

Measurements of total ozone 2000-2002

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General comments

A brief description of quality control, quality assurance and measurements of total ozone at Norrköping and Vindeln for the period 2000 to 2002 is reported. The measurements is operated within the swedish national environmental monitoring by SMHI and it is funded by the Swedish Environmental Protection Agency.

Plots of the daily data, Figures 1-6, and the daily standard lamp test values, Figures 7-8, are shown. Finally Tables 1-6 of daily values of total ozone are given. All Brewer values refer to Bass-Paur scale and are traceable to the Brewer Triad kept at Meteorological Service of Canada in Toronto via the travelling reference Brewer #017.

Data are regularly sent to the WOUDC (World Ozone and Ultraviolet Data Centre) about once a month. Eventual corrections to data are re-submitted. Therefore, the data kept at WOUDC should agree with the data kept at the national data centre at SMHI in Norrköping. The latter data are also available on the web site of SMHI (www.smhi.se), which is updated about once a week.

Quality of focused sun observations

The fundamental method for measuring the total ozone with Brewer and Dobson spectrophotometers is the direct sun method at relatively high solar elevations. However, at high latitude stations and at cloudy conditions other methods have to be applied. During overcast conditions empirical relations between direct sun observations and so called zenith sky observations are used. These relations have a larger uncertainty than the direct sun observations. But, to avoid gaps in the data during periods with cloudy weather this method is the only alternative. It is assumed that the method on average produce total ozone estimates in accordance with the direct sun method. Thus the monthly mean values and the long-term changes will be accurate. Although, individual values may be deviating with several percent (3-7%). During the winter time the sun is too low in the sky to permit reliable direct sun observations even during clear sky conditions. The signal is too low. For these occasions and also during morning and evening the focused sun method is a good alternative. Using the available instruments at Norrköping and Vindeln this method has been applied and the quality of the data has been evaluated, Josefsson (2003). The result was very encouraging. Focused sun observations is an accurate alternative for total ozone observations and thus the observation season can be extended to cover the full year at Norrköping and a larger part of the day as well. At Vindeln the sun is too low even for this method during the mid-winter. But the method also here extends the potential period for accurate observations and gives additional data.

Josefsson, W., 2003. Quality of Total Ozone Measured by the Focused Sun Method Using a Brewer Spectrophotometer, *J. Appl. Meteor.*, Vol. 42., No.1, pp.74-82.



Figure 1 Daily 'noon' values of total ozone recorded by Brewer #128 at Norrköping in 2000. Long-term mean and standard deviation are from Uppsala 1951-1966. The values at the bottom are the monthly deviations (percent) from the long term monthly means. All data refer to bass-Paur scale. Missing data are replaced by TOMS V6 data (thin line).

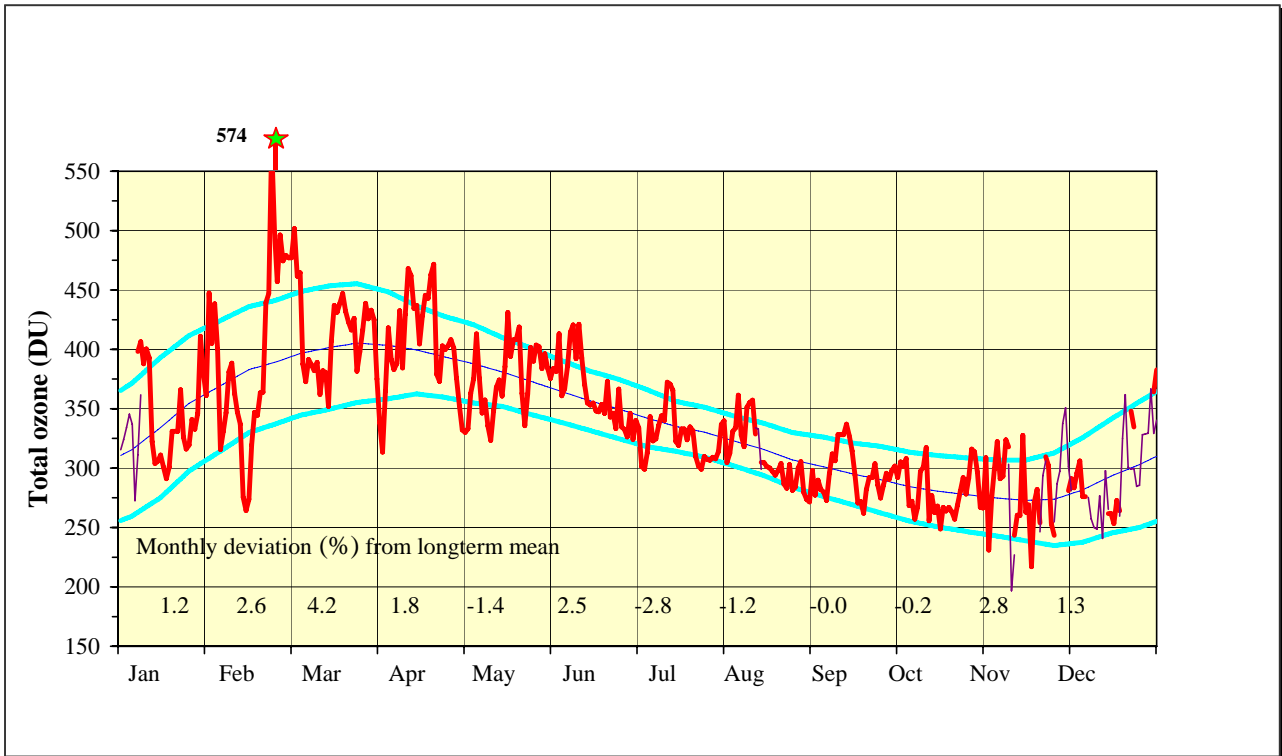


Figure 2 Daily 'noon' values of total ozone recorded by Brewer #128 at Norrköping in 2001. Long-term mean and standard deviation are from Uppsala 1951-1966. The values at the bottom are the monthly deviations (percent) from the long term monthly means. All data refer to bass-Paur scale. Missing data are replaced by TOMS V6 data (thin line).

