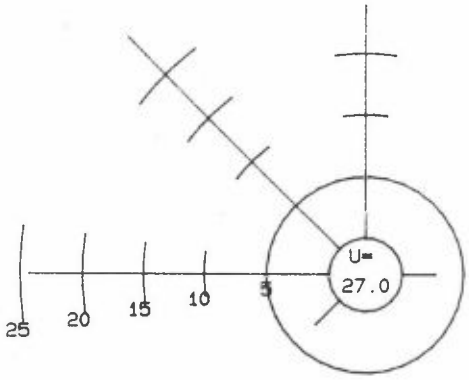
TAENIKON, SWITZERLAND
ALL DAYS



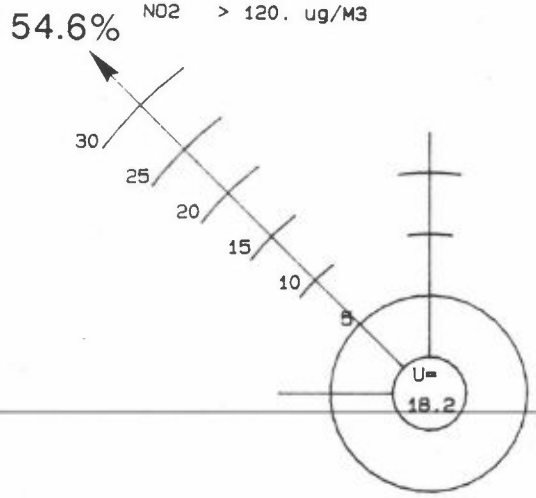
BOTTESFORD, UNITED KINGDOM
NO2 > 40. ug/M3



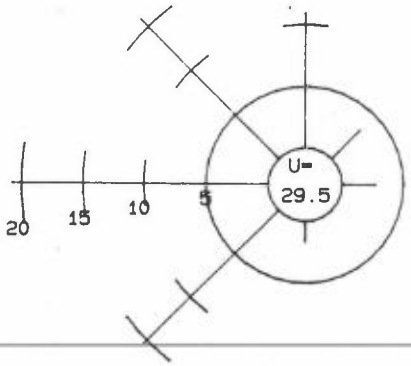
BOTTESFORD, UNITED KINGDOM
NO2 > 80. ug/M3



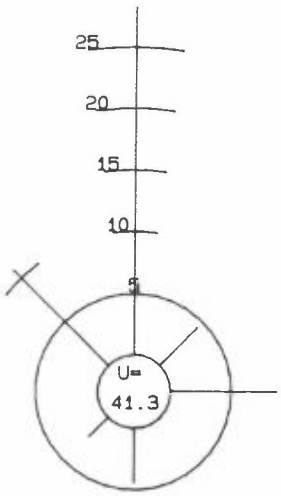
BOTTESFORD, UNITED KINGDOM
NO2 > 120. ug/M3



