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PROPOSED REFERENCE MODELS FOR NITROUS OXIDE AND METHANE IN THE MIDDLE ATMOSPHERE

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ABSTRACT

Data from the Stratospheric and Mesospheric Sounder (SAMS) on the Nimbus 7 satellite, for the three years from January 1979-December 1981, are used to prepare a reference model for the long-lived trace gases methane (CH_4) and nitrous oxide (N_2O) in the stratosphere. The model is presented in tabular form on seventeen pressure surfaces from 20 to 0.1 mb, in 10° latitude bins from 50S to 70N, and for each month of the year. The means by which the data quality and interannual variability, and some of the more interesting globally and seasonally variable features of the data are discussed briefly.

INTRODUCTION

N_2O and CH_4 are both important minor constituents of the stratosphere for several reasons. Neither gas has a known photochemical source in the middle atmosphere, both originating near the surface by a variety of processes which includes anthropogenic sources in each case /1/. As both gases have fairly long lifetimes against photochemical destruction ranging from about a year for methane in the lower stratosphere to a few weeks for nitrous oxide near the stratopause), they are important tracers of the transfer process across the tropopause and of the stratospheric mean circulation. Methane is a source of water vapour in the middle atmosphere as a result of a series of reactions equivalent to

$$CH_4 + 2O_2 = CO_2 + 2\,H_2O$$

while nitrous oxide is the main source of stratospheric NO_x by a series equivalent to

$$2N_2O + O_2 = 4NO$$

and subsequent reactions.

The Stratospheric and Mesospheric Sounder (SAMS) made observations from the Nimbus 7 spacecraft from 1978 to 1983. The SAMS instrument has been described by Drummond et al /2/ and examples of the results from the experiment are presented and discussed in the articles by Barnett et al /3/ and Jones and Pyle /4/. The last-named paper discusses the methane and nitrous oxide observations in particular detail, including the retrieval of abundances from radiance observations and an analysis of the error budget. The data used here are essentially the same as those used by Jones and Pyle, with some reprocessing and considerable reformatting and manipulation. Our goal is to produce standard tables which represent the mean distribution of methane and nitrous oxide as a function of height, latitude and month.

DESCRIPTION OF THE MEASUREMENTS

SAMS is a nine-channel, limb-viewing infrared radiometer employing the pressure-modulation technique /5/ to observe thermal emission from carbon dioxide (for temperature retrievals) and five other atmospheric minor constituents. Methane was observed in the ν_4 band near 7.6 μm and nitrous oxide in the ν_1 band near 7.8 μm. Both channels shared the same pyroelectric detector and the instrument had a 75% duty cycle; hence the observations of

either species occupied about one-third of each month on average.

The vertical resolution of the measurements is 8 to 10 km. Profiles were actually retrieved at seven altitudes, including a fixed base value at 1.4 scale heights (250 mb). The other levels were 2.6, 3.8, 5.0, 6.2, 7.4, and 8.6 scale heights (75, 20, 7, 2, 0.6, and 0.2 mb respectively). Most of the useful information is restricted to levels between 0.2 (0.6 for N_2O) and 20 mb.

The SAMS N_2O and CH_4 observations are not entirely independent, since their spectral bands overlap and data from one species is required by the retrieval program to determine the other. Vertical correlations are introduced by the finite field of view of the instrument and temporal correlations by the 'sequential maximum likelihood operator' approach used for the retrieval /4/. There is also some latitudinal interdependence in the data introduced by the temperature retrieval algorithm /6/. All of these effects are small, however, especially in monthly averages.

For the purposes of producing the present model, an additional filter was applied to the data. The smoothing was based on a $\log_{10}$ (mixing ratio) grid of 5 (altitudes) x 12 (latitudes) x 14 (months), (i.e. replicating January and December at each end to ensure continuity in time). Each grid point was then combined with a value obtained from the interpolation of up to 13 pairs of adjacent grid points, each reduced to 10% weighting. This gives a relatively small amount of smoothing which removed a few rogue points and smoothed out the sharper features which although real were probably atypical.

The accuracy of the retrieved zonal mean as determined by Jones and Pyle /4/, who combined conservative estimates of all of the known sources of error including spectroscopic and retrieval uncertainties, and noise due to instrumental sources and spacecraft jitter, varies with height but is at best 20% for CH_4 and 25% for N_2O. The corresponding precision is $\sim$ 3% for CH_4 and $\sim$ 6% for N_2O. The 'confidence limits' established by the same authors for the vertical range of the measurements is 20 mb ($\simeq$ 25 km) to 0.2 mb ($\simeq$ 60 km) for CH_4 and 0.6 mb ($\simeq$ 53 km) for N_2O.

COMPARISON WITH OTHER MEASUREMENTS

The lower part of the SAMS retrieved profiles can be compared with balloon measurements /7/, which extend up to about 7 mb and therefore overlap the lowest two SAMS vertical resolution elements. Jones and Pyle /4/ made such comparisons and found that, while the in-situ and satellite data agree quite well near the top of the region of overlap, lower down discrepancies of nearly a factor of two occur with the SAMS amounts being higher. More recent measurements /8/ of both CH_4 and N_2O by a cryogenic sampling technique in 1979, 1982 and 1985 confirm the discrepancy but its origin is still a mystery. One possibility is the spectroscopic data used in the SAMS retrieval, which may not include enough weak lines of the fundamental or some overlapping band. This possibility is under investigation and the data set may be completely revised at some later date. For the meantime, even if it can be assumed that the responsibility for the discrepancy lies entirely with the satellite data, which is probably not the case as the in-situ data shows a considerable scatter, we cannot correct our model without more information on the extent to which the difference depends on (a) altitude, (b) latitude, (c) month, and (d) natural variability of the atmosphere. We do provide, however, (Table 1) a list of the estimated mean differences between the two kinds of data for the latitudes and times at which comparisons are possible. It should further be noted that, according to Schmidt /8/, not only the absolute amounts but also the trend with time in late summer at 45°N is in disagreement. Balloon data show lower abundances in October/November than in September, in contrast to SAMS findings. Again, the reason for this is under investigation but in this case a spectroscopic explanation seems unlikely. It also illustrates the risk of using the ratios in table 1 simply as a universal 'correction factor'.

Table 1

Approximate ratios between SAMS data and mean values from in-situ data/7/ at 30 to 45°N

Pressure (mb)	(N_2O)in-situ/SAMS	(CH_4)in-situ/SAMS
20	0.60	0.80
15	0.69	0.85
10	0.84	0.93
7 and lower	1.00	1.00

MODELS OF VERTICAL STRUCTURE OF METHANE AND NITROUS OXIDE

Models were produced by averaging the SAMS data for the three year period from January 1979 through December 1981 and applying some smoothing. SAMS actually made observations from shortly after launch on 24 October 1978 until June 1983, but the early data consists mainly of instrument checkout modes while those obtained after March 1982 were rendered more difficult to interpret by the volcanic dust injected into the stratosphere by the eruption of El Chichon and will require further validation.

Averages were formed first by day and by latitude, the latter in 10° bins. The daily data and their estimated errors were then used to produce an error-weighted average by month, before the corresponding months for the three years were combined. Thereafter, the 'error' was taken to be the square root of the greater of either the variance or the inverse sum of the weights of the contributing data. This approach brings in the standard deviation of the profiles contributing to the mean. For any further manipulation of the data, each point was weighted by the inverse square of this 'error'. The extension of the N_2O data to 0.2 mb was done simply by subtracting 0.5 from the log (mixing ratio) at 0.6 mb, accompanied by an increase in the variance of the log mixing ratio of 0.1, i.e. an additional error in the mixing ratio of about a factor of 2.

Table 2 gives the monthly zonal mean nitrous oxide and methane mixing ratios in ppbv and ppmv respectively, as a function of latitude and height, for each month. The height intervals are the standard ones chosen by Keating and Young /9/ for their model of middle atmosphere ozone. In the table, the value for mixing ratio is accompanied by an indication of the uncertainty of the number due to instrument noise, to daily variance and to extrapolation outside the 'confidence limits' for the original measurements.

DISCUSSION OF MAJOR FEATURES

A programme of scientific analysis of these data is going on, and in particular a detailed discussion of the features present in the time-averaged data used to produce the model tabulated here will shortly appear in a paper now in preparation /10/. A scientific interpretation of the structure which appears in the distribution profiles of stratospheric methane and nitrous oxide is clearly beyond the scope of the present paper, but the following brief phenomenological description of the main features may assist one's understanding of the model.

Firstly, the overall structure seen in abundance charts for either CH_4 and N_2O is qualitatively the same, as might be expected of long-lived species whose distribution is controlled more by dynamics than chemistry. The following remarks, therefore, apply to both gases, and always (in this paper) to zonal mean abundances.

The highest absolute amounts occur towards the end of Summer, i.e. in September/October in the Northern Hemisphere and March/April in the Southern. At any given latitude, the zonal mean abundance tends to peak earlier at higher altitudes, the opposite to the behavior to be expected if material from the troposphere was simply being advected vertically. At high altitudes (near the 0.2 mb level) there is a pronounced semi-annual oscillation in the abundances of CH_4 and N_2O which, incidentally, is not present in the thermal structure when averaged in the same way. Remarkably, this feature is present in the Southern but not the Northern Hemisphere.

TABLE 2

Monthly mean mixing ratios for nitrous oxide in parts per billion (10^9) by volume (ppbv) then methane in parts per million by volume (ppmv). An indication of the reliability of the values as a model of the actual amounts to be expected in any given year is given by the letter following each entry. These represent the standard deviation or standard error of the data making up the value, as given in the key and described in the text. Absence of a letter means less than ten percent deviation in the data. Annual averages are given at the end of the set of monthly means.

Average N_2O (ppbv) for JANUARY

Press. (mb)	Latitude (°N)												
	-50°	-40	-30	-20	-10	0	+10	+20	+30	+40	+50	+60	+70°
0.10*	0.21^D	0.50^D	0.88^D	1.18^D	1.47^D	1.17^D	0.91^D	0.94^D	0.86^D	0.73^D	0.61^D	0.59^D	0.66^D
0.15*	0.24^D	0.58^D	1.01^D	1.36^D	1.65^D	1.43^D	1.03^D	1.06^D	0.98^D	0.83^D	0.70^D	0.67^D	0.76^D
0.20*	0.28^D	0.66^D	1.16^C	1.57^D	1.91^D	1.51^D	1.18^D	1.19^D	1.11^D	0.94^D	0.79^D	0.77^D	0.86^D
0.30*	0.37^D	0.87^D	1.54^C	2.09^C	2.48^C	1.96^C	1.52^D	1.51^C	1.42^C	1.21^D	1.03^C	1.00^C	1.11^D
0.40*	0.49^D	1.15^C	2.04^C	2.77^C	3.21^C	2.53^C	1.96^C	1.92^C	1.82^C	1.56^C	1.33^C	1.29^C	1.44^C
0.50*	0.65^D	1.52^C	2.70^C	3.68^C	4.16^C	3.28^C	2.54^C	2.44^C	2.33^C	2.02^C	1.72^C	1.68^C	1.86^C
0.70	1.00^C	2.26^C	4.04^D	5.54^D	6.10^D	4.81^B	3.69^B	3.43^B	3.29^D	2.89^B	2.49^B	2.40^B	2.56^B
1.00	1.45^C	3.05^B	5.41^B	7.62^B	8.34^B	6.63^B	5.01^B	4.44^B	4.14^B	3.72^B	3.27^B	2.99^B	2.88^B
1.50	2.71^C	5.04^B	8.81^B	12.96^B	14.07^B	11.32^B	8.32^B	6.83^B	6.07^B	5.67^B	5.19^B	4.31^B	3.52^C
2.00	5.08^C	8.33^B	14.35^B	22.02^b	23.73^B	19.34^B	13.83^B	10.49^B	8.91^B	8.64^B	8.22^B	6.23^B	4.30^C
3.00	8.06^C	12.53^B	20.70^B	31.40^B	35.14^B	29.80^B	21.83^B	16.58^B	13.84^B	13.07^B	11.85^B	8.81^B	6.15^C
4.00	12.48^B	18.52^B	29.37^B	43.82^B	51.01^B	45.02^B	33.86^B	25.90^B	21.29^B	19.52^B	16.80^B	12.32^B	8.78^C
5.00	19.32^D	27.37^B	41.50^D	61.17^B	74.05^B	68.02^D	52.53^B	40.44^D	32.74^B	29.17^B	23.83^B	17.23^D	12.53^C
7.00	42.23^A	54.96^B	76.97^B	110.28^D	142.90^D	141.32^D	114.87^B	89.65^B	70.79^B	60.14^B	45.30^B	32.10^B	24.07^C
10.00	54.25^B	67.61^B	89.74^B	123.61^D	159.90^D	165.77^B	143.20^D	114.31^D	92.04^B	81.08^B	67.90^B	50.73^C	35.58^C
15.00	82.36^C	95.50^B	115.91^B	149.51^B	192.83^B	216.29^D	206.77^B	171.40^D	142.57^B	133.38^B	133.31^B	108.73^C	68.23^C
20.00	125.04^C	134.90^C	149.71^D	180.83^B	232.55^B	262.19^B	298.56^B	257.01^B	220.83^D	219.42^B	261.73^B	233.07^C	130.87^C

Average N_2O (ppbv) for FEBRUARY

Press. (mb)	Latitude (°N)												
	-50°	-40	-30	-20	-10	0	+10	+20	+30	+40	+50	+60	+70°
0.10*	0.54^D	1.08^D	1.40^D	1.50^D	1.05^D	0.75^D	0.76^D	1.06^D	1.17^D	0.89^D	0.68^D	0.57^D	0.49^D
0.15*	0.62^D	1.22^D	1.60^D	1.50^D	1.22^D	0.88^D	0.88^D	1.20^D	1.32^D	1.01^D	0.78^D	0.65^D	0.56^D
0.20*	0.70^D	1.39^D	1.83^D	1.74^D	1.42^D	1.03^D	1.02^D	1.37^D	1.49^D	1.15^D	0.89^D	0.74^D	0.64^D
0.30*	0.90^D	1.78^D	2.41^C	2.34^C	1.93^C	1.42^D	1.38^C	1.77^C	1.90^C	1.49^D	1.16^D	0.98^D	0.85^D
0.40*	1.16^D	2.28^C	3.16^C	3.14^C	2.62^C	1.96^C	1.86^C	2.29^C	2.42^C	1.93^C	1.52^C	1.28^C	1.11^C
0.50*	1.50^D	2.92^C	4.15^C	4.22^C	3.56^C	2.70^C	2.50^C	2.96^C	3.09^C	2.50^C	1.99^C	1.68^C	1.46^C
0.70	2.11^C	4.10^C	6.09^B	6.47^B	5.61^B	4.33^C	3.86^B	4.30^B	4.37^B	3.59^C	2.92^C	2.50^C	2.20^C
1.00	2.60^C	5.13^C	8.02^B	9.12^B	8.24^B	6.39^B	5.48^B	5.75^B	5.65^B	4.64^B	3.88^B	3.43^B	3.07^C
1.50	3.67^C	7.44^B	12.65^B	16.17^b	15.65^B	12.23^B	9.79^B	9.32^B	8.66^B	7.12^B	6.23^B	5.79^B	5.38^C
2.00	5.19^C	10.78^B	19.98^B	28.65^B	29.79^B	23.42^B	17.51^B	15.11^B	13.28^B	10.92^B	10.00^B	9.60^B	9.43^B
3.00	8.24^C	15.93^B	27.66^B	38.63^B	41.82^B	35.07^B	27.05^B	22.64^B	18.90^B	15.54^B	14.13^B	13.51^B	12.84^C
4.00	13.01^B	23.27^B	37.63^B	50.87^B	57.16^B	51.10^B	40.87^B	33.34^B	26.49^B	21.78^B	19.62^B	18.21^B	17.07^C
5.00	20.53^B	34.01^B	51.18^B	66.91^B	78.14^B	74.46^B	61.77^B	49.10^B	37.13^B	30.52^B	27.23^B	24.56^B	22.68^C
7.00	46.69^A	66.99^B	88.50^B	109.07^b	136.15^B	145.19^B	128.51^B	97.96^B	68.21^B	56.08^B	49.49^B	42.44^B	37.77^C
10.00	64.57^B	83.09^B	102.59^B	125.26^B	156.33^B	169.30^B	152.26^B	120.21^B	87.05^B	72.02^B	67.78^B	57.89^B	45.43^C
15.00	110.86^B	118.96^B	131.24^B	157.75^B	196.82^B	218.70^B	201.99^B	169.10^B	130.73^B	109.27^B	114.50^B	97.14^B	61.78^C
20.00	190.32^C	170.32^C	167.90^B	198.68^B	247.81^B	282.52^B	267.96^B	237.85^B	196.33^B	165.80^B	193.42^B	162.99^C	84.03^C