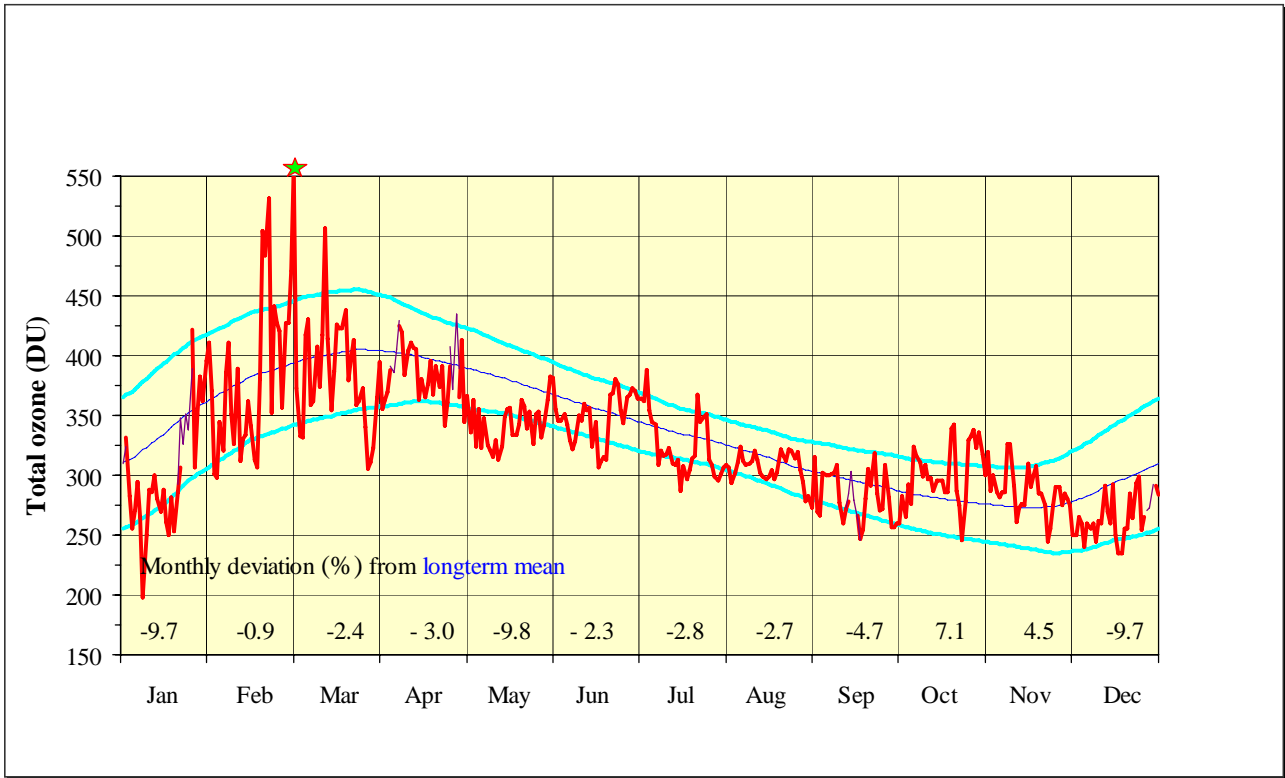


Figure 3 Daily 'noon' values of total ozone recorded by Brewer #128 at Norrköping in 2002. Long-term mean and standard deviation are from Uppsala 1951-1966. The values at the bottom are the monthly deviations (percent) from the long term monthly means. All data refer to bass-Paur scale. Missing data are replaced by TOMS V6 data (thin line).



Figure 4 Daily 'noon' values of total ozone recorded by Brewer #006 (red) and by Dobson #30 (green) at Vindeln in 2000. Long-term mean and standard deviation are from Uppsala 1951-1966. The values at the bottom are the monthly deviations (percent) from the long term monthly means. All data refer to bass-Paur scale. Missing data are replaced by TOMS V6 data (thin line).