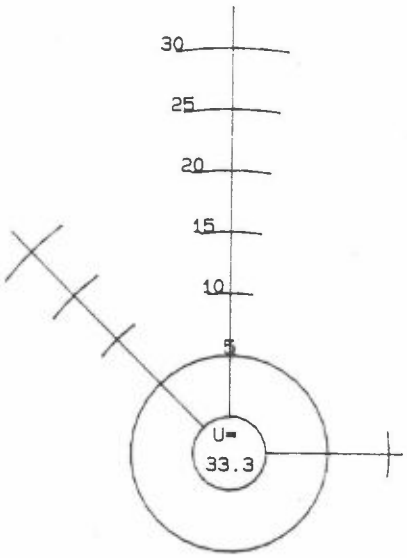
BOTTESFORD, UNITED KINGDOM
ALL DAYS



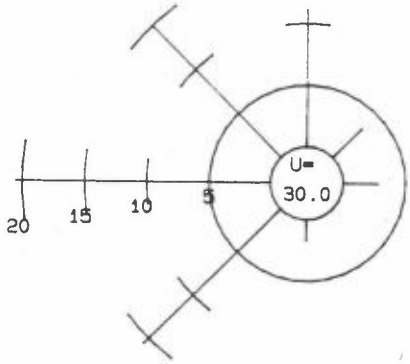
HARWELL, UNITED KINGDOM
NO2 > 40. ug/M3



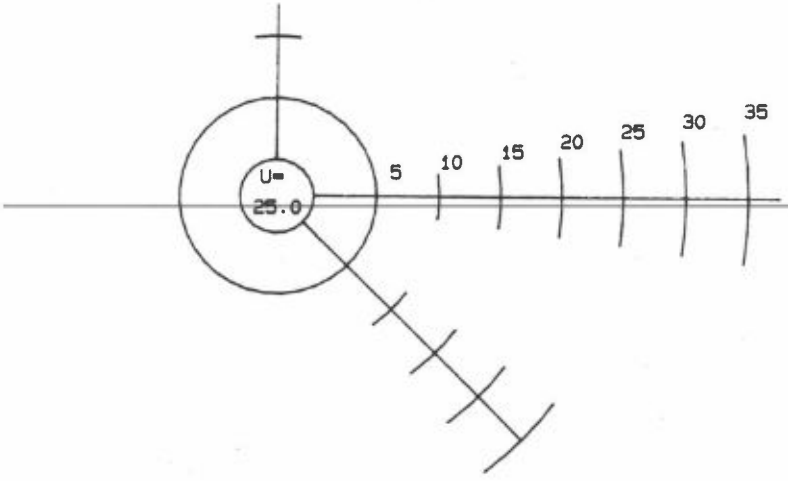
HARWELL, UNITED KINGDOM
NO2 > 80. ug/M3



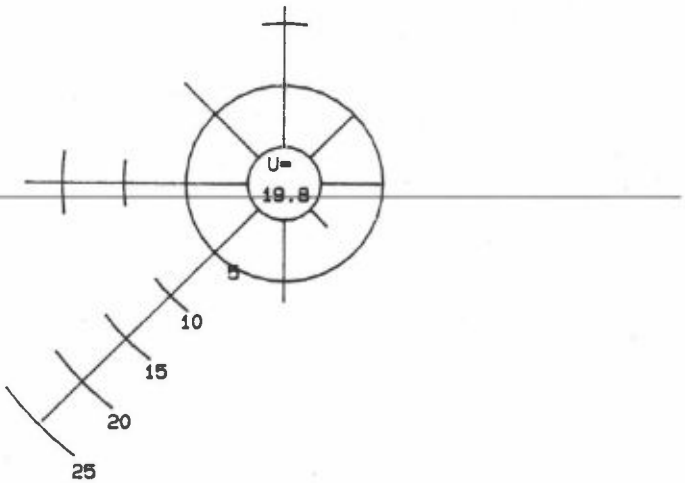
HARWELL, UNITED KINGDOM
ALL DAYS



WRAY, UNITED KINGDOM
NO2 > 40. ug/M3

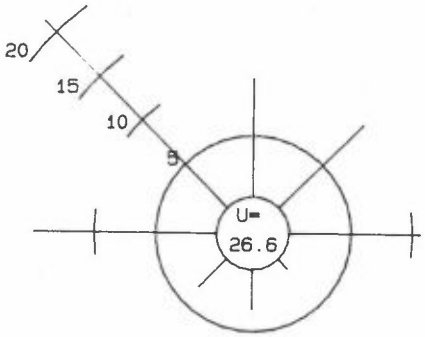


WRAY, UNITED KINGDOM
ALL DAYS



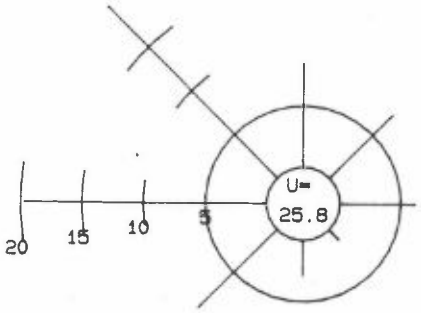
CRETEIL, FRANCE

PAN > 10. ug/M3



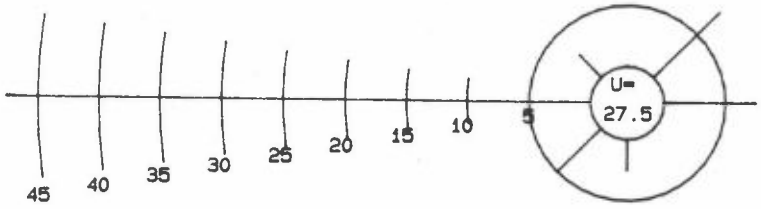
CRETEIL, FRANCE

ALL DAYS



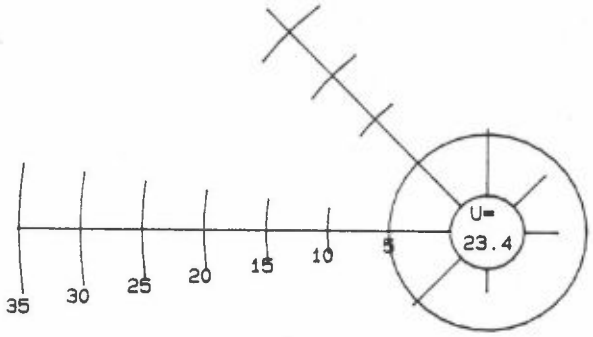
DELFT, NETHERLANDS

PAN > 10. ug/M3



DELFT, NETHERLANDS

ALL DAYS



NORSK INSTITUTT FOR LUFTFORSKNING (NILU)
NORWEGIAN INSTITUTE FOR AIR RESEARCH
POSTBOKS 64, N-2001 LILLESTRØM

RAPPORTTYPE OPPDRAGSRAPPORT	RAPPORTNR. 31/88	ISBN-82-7247-925-1	
DATO MAY 1988	ANSV. SIGN. J. Schjoldager	ANT. SIDER 175	PRIS NOK 205,-

TITTEL
Oxidant data collection in OECD-Europe 1985-87 (OXIDATE). Report on ozone, nitrogen dioxide and peroxyacetyl nitrate, October 1985-March 1986 and April-September 1986

PROSJEKTLEDER
J. Schjoldager

NILU PROSJEKT NR.
A-8535

FORFATTER(E)
P. Grennfelt