Average N_2O (ppbv) for MARCH

Press. (mb)	Latitude (°N)												
	-50°	-40	-30	-20	-10	0	+10	+20	+30	+40	+50	+60	+70°
0.10*	1.10^D	1.55^D	1.86^D	1.30^D	0.74^D	0.56^D	0.61^D	0.80^D	1.03^D	1.08^D	0.74^D	0.52^D	0.43^D
0.15*	1.24^D	1.76^D	2.11^D	1.49^D	0.86^D	0.66^D	0.72^D	0.92^D	1.18^C	1.23^D	0.84^D	0.59^D	0.49^D
0.20*	1.39^D	1.99^D	2.39^C	1.71^D	1.01^D	0.77^D	0.84^D	1.07^D	1.35^C	1.39^D	0.96^D	0.68^D	0.57^D
0.30*	1.77^D	2.55^C	3.09^C	2.27^C	1.38^C	1.07^C	1.14^C	1.42^C	1.76^C	1.80^C	1.26^D	0.90^D	0.74^C
0.40*	2.24^D	3.28^C	3.98^C	3.00^C	1.89^C	1.47^C	1.56^C	1.89^C	2.30^C	2.32^C	1.64^C	1.19^C	0.97^C
0.50*	2.84^C	4.20^C	5.13^C	3.97^C	2.58^C	2.03^C	2.12^C	2.51^C	3.01^C	3.00^C	2.14^C	1.57^C	1.27^C
0.70	3.76^C	5.84^B	7.35^B	5.99^B	4.11^B	3.27^B	3.34^B	3.82^B	4.43^B	4.28^B	3.12^B	2.34^B	1.90^B
1.00	4.01^C	6.95^B	9.52^B	8.40^B	6.10^B	4.86^B	4.86^B	5.42^B	5.96^B	5.48^B	4.09^B	3.20^B	2.65^B
1.50	4.45^C	9.29^B	14.67^B	14.77^B	11.76^B	9.39^B	9.08^B	9.67^B	9.74^B	8.27^B	6.41^B	5.37^B	4.61^B
2.00	4.94^B	12.40^B	22.60^B	25.96^B	22.67^B	18.14^B	16.95^B	17.26^B	15.93^B	12.49^B	10.06^B	9.01^B	8.02^C
3.00	7.83^B	17.56^B	30.45^D	36.50^B	34.23^B	28.77^B	26.49^B	25.68^B	22.50^B	17.37^B	14.15^B	12.82^B	11.74^C
4.00	12.50^B	24.70^B	40.32^b	50.09^B	50.30^B	44.47^B	40.42^B	37.33^B	31.17^B	23.82^B	19.59^B	17.85^B	16.80^B
5.00	19.98^B	34.73^B	53.39^B	68.76^B	73.91^B	68.73^B	61.67^B	54.26^B	43.18^B	32.65^B	27.10^B	24.85^B	24.06^B
7.00	46.30^B	64.21^B	88.47^B	120.66^B	146.02^B	148.61^B	130.32^B	105.30^B	77.19^B	57.55^B	48.84^B	45.57^B	46.53^B
10.00	62.52^B	82.85^B	107.63^D	138.59^B	167.86^B	175.08^B	153.23^D	122.25^D	91.12^B	71.13^B	64.43^B	64.82^B	70.35^C
15.00	103.14^B	126.69^B	149.22^B	174.59^B	211.76^B	230.07^D	200.71^B	156.78^B	120.16^B	101.27^B	102.26^B	116.59^C	140.14^C
20.00	170.15^B	193.73^B	206.89^b	219.93^B	267.13^B	302.34^b	262.90^B	201.06^B	158.45^b	144.18^B	162.31^B	209.72^C	279.14^D

* Extrapolated from original data.

Variation in data <10%, >10%^{A}, >20%^{B}, >50%^{C}, >100%^{D}

Average N_2O (ppbv) for APRIL

Press. (mb)	Latitude (°N)												
	-50°	-40	-30	-20	-10	0	+10	+20	+30	+40	+50	+60	+70°
0.10°	1.87^{D}	1.63^{D}	1.21^{D}	0.59^{D}	0.37^{D}	0.41^{D}	0.53^{D}	0.79^{D}	1.03^{D}	1.13^{D}	0.78^{D}	0.43^{D}	0.29^{D}
0.15°	2.08^{D}	1.84^{D}	1.39^{C}	0.69^{D}	0.44^{D}	0.47^{D}	0.62^{D}	0.91^{C}	1.18^{C}	1.28^{D}	0.88^{D}	0.49^{D}	0.34^{D}
0.20°	2.31^{D}	2.08^{D}	1.60^{C}	0.81^{C}	0.61^{C}	0.55^{C}	0.72^{C}	1.05^{C}	1.36^{C}	1.44^{C}	1.00^{D}	0.57^{D}	0.38^{D}
0.30°	2.85^{D}	2.66^{C}	2.11^{C}	1.11^{C}	0.71^{C}	0.75^{C}	0.97^{C}	1.39^{C}	1.77^{C}	1.82^{C}	1.27^{C}	0.74^{C}	0.51^{D}
0.40°	3.52^{D}	3.40^{C}	2.78^{C}	1.53^{C}	0.98^{C}	1.02^{C}	1.30^{C}	1.83^{C}	2.31^{C}	2.32^{C}	1.61^{C}	0.97^{C}	0.67^{C}
0.50°	4.35^{C}	4.35^{C}	3.66^{C}	2.10^{C}	1.35^{C}	1.39^{C}	1.75^{C}	2.42^{C}	3.03^{C}	2.94^{C}	2.05^{C}	1.27^{C}	0.88^{C}
0.70	5.65^{C}	6.08^{B}	5.47^{B}	3.40^{B}	2.22^{B}	2.22^{B}	2.75^{B}	3.68^{B}	4.46^{B}	4.12^{B}	2.88^{B}	1.87^{B}	1.32^{B}
1.00	6.22^{C}	7.47^{B}	7.55^{D}	5.22^{B}	3.53^{B}	3.43^{B}	4.11^{B}	5.26^{B}	6.03^{B}	5.27^{B}	3.71^{B}	2.54^{B}	1.84^{B}
1.50	7.28^{B}	10.54^{B}	12.89^{B}	10.67^{B}	7.67^{B}	7.04^{B}	8.02^{B}	9.58^{B}	9.97^{B}	7.96^{B}	5.64^{B}	4.20^{B}	3.22^{C}
2.00	8.53^{B}	14.86^{B}	22.03^{B}	21.82^{B}	16.66^{D}	14.45^{B}	15.65^{B}	17.43^{B}	16.48^{B}	12.00^{B}	8.58^{B}	6.95^{B}	5.63^{C}
3.00	12.05^{B}	20.57^{B}	30.46^{B}	32.17^{B}	26.80^{B}	24.16^{B}	25.35^{B}	26.35^{B}	23.58^{B}	16.95^{B}	12.33^{B}	10.24^{B}	8.60^{B}
4.00	17.03^{B}	28.17^{B}	41.18^{B}	45.95^{B}	41.73^{B}	39.28^{B}	40.04^{B}	38.89^{B}	33.07^{B}	23.61^{B}	17.47^{B}	14.81^{B}	12.85^{B}
5.00	24.08^{B}	38.58^{B}	55.68^{B}	65.63^{B}	64.99^{B}	63.88^{B}	63.22^{B}	57.40^{B}	46.39^{B}	32.87^{B}	24.76^{B}	21.41^{B}	19.20^{B}
7.00	45.32^{B}	68.23^{B}	95.72^{B}	123.76^{B}	142.35^{B}	150.63^{B}	141.54^{B}	114.09^{D}	84.54^{B}	59.49^{B}	46.52^{B}	41.94^{B}	40.01^{B}
10.00	64.50^{B}	89.43^{B}	117.4[illegible]	146.24^{B}	167.37^{B}	175.90^{B}	162.50^{B}	128.41^{B}	97.02^{B}	73.24^{B}	61.99^{B}	60.08^{B}	60.44^{C}
15.00	116.16^{B}	140.40^{B}	165.22^{D}	193.15^{B}	219.22^{B}	227.79^{B}	204.54^{B}	156.38^{B}	122.05^{B}	103.58^{B}	100.01^{B}	109.35^{C}	120.19^{C}
20.00	209.17^{C}	220.41^{B}	232.39^{B}	255.10^{B}	287.13^{B}	294.98^{B}	257.46^{B}	190.43^{B}	153.53^{D}	146.49^{B}	161.34^{B}	199.03^{C}	239.03^{D}

Average N_2O (ppbv) for MAY

Press. (mb)	Latitude (°N)												
	-50°	-40	-30	-20	-10	0	+10	+20	+30	+40	+50	+60	+70°
0.10°	1.05^{D}	0.85^{D}	0.59^{C}	0.38^{D}	0.32^{D}	0.38^{D}	0.59^{C}	0.93^{D}	1.07^{D}	0.92^{D}	0.57^{D}	0.37^{D}	0.33^{D}
0.15°	1.21^{D}	0.98^{D}	0.68^{C}	0.44^{C}	0.38^{D}	0.45^{D}	0.68^{C}	1.07^{C}	1.22^{C}	1.04^{D}	0.65^{D}	0.42^{D}	0.38^{D}
0.20°	1.38^{D}	1.12^{C}	0.79^{C}	0.52^{C}	0.44^{D}	0.52^{C}	0.79^{C}	1.22^{C}	1.40^{C}	1.18^{C}	0.73^{C}	0.49^{D}	0.44^{D}
0.30°	1.81^{D}	1.47^{C}	1.05^{C}	0.70^{C}	0.61^{C}	0.71^{C}	1.05^{C}	1.60^{C}	1.82^{C}	1.52^{C}	0.94^{C}	0.63^{D}	0.58^{D}
0.40°	2.36^{C}	1.94^{C}	1.39^{C}	0.96^{C}	0.85^{C}	0.98^{C}	1.40^{C}	2.10^{C}	2.36^{C}	1.95^{C}	1.21^{C}	0.83^{C}	0.76^{D}
0.50°	3.09^{C}	2.55^{C}	1.85^{B}	1.30^{C}	1.17^{C}	1.33^{C}	1.87^{B}	2.76^{C}	3.07^{C}	2.50^{C}	1.55^{C}	1.08^{C}	1.00^{C}
0.70	4.50^{B}	3.80^{B}	2.86^{B}	2.09^{B}	1.92^{B}	2.14^{B}	2.89^{B}	4.12^{B}	4.48^{B}	3.56^{B}	2.22^{B}	1.59^{B}	1.47^{C}
1.00	5.82^{B}	5.22^{B}	4.25^{B}	3.28^{B}	2.99^{B}	3.26^{B}	4.24^{D}	5.77^{B}	5.99^{B}	4.56^{B}	2.88^{B}	2.10^{B}	1.91^{C}
1.50	8.94^{B}	8.87^{B}	8.21^{B}	6.93^{B}	6.28^{B}	6.61^{B}	8.05^{B}	10.11^{B}	9.68^{B}	6.90^{B}	4.48^{B}	3.36^{B}	2.93^{C}
2.00	13.72^{B}	15.07^{B}	15.86^{B}	14.65^{B}	13.19^{B}	13.39^{B}	15.29^{B}	17.71^{B}	15.67^{B}	10.43^{B}	6.96^{B}	5.37^{B}	4.50^{B}
3.00	19.52^{B}	22.10^{B}	24.22^{B}	23.79^{B}	22.13^{B}	22.17^{B}	24.21^{B}	25.99^{B}	22.22^{B}	15.03^{B}	10.29^{B}	8.13^{B}	6.92^{B}
4.00	27.37^{B}	31.75^{B}	36.00^{B}	37.46^{B}	36.07^{B}	35.71^{B}	37.39^{B}	37.29^{B}	30.92^{B}	21.36^{B}	14.98^{B}	12.13^{B}	10.52^{B}
5.00	38.37^{B}	45.60^{B}	53.50^{B}	59.00^{B}	58.78^{B}	57.52^{B}	57.75^{B}	53.51^{B}	43.05^{B}	30.36^{B}	21.81^{B}	18.09^{B}	16.00^{B}
7.00	70.72^{B}	87.41^{B}	108.46^{B}	131.71^{B}	139.20^{B}	133.75^{B}	124.61^{B}	101.43^{D}	77.66^{B}	57.17^{B}	43.03^{B}	37.32^{B}	34.21^{A}
10.00	93.54^{B}	111.37^{D}	133.41^{D}	154.22^{B}	161.64^{B}	159.38^{D}	145.71^{B}	116.53^{D}	92.48^{D}	73.38^{D}	58.42^{B}	52.29^{B}	49.65^{D}
15.00	149.06^{C}	166.78^{B}	188.38^{B}	200.61^{B}	207.36^{B}	213.48^{D}	189.09^{B}	146.85^{B}	123.74^{B}	111.23^{B}	97.22^{B}	91.76^{B}	92.38^{C}
20.00	237.54^{C}	249.77^{B}	265.96^{B}	260.95^{B}	268.01^{B}	285.93^{B}	245.39^{B}	185.06^{B}	165.55^{B}	168.60^{B}	161.81^{B}	161.01^{C}	171.89^{C}