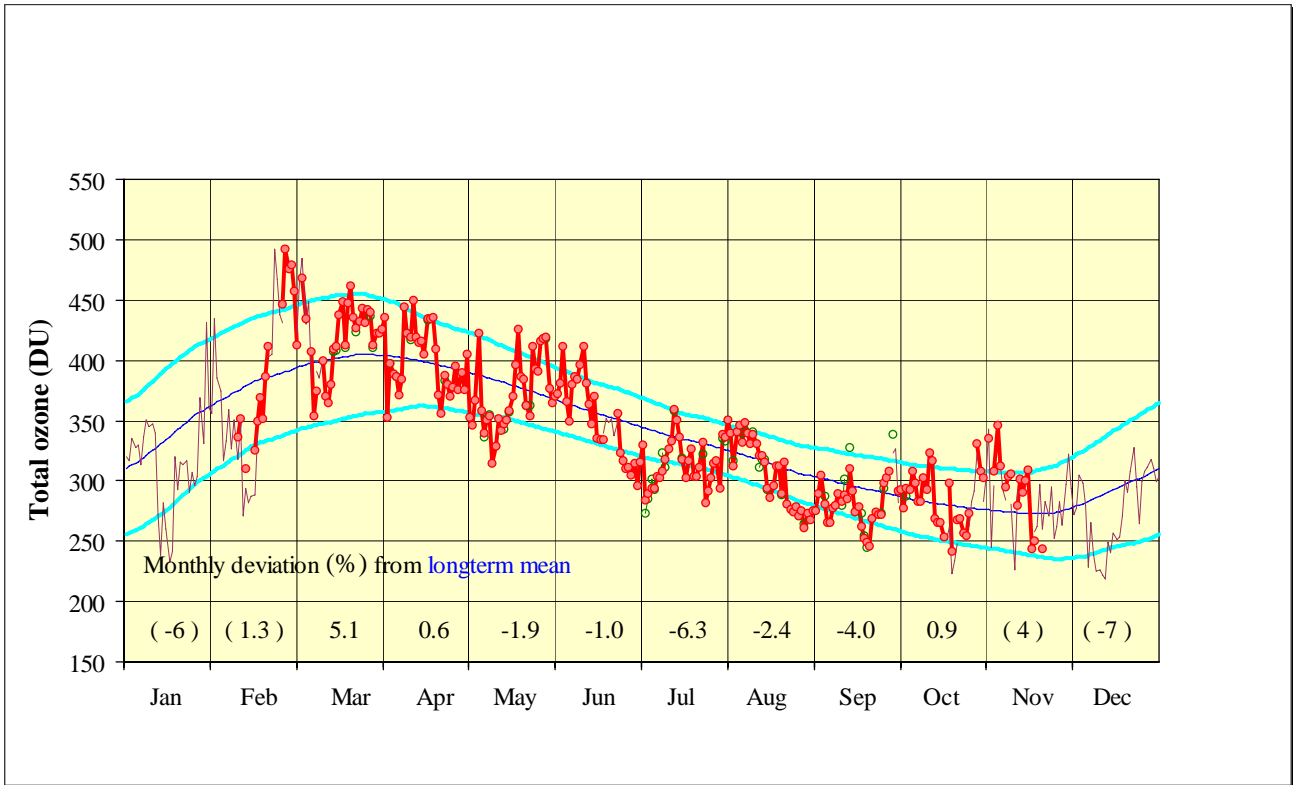


Figure 5 Daily 'noon' values of total ozone recorded by Brewer #006 (red) and by Dobson #30 (green) at Vindeln in 2001. Long-term mean and standard deviation are from Uppsala 1951-1966. The values at the bottom are the monthly deviations (percent) from the long term monthly means. All data refer to bass-Paur scale. Missing data are replaced by TOMS V6 data (thin line).



Figure 6 Daily 'noon' values of total ozone recorded by Brewer #006 (red) and by Dobson #30 (green) at Vindeln in 2002. Long-term mean and standard deviation are from Uppsala 1951-1966. The values at the bottom are the monthly deviations (percent) from the long term monthly means. All data refer to bass-Paur scale. Missing data are replaced by TOMS V6 data (thin line).

Status of Brewer #128

The responsivity of Brewer #128 retrieved from the calibration at Vindeln in June 1999 was altered during the transport to Norrköping. Data had to be corrected using the standard lamp test values.

At the NOGIC 2000 intercomparison at Tylösand (2000-06-09—15) the Brewer #128 was once again compared (calibrated) versus the travelling reference Brewer #017 operated by IOS (Ken Lamb and assisted by Vladimir Savastiouk). The outcome of this calibration proved that the correction using standard lamp test values seems to have been very good, i.e. within 1%. Despite the good agreement data from June 1999 up to 2000 has been corrected based on the Tylösand calibration and standard lamp measurements. This revision was made in January 2001 followed by resubmission of data to WOUDC.

The standard lamp test results over the years since 1999 indicate a gradual change of the responsivity. Preliminary correction based on these results are applied to the total ozone data. Final analysis will be made after the next absolute calibration.

