File Revision Date:
August 31, 2000

WHOLE DATA SET

DataSetName: Nitric acid, ozone, and nitrous oxide vertical profiles over:
South Pole, Antarctica; 1993
South Pole, Antarctica; January, 1994
South Pole, Antarctica; 1995

DataSource: Stony Brook ground-based mm-wave spectrometer

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SourceCharacteristics: Stratospheric HNO3, O3 and N2O between 17 and 50 km.

InvestigationObjectives: Measurement of the variations in the vertical profiles of chlorine monoxide, nitric acid, ozone and nitrous oxide in the stratosphere over South Pole and McMurdo Station, Antarctica.

InstrumentAttributes: Ground-based mm-wave heterodyne receiver/spectrometer using a Shottky 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 an integrated spectrum for data analysis.
See reference 1.

MeasuredParameters: Mixing ratio of nitric acid, ozone, or nitrous oxide as a function of altitude. Resolution approximately six km. Altitude for peak of mixing ratio distribution for a layer is determined to +/- 2 km or less.

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 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 secular change of the vertical profiles of ozone, nitrous oxide, and nitric acid, reflecting transport and chemical changes over the course of a year's observations. An additional use is to correlate these data with similar measurements taken by the Microwave Limb Sounder instrument aboard UARS.

FileClassRelationships: File classes are for different molecular species, nitric acid, ozone, and nitrous oxide.

LitReferences: 1) A. Parrish, R.L. de Zafra, P.M. Solomon, and J.W. Barrett, Radio Science, 23, 106-118, 1988.
2) S. Twomey, B. Herman, R. Rabinoff, Journal of the Atmospheric Sciences, 34, 1085-1090, 1977.
3) S. Twomey, Introduction to the Mathematics of Inversion in Remote Sensing and Indirect Measurements, Elsevier, Amsterdam, Holland, 1977.

FILE CLASS

FileClassName: Nitrous oxide
RecordTypeNames: Vertical profile
Algorithms: Reference 2
FileClassSyntax: Chronological
FileClassFieldRelationships: South Pole, Antarctica; 1993 contains the same fields in all file classes

FileClassName: Nitric Acid
RecordTypeNames: Vertical profile
Algorithms: Reference 3
FileClassSyntax: Chronological
FileClassFieldRelationships: South Pole, Antarctica; 1993 contains the same fields in all file classes

FileClassName: Ozone
RecordTypeNames: Vertical profile
Algorithms: Reference 2
FileClassSyntax: Chronological
FileClassFieldRelationships: South Pole, Antarctica; 1993 contains the same fields in all file classes

RECORD

RecordName: Vertical profile
RecordStructure: Variable
RecordLength: 34 data points
RecordFieldNames: Altitude, pressure, mixing ratio, and uncertainty in mixing ratio.
RecordSyntax: Each line of data contains altitude, pressure, mixing ratio,and uncertainty 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 (N2O), .0001 (HNO3), .001 (O3)
FieldRange: .001 to .300 (N2O), .0001 to .0240 (HNO3), .001 to 5.500 (O3)
FieldDescription: Mixing ratio of species
FieldRepresentation: integer*4

FieldName: Uncertainty in mixing ratio
FieldMnemonic: MRsigma
FieldSyntax: One-dimensional array
FieldUnits: Part per million by volume (ppmv)
FieldResolution: .001 (N2O), .0001 (HNO3), .001 (O3)
FieldRange: .001 to .025 (N2O), .0001 to .0030 (HNO3), .001 to .400 (O3)
Field Description: see comments in individual datafiles
FieldRepresentation: integer*4