Average N_2O (ppbv) for JUNE

Press. (mb)	Latitude (°N)												
	-50°	-40	-30	-20	-10	0	+10	+20	+30	+40	+50	+60	+70°
0.10°	0.27^{D}	0.25^{D}	0.28^{C}	0.37^{C}	0.43^{C}	0.52^{D}	0.78^{C}	1.08^{D}	1.21^{D}	0.91^{D}	0.50^{D}	0.47^{D}	0.75^{D}
0.15°	0.31^{D}	0.30^{D}	0.33^{C}	0.43^{C}	0.50^{C}	0.60^{C}	0.90^{C}	1.23^{C}	1.38^{C}	1.04^{D}	0.57^{D}	0.53^{D}	0.84^{D}
0.20°	0.36^{C}	0.35^{D}	0.39^{C}	0.49^{C}	0.57^{C}	0.69^{C}	1.03^{C}	1.42^{C}	1.57^{C}	1.18^{C}	0.65^{D}	0.61^{D}	0.95^{D}
0.30°	0.48^{D}	0.48^{C}	0.52^{C}	0.65^{C}	0.76^{C}	0.92^{C}	1.37^{C}	1.87^{C}	2.05^{C}	1.52^{C}	0.84^{C}	0.79^{C}	1.21^{D}
0.40°	0.64^{D}	0.67^{C}	0.71^{C}	0.86^{C}	1.00^{C}	1.22^{C}	1.81^{C}	2.46^{C}	2.68^{C}	1.96^{C}	1.10^{C}	1.02^{C}	1.54^{C}
0.50°	0.86^{C}	0.92^{C}	0.97^{B}	1.13^{B}	1.32^{B}	1.61^{C}	2.39^{C}	3.24^{C}	3.50^{C}	2.53^{C}	1.42^{C}	1.33^{C}	1.95^{C}
0.70	1.37^{C}	1.50^{B}	1.56^{B}	1.75^{B}	2.03^{B}	2.47^{B}	3.62^{B}	4.84^{B}	5.09^{B}	3.60^{B}	2.06^{B}	1.92^{B}	2.67^{C}
1.00	2.18^{C}	2.36^{D}	2.45^{B}	2.68^{D}	3.00^{B}	3.60^{D}	5.13^{D}	6.64^{D}	6.66^{D}	4.51^{B}	2.68^{D}	2.47^{B}	3.14^{C}
1.50	4.73^{C}	5.03^{B}	5.20^{B}	5.46^{D}	5.77^{D}	6.76^{B}	9.17^{B}	11.25^{B}	10.42^{B}	6.68^{B}	4.16^{D}	3.75^{B}	4.11^{C}
2.00	10.29^{C}	10.71^{D}	11.06^{B}	11.13^{B}	11.06^{B}	12.70^{B}	16.39^{D}	19.07^{D}	16.32^{B}	9.82^{B}	6.45^{B}	5.68^{B}	5.38^{B}
3.00	15.78^{C}	17.27^{B}	18.60^{D}	18.88^{D}	18.52^{B}	20.80^{B}	25.03^{B}	27.42^{B}	22.86^{B}	14.29^{D}	9.66^{D}	8.46^{B}	7.97^{B}
4.00	23.38^{C}	27.00^{B}	30.37^{B}	31.18^{B}	30.21^{B}	32.33^{B}	37.38^{B}	38.60^{B}	31.48^{B}	20.55^{B}	14.25^{B}	12.42^{B}	11.76^{B}
5.00	34.65^{C}	42.20^{B}	49.56^{B}	51.48^{B}	49.28^{B}	50.99^{B}	55.82^{B}	54.35^{B}	43.36^{B}	29.54^{B}	21.03^{B}	18.23^{B}	17.35^{B}
7.00	70.54^{B}	93.82^{B}	118.41^{B}	125.36^{B}	117.58^{B}	114.67^{B}	113.80^{B}	99.81^{B}	76.92^{B}	56.71^{B}	42.39^{B}	36.54^{B}	35.16^{B}
10.00	96.27^{B}	121.89^{B}	147.74^{B}	154.99^{B}	146.26^{B}	141.99^{B}	135.39^{B}	116.42^{B}	93.47^{B}	72.30^{B}	56.19^{B}	50.14^{B}	50.04^{B}
15.00	161.66^{B}	188.53^{B}	213.66^{B}	220.73^{B}	210.45^{B}	202.72^{B}	180.84^{B}	150.49^{B}	129.35^{B}	108.36^{B}	89.90^{B}	84.95^{B}	90.09^{B}
20.00	271.46^{B}	291.60^{B}	308.99^{B}	314.35^{B}	302.81^{B}	289.43^{B}	241.56^{B}	194.52^{B}	178.99^{B}	162.41^{B}	143.83^{B}	143.93^{B}	162.20^{C}

* Extrapolated from original data.

Variation in data <10%, >10%^{A}, >20%^{B}, >50%^{C}, >100%^{D}

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OF POOR QUALITY

Average N_2O (ppbv) for JULY

Press. (mb)	Latitude (°N)												
	−50*	−40	−30	−20	−10	0	+10	+20	+30	+40	+50	+60	+70*
0.10*	0.31^{D}	0.24^{D}	0.30^{D}	0.45^{D}	0.49^{D}	0.70^{D}	1.19^{C}	1.56^{C}	1.52^{C}	0.99^{D}	0.56^{D}	0.59^{D}	0.98^{D}
0.15*	0.35^{D}	0.28^{D}	0.35^{D}	0.51^{C}	0.56^{C}	0.80^{C}	1.36^{C}	1.79^{C}	1.73^{C}	1.12^{D}	0.64^{D}	0.66^{D}	1.10^{D}
0.20*	0.40^{D}	0.32^{D}	0.40^{D}	0.59^{C}	0.65^{C}	0.92^{C}	1.56^{C}	2.04^{C}	1.97^{C}	1.28^{C}	0.73^{D}	0.75^{D}	1.23^{D}
0.30*	0.51^{D}	0.44^{D}	0.55^{C}	0.77^{C}	0.86^{C}	1.22^{C}	2.04^{C}	2.67^{C}	2.56^{C}	1.65^{C}	0.94^{C}	0.96^{D}	1.54^{D}
0.40*	0.66^{D}	0.59^{C}	0.74^{C}	1.02^{C}	1.14^{C}	1.62^{C}	2.68^{C}	3.48^{C}	3.32^{C}	2.12^{C}	1.21^{C}	1.23^{C}	1.93^{C}
0.50*	0.85^{D}	0.81^{C}	1.00^{C}	1.34^{C}	1.52^{C}	2.14^{C}	3.50^{C}	4.55^{B}	4.30^{C}	2.74^{C}	1.56^{C}	1.57^{C}	2.41^{C}
0.70	1.25^{C}	1.26^{C}	1.57^{B}	2.00^{B}	2.28^{B}	3.22^{B}	5.16^{B}	6.64^{B}	6.16^{B}	3.87^{B}	2.21^{B}	2.17^{B}	3.15^{B}
1.00	1.76^{C}	1.84^{C}	2.24^{B}	2.73^{B}	3.09^{B}	[illegible].41^{B}	6.94^{B}	8.74^{B}	7.81^{B}	4.78^{B}	2.73^{B}	2.56^{B}	3.36^{B}
1.50	3.11^{C}	3.43^{C}	4.07^{B}	4.56^{B}	5.17^{B}	7.45^{B}	11.35^{B}	13.82^{B}	11.62^{B}	6.80^{B}	3.89^{B}	3.35^{B}	3.73^{B}
2.00	5.50^{C}	6.39^{B}	7.39^{B}	7.63^{B}	8.62^{B}	12.59^{B}	18.57^{B}	21.85^{B}	17.27^{B}	9.67^{B}	5.55^{B}	4.40^{B}	4.14^{B}
3.00	9.18^{C}	10.70^{B}	12.19^{B}	12.73^{B}	14.29^{B}	19.62^{B}	27.44^{B}	31.11^{D}	24.41^{B}	14.23^{B}	8.52^{B}	6.74^{B}	6.26^{B}
4.00	15.06^{C}	17.52^{B}	19.70^{B}	20.92^{B}	23.30^{B}	30.03^{B}	39.82^{B}	43.55^{B}	34.02^{B}	20.73^{B}	12.97^{B}	10.30^{B}	9.51^{B}
5.00	24.68^{C}	28.67^{B}	31.83^{B}	34.37^{B}	38.01^{B}	45.96^{B}	57.78^{B}	60.95^{B}	47.43^{B}	30.21^{B}	19.74^{B}	15.72^{B}	14.47^{D}
7.00	60.34^{B}	69.50^{B}	75.33^{B}	83.79^{B}	91.30^{B}	98.57^{B}	112.21^{B}	110.75^{B}	85.93^{B}	59.44^{B}	42.06^{B}	33.86^{B}	31.16^{B}
10.00	90.09^{B}	96.54^{B}	103.50^{B}	115.37^{B}	123.36^{B}	129.27^{B}	135.48^{B}	128.09^{B}	104.06^{B}	76.60^{B}	56.92^{B}	48.74^{B}	48.13^{B}
15.00	175.67^{B}	166.94^{B}	175.77^{C}	196.61^{C}	203.72^{D}	203.12^{D}	185.46^{D}	163.21^{B}	143.17^{B}	116.92^{B}	94.21^{B}	89.46^{B}	9[illegible].15^{D}
20.00	342.58^{B}	238.67^{B}	298.49^{C}	335.05^{C}	336.42^{B}	319.17^{B}	253.88^{B}	207.98^{B}	196.97^{B}	178.46^{B}	155.95^{B}	164.19^{D}	205.06^{B}

Average N_2O (ppbv) for AUGUST

Press. (mb)	Latitude (°N)												
	−50*	−40	−30	−20	−10	0	+10	+20	+30	+40	+50	+60	+70*
0.10*	0.58^{D}	0.37^{D}	0.41^{D}	0.68^{D}	0.85^{D}	1.08^{D}	1.56^{D}	1.91[illegible]	1.90^{D}	1.31^{D}	0.79^{D}	0.52^{D}	0.34^{D}
0.15*	0.65^{D}	0.43^{D}	0.47^{D}	0.77^{D}	0.97^{D}	1.24^{D}	1.78^{C}	2.18^{C}	2.16^{C}	1.46^{D}	0.89^{D}	0.60^{D}	0.38^{D}
0.20*	0.73^{D}	0.50^{D}	0.55^{D}	0.87^{C}	1.10^{C}	1.41^{C}	2.03^{C}	2.49^{C}	2.45^{C}	1.68^{D}	1.00^{D}	0.67^{D}	0.44^{D}
0.30*	0.92^{D}	0.68^{D}	0.74^{C}	1.12^{C}	1.41^{C}	1.83^{C}	2.65^{C}	3.25^{C}	3.15^{C}	2.14^{C}	1.27^{C}	0.85^{D}	0.57^{D}
0.40*	1.16^{D}	0.91^{C}	0.99^{C}	1.45^{C}	1.82^{C}	2.38^{C}	3.45^{C}	4.24^{C}	4.07^{C}	2.73^{C}	1.61^{C}	1.08^{C}	0.74^{C}
0.50*	1.46^{C}	1.22^{C}	1.33^{C}	1.87^{C}	2.34^{C}	3.09^{C}	4.50^{C}	5.53^{B}	5.24^{C}	3.48^{C}	2.04^{C}	1.37^{C}	0.96^{C}
0.70	1.96^{C}	1.83^{C}	2.04^{B}	2.70^{B}	3.38^{B}	4.51^{B}	6.58^{B}	8.07^{B}	7.48^{B}	4.86^{B}	2.77^{B}	1.85^{B}	1.33^{B}
1.00	2.28^{C}	2.40^{C}	2.78^{B}	3.59^{B}	4.51^{B}	6.08^{B}	8.81^{B}	10.61^{B}	9.60^{B}	6.00^{B}	3.20^{B}	2.08^{B}	1.54^{B}
1.50	2.91^{C}	3.75^{C}	4.66^{B}	5.79^{B}	7.31^{B}	9.99^{B}	14.31^{B}	16.76^{B}	14.54^{B}	8.52^{B}	4.07^{B}	2.52^{B}	1.94^{C}
2.00	3.72^{C}	5.88^{B}	7.83^{B}	9.33^{B}	11.86^{B}	16.40^{B}	23.24^{B}	26.47^{B}	22.04^{B}	12.11^{B}	5.19^{B}	3.06^{B}	2.46^{C}
3.00	6.17^{C}	9.39^{B}	12.16^{B}	14.40^{B}	18.00^{B}	24.16^{B}	32.81^{B}	35.86^{B}	29.57^{B}	17.18^{B}	8.03^{B}	4.87^{B}	3.86^{C}
4.00	10.22^{C}	14.81^{B}	18.57^{B}	21.88^{B}	26.89^{B}	34.93^{B}	45.46^{B}	47.68^{B}	39.03^{B}	24.13^{B}	12.42^{B}	7.76^{B}	6.06^{C}
5.00	16.93^{C}	23.36^{B}	28.34^{B}	33.24^{B}	40.17^{B}	50.50^{B}	62.99^{B}	63.39^{B}	51.52^{B}	33.89^{B}	19.21^{B}	12.38^{B}	9.53^{B}
7.00	42.23^{C}	53.36^{B}	61.12^{B}	70.94^{B}	83.00^{B}	98.06^{B}	113.10^{B}	105.90^{B}	85.03^{B}	62.55^{B}	42.16^{B}	28.82^{B}	21.70^{B}
10.00	63.91^{C}	79.04^{B}	89.96^{B}	101.79^{B}	114.70^{B}	127.34^{B}	140.02^{B}	130.11^{B}	105.05^{B}	81.00^{B}	58.71^{B}	42.88^{B}	33.66^{B}
15.00	127.53^{C}	152.15^{B}	171.32^{C}	185.82^{C}	196.66^{B}	196.80^{B}	199.86^{B}	183.37^{B}	149.45^{B}	124.64^{B}	101.94^{B}	83.15^{B}	69.95^{B}
20.00	254.48^{C}	292.87^{C}	326.26^{C}	339.20^{C}	337.19^{B}	304.16^{B}	285.27^{B}	258.42^{B}	212.61^{B}	191.77^{B}	177.00^{B}	161.25^{B}	145.38^{B}

Average N_2O (ppbv) for SEPTEMBER

Press. (mb)	Latitude (°N)												
	−50*	−40	−30	−20	−10	0	+10	+20	+30	+40	+50	+60	+70*
0.10*	0.91^{D}	0.82^{D}	0.69^{D}	0.66^{D}	0.90^{D}	1.23^{D}	1.49^{D}	1.82^{D}	2.02^{C}	1.86^{D}	1.29^{D}	0.74^{D}	0.43^{D}
0.15*	1.03^{D}	0.93^{D}	0.78^{D}	0.75^{D}	1.02^{D}	1.40^{D}	1.70^{D}	2.08^{C}	2.31^{C}	2.09^{D}	1.43^{D}	0.82^{D}	0.49^{D}
0.20*	1.17^{D}	1.06^{D}	0.89^{C}	0.86^{C}	1.17^{C}	1.60^{C}	1.94^{C}	2.38^{C}	2.63^{C}	2.36^{C}	1.59^{D}	0.92^{D}	0.56^{D}
0.30*	1.50^{D}	1.36^{C}	1.16^{C}	1.13^{C}	1.62^{C}	2.07^{C}	2.53^{C}	3.11^{C}	3.42^{C}	2.98^{C}	1.97^{C}	1.15^{C}	0.73^{D}
0.40*	1.92^{D}	1.75^{C}	1.50^{C}	1.48^{C}	1.98^{C}	2.69^{C}	3.30^{C}	4.07^{C}	4.44^{C}	3.78^{C}	2.43^{C}	1.44^{C}	0.94^{C}
0.50*	2.46^{C}	2.24^{C}	1.94^{C}	1.94^{C}	2.59^{C}	3.49^{C}	4.29^{C}	5.32^{C}	5.77^{B}	4.79^{C}	3.00^{C}	1.80^{C}	1.21^{C}
0.70	3.44^{C}	3.17^{B}	2.82^{B}	2.87^{D}	3.79^{B}	5.08^{D}	6.31^{B}	7.81^{B}	8.31^{B}	6.59^{B}	3.97^{B}	2.37^{B}	1.59^{B}
1.00	4.13^{C}	3.97^{B}	3.73^{B}	3.94^{B}	5.13^{B}	6.84^{D}	8.57^{B}	10.43^{B}	10.65^{B}	8.00^{B}	4.64^{B}	2.58^{B}	1.53^{B}
1.50	5.63^{C}	5.78^{B}	5.94^{B}	6.65^{B}	8.49^{B}	11.20^{B}	14.28^{B}	16.87^{B}	16.10^{B}	11.03^{B}	6.00^{B}	2.98^{B}	1.42^{B}
2.00	7.66^{C}	8.11^{B}	9.47^{B}	11.23^{B}	14.04^{B}	18.36^{B}	23.80^{B}	27.30^{B}	24.35^{B}	15.22^{B}	7.77^{B}	3.43^{B}	1.32^{B}
3.00	10.94^{C}	12.31^{B}	14.00^{B}	16.65^{B}	20.90^{B}	27.19^{B}	34.41^{B}	37.59^{B}	32.59^{B}	20.76^{B}	11.15^{B}	5.32^{B}	2.23^{B}
4.00	15.49^{C}	17.82^{B}	20.38^{B}	24.20^{B}	30.52^{B}	39.56^{B}	48.79^{B}	50.77^{B}	42.92^{B}	28.05^{B}	15.94^{B}	8.28^{B}	3.86^{B}
5.00	21.95^{B}	25.78^{B}	29.65^{B}	35.18^{B}	44.58^{B}	57.55^{B}	69.17^{B}	68.57^{B}	56.51^{B}	37.89^{B}	22.77^{B}	12.89^{B}	6.67^{B}
7.00	41.75^{B}	50.65^{B}	58.75^{B}	69.51^{B}	88.48^{B}	112.77^{B}	128.87^{B}	117.24^{B}	92.76^{B}	65.40^{B}	43.51^{B}	28.79^{B}	18.13^{B}
10.00	64.68^{B}	74.09^{B}	84.42^{B}	99.17^{B}	120.68^{B}	143.81^{B}	153.88^{B}	137.73^{B}	113.10^{B}	85.31^{B}	59.48^{B}	42.86^{B}	31.54^{B}
15.00	134.14^{B}	139.67^{B}	154.49^{B}	179.30^{C}	202.46^{B}	215.68^{B}	206.80^{B}	180.14^{B}	157.38^{B}	132.84^{B}	100.15^{B}	83.21^{B}	79.40^{B}
20.00	278.22^{C}	263.29^{B}	282.72^{C}	324.18^{C}	339.65^{C}	323.45^{B}	277.94^{B}	235.61^{B}	218.99^{B}	206.86^{B}	168.63^{B}	161.54^{B}	199.87^{B}

* Extrapolated from original data.