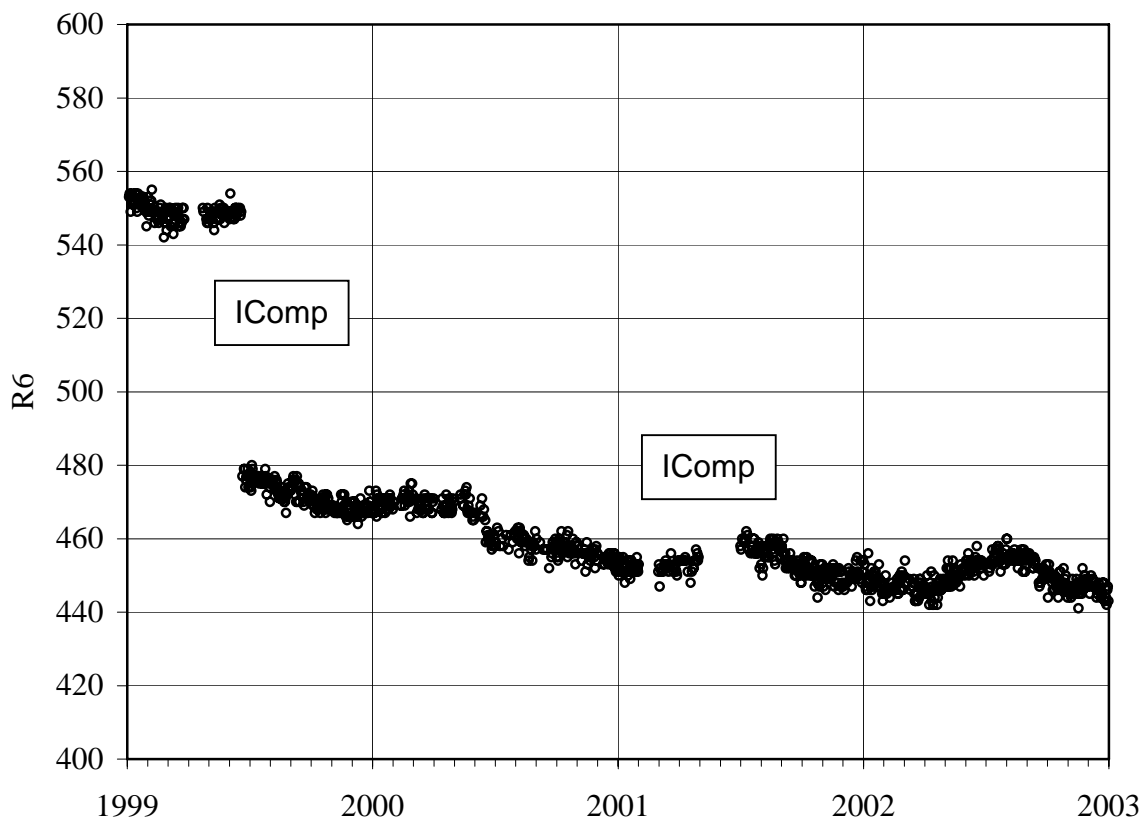


Figure 7 Standard lamp test value R6 for Brewer #128 over the period 1999-2003. The large change after the calibration in 1999 is clearly seen. Note that the relative scale is different as compared with the similar graph for Brewer #006.

Status of Brewer #006

The change in the responsivity of the instrument is tracked using the standard lamp tests. In September 2002 a preliminary analysis was made and the temporal change in the responsivity since the calibration in 1999 was deduced. Based on the results, adjustments were made to the total ozone and the new values were resubmitted to WOUDC in September 2002.

After the Intercomparison at Vindeln in June 2002, IC₂₀₀₂, it was noted that Brewer #006 has changed its responsivity. This is a summary of the magnitude of the change and some arguments when and how to apply corrections to the pre-calibration data.

- An estimate of the shift @IC₂₀₀₂ using the Dobson #30 gives about 4%.
- The difference in the ETC's

	IC ₁₉₉₉	IC ₂₀₀₂	Δ
ETC-ozon	3034	2995	39
ETC-SO ₂	3004	2945	59

The difference in ETC's affects the total ozone TOZ through the equation

$$TOZ = (R6 - ETC) / (10 * \alpha * \mu)$$

It can be seen that the effect is μ -dependent. At noon-time during the summer the difference in TOZ will be about 3%.

- The difference in the SL-test values at the intercomparisons

	IC ₁₉₉₉	IC ₂₀₀₂	Δ
SL-ozon-R6	1915	1875	40
SL-SO ₂ -R5	3685	3610	75

The difference in the SL-test R6-values affects the total ozone TOZ through the equation

$$TOZ = (R6 + \Delta - ETC) / (10 * \alpha * \mu)$$

It can be seen that the effect is μ -dependent. At noon-time during the summer the difference in TOZ will be about 3%. The following assumptions are made

1. The SL-test values track the changes in the sensitivity.
2. The effect on the TOZ due to changes in the wavelength setting detected at the IC₂₀₀₂ are assumed to be properly described by the SL-test values.

The SL-test values applied in the corrections are given by time dependent linear equations in a correction program, see Figure 8.

