File Revision Date:
August 31, 2000

WHOLE DATA SET

DataSetName: Chlorine monoxide and nitrous oxide vertical profiles over:
Thule, Greenland; February and March, 1992
McMurdo Station, Antarctica; September and October, 1992
Thule, Greenland; February and March, 1993
McMurdo Station, Antarctica; September and October, 1993
McMurdo Station, Antarctica; September and October, 1994
McMurdo Station, Antarctica; September and October, 1995

DataSource: Stony Brook ground-based mm-wave spectrometer

ScientificContact: Dr. Robert L. de Zafra
Physics Dept., SUNY
Stony Brook, NY 11794
RDEZAFRA@notes.cc.sunysb.edu
(516) 632-8137

SourceCharacteristics: Stratospheric ClO and N2O between 17 and 50 km.

InvestigationObjectives: Measurement of the variations in the vertical profiles of chlorine monoxide and nitrous oxide in the stratosphere over Thule, Greenland and McMurdo Station, Antarctica.

InstrumentAttributes: Ground-based mm-wave heterodyne receiver/spectrometer using a superconducting (SIS) niobium tunnel junction mixer. Pressure broadened emission spectra from molecular rotation lines are measured. Data is acquired alternately from the zenith (the reference) and from approximately ten degrees above the horizon (the signal). The difference spectrum, [signal-reference]/reference, is used to isolate stratospheric emissions. Data is recorded in fifteen minute scans that are combined into two hour time bins during data analysis.
See reference 1.

MeasuredParameters: Mixing ratio of chlorine monoxide or nitrous oxide as function of altitude. Resolution approximately six km.

DataSetQuality: Spectral line intensity calibrated against black-body sources of known temperature several times per day.
Estimated calibration errors +/- 10%; estimated vertical profile retrieval errors given separately with data files.

DataProcessingOverview: Input data are pressure broadened emission spectra with a bandwidth of 512 MHz at 1 MHz resolution.
Output data are mixing ratios as functions of altitude, extracted from the input lineshapes by numerical deconvolution. Vertical resolution is approximately 6 km, but smoothly interpolated mixing ratios are given at 1 km intervals.

DataUsage: Expected uses are to show diurnal variation and secular change of the chlorine monoxide vertical profile, to show secular variations in the nitrous oxide vertical profile, and to correlate these data with similar measurements taken by the Microwave Limb Sounder instrument aboard UARS.

FileClassRelationships: File classes are for different molecular species, chlorine monoxide and nitrous oxide.

LitReferences: 1) A. Parrish, R.L. de Zafra, P.M. Solomon, and J.W. Barrett, Science, 23, 106-118, 1988.
2) S. Twomey, B. Herman, R. Rabinoff, Journal of the Sciences, 34, 1085-1090, 1977.

FILE CLASS

FileClassName: Chlorine monoxide
RecordTypeNames: Vertical profile
Algorithms: Reference 2
FileClassSyntax: Chronological
FileClassFieldRelationships: Thule 1992 and Thule 1993 data contain the fields altitude, pressure, mixing ratio, mixing ratio minimum, and mixing ratio maximum. All other data contain the fields altitude, pressure, mixing ratio, and one nominal standard deviation in mixing ratio.
All ClO data from McMurdo 1995 were processed using the same version of the retrival software plus the same binnings and starting profiles. These data are midday values.

FileClassName: Nitrous oxide
RecordTypeNames: Vertical profile
Algorithms: Reference 2
FileClassSyntax: Chronological
FileClassFieldRelationships: Fields same in all file classes

RECORD

RecordName: Vertical profile
RecordStructure: Variable
RecordLength: 34 data points
RecordFieldNames: Altitude, pressure, mixing ratio, and mixing ratio minimum and mixing ratio maximum, or one nominal standard deviation in mixing ratio.

RecordSyntax: Each line of data contains altitude, pressure, mixing ratio, and either mixing ratio maxima and minima, or one nominal standard deviation in mixing ratio at that altitude. Altitude increases from beginning to end of file.

FIELDS

FieldName: Altitude
FieldMnemonic: z
FieldSyntax: One-dimensional array
FieldUnits: Meters
FieldResolution: 1000
FieldRange: 17000 to 50000
FieldDescription: Altitude above observing site
FieldRepresentation: Integer*4

FieldName: Pressure
FieldMnemonic: P
FieldSyntax: One-dimensional array
FieldUnits: mbar
FieldResolution: .01
FieldRange: 80 to .5
FieldDescription: Atmospheric pressure
FieldRepresentation: integer*4

FieldName: Mixing ratio
FieldMnemonic: MR
FieldSyntax: One-dimensional array
FieldUnits: Parts per million by volume (ppmv)
FieldResolution: .001 (N_2O), .00001 (ClO)
FieldRange: .001 to .300 (N_2O), .00001 to .00200 (ClO)
FieldDescription: Mixing ratio of species
FieldRepresentation: integer*4

FieldName: Mixing ratio minimum
FieldMnemonic: MRmin
FieldSyntax: One-dimensional array
FieldUnits: Part per million by volume (ppmv)
FieldResolution: .001 (N_2O), .00001(ClO)
FieldRange: .001 to .300 (N_2O), .00001 to .00200 (ClO)
FieldDescription: Minimum mixing ratio from profile retrievals
FieldRepresentation: integer*4

FieldName: Mixing ratio maximum
FieldMnemonic: MRmax
FieldSyntax: One-dimensional array

FieldUnits: Part per million by volume (ppmv)
FieldResolution: .001 (N_2O), .00001(ClO)
FieldRange: .001 to .300 (N_2O), .00001 to .00200 (ClO)
FieldDescription: Maximum mixing ratio from profile retrievals
FieldRepresentation: integer*4

FieldName: One nominal standard deviation in mixing ratio
FieldMnemonic: MRsigma
FieldSyntax: One-dimensional array
FieldUnits: Part per million by volume (ppmv)
FieldResolution: .000001(ClO)
FieldRange: .00001 to .00200 (ClO)
Field Description: For an estimate of the total error, to this nominal standarddeviation it must be added in quadrature an estimated uncertainty of ~11% at the lower mixing ratio peak (~18 km) to account for combined uncertainties in intrinsic line intensity, pressure broadening coefficient and its temperature dependance, temperature and pressure profiles vs altitude, and calibration of the receiver sensitivity.
FieldRepresentation: integer*4