Variation in data <10%, >10%^{A}, >20%^{B}, >50%^{C}, >100%^{D}

Average N_2O (ppbv) for OCTOBER

Press. (mb)	Latitude (°N)												
	-50*	-40	-30	-20	-10	0	+10	+20	+30	+40	+50	+60	+70*
0.10*	1.12^{D}	1.04^{D}	0.72^{D}	0.60^{D}	0.82^{D}	0.89^{D}	0.98^{D}	1.18^{D}	1.41^{D}	1.53^{D}	1.25^{D}	0.84^{D}	0.52^{D}
0.15*	1.26^{D}	1.22^{D}	0.82^{D}	0.70^{D}	0.94^{D}	1.02^{D}	1.12^{D}	1.35^{D}	1.60^{D}	1.73^{C}	1.41^{C}	0.94^{D}	0.59^{D}
0.20*	1.43^{D}	1.37^{D}	0.94^{D}	0.80^{D}	1.07^{D}	1.16^{C}	1.28^{C}	1.54^{C}	1.82^{C}	1.96^{C}	1.59^{C}	1.05^{D}	0.66^{D}
0.30*	1.82^{D}	1.72^{D}	1.23^{C}	1.07^{C}	1.40^{C}	1.52^{C}	1.68^{C}	2.00^{C}	2.36^{C}	2.51^{C}	2.00^{C}	1.32^{C}	0.84^{D}
0.40*	2.32^{D}	2.18^{C}	1.60^{C}	1.42^{C}	1.83^{C}	1.99^{C}	2.21^{C}	2.61^{C}	3.04^{C}	3.21^{C}	2.53^{C}	1.66^{C}	1.08^{C}
0.50*	2.95^{C}	2.75^{C}	2.08^{C}	1.89^{C}	2.39^{C}	2.61^{C}	2.89^{C}	3.39^{C}	3.92^{C}	4.12^{C}	3.20^{C}	2.10^{C}	1.37^{C}
0.70	4.01^{C}	3.77^{C}	3.05^{B}	2.87^{B}	3.51^{B}	3.88^{B}	4.29^{B}	5.00^{B}	5.69^{B}	5.80^{B}	4.41^{B}	2.83^{B}	1.83^{B}
1.00	4.56^{C}	4.59^{B}	4.07^{D}	3.96^{B}	4.74^{B}	5.24^{D}	5.86^{B}	6.86^{B}	7.61^{B}	7.28^{B}	5.37^{B}	3.30^{B}	1.94^{C}
1.50	5.64^{C}	6.35^{B}	6.58^{D}	6.80^{B}	7.79^{D}	8.75^{D}	9.85^{B}	11.61^{B}	12.37^{B}	10.64^{B}	7.46^{B}	4.25^{C}	2.15^{C}
2.00	6.97^{B}	8.80^{B}	10.64^{B}	11.66^{B}	12.83^{B}	14.59^{B}	16.57^{B}	19.67^{B}	20.09^{B}	15.54^{B}	10.38^{B}	5.48^{C}	2.38^{C}
3.00	10.89^{B}	13.20^{B}	15.56^{B}	17.57^{B}	20.18^{B}	23.44^{B}	26.80^{B}	[illegible]15^{B}	28.59^{B}	21.59^{B}	14.53^{B}	7.98^{C}	3.72^{C}
4.00	17.03^{B}	19.65^{B}	22.37^{B}	25.96^{B}	31.22^{B}	37.01^{D}	42.61^{D}	45.33^{B}	39.92^{B}	29.62^{B}	20.14^{B}	11.57^{B}	5.84^{C}
5.00	26.63^{B}	29.25^{B}	32.14^{B}	38.35^{B}	48.30^{B}	58.46^{D}	67.75^{D}	68.16^{B}	55.74^{B}	40.63^{D}	27.92^{B}	16.78^{D}	9.18^{C}
7.00	59.18^{B}	59.84^{B}	61.95^{D}	77.31^{B}	105.20^{D}	131.63^{B}	153.45^{D}	140.02^{B}	101.29^{B}	71.89^{B}	50.45^{D}	33.01^{B}	21.02^{C}
10.00	75.74^{C}	79.13^{B}	83.38^{B}	100.37^{B}	132.03^{B}	160.71^{B}	175.36^{D}	158.82^{D}	123.17^{B}	91.68^{B}	66.26^{B}	47.31^{B}	34.21^{B}
15.00	114.25^{D}	126.06^{C}	136.77^{B}	155.07^{B}	192.79^{B}	224.14^{B}	219.04^{B}	195.91^{B}	170.66^{B}	137.50^{B}	104.36^{B}	86.18^{B}	77.04^{B}
20.00	172.34^{D}	200.83^{C}	224.35^{C}	239.59^{C}	281.52^{B}	312.61^{B}	273.60^{B}	241.67^{B}	236.48^{B}	206.20^{B}	164.37^{B}	157.00^{B}	173.51^{D}

Average N_2O (ppbv) for NOVEMBER

Press. (mb)	Latitude (°N)												
	-50*	-40	-30	-20	-10	0	+10	+20	+30	+40	+50	+60	+70*
0.10*	0.29^{D}	0.51^{D}	0.67^{D}	0.63^{D}	0.73^{D}	0.71^{C}	0.55^{C}	0.55^{D}	0.70^{D}	0.99^{C}	0.85^{C}	0.60^{C}	0.61
0.15*	0.33^{D}	0.5[illegible]^{D}	0.76^{D}	0.73^{D}	0.84^{D}	0.82^{C}	0.62^{C}	0.64^{C}	0.80^{C}	1.12^{C}	0.97^{C}	0.68^{C}	0.68
0.20*	0.38^{D}	0.67^{D}	0.87^{D}	0.85^{D}	0.97^{C}	0.94^{C}	0.72^{C}	0.74^{C}	0.92^{C}	1.28^{C}	1.09^{C}	0.77^{C}	0.76
0.30*	0.51^{D}	0.88^{D}	1.14^{C}	1.13^{C}	1.29^{C}	1.23^{C}	0.96^{C}	0.98^{C}	1.22^{C}	1.65^{C}	1.41^{C}	0.98^{B}	0.94
0.40*	0.68^{D}	1.15^{C}	1.50^{C}	1.52^{C}	1.72^{C}	1.62^{C}	1.26^{C}	1.29^{C}	1.60^{C}	2.12^{C}	1.81^{C}	1.25^{B}	1.17
0.50*	0.91^{D}	1.50^{C}	1.96^{C}	2.03^{C}	2.28^{C}	2.13^{C}	1.67^{B}	1.72^{C}	2.11^{C}	2.73^{C}	[illegible]2^{B}	1.60^{B}	1.45
0.70	1.39^{C}	2.21^{C}	2.89^{B}	3.10^{B}	3.44^{B}	3.18^{B}	2.54^{B}	2.61^{B}	3.14^{B}	3.87^{B}	3.27^{B}	2.21^{B}	1.82^{A}
1.00	1.93^{C}	2.96^{C}	3.92^{B}	4.35^{B}	4.73^{B}	4.37^{B}	3.66^{B}	3.73^{B}	4.24^{B}	4.84^{B}	4.07^{B}	2.60^{B}	1.73^{B}
1.50	3.36^{C}	4.84^{B}	6.50^{B}	7.65^{B}	8.05^{B}	7.43^{B}	6.69^{B}	6.74^{B}	7.03^{B}	7.01^{B}	5.87^{B}	3.41^{B}	1.59^{B}
2.00	5.86^{C}	7.90^{B}	10.78^{B}	13.45^{B}	13.70^{B}	12.65^{B}	12.24^{B}	12.20^{B}	11.65^{B}	10.15^{B}	8.47^{B}	4.47^{B}	1.47^{B}
3.00	9.17^{C}	12.11^{B}	16.24^{B}	20.77^{B}	22.15^{B}	20.96^{B}	20.47^{B}	20.39^{B}	19.00^{B}	15.87^{B}	12.51^{B}	6.78^{B}	2.53^{B}
4.00	14.09^{B}	18.25^{B}	24.04^{B}	31.42^{B}	35.19^{B}	34.16^{B}	33.53^{B}	33.42^{B}	30.50^{B}	24.58^{B}	18.29^{B}	10.24^{B}	4.45^{B}
5.00	21.63^{B}	27.50^{B}	35.59^{B}	47.51^{B}	55.91^{B}	55.68^{B}	54.92^{B}	54.75^{B}	48.97^{B}	38.08^{B}	26.74^{B}	15.47^{B}	7.84^{C}
7.00	46.96^{C}	57.43^{B}	71.47^{B}	98.61^{B}	126.69^{B}	131.90^{B}	131.04^{B}	130.73^{B}	113.14^{B}	83.13^{B}	53.19^{B}	32.77^{B}	21.80^{C}
10.00	66.48^{C}	74.98^{C}	85.44^{B}	112.39^{B}	147.60^{B}	153.95^{B}	150.24^{B}	150.14^{B}	133.67^{B}	104.57^{B}	72.66^{B}	48.32^{B}	33.94^{C}
15.00	118.64^{D}	116.86^{C}	115.06^{B}	139.76^{B}	190.39^{B}	199.19^{B}	188.71^{B}	189.11^{B}	176.49^{B}	153.29^{B}	122.19^{B}	92.27^{C}	70.97^{B}
20.00	211.73^{D}	182.16^{D}	154.94^{B}	173.81^{B}	245.58^{B}	257.71^{B}	237.02^{B}	238.19^{B}	233.03^{B}	224.71^{B}	205.49^{C}	176.21^{C}	148.41^{B}

Average N_2O (ppbv) for DECEMBER

Press. (mb)	Latitude (°N)												
	-50*	-40	-30	-20	-10	0	+10	+20	+30	+40	+50	+60	+70*
0.10*	0.14^{D}	0.31^{D}	0.60^{D}	0.97^{D}	1.09^{D}	0.81^{C}	0.58^{C}	0.51^{D}	0.57^{D}	0.77^{D}	0.74^{C}	0.56^{D}	0.50^{D}
0.15*	0.16^{D}	0.36^{D}	0.70^{D}	1.11^{C}	1.24^{C}	0.93^{C}	0.66^{C}	0.59^{C}	0.66^{D}	0.87^{D}	0.84^{C}	0.64^{D}	0.57^{D}
0.20*	0.19^{D}	0.41^{D}	0.81^{C}	1.28^{C}	1.42^{C}	1.06^{C}	0.75^{C}	0.67^{C}	0.75^{C}	0.99^{C}	0.94^{C}	0.73^{C}	0.65^{D}
0.30*	0.26^{D}	0.56^{D}	1.07^{C}	1.67^{C}	1.86^{C}	1.38^{C}	0.98^{C}	0.88^{C}	0.98^{C}	1.26^{C}	1.20^{C}	0.94^{C}	0.84^{D}
0.40*	0.35^{D}	0.75^{C}	1.43^{C}	2.19^{C}	2.43^{C}	1.80^{C}	1.28^{C}	1.15^{C}	1.28^{C}	1.62^{C}	1.52^{C}	1.21^{C}	1.09^{C}
0.50*	0.47^{D}	1.01^{C}	1.90^{C}	2.86^{C}	3.17^{C}	2.36^{B}	1.66^{B}	1.50^{C}	1.68^{C}	2.06^{C}	1.93^{B}	1.56^{C}	1.41^{C}
0.70	0.73^{C}	1.56^{C}	2.89^{B}	4.26^{B}	4.69^{B}	3.47^{B}	2.44^{B}	2.21^{B}	2.45^{B}	2.89^{B}	2.65^{B}	2.14^{B}	1.88^{B}
1.00	1.08^{C}	2.21^{C}	4.04^{B}	5.90^{B}	6.43^{B}	4.76^{B}	3.33^{B}	2.94^{B}	3.16^{B}	3.59^{B}	3.18^{B}	2.41^{B}	1.92^{B}
1.50	2.05^{C}	3.97^{B}	7.03^{B}	10.16^{D}	10.90^{B}	8.06^{B}	5.57^{B}	4.75^{B}	4.83^{B}	5.13^{B}	4.29^{B}	2.94^{B}	1.99^{B}
2.00	3.92^{C}	7.12^{B}	12.26^{B}	17.49^{B}	18.46^{B}	13.64^{B}	9.34^{B}	7.66^{B}	7.39^{B}	7.34^{B}	5.79^{B}	3.68^{B}	2.06^{B}
3.00	6.63^{C}	11.08^{B}	18.08^{D}	26.14^{D}	28.71^{D}	21.97^{D}	15.55^{B}	13.20^{B}	12.80^{B}	12.10^{B}	9.22^{D}	5.61^{B}	3.12^{B}
4.00	10.95^{B}	16.89^{B}	26.09^{B}	38.29^{B}	43.84^{B}	34.79^{D}	25.48^{B}	22.48^{B}	21.98^{B}	19.81^{B}	14.62^{B}	8.78^{B}	4.80^{B}
5.00	18.10^{B}	25.73^{B}	37.65^{B}	56.07^{B}	66.93^{B}	55.09^{B}	41.76^{B}	38.28^{B}	37.75^{B}	32.44^{B}	23.19^{B}	13.76^{B}	7.37^{C}
7.00	44.42^{B}	54.57^{B}	72.23^{B}	109.70^{B}	140.88^{B}	124.40^{B}	100.44^{B}	98.21^{B}	98.13^{B}	78.26^{B}	53.44^{B}	31.15^{C}	16.21^{C}
10.00	59.11^{C}	68.65^{B}	84.97^{B}	120.29^{B}	155.71^{B}	149.08^{B}	124.85^{B}	119.72^{B}	117.36^{B}	102.70^{B}	78.12^{B}	47.35^{C}	26.10^{C}
15.00	95.19^{D}	100.65^{C}	111.40^{B}	140.27^{B}	183.98^{B}	201.54^{B}	179.40^{B}	166.55^{B}	158.13^{B}	161.52^{B}	147.07^{C}	95.15^{C}	57.75^{C}
20.00	153.29^{D}	147.56^{C}	146.04^{B}	163.58^{B}	217.38^{B}	272.46^{B}	257.78^{B}	231.69^{B}	213.07^{B}	254.04^{B}	276.89^{C}	191.23^{C}	127.78^{C}

* Extrapolated from original data.