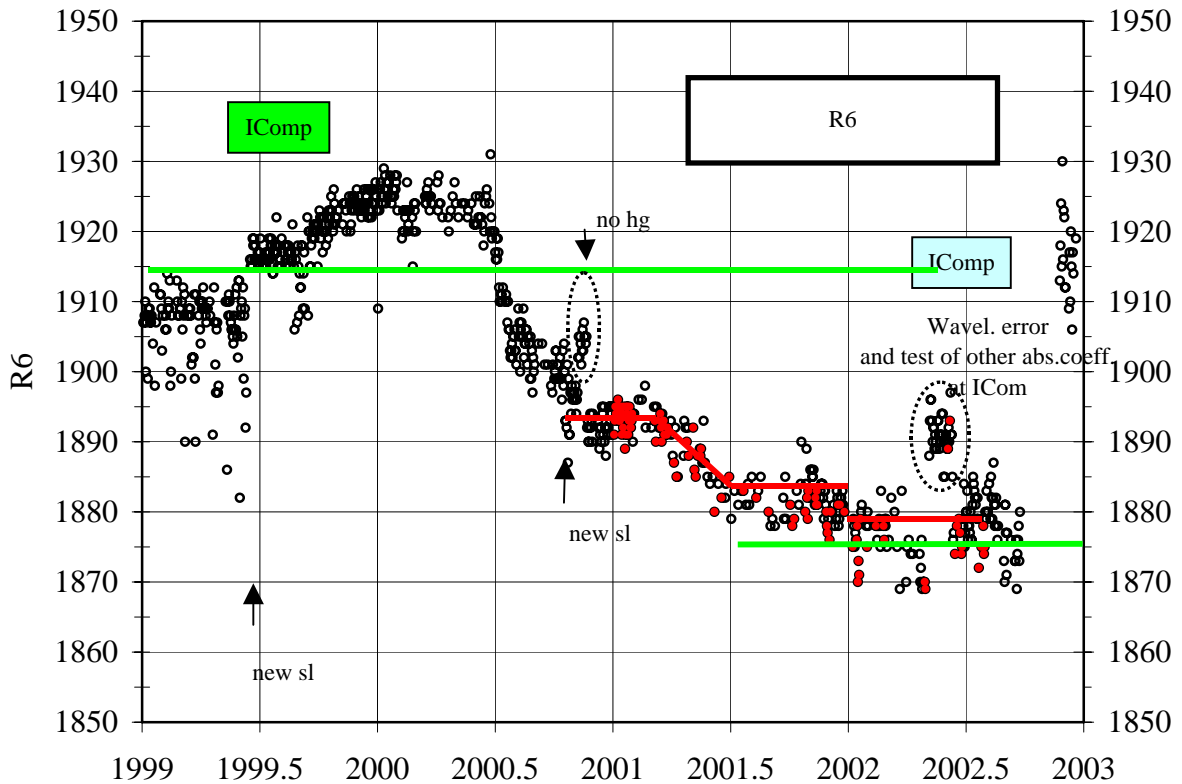


Figure 8. Standard lamp test value R6 for Brewer #006 over the period 1999-2003. Comments regarding intercomparisons in 1999 and 2002. Changes of lamps affects the results.

Status of Dobson #30

The Dobson #30 was calibrated in June 2001 at Hohenpeissenberg, Germany. The results were encouraging. Initially there was a small difference versus the reference instrument Dobson # 64. However, after cleaning the optics the following calibration showed very good agreement with the previous calibration at Arosa in 1996.

TOTAL OZONE (DU), VINDELN 2000 Brewer # 006

2000	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	-	-	-	360.7	322.9	380.5	310.0	302.5	280.5	266.7	-	-
2	-	-	308.5	368.5	332.3	356.7	313.1	299.4	291.8	275.0	-	-
3	-	348.5	298.5	359.8	370.4	370.0	305.0	319.4	322.4	265.0	-	-
4	-	-	305.5	-	351.6	385.0	301.8	300.1	310.6	260.0	-	-
5	-	-	288.9	-	377.3	368.5	314.3	312.3	314.3	270.0	-	-
6	-	-	300.0	394.1	335.9	367.0	326.1	314.5	300.1	270.0	-	-
7	-	-	310.0	376.7	360.7	370.0	330.0	345.0	295.0	-	-	-
8	-	332.9	313.5	360.4	347.0	353.6	340.0	345.7	300.0	-	-	-
9	-	363.1	315.9	265.8	337.6	334.3	347.4	320.8	302.0	-	-	-
10	-	-	299.0	285.5	359.3	304.2	346.5	317.2	311.4	278.3	-	-
11	-	443.6	311.6	328.3	399.5	340.5	340.3	309.5	318.4	-	-	-
12	-	331.4	294.5	319.3	337.4	359.1	350.0	300.0	302.0	-	-	-
13	-	-	280.0	309.6	335.8	322.8	333.6	301.0	303.6	280.0	-	-
14	-	455.8	380.4	335.0	343.2	399.0	-	300.2	291.5	301.3	-	-
15	-	414.2	405.4	390.0	335.8	378.7	-	300.0	290.1	290.0	-	-
16	-	-	355.7	380.0	321.1	378.1	-	295.0	252.3	254.6	-	-
17	-	-	334.4	395.0	333.9	388.5	330.0	310.3	238.2	-	-	-
18	-	-	375.5	365.0	326.3	353.0	308.0	316.8	253.1	280.1	-	-
19	-	404.0	366.7	366.1	316.6	338.0	300.0	325.9	248.5	278.2	-	-
20	-	378.6	363.3	344.9	320.0	370.4	320.0	321.8	241.2	-	-	-
21	-	366.4	417.0	339.4	348.9	319.0	300.6	320.0	238.4	-	-	-
22	-	-	428.3	390.0	360.9	309.1	300.8	324.8	229.4	283.7	-	-
23	-	-	395.5	359.0	350.7	335.2	311.8	310.3	235.1	258.7	-	-
24	-	-	453.7	361.6	351.9	333.0	325.0	304.5	250.5	-	-	-
25	250.0	-	407.5	382.2	350.0	323.8	287.2	276.1	250.9	-	-	-
26	260.7	-	426.5	382.8	340.0	317.5	285.7	262.6	252.2	-	-	-
27	-	-	380.5	363.4	362.9	330.0	279.5	271.3	266.6	304.2	-	-
28	313.0	-	375.5	340.0	359.9	316.6	282.8	285.1	281.8	282.8	-	-
29	-	-	344.7	344.6	333.4	306.6	288.7	284.0	240.0	287.6	-	-
30	-	-	353.2	337.7	370.0	311.5	294.3	285.0	249.7	-	-	-
31	-	-	338.4	-	395.3	-	304.3	294.6	-	-	-	-