J. Saltbones
J. Schjoldager

TILGJENGELIGHET
A

OPPDRAGSGIVERS REF.

OPPDRAGSGIVER (NAVN OG ADRESSE)
Nordisk Ministerråd (Nordic Council of Ministers)
Store Strandstræde 18
DK-1255 København K, Danmark

3 STIKKORD (à maks. 20 anslag)
Ozon | Nitrogendioksid | PAN

REFERAT (maks. 300 anslag, 7 linjer)
Rapporten referer timedata fra 36 målesteder i 11 land i Europa. Ozondata foreligger fra 34 steder, NO_2-data fra 9 steder og PAN-data fra tre steder. Høyeste timesverdier og døgnverdier er gitt, sammen med kumulative frekvensfordelinger, midlere døgnvariasjon og fordeling på trajektorie-sektorer og en kort drøfting av ozonepisoder.

TITLE

ABSTRACT (max. 300 characters, 7 lines)
The report summarizes hourly data from 36 regional measurement stations in 11 countries. Ozone data is given for 34 stations, nitrogen dioxide data for nine stations and PAN data for three stations. Extreme values, monthly mean concentrations, frequency distributions, diurnal concentration variations and back trajectory sector distributions are given together with a brief discussion of oxidant episodes.

* Kategorier: Åpen - kan bestilles fra NILU A
Må bestilles gjennom oppdragsgiver B
Kan ikke utleveres C