Variation in data: <10%, >10%^{A}, >20%^{B}, >50%^{C}, >100%^{D}

Average CH_4 (ppmv) for JANUARY

Press. (mb)	Latitude (°N)												
	−50°	−40	−30	−20	−10	0	+10	+20	+30	+40	+50	+60	+70°
0.10°	0.14	0.12	0.10[A]	0.09[A]	0.10[A]	0.11[A]	0.12[A]	0.12[A]	0.12[A]	0.11[A]	0.09[A]	0.08[A]	0.07[B]
0.15°	0.14	0.12	0.11[A]	0.10[A]	0.11[A]	0.12[A]	0.13[A]	0.14[A]	0.13[A]	0.12[A]	0.10[A]	0.09[A]	0.08[B]
0.20	0.14	0.13	0.12[A]	0.11[A]	0.12[A]	0.13[A]	0.14[A]	0.15[A]	0.14[A]	0.13[A]	0.11[A]	0.09[A]	0.08[B]
0.30	0.15	0.15[A]	0.14[A]	0.15[A]	0.16[A]	0.17[A]	0.17[A]	0.17[A]	0.16[A]	0.15[A]	0.13[A]	0.11[A]	0.09[B]
0.40	0.15[A]	0.16[A]	0.18[A]	0.19[A]	0.21[A]	0.21[A]	0.21[A]	0.21[A]	0.19[A]	0.18[A]	0.16[A]	0.13[A]	0.10[A]
0.50	0.16[A]	0.18[A]	0.22[A]	0.25[A]	0.26[A]	0.26[A]	0.26[A]	0.25[A]	0.22[A]	0.20[A]	0.19[A]	0.16[A]	0.12[A]
0.70	0.17[A]	0.22[A]	0.28[A]	0.35[A]	0.37[A]	0.35[A]	0.33[A]	0.30[A]	0.27[A]	0.25[A]	0.23[A]	0.20[A]	0.14[A]
1.00	0.20[A]	0.25[A]	0.32[A]	0.40[A]	0.42[A]	0.40[A]	0.38[A]	0.34[A]	0.30[A]	0.27[A]	0.26[A]	0.22[A]	0.16[A]
1.50	0.24[A]	0.31[A]	0.40[A]	0.51[A]	0.54[A]	0.50[A]	0.46[A]	0.40[A]	0.35[A]	0.32[A]	0.30[A]	0.26[A]	0.19[B]
2.00	0.29[A]	0.38[A]	0.50	0.64	0.69	0.63	0.55	0.47[A]	0.40[A]	0.37[A]	0.35[A]	0.31[B]	0.23[B]
3.00	0.34[A]	0.44[A]	0.56[A]	0.69	0.76	0.70	0.63	0.54[A]	0.47[A]	0.43[A]	0.41[A]	0.35[B]	0.26[B]
4.00	0.41[A]	0.50[A]	0.61[A]	0.75	0.82	0.78	0.71	0.61[A]	0.54[A]	0.51[A]	0.48[A]	0.40[A]	0.29[B]
5.00	0.49	0.57[A]	0.67[A]	0.80	0.89	0.87	0.79	0.70	0.63[A]	0.60[A]	0.55[A]	0.45[A]	0.32[B]
7.00	0.67	0.71	0.79[A]	0.91	1.02[A]	1.05	0.99	0.89	0.82	0.79	0.72[A]	0.58[A]	0.41[B]
10.00	0.76[A]	0.78[A]	0.83[A]	0.94[A]	1.06[A]	1.14[A]	1.10[A]	0.99[A]	0.92[A]	0.90[A]	0.83[A]	0.69[A]	0.56[B]
15.00	0.93[B]	0.90[A]	0.91[A]	0.99[A]	1.14[A]	1.31[A]	1.31[A]	1.18[A]	1.12[A]	1.11[B]	1.03[B]	0.95[B]	0.94[B]
20.00	1.15[B]	1.05[B]	1.00[A]	1.04[A]	1.22[A]	1.50[A]	1.57[A]	1.42[B]	1.35[B]	1.37[B]	1.28[B]	1.29[B]	1.57[B]

Average CH_4 (ppmv) for FEBRUARY

Press. (mb)	Latitude (°N)												
	−50°	−40	−30	−20	−10	0	+10	+20	+30	+40	+50	+60	+70°
0.10°	0.16[B]	0.11[A]	0.08[A]	0.08[A]	0.09[A]	0.10[A]	0.10[A]	0.10[A]	0.09[A]	0.09[A]	0.09[A]	0.08[A]	0.07[B]
0.15°	0.17[A]	0.12[A]	0.09[A]	0.09[A]	0.11[A]	0.11[A]	0.12[A]	0.11[A]	0.10[A]	0.10[A]	0.09[A]	0.08[A]	0.07[B]
0.20	0.17[A]	0.13[A]	0.10[A]	0.11[A]	0.12[A]	0.13[A]	0.13[A]	0.12[A]	0.11[A]	0.11[A]	0.10[A]	0.09[A]	0.08[B]
0.30	0.17[A]	0.15[A]	0.14[A]	0.15[A]	0.16[A]	0.16[A]	0.16[A]	0.15[A]	0.14[A]	0.14[A]	0.13[A]	0.11[A]	0.10[B]
0.40	0.17[A]	0.17[A]	0.18[A]	0.20[A]	0.21[A]	0.20[A]	0.19[A]	0.19[A]	0.18[A]	0.17[A]	0.16[A]	0.13[A]	0.12[B]
0.50	0.17[A]	0.20[A]	0.24[A]	0.27[A]	0.28[A]	0.25[A]	0.24[A]	0.24[A]	0.23[A]	0.21[A]	0.19[A]	0.16[A]	0.14[B]
0.70	0.18[A]	0.25[A]	0.33[A]	0.40[A]	0.39[A]	0.34[A]	0.32[A]	0.33[A]	0.31[A]	0.28[A]	0.25[A]	0.21[A]	0.18[B]
1.00	0.20[A]	0.28[A]	0.38[A]	0.46[A]	0.45[A]	0.39[A]	0.37[A]	0.37[A]	0.34[A]	0.31[A]	0.27[A]	0.23[A]	0.21[B]
1.50	0.25[A]	0.34[A]	0.46[A]	0.56[A]	0.57[A]	0.51	0.47[A]	0.44[A]	0.40[A]	0.36[A]	0.32[A]	0.28[A]	0.27[B]
2.00	0.29[A]	0.42[A]	0.57[A]	0.70[A]	0.72[A]	0.65	0.59	0.54[A]	0.47[A]	0.42[A]	0.37[A]	0.35[A]	0.34[B]
3.00	0.35[A]	0.48[A]	0.62	0.75	0.79[A]	0.73	0.67	0.61[A]	0.53[A]	0.47[A]	0.42[A]	0.39[A]	0.38[B]
4.00	0.41[A]	0.53	0.67	0.80	0.85	0.81	0.74	0.68	0.59	0.52[A]	0.48[A]	0.45[A]	0.41[B]
5.00	0.49[A]	0.60	0.73	0.86	0.92	0.89	0.83	0.76	0.66	0.58	0.54[A]	0.51[A]	0.45[B]
7.00	0.65	0.73	0.84	0.96	1.04	1.06	1.00	0.92	0.81	0.71	0.68[A]	0.63[A]	0.54[B]
10.00	0.71[A]	0.78[A]	0.87	0.98	1.08[A]	1.14[A]	1.12[A]	1.02[A]	0.89[A]	0.80[A]	0.79[A]	0.75[A]	0.68[B]
15.00	0.83[B]	0.86[A]	0.93	1.02[A]	1.15[A]	1.29[A]	1.33[A]	1.20[A]	1.03[D]	0.99[B]	1.00[B]	1.00[B]	0.99[B]
20.00	0.97[B]	0.95[A]	0.99[A]	1.06[A]	1.21[A]	1.46[A]	[illegible]	1.40[B]	1.20[B]	1.23[B]	1.28[B]	1.32[B]	1.43[B]

Average CH_4 (ppmv) for MARCH

Press. (mb)	Latitude (°N)												
	−50°	−40	−30	−20	−10	0	+10	+20	+30	+40	+50	+60	+70°
0.10°	0.18	0.11[A]	0.08[B]	0.08[A]	0.10[A]	0.10[A]	0.10[A]	0.09[A]	0.08[A]	0.08	0.08	0.06[A]	0.05[B]
0.15°	0.18[A]	0.12[A]	0.09[B]	0.09[A]	0.11[A]	0.11[A]	0.11[A]	0.10[A]	0.09[A]	0.09	0.08	0.07[A]	0.06[B]
0.20	0.18[A]	0.13[A]	0.11[B]	0.11[A]	0.12[A]	0.13[A]	0.12[A]	0.12[A]	0.11[A]	0.10	0.09[A]	0.08[A]	0.06[B]
0.30	0.18[A]	0.17[A]	0.15[A]	0.15[A]	0.16[A]	0.16[A]	0.15[A]	0.15[A]	0.14[A]	0.13[A]	0.11[A]	0.09[A]	0.08[B]
0.40	0.19[A]	0.21[A]	0.22[A]	0.21[A]	0.20[A]	0.19[A]	0.18[A]	0.18[A]	0.18[A]	0.16[A]	0.14[A]	0.12[A]	0.10[A]
0.50	0.19[A]	0.26[A]	0.31[A]	0.29[A]	0.26[A]	0.24[A]	0.23[A]	0.23[A]	0.23[A]	0.20[A]	0.17[A]	0.14[A]	0.13[A]
0.70	0.19[A]	0.34[A]	0.47[A]	0.43[A]	0.35[A]	0.31[A]	0.30[A]	0.31[A]	0.31[A]	0.27[A]	0.22[A]	0.19[A]	0.18[A]
1.00	0.22[A]	0.36[A]	0.50[A]	0.48[A]	0.41[A]	0.36[A]	0.35[A]	0.36[A]	0.35[A]	0.30[A]	0.24[A]	0.21[A]	0.20[A]
1.50	0.26[A]	0.40[A]	0.55[A]	0.58[A]	0.53[A]	0.47	0.45	0.46[A]	0.43[A]	0.36[A]	0.30[A]	0.27[A]	[illegible]
2.00	0.31[A]	0.45[A]	0.61	0.70[A]	0.68[A]	0.61	0.58	0.58	0.53	0.44	0.36[A]	0.33[A]	0.32[A]
3.00	0.36[A]	0.50[A]	0.66	0.76[A]	0.75[A]	0.69	0.66	0.65	0.59	0.49	0.41[A]	0.39[A]	0.37[A]
4.00	0.41[A]	0.55[A]	0.71	0.81[A]	0.82[A]	0.76	0.74	0.72	0.65	0.54	0.46[A]	0.44[A]	0.43[A]
5.00	0.48[A]	0.61[A]	0.76	0.87	0.89	0.85	0.83	0.80	0.71	0.59	0.52[A]	0.51[A]	0.50[A]
7.00	0.62	0.73	0.86	0.99	1.04	1.03	1.02	0.96	0.84	0.70[A]	0.65[A]	0.66[A]	0.66[A]
10.00	0.68[A]	0.78[A]	0.90	1.02	1.08[A]	1.11[A]	1.12[A]	1.05[A]	0.92[A]	0.82[A]	0.76[A]	0.76[A]	0.79[A]
15.00	0.82[A]	0.86[A]	0.97[A]	1.08[A]	1.15[A]	1.24[A]	1.31[A]	1.22[A]	1.08[A]	1.05[A]	1.00[A]	0.97[A]	1.05[A]
20.00	0.97[B]	0.96[A]	1.04[A]	1.15[A]	1.22[A]	1.39[A]	1.52[A]	1.41[B]	1.26[B]	1.34[B]	1.31[B]	1.24[A]	1.40[A]

* Extrapolated from original data.

Variation in data <10%, >10%[A], >20%[B], >50%[C], >100%[D]

Average CH_4 (ppmv) for APRIL

Press. (mb)	Latitude (°N)												
	−50°	−40	−30	−20	−10	0	+10	+20	+30	+40	+50	+60	+70°
0.10*	0.14^{A}	0.11^{B}	0.09^{B}	0.09^{A}	0.11^{A}	0.11^{A}	0.10^{A}	0.10^{A}	0.09^{A}	0.09^{A}	0.08	0.06^{A}	0.05^{B}
0.15*	0.15^{A}	0.12^{B}	0.10^{B}	0.10^{A}	0.12^{A}	0.12^{A}	0.12^{A}	0.11^{A}	0.10^{A}	0.10^{A}	0.08	0.06^{A}	0.05^{B}
0.20	0.16^{A}	0.14^{B}	0.12^{B}	0.12^{A}	0.13^{A}	0.13^{A}	0.13^{A}	0.12^{A}	0.11^{A}	0.11^{A}	0.09	0.07^{A}	0.06^{B}
0.30	0.17^{A}	0.17^{B}	0.16^{B}	0.15^{A}	0.16^{A}	0.16^{A}	0.16^{A}	0.16^{A}	0.15^{A}	0.13^{A}	0.11^{A}	0.08^{A}	0.07^{B}
0.40	0.19^{A}	0.20^{A}	0.20^{A}	0.19^{A}	0.19^{A}	0.19^{A}	0.19^{A}	0.20^{A}	0.19^{A}	0.16^{A}	0.13^{A}	0.10^{A}	0.08^{B}
0.50	0.21^{A}	0.25^{A}	0.26^{A}	0.25^{A}	0.23^{A}	0.23^{A}	0.24^{A}	0.25^{A}	0.25^{A}	0.20^{A}	0.15^{A}	0.12^{A}	0.10^{B}
0.70	0.24^{A}	0.32^{A}	0.36^{A}	0.34^{A}	0.30^{A}	0.29	0.31^{A}	0.34^{A}	0.34^{A}	0.26^{A}	0.19^{A}	0.15^{A}	0.13^{A}
1.00	0.26^{A}	0.34^{A}	0.41^{A}	0.40^{A}	0.35^{A}	0.33	0.35	0.39^{A}	0.38^{A}	0.29^{A}	0.21^{A}	0.18^{A}	0.15^{A}
1.50	0.29^{A}	0.40^{A}	0.49^{A}	0.50^{A}	0.45^{A}	0.42	0.44	0.47	0.44^{A}	0.35^{A}	0.26^{A}	0.22^{A}	0.20^{A}
2.00	0.34^{A}	0.45^{A}	0.58^{A}	0.63^{A}	0.59^{A}	0.54	0.55	0.58	0.53	0.42	0.33	0.28	0.25
3.00	0.39^{A}	0.52^{A}	0.65^{A}	0.71^{A}	0.67^{A}	0.63	0.63	0.65	0.59	0.47	0.37	0.33	0.31
4.00	0.45^{A}	0.58^{A}	0.72^{A}	0.78^{A}	0.76^{A}	0.72	0.71	0.71	0.65	0.52	0.42^{A}	0.38	0.37
5.00	0.52^{A}	0.66^{A}	0.79^{A}	0.86^{A}	0.85	0.82	0.80	0.79	0.73	0.58^{A}	0.47^{A}	0.44	0.45
7.00	0.68^{A}	0.81^{A}	0.94	1.02	1.05	1.04	1.00	0.95	0.88	0.71^{A}	0.58^{A}	0.59^{A}	0.63
10.00	0.74^{A}	0.87^{A}	0.99	1.06	1.09^{A}	1.11	1.08	1.02	0.96^{A}	0.82^{A}	0.72^{A}	0.74^{A}	0.78
15.00	0.85^{A}	0.96^{A}	1.08^{A}	1.14^{A}	1.16^{A}	1.25^{A}	1.25^{A}	1.16^{A}	1.11^{A}	1.06^{A}	1.04^{A}	1.07^{A}	1.13^{A}
20.00	0.98^{A}	1.07^{A}	1.19^{A}	1.23^{A}	1.24^{A}	1.40^{A}	1.43^{A}	1.32^{A}	1.29^{A}	1.36^{A}	1.48^{B}	1.56^{A}	1.62^{A}