TOTAL OZONE (DU), VINDELN 2001 Brewer # 006

2001	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	-	-	457.3	426.2	405.0	369.8	315.3	350.3	275.7	293.0	334.9	-
2	-	-	412.5	435.1	353.2	372.0	329.6	339.5	289.5	278.0	-	-
3	-	-	-	352.4	346.6	380.9	284.4	312.0	305.0	293.7	308.0	-
4	-	-	468.4	397.4	366.8	411.5	289.9	341.0	280.7	293.0	345.8	-
5	-	-	434.3	388.3	422.4	366.0	293.7	346.0	265.0	308.0	311.9	-
6	-	-	-	386.4	358.5	350.0	294.3	332.1	265.7	298.0	-	-
7	-	-	406.7	371.0	339.6	379.9	303.7	348.3	277.2	283.0	294.6	-
8	-	-	354.1	384.0	350.2	386.1	302.4	339.8	280.0	283.0	303.8	-
9	-	336.0	375.0	444.0	354.0	384.8	308.1	331.0	290.0	303.0	305.6	-
10	-	351.3	-	422.5	314.1	396.0	317.4	338.7	283.5	293.0	-	-
11	-	-	400.0	419.2	328.7	412.1	327.0	331.3	287.9	323.0	279.3	-
12	-	310.1	370.0	449.3	351.7	380.6	332.8	320.8	285.0	316.9	301.1	-
13	-	-	365.0	418.9	341.6	363.2	359.1	321.5	310.0	268.5	290.8	-
14	-	-	380.0	415.1	346.9	347.0	350.3	315.9	291.2	265.9	300.8	-
15	-	325.0	409.3	416.2	350.4	370.5	336.8	293.8	274.1	265.1	309.6	-
16	-	349.6	411.4	405.0	357.8	334.9	317.5	286.6	278.5	253.0	243.4	-
17	-	369.4	437.8	435.0	370.4	334.2	302.5	296.5	262.1	-	250.4	-
18	-	351.4	448.1	434.0	396.0	333.8	317.0	312.8	252.8	298.3	-	-
19	-	386.2	412.8	435.1	426.0	-	327.0	312.7	249.6	241.1	-	-
20	-	412.1	448.0	409.6	386.0	-	304.1	289.7	245.6	-	243.5	-
21	-	-	461.7	371.0	383.9	-	303.6	316.0	269.2	267.4	-	-
22	-	-	435.7	355.6	362.5	-	311.7	280.8	274.0	268.7	-	-
23	-	-	427.2	387.7	353.5	356.1	332.0	276.0	272.4	256.8	-	-
24	-	-	432.5	380.0	412.1	323.8	281.8	274.3	271.6	254.7	-	-
25	-	446.5	443.5	370.0	393.4	317.0	291.8	279.1	297.7	272.8	-	-
26	-	492.6	430.9	378.0	391.3	309.7	302.3	270.6	302.1	-	-	-
27	-	476.2	442.0	395.0	416.0	311.5	314.3	275.0	307.9	-	-	-
28	-	479.1	439.8	376.0	418.4	304.9	317.2	261.6	-	330.6	-	-
29	-	-	413.1	389.5	419.0	314.2	294.4	273.4	-	308.2	-	-
30	-	-	423.0	375.2	376.2	296.3	338.4	267.3	291.5	302.7	-	-
31	-	-	423.0	-	364.7	-	336.4	275.3	-	-	-	-

TOTAL OZONE (DU), VINDELN 2002 Brewer # 006

2002	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	-	-	486.2	373.4	351.1	346.7	366.5	299.0	249.2	279.5	268.3	-
2	-	-	528.0	356.5	385.0	383.0	346.8	289.1	256.8	277.2	-	-
3	-	-	404.6	358.9	351.9	340.3	373.9	298.0	252.1	290.0	245.1	-
4	-	-	372.3	381.0	350.2	321.3	334.9	315.9	-	-	246.9	-
5	-	328.4	436.3	343.0	384.5	317.8	339.0	290.8	-	-	253.3	-
6	-	-	412.6	385.3	308.6	310.2	324.2	285.9	-	300.0	-	-
7	-	-	393.3	381.1	278.3	301.7	335.3	291.2	-	-	-	-
8	-	-	384.0	365.2	288.9	298.3	344.2	306.4	272.6	295.0	-	-
9	-	-	-	381.9	324.9	300.1	304.1	300.1	257.4	287.0	-	-
10	-	-	424.0	338.0	311.1	308.4	302.3	304.8	249.0	270.0	-	-
11	-	-	382.1	320.7	300.0	312.5	297.5	312.1	281.8	270.0	-	-
12	-	-	-	397.7	309.2	313.5	314.8	299.1	280.4	280.0	-	-
13	-	327.6	520.3	387.0	314.5	356.9	308.9	284.0	287.9	280.0	-	-
14	-	-	354.1	365.7	317.6	346.2	316.0	286.1	239.0	275.0	-	-
15	-	364.3	358.7	358.2	330.5	343.9	317.0	285.3	257.9	267.9	-	-
16	-	303.3	400.0	370.3	330.5	337.6	299.2	293.5	268.7	284.0	-	-
17	-	379.3	425.0	375.7	372.3	356.9	281.0	285.7	266.8	300.8	-	-
18	-	-	415.0	386.1	409.8	302.8	288.9	298.7	265.1	314.6	-	-
19	-	517.1	415.0	407.9	363.3	344.3	306.1	314.7	269.5	300.0	-	-
20	-	524.2	420.0	354.8	329.5	349.3	295.5	303.8	300.0	315.0	-	-
21	-	520.9	415.0	366.5	348.3	336.8	288.9	301.7	292.9	295.0	-	-
22	-	-	405.0	342.1	345.1	352.4	298.2	299.4	285.9	250.0	-	-
23	-	-	350.0	368.3	349.5	359.0	327.2	292.7	293.7	-	-	-
24	-	-	375.0	354.4	363.2	338.6	330.8	-	308.6	312.8	-	-
25	-	-	370.0	379.6	347.3	355.8	334.7	294.3	300.0	-	-	-
26	-	-	339.3	386.6	336.0	354.3	332.0	270.1	266.4	325.0	-	-
27	-	-	346.0	375.7	336.3	353.2	-	277.5	250.0	-	-	-
28	-	443.0	316.0	401.7	330.5	360.9	-	257.0	-	-	-	-
29	-	-	317.4	397.3	340.8	363.3	269.0	291.1	300.0	-	-	-
30	-	-	360.2	365.0	-	371.8	278.7	260.9	290.1	-	-	-
31	-	-	371.0	-	349.9	-	295.6	294.5	-	-	-	-

TOTAL OZONE (DU), NORRKÖPING 2000 Brewer # 128

2000	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	272.4	304.0	311.0	350.0	337.0	375.2	346.8	318.1	293.3	254.7	312.3	281.8
2	293.7	302.6	316.3	367.8	346.0	342.9	341.2	315.0	307.2	253.3	337.7	-
3	292.4	340.9	335.1	372.0	347.4	357.3	328.3	324.8	327.0	275.1	-	283.3
4	311.6	266.0	-99.0	364.7	353.1	346.9	328.9	329.5	325.5	264.0	-	285.0
5	315.0	250.3	320.2	370.6	339.5	344.4	333.2	308.6	323.3	262.0	315.9	-
6	313.9	280.7	271.0	391.1	330.8	327.0	330.5	328.0	307.0	259.5	285.5	257.3
7	284.2	326.8	308.2	410.2	350.6	342.0	357.0	343.2	309.3	272.0	-	-
8	290.0	351.0	310.1	355.5	351.0	336.2	337.1	329.0	279.4	267.0	280.0	-
9	292.9	351.0	334.8	383.3	354.8	-	354.9	329.7	311.4	277.0	305.5	338.3
10	310.7	336.6	336.8	341.6	350.4	-	350.0	310.1	308.0	292.0	-	379.0
11	310.0	360.0	331.4	332.0	362.0	-	354.9	313.7	309.2	297.0	295.4	362.2
12	320.0	342.0	299.2	352.0	334.3	-	345.2	306.9	297.0	287.0	267.9	337.8
13	320.0	481.1	291.9	357.0	327.1	-	367.0	300.7	297.6	290.7	-	-
14	320.0	379.1	352.4	333.6	330.0	-	349.4	301.9	312.9	303.3	-	388.2
15	313.1	406.9	367.2	355.9	333.1	-	329.7	302.5	293.2	294.0	-	-
16	274.5	430.7	370.9	391.7	338.0	376.7	352.0	301.4	275.7	256.3	-	372.7
17	305.7	446.0	345.9	366.4	327.8	353.9	344.0	309.1	257.9	252.0	-	375.5
18	399.5	362.6	346.9	350.4	336.6	343.0	342.7	312.0	252.8	296.2	-	-
19	334.7	351.6	358.9	358.0	353.1	337.2	346.3	324.5	260.0	301.0	-	337.6
20	384.5	403.3	330.5	361.6	344.1	334.5	342.0	317.2	264.5	291.0	-	-
21	336.6	381.1	360.3	349.9	366.5	322.7	337.0	317.5	270.2	273.6	-	-
22	329.2	396.0	363.2	358.2	372.2	312.8	332.0	317.0	252.7	285.7	-	-
23	344.2	341.0	412.1	336.1	363.9	329.7	332.0	321.7	245.8	265.2	240.2	-
24	340.7	326.0	382.5	329.5	356.0	348.1	335.9	315.6	248.0	281.3	-	-
25	247.6	433.7	366.9	349.4	347.0	345.8	309.3	292.2	259.0	298.1	231.8	-
26	265.2	378.4	371.0	335.4	374.5	355.7	317.0	274.9	261.7	301.0	-	-
27	300.8	299.1	405.8	333.7	332.7	352.0	302.0	288.2	271.0	307.7	-	-
28	258.1	301.0	402.2	323.7	353.1	345.4	313.0	296.5	257.0	286.0	296.3	-
29	291.0	309.1	369.6	330.1	361.5	330.8	314.0	298.3	248.1	291.8	-	-
30	347.3	-	342.1	341.5	395.3	327.0	314.6	310.0	253.3	326.0	-	-
31	355.4	-	347.0	-	390.5	-	311.8	319.9	-	298.3	-	-

TOTAL OZONE (DU), NORRKÖPING 2001 Brewer # 128

2001	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	-	447.4	477.0	-	332.2	375.5	340.2	339.8	298.0	292.0	308.9	291.0
2	-	405.0	477.0	338.1	330.1	384.0	333.9	304.6	277.2	305.2	231.0	283.4
3	-	438.3	501.7	313.5	333.1	381.4	301.3	312.5	289.8	301.6	274.4	296.0
4	364.2	400.6	461.5	365.0	363.0	413.2	299.1	330.9	282.0	308.1	298.9	306.0
5	-	315.6	464.6	418.1	375.0	360.9	312.8	334.0	279.8	268.4	322.4	276.0
6	-	331.0	387.6	391.6	413.1	366.8	343.3	361.5	272.7	272.0	291.0	276.0
7	398.2	346.6	372.8	383.0	375.8	385.8	322.9	327.8	295.4	257.0	293.2	-
8	406.5	381.0	391.5	388.0	346.4	414.5	324.7	318.0	311.9	267.0	323.8	-
9	387.9	388.4	387.0	432.6	357.4	420.6	335.9	351.3	306.2	297.3	317.9	-
10	400.4	362.3	382.0	384.3	335.6	392.1	344.0	355.3	328.3	300.8	-	244.9
11	392.8	347.0	389.1	429.3	323.3	421.1	340.2	357.3	328.2	317.4	243.4	-
12	322.4	337.0	362.0	468.0	348.5	392.7	372.3	328.7	328.1	255.6	260.3	-
13	304.0	275.5	382.0	462.1	368.1	370.1	370.8	-	337.0	276.9	260.1	-
14	305.9	264.3	380.5	434.5	374.2	354.9	365.7	304.8	327.0	262.6	327.7	261.7
15	311.0	273.7	352.0	437.0	360.6	353.1	322.6	304.6	314.6	268.0	262.9	261.7
16	301.0	319.4	407.0	404.6	385.4	354.9	319.1	301.3	294.2	248.8	269.0	253.4
17	291.0	347.0	437.0	428.3	431.1	348.0	333.0	300.1	270.6	267.0	217.0	272.8
18	301.0	344.5	431.2	445.5	394.1	347.4	333.0	297.2	271.8	263.8	271.1	264.1
19	331.0	363.4	439.1	443.0	408.1	353.7	323.8	294.0	262.0	267.0	282.1	-
20	331.0	363.9	447.0	463.0	408.6	346.1	334.8	298.1	282.0	263.3	253.9	334.3
21	331.0	439.3	-	471.6	418.8	373.0	331.5	303.9	292.0	257.0	-	-
22	366.0	447.0	423.1	379.1	362.9	343.0	309.5	286.6	292.0	268.6	309.5	348.1
23	326.0	573.9	416.3	373.0	335.7	346.2	301.7	283.1	303.7	280.5	302.2	334.7
24	316.0	498.9	426.1	403.0	362.6	333.2	299.1	303.0	285.6	292.0	253.3	-
25	319.4	457.0	381.6	399.8	401.8	366.5	309.9	281.3	274.8	278.1	243.4	-
26	341.0	496.3	397.9	403.0	390.0	334.6	307.4	284.0	285.6	291.6	-	-
27	332.7	474.5	416.3	408.2	403.7	332.7	306.6	300.2	295.7	316.0	-	361.8
28	346.0	479.1	438.8	401.2	402.3	326.3	309.2	305.5	290.6	313.8	-	-
29	411.0	-	425.7	375.8	383.8	346.2	307.8	279.5	298.2	296.6	-	-
30	380.3	-	433.0	352.8	396.3	324.1	314.0	273.6	301.7	267.0	281.0	364.1
31	361.0	-	-	-	384.4	-	336.7	271.6	-	266.4	-	382.8