Average CH_4 (ppmv) for MAY

Press. (mb)	Latitude (°N)												
	−50°	−40	−30	−20	−10	0	+10	+20	+30	+40	+50	+60	+70°
0.10*	0.05^{A}	0.08^{A}	0.11^{A}	0.11^{A}	0.12^{A}	0.12^{A}	0.11^{A}	0.11^{A}	0.10^{A}	0.09^{A}	0.07^{A}	0.06^{B}	0.06^{B}
0.15*	0.06^{A}	0.09^{A}	0.12^{A}	0.12^{A}	0.12^{A}	0.13^{A}	0.12^{A}	0.12^{A}	0.11^{A}	0.10^{A}	0.08^{A}	0.07^{B}	0.06^{B}
0.20	0.07^{A}	0.10^{A}	0.13^{A}	0.13^{A}	0.13^{A}	0.14^{A}	0.14^{A}	0.13^{A}	0.13^{A}	0.11^{A}	0.08^{A}	0.07^{B}	0.07^{B}
0.30	0.09^{B}	0.13^{A}	0.15^{A}	0.15^{A}	0.15^{A}	0.16^{A}	0.17^{A}	0.17^{A}	0.16^{A}	0.13^{A}	0.10^{A}	0.08^{A}	0.07^{B}
0.40	0.11^{B}	0.15^{A}	0.18^{A}	0.17^{A}	0.18^{A}	0.19^{A}	0.20^{A}	0.21^{A}	0.20^{A}	0.15^{A}	0.11^{A}	0.09^{A}	0.08^{B}
0.50	0.14^{B}	0.19^{A}	0.21^{A}	0.20^{A}	0.21^{A}	0.22^{A}	0.25^{A}	0.26^{A}	0.25^{A}	0.18^{A}	0.13^{A}	0.11^{A}	0.09^{B}
0.70	0.20^{B}	0.24^{A}	0.26^{A}	0.25^{A}	0.25	0.28	0.32^{A}	0.35^{A}	0.33^{A}	0.23^{A}	0.16^{A}	0.13^{A}	0.10^{A}
1.00	0.23^{B}	0.28^{A}	0.30^{A}	0.29^{A}	0.30	0.32	0.36^{A}	0.40^{A}	0.37^{A}	0.26^{A}	0.19^{A}	0.15^{A}	0.12^{A}
1.50	0.30^{B}	0.36^{A}	0.39^{A}	0.38^{A}	0.39	0.41	0.45^{A}	0.48^{A}	0.44^{A}	0.32	0.23^{A}	0.19^{A}	0.16^{A}
2.00	0.38^{A}	0.46^{A}	0.50^{A}	0.50^{A}	0.50	0.52^{A}	0.57	0.59	0.52	0.39	0.29^{A}	0.24^{A}	0.21^{A}
3.00	0.45^{A}	0.53^{A}	0.57^{A}	0.58^{A}	0.59	0.60	0.64	0.66	0.58	0.44	0.34^{A}	0.29^{A}	0.27^{A}
4.00	0.53^{A}	0.61^{A}	0.66^{A}	0.68	0.68	0.69	0.72	0.73	0.65	0.50	0.39^{A}	0.35^{A}	0.33^{A}
5.00	0.63^{A}	0.70^{A}	0.75	0.78	0.79	0.78	0.80	0.80	0.72	0.56^{A}	0.45^{A}	0.42^{A}	0.40^{A}
7.00	0.83^{A}	0.89^{A}	0.96	1.02	1.03	0.99	0.98	0.96	0.86	0.70^{A}	0.60^{A}	0.58^{A}	0.58
10.00	0.87^{A}	0.97^{A}	1.04	1.08	1.10	1.08	1.06	1.00	0.91^{A}	0.80^{A}	0.73^{A}	0.73^{A}	0.74^{A}
15.00	0.94^{A}	1.10^{A}	1.20^{A}	1.21^{A}	1.22	1.24	1.20^{A}	1.09^{A}	1.00^{A}	1.00^{A}	1.04^{A}	1.07^{A}	1.10^{A}
20.00	1.01^{A}	1.24^{A}	1.38^{A}	1.35^{A}	1.37	1.42^{A}	1.35^{A}	1.18^{A}	1.09^{A}	1.25^{B}	1.48^{B}	1.57^{A}	1.63^{A}

Average CH_4 (ppmv) for JUNE

Press. (mb)	Latitude (°N)												
	−50°	−40	−30	−20	−10	0	+10	+20	+30	+40	+50	+60	+70°
0.10*	0.06	0.10	0.13^{A}	0.12^{A}	0.12^{A}	0.12^{A}	0.12^{A}	0.11^{A}	0.10^{A}	0.09^{A}	0.07^{A}	0.06^{A}	0.06^{B}
0.15*	0.06	0.10	0.13^{A}	0.13^{A}	0.13^{A}	0.13^{A}	0.13^{A}	0.12^{A}	0.11^{A}	0.10^{A}	0.08^{A}	0.07^{A}	0.07^{B}
0.20	0.07	0.11	0.14^{A}	0.14^{A}	0.14^{A}	0.14^{A}	0.14^{A}	0.14^{A}	0.13^{A}	0.11^{A}	0.08^{A}	0.07^{A}	0.07^{B}
0.30	0.08^{A}	0.13^{A}	0.16^{A}	0.16^{A}	0.16^{A}	0.17^{A}	0.18^{A}	0.18^{A}	0.16^{A}	0.13^{A}	0.10^{A}	0.08^{A}	0.07^{B}
0.40	0.10^{A}	0.14^{A}	0.18^{A}	0.18^{A}	0.19^{A}	0.20^{A}	0.22^{A}	0.22^{A}	0.20^{A}	0.15^{A}	0.11^{A}	0.09^{A}	0.08^{B}
0.50	0.12^{B}	0.16^{A}	0.20^{A}	0.21^{A}	0.22^{A}	0.24^{A}	0.27^{A}	0.29^{A}	0.24^{A}	0.18^{A}	0.12^{A}	0.10^{A}	0.08^{B}
0.70	0.15^{B}	0.20^{B}	0.23^{A}	0.25^{A}	0.27	0.30^{A}	0.36^{A}	0.38^{A}	0.32^{A}	0.23^{A}	0.15^{A}	0.11^{A}	0.09^{B}
1.00	0.18^{B}	0.23^{B}	0.27^{A}	0.29^{A}	0.31^{A}	0.34^{A}	0.40^{A}	0.43^{A}	0.36^{A}	0.26^{A}	0.17^{A}	0.13^{A}	0.11^{A}
1.50	0.24^{B}	0.29^{A}	0.34^{A}	0.35^{A}	0.38^{A}	0.42^{A}	0.49^{A}	0.52^{A}	0.44^{A}	0.31^{A}	0.21^{A}	0.17^{A}	0.15^{A}
2.00	0.32^{B}	0.38^{A}	0.42^{A}	0.44^{A}	0.47^{A}	0.52^{A}	0.59	0.62	0.54	0.38	0.26^{A}	0.22^{A}	0.20^{A}
3.00	0.38^{B}	0.46^{A}	0.51^{A}	0.52^{A}	0.55^{A}	0.60^{A}	0.67	0.68	0.60	0.44	0.32^{A}	0.27^{A}	0.25^{A}
4.00	0.45^{B}	0.55^{A}	0.61^{A}	0.61^{A}	0.63^{A}	0.69^{A}	0.74	0.75	0.66	0.50	0.38^{A}	0.33^{A}	0.30^{A}
5.00	0.53^{B}	0.65^{A}	0.72^{A}	0.72^{A}	0.73^{A}	0.79	0.83	0.82	0.73	0.57	0.46^{A}	0.41^{A}	0.37^{A}
7.00	0.71^{A}	0.90^{A}	1.00	0.96^{A}	0.96^{A}	1.00	1.01	0.96	0.87	0.73	0.64	0.60	0.55
10.00	0.85^{A}	1.02^{A}	1.09^{A}	1.04^{A}	1.03^{A}	1.08	1.07	1.00	0.91^{A}	0.81^{A}	0.75^{A}	0.73	0.71
15.00	1.16^{B}	1.27^{A}	1.28^{A}	1.19^{A}	1.17^{A}	1.21^{A}	1.18^{A}	1.07^{A}	0.96^{A}	0.94^{A}	0.97^{A}	1.02^{A}	1.10
20.00	1.58^{B}	1.57^{B}	1.49^{A}	1.36^{A}	1.33^{A}	1.36^{A}	1.30^{A}	1.15^{A}	1.02^{A}	1.11^{B}	1.27^{A}	1.43^{A}	1.72^{A}

* Extrapolated from original data.

Variation in data <10%, >10%^{A}, >20%^{B}, >50%^{C}, >100%^{D}

Average CH_4 (ppmv) for JULY

Press. (mb)	Latitude (°N)												
	-50°	-40	-30	-20	-10	0	+10	+20	+30	+40	+50	+60	+70°
0.10°	0.08	0.10	0.12^{A}	0.13^{A}	0.12^{A}	0.12^{A}	0.12^{A}	0.10^{A}	0.09^{A}	0.09^{A}	0.08^{A}	0.08^{D}	0.07^{B}
0.15°	0.09	0.11	0.13^{A}	0.13^{A}	0.13^{A}	0.14^{A}	0.13^{A}	0.12^{A}	0.11^{A}	0.10^{A}	0.09^{A}	0.08^{B}	0.07^{B}
0.20	0.09	0.11	0.14^{A}	0.14^{A}	0.15^{A}	0.15^{A}	0.15^{A}	0.14^{A}	0.12^{A}	0.11^{A}	0.09^{A}	0.08^{A}	0.07^{B}
0.30	0.09	0.13^{A}	0.16^{A}	0.17^{A}	0.17^{A}	0.19^{A}	0.19^{A}	0.18^{A}	0.16^{A}	0.13^{A}	0.10^{A}	0.09^{A}	0.07^{B}
0.40	0.09^{A}	0.14^{A}	0.18^{A}	0.19^{A}	0.21^{A}	0.23^{A}	0.25^{A}	0.24^{A}	0.21^{A}	0.16^{A}	0.12^{A}	0.09^{A}	0.07^{B}
0.50	0.10^{A}	0.15^{A}	0.20^{A}	0.22^{A}	0.25^{A}	0.28^{A}	0.32^{A}	0.32^{A}	0.27^{A}	0.19^{A}	0.13^{A}	0.10^{A}	0.07^{A}
0.70	0.11^{D}	0.18^{A}	0.24^{A}	0.27^{A}	0.31^{A}	0.37^{A}	0.43^{A}	0.45^{A}	0.38^{A}	0.25^{A}	0.15^{A}	0.11^{A}	0.08^{A}
1.00	0.13^{B}	0.20^{A}	0.26^{A}	0.29^{A}	0.33^{A}	0.40^{A}	0.48^{A}	0.50^{A}	0.42^{A}	0.28^{A}	0.17^{A}	0.12^{A}	0.10^{A}
1.50	0.19^{B}	0.25^{A}	0.30^{A}	0.34^{A}	0.39^{A}	0.47^{A}	0.56^{A}	0.59^{A}	0.50^{A}	0.33^{A}	0.21^{A}	0.16^{A}	0.13^{A}
2.00	0.26^{B}	0.31^{B}	0.35^{A}	0.39^{A}	0.45^{A}	0.55^{A}	0.67^{A}	0.69	0.58	0.40^{A}	0.26^{A}	0.20^{A}	0.17^{A}
3.00	0.32^{B}	0.38^{A}	0.42^{A}	0.46^{A}	0.52^{A}	0.62^{A}	0.73	0.74	0.64	0.46^{A}	0.32^{A}	0.25^{A}	0.23^{A}
4.00	0.37^{A}	0.45^{A}	0.51^{A}	0.54^{A}	0.61^{A}	0.70^{A}	0.80	0.79	0.70	0.53^{A}	0.38^{A}	0.32^{A}	0.29
5.00	0.44^{A}	0.54^{A}	0.60^{A}	0.64^{A}	0.70^{A}	0.79^{A}	0.86	0.85	0.76	0.60^{A}	0.46^{A}	0.40^{A}	0.38
7.00	0.60	0.75^{A}	0.84^{A}	0.87^{A}	0.92^{A}	0.98	1.00	0.95	0.89	0.76^{A}	0.65^{A}	0.61	0.60
10.00	0.82	0.93^{A}	0.96^{A}	0.96^{A}	1.00^{A}	1.05^{A}	1.06	1.00	0.92^{A}	0.83^{A}	0.74^{A}	0.73	0.76
15.00	1.39	1.30^{A}	1.20^{A}	1.13^{A}	1.16^{A}	1.19^{A}	1.17^{A}	1.08^{A}	0.98^{A}	0.94^{A}	0.92^{A}	0.98	1.15
20.00	2.33	1.83^{A}	1.50^{A}	1.32^{A}	1.33^{A}	1.35^{A}	1.29^{A}	1.17^{A}	1.05^{A}	1.07^{B}	1.14^{A}	1.33^{A}	1.72