TOTAL OZONE (DU), NORRKÖPING 2002 Brewer # 128

2002	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	-	371.0	470.5	394.3	344.8	382.0	364.1	309.2	314.9	259.3	319.8	250.0
2	331.4	301.0	558.8	355.3	366.3	355.8	364.1	306.2	269.8	282.7	286.5	250.0
3	282.1	297.5	372.7	363.1	336.3	345.9	362.1	293.4	266.0	265.1	299.9	265.0
4	255.3	344.4	333.0	369.1	363.0	346.0	388.0	302.2	302.3	292.0	286.0	260.0
5	270.8	321.0	331.2	388.4	324.4	351.4	354.6	311.4	300.1	276.0	281.0	240.0
6	294.6	385.6	417.0	-	355.1	342.4	344.3	323.8	299.7	324.3	285.5	260.0
7	265.0	411.0	430.0	-	322.9	329.4	342.8	312.0	300.9	316.1	286.2	255.0
8	198.3	351.0	359.2	424.7	348.3	321.2	309.0	309.1	301.8	311.0	326.0	260.0
9	250.0	326.2	362.0	419.1	325.4	328.1	320.3	309.6	308.2	298.9	326.0	244.8
10	287.8	388.8	407.5	383.5	320.3	350.1	316.7	312.1	277.3	308.9	291.0	262.5
11	285.9	311.5	373.9	403.9	314.9	346.1	317.1	320.4	259.4	296.6	261.0	260.0
12	300.0	330.6	417.0	410.9	329.7	359.5	322.7	312.6	272.0	297.6	272.6	291.0
13	280.0	333.5	507.0	407.0	312.6	354.7	310.1	301.8	277.9	286.8	276.0	270.0
14	270.0	362.4	414.3	405.6	324.2	356.4	308.8	298.5	-	296.0	275.0	260.0
15	287.7	341.7	354.2	363.0	348.8	323.5	312.7	296.6	-	296.0	310.0	292.0
16	261.0	313.2	386.7	380.1	355.2	345.1	287.0	298.5	266.1	296.0	290.0	250.0
17	250.0	306.6	425.7	365.7	356.3	306.4	307.4	304.0	246.2	286.0	300.0	235.0
18	281.0	380.0	423.0	375.8	333.2	311.8	296.3	297.0	254.1	285.5	307.9	235.0
19	253.6	504.2	423.0	396.0	333.2	315.5	304.6	302.7	280.8	338.9	285.0	255.0
20	286.0	483.2	437.9	367.6	342.3	313.2	314.5	321.9	305.5	342.5	285.0	255.0
21	306.0	531.9	379.1	390.9	363.0	367.2	316.0	316.4	291.3	286.6	275.0	284.7
22	-	352.0	398.0	373.6	357.1	368.2	366.9	311.9	318.1	275.4	245.0	264.5
23	326.0	441.0	413.0	391.2	339.1	380.1	345.0	322.1	285.2	246.0	255.0	293.2
24	-	426.9	358.2	341.6	353.0	375.6	348.6	320.7	270.8	278.5	275.0	298.9
25	421.9	420.7	362.3	360.7	326.0	354.4	350.6	314.1	271.2	329.0	290.0	254.0
26	306.0	357.0	372.5	391.2	351.1	343.0	312.6	319.1	309.2	333.0	290.0	265.0
27	351.0	427.0	339.7	-	353.0	365.2	309.2	304.2	282.0	338.2	275.0	255.0
28	382.7	427.0	305.9	-	331.9	367.8	298.7	295.0	256.7	322.7	285.0	250.0
29	362.1	-	311.2	365.6	341.1	372.9	295.9	278.2	257.0	336.2	280.0	255.0
30	396.0	-	323.2	412.9	363.5	370.8	300.6	282.4	259.3	317.6	275.0	291.8
31	411.0	-	365.5	-	382.2	-	307.0	272.8	-	299.9	-	283.9