Average CH_4 (ppmv) for AUGUST

Press. (mb)	Latitude (°N)												
	-50°	-40	-30	-20	-10	0	+10	+20	+30	+40	+50	+60	+70°
0.10°	0.09	0.10	0.11	0.13^{A}	0.13^{A}	0.13^{B}	0.12^{A}	0.10^{A}	0.10^{A}	0.10^{A}	0.11^{A}	0.11^{A}	0.11^{B}
0.15°	0.09	0.11	0.12	0.14^{A}	0.15^{A}	0.15^{B}	0.14^{A}	0.12^{A}	0.11^{A}	0.11^{A}	0.12^{A}	0.11^{A}	0.10^{B}
0.20	0.10	0.12	0.14	0.15^{A}	0.16^{A}	0.17^{B}	0.16^{A}	0.14^{A}	0.13^{A}	0.13^{A}	0.12^{A}	0.11^{A}	0.10^{B}
0.30	0.11	0.14	0.17	0.19^{A}	0.19^{A}	0.21^{A}	0.21^{A}	0.20^{A}	0.18^{A}	0.16^{A}	0.13^{A}	0.11^{A}	0.09^{B}
0.40	0.12^{A}	0.17^{A}	0.21	0.23^{A}	0.23^{A}	0.26^{A}	0.28^{A}	0.28^{A}	0.25^{A}	0.20^{A}	0.15^{A}	0.11^{A}	0.08^{A}
0.50	0.13^{A}	0.20^{A}	0.26^{A}	0.28^{A}	0.28^{A}	0.32^{A}	0.37^{A}	0.39^{A}	0.34^{A}	0.24^{A}	0.16^{A}	0.11^{A}	0.08^{A}
0.70	0.16^{B}	0.25^{A}	0.34^{A}	0.35^{A}	0.35^{A}	0.42^{A}	0.52^{A}	0.58^{A}	0.49^{A}	0.32^{A}	0.19^{A}	0.11^{A}	0.07^{A}
1.00	0.18^{B}	0.26^{A}	0.33^{A}	0.35^{A}	0.37^{A}	0.45^{A}	0.60^{A}	0.61^{A}	0.52^{A}	0.34^{A}	0.20^{A}	0.13^{A}	0.09^{A}
1.50	0.24^{B}	0.28^{A}	0.33^{A}	0.35^{A}	0.41^{A}	0.52^{A}	0.62^{A}	0.66	0.57^{A}	0.39^{A}	0.23^{A}	0.15^{A}	0.11^{A}
2.00	0.31^{B}	0.30^{A}	0.32^{A}	0.36^{A}	0.45^{A}	0.60^{A}	0.70	0.71	0.62	0.45^{A}	0.26^{A}	0.17^{A}	0.15^{A}
3.00	0.37^{B}	0.36^{A}	0.38^{A}	0.42^{A}	0.51^{A}	0.66^{A}	0.75	0.77	0.67	0.50^{A}	0.31^{A}	0.22^{A}	0.19^{A}
4.00	0.43^{B}	0.43^{A}	0.46^{A}	0.50^{A}	0.59^{A}	0.73^{A}	0.81	0.82	0.73	0.56^{A}	0.38^{A}	0.28^{A}	0.25^{A}
5.00	0.50^{A}	0.52^{A}	0.54^{A}	0.59^{A}	0.68^{A}	0.79^{A}	0.88	0.88	0.79	0.62^{A}	0.45^{A}	0.36^{A}	0.33^{A}
7.00	0.67^{A}	0.72^{A}	0.75^{A}	0.79^{A}	0.87^{A}	0.94	1.00	1.00	0.90	0.76^{A}	0.63^{A}	0.57^{A}	0.53
10.00	0.87^{A}	0.86^{A}	0.84^{A}	0.86^{A}	0.95^{A}	1.02^{A}	1.06^{A}	1.04^{A}	0.96^{A}	0.83^{A}	0.72^{A}	0.68^{A}	0.68^{A}
15.00	1.36^{A}	1.16^{A}	1.02^{A}	1.00^{A}	1.10^{A}	1.17^{A}	1.15^{A}	1.12^{A}	1.05^{A}	0.96^{A}	0.88^{A}	0.91^{A}	1.06^{A}
20.00	2.13^{A}	1.56^{A}	1.24^{A}	1.17^{A}	1.28^{A}	1.34^{A}	1.26^{A}	1.19^{A}	1.16^{A}	1.11^{A}	1.08^{A}	1.23^{A}	1.64^{A}

Average CH_4 (ppmv) for SEPTEMBER

Press. (mb)	Latitude (°N)												
	-50°	-40	-30	-20	-10	0	+10	+20	+30	+40	+50	+60	+70°
0.10°	0.10^{B}	0.10^{B}	0.10^{A}	0.13^{A}	0.14^{A}	0.14^{A}	0.12^{A}	0.10^{A}	0.10^{A}	0.13^{A}	0.15^{A}	0.15^{A}	0.15
0.15°	0.11^{D}	0.11^{B}	0.12^{A}	0.14^{A}	0.16^{A}	0.16^{A}	0.14^{A}	0.12^{A}	0.12^{A}	0.14^{A}	0.16^{A}	0.15^{A}	0.14
0.20	0.12^{B}	0.12^{A}	0.13^{A}	0.16^{A}	0.17^{A}	0.18^{A}	0.16^{A}	0.14^{A}	0.14^{A}	0.16^{A}	0.17^{A}	0.15^{A}	0.13
0.30	0.13^{B}	0.15^{A}	0.17^{A}	0.19^{A}	0.21^{A}	0.22^{A}	0.21^{A}	0.19^{A}	0.19^{A}	0.20^{A}	0.19^{A}	0.15^{A}	0.11
0.40	0.15^{B}	0.19^{A}	0.22^{A}	0.24^{A}	0.25^{A}	0.28^{A}	0.28^{A}	0.27^{A}	0.26^{A}	0.25^{A}	0.21^{A}	0.14^{A}	0.10
0.50	0.18^{A}	0.24^{A}	0.28^{A}	0.29^{A}	0.31^{A}	0.34^{A}	0.36^{A}	0.37^{A}	0.36^{A}	0.32^{A}	0.23^{A}	0.14^{A}	0.08
0.70	0.21^{A}	0.31^{A}	0.38^{A}	0.37^{A}	0.39^{A}	0.45^{A}	0.50^{A}	0.54^{A}	0.52^{A}	0.42^{A}	0.26^{A}	0.14^{A}	0.07
1.00	0.24^{A}	0.32^{A}	0.39^{A}	0.39^{A}	0.42^{A}	0.49^{A}	0.54^{A}	0.58^{A}	0.56^{A}	0.44^{A}	0.27^{A}	0.14^{A}	0.07
1.50	0.28^{A}	0.34^{A}	0.40^{A}	0.43^{A}	0.48^{A}	0.56^{A}	0.63^{A}	0.66^{A}	0.63^{A}	0.48^{A}	0.28^{A}	0.15^{A}	0.08^{A}
2.00	0.32^{A}	0.36^{B}	0.41^{B}	0.47^{A}	0.54^{A}	0.63	0.72	0.75	0.70	0.53^{A}	0.30^{A}	0.15^{A}	0.09^{A}
3.00	0.38^{A}	0.41^{A}	0.45^{B}	0.52^{A}	0.60^{A}	0.69	0.77	0.80	0.75	0.58^{A}	0.35^{A}	0.20^{A}	0.12^{A}
4.00	0.45^{A}	0.47^{A}	0.51^{B}	0.57^{A}	0.66^{A}	0.75	0.83	0.85	0.79	0.63^{A}	0.41^{A}	0.26^{A}	0.18^{A}
5.00	0.53^{A}	0.54^{A}	0.56^{A}	0.62^{A}	0.72^{A}	0.82	0.88	0.90	0.84	0.69^{A}	0.49^{A}	0.34^{A}	0.25^{A}
7.00	0.71^{B}	0.69^{A}	0.69^{A}	0.73^{A}	0.85^{A}	0.95	1.00	0.99	0.93	0.80^{A}	0.67^{A}	0.55	0.46^{A}
10.00	0.84^{A}	0.79^{A}	0.77^{A}	0.81^{A}	0.93^{A}	1.05	1.06	1.03^{A}	0.98^{A}	0.87^{A}	0.75^{A}	0.67	0.63^{A}
15.00	1.11^{A}	0.99^{B}	0.93^{B}	0.95^{A}	1.08^{A}	1.23^{A}	1.18^{A}	1.10^{A}	1.07^{A}	0.99^{A}	0.91^{A}	0.93^{A}	1.04^{A}
20.00	1.47^{A}	1.24^{B}	1.13^{B}	1.12^{A}	1.25^{A}	1.45^{A}	1.32^{A}	1.17^{A}	1.17^{A}	1.12^{A}	1.11^{A}	1.30^{A}	1.72^{A}

* Extrapolated from original data.

Variation in data <10%, >10%^{A}, >20%^{B}, >50%^{C}, >100%^{D}

Average CH_4 (ppmv) for OCTOBER

Press. (mb)	Latitude (°N)												
	-50*	-40	-30	-20	-10	0	+10	+20	+30	+40	+50	+60	+70*
0.10*	0.10	0.10[A]	0.11[A]	0.12[A]	0.15[A]	0.16[A]	0.14[A]	0.12[A]	0.12[A]	0.13[A]	0.14[A]	0.14[A]	0.15[A]
0.15*	0.10	0.11[A]	0.12[A]	0.14[A]	0.16[A]	0.18[A]	0.16[A]	0.14[A]	0.13[A]	0.15[A]	0.15[A]	0.14[A]	0.14[A]
0.20	0.11	0.12[A]	0.13[A]	0.15[A]	0.18[A]	0.19[A]	0.17[A]	0.15[A]	0.15[A]	0.16[A]	0.16[A]	0.14[A]	0.13[A]
0.30	0.13	0.15[A]	0.16[A]	0.18[A]	0.21[A]	0.23[A]	0.22[A]	0.20[A]	0.20[A]	0.20[A]	0.18[A]	0.16[A]	0.11[A]
0.40	0.15	0.17[A]	0.20[A]	0.22[A]	0.24[A]	0.27[A]	0.27[A]	0.26[A]	0.26[A]	0.24[A]	0.20[A]	0.15[A]	0.10[A]
0.50	0.18	0.21[A]	0.24[A]	0.27[A]	0.29[A]	0.31[A]	0.33[A]	0.34[A]	0.34[A]	0.29[A]	0.23[A]	0.16[A]	0.09[A]
0.70	0.21[A]	0.26[A]	0.31[A]	0.34[A]	0.36	0.39	0.43[A]	0.47[A]	0.46[A]	0.36[A]	0.27[A]	0.16[A]	0.08[A]
1.00	0.23[A]	0.28[A]	0.33[A]	0.37[A]	0.39[A]	0.43[A]	0.47[A]	0.51[A]	0.50[A]	0.39[A]	0.28[A]	0.16[A]	0.08[A]
1.50	0.26[A]	0.31[A]	0.37[A]	0.43[A]	0.47[A]	0.51[A]	0.56[A]	0.59[A]	0.57[A]	0.45[A]	0.30[A]	0.17[A]	0.08[A]
2.00	0.30[A]	0.35[A]	0.42[A]	0.49[A]	0.55[A]	0.61[A]	0.67	0.69	0.65[A]	0.51[A]	0.32[A]	0.17[A]	0.08[A]
3.00	0.35[A]	0.40[A]	0.47[A]	0.55[A]	0.62[A]	0.68	0.73	0.75	0.70[A]	0.56[A]	0.38[A]	0.21[A]	0.11
4.00	0.42[A]	0.47[A]	0.53[A]	0.60[A]	0.68[A]	0.75	0.79	0.81	0.76[A]	0.62[A]	0.44[A]	0.28[A]	0.16
5.00	0.49[A]	0.54[A]	0.60[A]	0.66[A]	0.76[A]	0.83	0.86	0.88	0.82	0.68	0.52[A]	0.36[A]	0.23
7.00	0.67[A]	0.71[A]	0.74[A]	0.78[A]	0.91	0.99	1.01	1.01	0.94[A]	0.82	0.69	0.56[A]	0.44
10.00	0.81[A]	0.82[A]	0.81[A]	0.85[A]	0.99	1.10	1.10[A]	1.07[A]	1.00[A]	0.90[A]	0.78[A]	0.68[A]	0.57[A]
15.00	1.13[A]	1.02[A]	0.95[B]	0.97[A]	1.15	1.31	1.26[A]	1.17[A]	1.12[A]	1.05[A]	0.96[A]	0.92[A]	0.89[A]
20.00	1.57	1.28[B]	1.11[B]	1.11[A]	1.33	1.57[A]	1.45[A]	1.28[B]	1.26[B]	1.23[A]	1.19[A]	1.25[A]	1.39[A]

Average CH_4 (ppmv) for NOVEMBER

Press. (mb)	Latitude (°N)												
	-50*	-40	-30	-20	-10	0	+10	+20	+30	+40	+50	+60	+70*
0.10*	0.10[A]	0.11[B]	0.13[A]	0.13[A]	0.14[A]	0.15[A]	0.14[A]	0.13[A]	0.13[A]	0.13[A]	0.11[A]	0.09[A]	0.08
0.15*	0.11[A]	0.12[A]	0.13[A]	0.14[A]	0.15[A]	0.16[A]	0.15[A]	0.14[A]	0.14[A]	0.14[A]	0.12[A]	0.10[A]	0.08[A]
0.20	0.11[A]	0.13[A]	0.14[A]	0.15[A]	0.16[A]	0.18[A]	0.17[A]	0.16[A]	0.16[A]	0.15[A]	0.13[A]	0.10[A]	0.09[A]
0.30	0.13[A]	0.14[A]	0.16[A]	0.17[A]	0.19[A]	0.20[A]	0.20[A]	0.19[A]	0.19[A]	0.18[A]	0.15[A]	0.11[A]	0.09[A]
0.40	0.14[A]	0.16[A]	0.18[A]	0.20[A]	0.22[A]	0.23[A]	0.24[A]	0.24[A]	0.23[A]	0.21[A]	0.17[A]	0.13[A]	0.09[A]
0.50	0.16[A]	0.18[A]	0.20[A]	0.23[A]	0.25[A]	0.27[A]	0.29[A]	0.29[A]	0.28[A]	0.24[A]	0.19[A]	0.14[A]	0.10[A]
0.70	0.19[B]	0.21[A]	0.24[A]	0.28[A]	0.31[A]	0.33[A]	0.36[A]	0.37[A]	0.36[A]	0.30[A]	0.23[A]	0.16[A]	0.10[A]
1.00	0.20[A]	0.24[A]	0.27[A]	0.32[A]	0.35[A]	0.37[A]	0.40[A]	0.41[A]	0.39[A]	0.33[A]	0.25[A]	0.17[A]	0.11[B]
1.50	0.23[A]	0.28[A]	0.33[A]	0.39[A]	0.44[A]	0.46[A]	0.48[A]	0.49[A]	0.47[A]	0.39[A]	0.29[A]	0.20[A]	0.12[B]
2.00	0.27[A]	0.33[A]	0.40[A]	0.47[A]	0.54	0.57[A]	0.57[A]	0.58[A]	0.56[A]	0.46[A]	0.34[A]	0.22[A]	0.13[B]
3.00	0.32[A]	0.39[A]	0.47[A]	0.54[A]	0.61	0.65	0.65	0.66[A]	0.63[A]	0.53[A]	0.40[A]	0.27[A]	0.17[B]
4.00	0.38[A]	0.46[A]	0.54[A]	0.61[A]	0.68	0.73	0.74	0.74[A]	0.70[A]	0.60[A]	0.47[A]	0.33[A]	0.22[B]
5.00	0.45[A]	0.54[A]	0.63[A]	0.70[A]	0.77	0.81	0.83	0.83[A]	0.78[A]	0.68[A]	0.55[A]	0.41[A]	0.29[A]
7.00	0.62[A]	0.72[A]	0.81	0.87[A]	0.94	1.00	1.03	1.03	0.96	0.86	0.74[A]	0.60[A]	0.48[A]
10.00	0.77[A]	0.83[A]	0.88[A]	0.93[A]	1.03[A]	1.12	1.13[A]	1.10[A]	1.05[A]	0.97[A]	0.84[A]	0.71[A]	0.61[A]
15.00	1.11[A]	1.08[A]	1.01[A]	1.04[A]	1.20[A]	1.34[A]	1.31[A]	1.24[A]	1.21[A]	1.17[A]	1.04[A]	0.93[A]	0.91[A]
20.00	1.61[A]	1.33[A]	1.16[A]	1.16[A]	1.39[A]	1.61[A]	1.53[A]	1.39[B]	1.40[B]	1.42[A]	1.28[A]	1.23[A]	1.35[A]

Average CH_4 (ppmv) for DECEMBER

Press. (mb)	Latitude (°N)												
	-50*	-40	-30	-20	-10	0	+10	+20	+30	+40	+50	+60	+70*
0.10*	0.11[A]	0.12[A]	0.12[A]	0.12[A]	0.12	0.12[A]	0.13[A]	0.13[A]	0.14[A]	0.13[A]	0.10[A]	0.08	0.07[A]
0.15*	0.12[A]	0.13[A]	0.13[A]	0.13[A]	0.13	0.13[A]	0.14[A]	0.14[A]	0.15[A]	0.14[A]	0.11[A]	0.09[A]	0.07[A]
0.20	0.12[A]	0.13[A]	0.14[A]	0.14[A]	0.14	0.14[A]	0.15[A]	0.15[A]	0.16[A]	0.15[A]	0.11[A]	0.09[A]	0.08[A]
0.30	0.13[A]	0.15[A]	0.15[A]	0.17[A]	0.17[A]	0.17[A]	0.18[A]	0.18[A]	0.18[A]	0.16[A]	0.13[A]	0.10[A]	0.08[A]
0.40	0.14[A]	0.16[A]	0.18[A]	0.20[A]	0.21[A]	0.21[A]	0.21[A]	0.21[A]	0.21[A]	0.18[A]	0.15[A]	0.12[A]	0.09[A]
0.50	0.16[B]	0.18[A]	0.20[A]	0.24[A]	0.25[A]	0.25[A]	0.25[A]	0.24[A]	0.24[A]	0.21[A]	0.17[A]	0.13[A]	0.10[A]
0.70	0.17[B]	0.20[A]	0.24[A]	0.30[A]	0.32[A]	0.32[A]	0.31[A]	0.30[A]	0.28[A]	0.25[A]	0.20[A]	0.15[A]	0.12[A]
1.00	0.18[B]	0.22[A]	0.28[A]	0.34[A]	0.37[A]	0.37[A]	0.35[A]	0.34[A]	0.31[A]	0.27[A]	0.22[A]	0.17[A]	0.12[A]
1.50	0.21[A]	0.27[A]	0.35[A]	0.42[A]	0.46[A]	0.46[A]	0.43[A]	0.41[A]	0.38[A]	0.33[A]	0.27[A]	0.19[A]	0.13[A]
2.00	0.23[A]	0.32[A]	0.43[A]	0.52	0.57[A]	0.58[A]	0.54[A]	0.50[A]	0.46[A]	0.40[A]	0.32[A]	0.22[A]	0.14[A]
3.00	0.28[A]	0.38[A]	0.50[A]	0.59[A]	0.65[A]	0.66[A]	0.61[A]	0.58[A]	0.54[A]	0.47[A]	0.38[A]	0.27[A]	0.18[A]
4.00	0.35[A]	0.46[A]	0.56	0.66[A]	0.73[A]	0.74[A]	0.70	0.67[A]	0.62[A]	0.54[A]	0.45[A]	0.33[A]	0.23[A]
5.00	0.44[A]	0.54[A]	0.64	0.74[A]	0.82[A]	0.83	0.80	0.77	0.72[A]	0.64[A]	0.54[A]	0.40[A]	0.29[A]
7.00	0.65[A]	0.74	0.81	0.90[A]	1.01[A]	1.03	1.00	1.00	0.94	0.85	0.74[A]	0.58[A]	0.44[A]
10.00	0.79[A]	0.82[A]	0.87[A]	0.95[A]	1.08[A]	1.14	1.10	1.08[A]	1.06[A]	1.00[A]	0.87[A]	0.70[A]	0.58[A]
15.00	1.08[A]	0.99[A]	0.97[A]	1.05[A]	1.22[A]	1.34	1.29[A]	1.23[A]	1.27[A]	1.32[A]	1.14[A]	0.96[A]	0.90[A]
20.00	1.49[B]	1.19[A]	1.09[A]	1.15[A]	1.36[A]	1.59	1.52[A]	1.41[A]	1.54[B]	1.75[A]	1.51[A]	1.30[A]	1.41[A]

* Extrapolated from original data.

Variation in data <10%, >10%[A], >20%[B], >50%[C], >100%[D]

Annual Average N_2O (ppbv)

Press. (mb)	Latitude (°N)												
	−50°	−40	−30	−20	−10	0	+10	+20	+30	+40	+50	+60	+70°
0.10*	0.53^{C}	0.63^{C}	0.69^{C}	0.69^{C}	0.70^{C}	0.72^{C}	0.82^{B}	1.01^{B}	1.14^{B}	1.05^{B}	0.75^{B}	0.55^{B}	0.50^{B}
0.15*	0.60^{C}	0.72^{C}	0.79^{C}	0.80^{C}	0.81^{C}	0.83^{B}	0.94^{B}	1.16^{B}	1.29^{B}	1.19^{B}	0.85^{B}	0.63^{B}	0.57^{B}
0.20*	0.69^{C}	0.82^{C}	0.91^{C}	0.92^{C}	0.93^{C}	0.96^{B}	1.08^{B}	1.32^{B}	1.47^{B}	1.35^{B}	0.96^{B}	0.71^{B}	0.64^{A}
0.30*	0.89^{C}	1.08^{C}	1.20^{C}	1.22^{C}	1.24^{C}	1.27^{B}	1.43^{B}	1.73^{B}	1.91^{B}	1.74^{B}	1.23^{B}	0.92^{B}	0.83^{A}
0.40*	1.15^{C}	1.42^{C}	1.59^{C}	1.62^{C}	1.65^{C}	1.69^{B}	1.89^{B}	2.27^{B}	2.49^{B}	2.23^{B}	1.58^{B}	1.19^{B}	1.07^{A}
0.50*	1.49^{C}	1.86^{C}	2.11^{C}	2.16^{C}	2.20^{C}	2.24^{B}	2.49^{B}	2.96^{B}	3.23^{B}	2.86^{B}	2.02^{B}	1.53^{B}	1.38^{A}
0.70	2.14^{C}	2.74^{C}	3.16^{C}	3.28^{C}	3.35^{B}	3.41^{B}	3.75^{B}	4.38^{B}	4.67^{B}	4.04^{B}	2.84^{B}	2.16^{B}	1.91^{B}
1.00	2.75^{C}	3.63^{C}	4.37^{C}	4.66^{C}	4.77^{B}	4.84^{B}	5.26^{B}	5.96^{B}	6.11^{B}	5.08^{B}	3.56^{B}	2.65^{B}	2.20^{B}
1.50	4.16^{C}	5.81^{C}	7.48^{C}	8.36^{C}	8.57^{B}	8.66^{D}	9.21^{B}	9.98^{B}	9.57^{B}	7.46^{B}	5.20^{B}	3.74^{B}	2.80^{C}
2.00	6.30^{B}	9.30^{B}	12.80^{B}	14.98^{C}	15.42^{D}	15.50^{B}	16.14^{B}	16.69^{B}	14.98^{B}	10.95^{B}	7.58^{B}	5.28^{B}	3.57^{C}
3.00	9.81^{B}	14.07^{B}	19.04^{B}	22.69^{B}	24.09^{B}	24.46^{B}	25.13^{B}	25.07^{B}	21.80^{B}	15.95^{B}	11.16^{B}	7.88^{B}	5.46^{C}
4.00	15.08^{B}	20.96^{B}	27.76^{B}	33.60^{B}	36.79^{D}	37.79^{D}	38.33^{D}	36.95^{B}	31.24^{B}	22.94^{B}	16.23^{B}	11.63^{B}	8.33^{C}
5.00	23.20^{B}	31.22^{B}	40.47^{B}	49.76^{B}	56.19^{D}	58.36^{B}	58.47^{B}	54.46^{B}	44.76^{B}	33.00^{B}	23.60^{A}	17.19^{B}	12.71^{B}
7.00	50.44^{A}	63.93^{B}	79.54^{B}	100.20^{B}	119.33^{D}	126.37^{A}	123.64^{A}	108.43^{A}	85.06^{A}	63.45^{A}	46.52^{A}	34.98^{A}	27.48^{B}
10.00	70.11^{B}	84.37^{B}	100.73^{B}	122.88^{B}	144.95^{B}	153.47^{A}	147.12^{A}	127.91^{A}	103.22^{A}	81.36^{A}	63.76^{A}	50.73^{B}	41.54^{B}
15.00	121.37^{B}	133.97^{B}	149.34^{B}	172.65^{B}	200.46^{B}	212.17^{A}	196.59^{A}	168.46^{A}	142.51^{A}	123.13^{A}	107.79^{B}	94.25^{B}	82.74^{B}
20.00	210.13^{B}	212.72^{B}	221.41^{B}	242.57^{B}	277.24^{D}	293.32^{A}	262.70^{A}	221.87^{A}	196.75^{A}	186.35^{B}	182.25^{B}	175.11^{B}	164.79^{A}

* Extrapolated from original data. Variation in data <10%, >10%^{A}, >20%^{B}, >50%^{C}, >100%^{D}

Annual Average CH_4 (ppmv)

Press. (mb)	Latitude (°N)												
	50°	−40	−30	−20	−10	0	+10	+20	+30	+40	+50	+60	+70°
0.10*	0.10^{D}	0.10^{A}	0.10	0.11^{A}	0.12^{A}	0.12^{A}	0.12^{A}	0.11	0.10^{A}	0.10^{D}	0.09^{D}	0.08^{D}	0.08^{D}
0.15*	0.11^{B}	0.11^{A}	0.12^{A}	0.12^{A}	0.13^{A}	0.14^{A}	0.13^{A}	0.12	0.12^{A}	0.11^{B}	0.10^{D}	0.09^{B}	0.08^{D}
0.20	0.11^{B}	0.12^{A}	0.13^{A}	0.13^{A}	0.14^{A}	0.15^{A}	0.15^{A}	0.14^{A}	0.13^{A}	0.12^{B}	0.11^{B}	0.09^{B}	0.08^{D}
0.30	0.13^{D}	0.14^{A}	0.16^{A}	0.16^{A}	0.17^{A}	0.18^{A}	0.18^{A}	0.18^{A}	0.17^{A}	0.15^{B}	0.13^{D}	0.10^{D}	0.09^{D}
0.40	0.14^{B}	0.17^{B}	0.19^{A}	0.20^{A}	0.21^{A}	0.22^{A}	0.22^{A}	0.22^{A}	0.21^{A}	0.18^{B}	0.15^{B}	0.12^{B}	0.09^{B}
0.50	0.15^{B}	0.20^{B}	0.23^{B}	0.25^{A}	0.26^{A}	0.27^{A}	0.28^{A}	0.29^{B}	0.27^{B}	0.22^{B}	0.17^{B}	0.13^{B}	0.10^{B}
0.70	0.18^{A}	0.24^{B}	0.30^{B}	0.32^{B}	0.33^{A}	0.34^{A}	0.37^{B}	0.39^{B}	0.36^{B}	0.28^{D}	0.20^{B}	0.15^{B}	0.11^{D}
1.00	0.20^{A}	0.27^{B}	0.33^{B}	0.36^{B}	0.37^{A}	0.37^{A}	0.41^{A}	0.43^{B}	0.39^{B}	0.31^{A}	0.23^{B}	0.16^{B}	0.12^{B}
1.50	0.25^{A}	0.32^{A}	0.39^{B}	0.43^{B}	0.45^{A}	0.48^{A}	0.50^{A}	0.51^{A}	0.46^{A}	0.36^{A}	0.27^{B}	0.19^{B}	0.14^{D}
2.00	0.30	0.37^{A}	0.45^{B}	0.51^{D}	0.56^{A}	0.58^{A}	0.61^{A}	0.60^{A}	0.54^{A}	0.43^{A}	0.31^{A}	0.23^{D}	0.17^{D}
3.00	0.36	0.43^{A}	0.51^{B}	0.58^{B}	0.63^{A}	0.66	0.68	0.67^{A}	0.60^{A}	0.48^{A}	0.37^{A}	0.28^{D}	0.22^{D}
4.00	0.42	0.50^{A}	0.58^{A}	0.65^{A}	0.70^{A}	0.74	0.75	0.74^{A}	0.67^{A}	0.55^{A}	0.43^{A}	0.34^{B}	0.28^{B}
5.00	0.49	0.58^{A}	0.66^{A}	0.73^{A}	0.79^{A}	0.82	0.83	0.81	0.74^{A}	0.61^{A}	0.50^{A}	0.42^{B}	0.34^{B}
7.00	0.67	0.76^{A}	0.83^{A}	0.90^{A}	0.97	1.01	1.00	0.97	0.89	0.76	0.66	0.59	0.52^{A}
10.00	0.79^{A}	0.85^{A}	0.90^{A}	0.95^{A}	1.03	1.09	1.09	1.03	0.95	0.86^{A}	0.77^{A}	0.71	0.67
15.00	1.04^{B}	1.03^{B}	1.03^{A}	1.06^{A}	1.16	1.26	1.24	1.15	1.08^{A}	1.04^{A}	0.99^{A}	0.98^{A}	1.02
20.00	1.38^{B}	1.25^{B}	1.18^{A}	1.18^{A}	1.29	1.45	1.42^{A}	1.29^{A}	1.22^{A}	1.27^{A}	1.28^{A}	1.33^{A}	1.54

* Extrapolated from original data. Variation in data <10%, >10%^{A}, >20%^{B}, >50%^{C}, >100%^{D}

The absolute abundance maxima and minima have an interesting distribution in latitude as well as time. As already noted, the absolute maxima occur in the Summer; they are centred on about 20° latitude. In the Northern Hemisphere, the low-latitude summer maximum is matched by a high-latitude (centred on about 60°) minimum, and vice-versa in the winter. Unfortunately, the asymmetrical latitudinal coverage of SAMS does not permit us to say whether the Southern Hemisphere low-latitude maxima and minima are also accompanied by high-latitude extrema of the opposite sign.

Consider now the variations with latitude and season which take place on constant height (log pressure) surfaces. Starting at the highest levels at which CH_4 was observed, i.e. around 60 km (N_2O is below the noise level at this height), a non-seasonal trend is observed whereby all latitudes in both hemispheres tend to have maxima around September, and minima around March. Lower down, the pattern described above with a low latitude Summer maximum and a high-latitude Summer minimum emerges, until at about 35 km all latitudinal and seasonal variability becomes subdued. The reason for this is clear when lower levels are examined; the pattern reverses phase to give low-latitude Summer minima and Winter maxima.

CONCLUSION AND FUTURE MODEL REFINEMENTS

Models of the zonally averaged, time averaged mixing ratios of nitrous oxide and methane have been derived from three years of the data from the Stratospheric and Mesospheric Sounder on the Nimbus 7 satellite. The distributions of both species are similar, as would be expected since both originate in the troposphere and both have long photochemical lifetimes. Considerable latitudinal and seasonally-varying structure is present in the observed distributions. This has been described in a phenomenological way but with no attempt to explain the mechanisms underlying the features. This aspect is still under study and will be reported at a later date.

It is likely that small improvements in the data set and hence in the model presented here will be possible as a result of further processing of the SAMS radiances, in particular to reduce the temperature error which contributes to the uncertainty in the constituent retrievals. The discrepancy between the satellite and balloon measurements suggests that errors of up to 50% in N_2O and 25% in CH_4 may remain at the lowest level sounded. We intend to reprocess the SAMS results with an improved treatment of the spectroscopy and examine longitudinal and other trends to see if any reason for this can be found.

An improved version of SAMS (ISAMS) is being built for the Upper Atmosphere Research Satellite, and a major revision of the model will be possible when these data become available early in the next decade.

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