SSBUV DATA SUBMISSION

Flights 1, 2, 3, 4 Ozone Data: AMES 1010 Format

Preliminary

TYPE OF DATA

Parameter/Measurement:

Total column amount of ozone and ozone profiles in the stratosphere derived from the Earth's spectral ultraviolet (UV) albedo.

Unit of Measurement:

Total ozone - Milliatmosphere cm. Ozone profile mass mixing ratio - parts per million by volume (PPMV) as a function of pressure height.

Data Source:

Data is derived from Shuttle Solar Backscatter Ultraviolet (SSBUV) experiment flown on STS-34 (October 1989) SSBUV-1, STS-41 (October 1990) SSBUV-2, STS-43 (August 1991) SSBUV-3, and STS-45/ATLAS-1 (March 1992) SSBUV-4. Each of these flights yielded the Earth uv albedo, total and profile ozone amounts.

Data Identification:

An SSBUV flight generates a time tagged telemetry stream which has either been retrieved from an on-board tape recorder or captured on the ground real time. Several data processing steps are taken to produce the archived products which are listed below. A more detailed discussion of the data processing steps are given in a subsequent section. In general the data products for all SSBUV flights are identical. The file naming convention is as follows ("&&" is the shuttle flight number and "##" is the data processing version number):

SSPUF&&.V## - A subset of the SSBUV Product Master File (Level II) in the AMES 1010 format. This data set contains SSBUV Earth view data for a given shuttle flight including spacial-temporal information, ultraviolet albedos, total and profile ozone values and data quality flags.

SPATIAL CHARACTERISTICS

Ozone along orbital track in the nadir and daytime only. Ozone values listed in AMES format file have been screened to include only those scans that pass quality code standards (as specified in the file header). Portions of mission are dedicated to SSBUV solar view, etc. Therefore, there is incomplete spacial coverage within these latitude bounds:

- SSBUV-17 South to 34 North Latitude
- SSBUV-229 South to 28 North Latitude
- SSBUV-325 South to 29 North Latitude
- SSBUV-436 South to 57 North Latitude

Spatial resolution is 50 to 250 km depending on scan mode. The altitude range for ozone profiles is about 50 to 25 km with a seven km resolution.

TEMPORAL CHARACTERISTICS

Temporal Coverage

Coverage is not continuous during the mission. Data Periods are provided within the AMES format archive file header.

SSBUV-1/STS-34: 31 orbits of ozone retrievals; Coverage dates: 1989 292 (October 19) - 294 (October 21) UT

SSBUV-2/STS-41: 31 orbits of ozone retrievals; Coverage dates: 1990 280 (October 7) - 283 (October 10) UT

SSBUV-3/STS-43: 33 orbits of ozone retrievals; Coverage dates: 1991 215 (August 3) - 218 (August 6) UT

SSBUV-4/STS-45/ATLAS-1: 33 orbits of ozone retrievals; Coverage dates: 1992 087 (March 28) - 090 (March 31) UT

Temporal resolution:

> Ozone values are derived for each instrument wavelength scan which is 32 seconds. The shuttle view of the Earth moves approximately 250 km during this period. Data are taken from nearly sunrise to sunset terminators.

SPECTRAL CHARACTERISTICS

Spectral Coverage:

> The spectral coverage for SSBUV-1 through SSBUV-4 is 252.2 to 339.99 nm for ozone retrievals. The instrument is stepped through twelve wavelengths in this range (wavelengths in this range (wavelengths are listed in the AMES format archive file header).

Spectral Resolution:

> The spectral resolution is 1.1 nm.

INSTRUMENT DESCRIPTION

SSBUV, a nadir viewing instrument, is nearly identical to the SBUV/2 instruments flying on the NOAA satellites. The SBUV/2 is a successor to the SBUV which flies on the Nimbus-7 satellite. The monochromator is a 1/4 meter double ebert fastie type and uses a single photomultiplier detector to cover the whole dynamic range of measurements in both the Solar and Earth views. The wavelength resolution is 1.1 nm. For the ozone measurements the instrument steps over wavelengths between 252.2 and 339.99 nm while viewing the earth in the nadir position. The wavelength drive is controlled by a microprocessor therefore any wavelength interval can be scanned by ground command. The SSBUV differs from the SBUV/2 in that a transmission diffuser is viewed rather than a reflectance type for Solar irradiance measurements. In addition SSBUV carries in-flight radiometric lamps to check instruments sensitivity in orbit as well as a lamp for wavelength registration checks.

The SSBUV payload is carried in two canisters; one of which contains the instrument, solar and nadir aspect sensors. The second canister contains the power, data and command systems. The instrument canister employs a door which is opened during the observation periods. This door provides contamination control during ground and flight operations. The payload is nearly self contain affording a great deal of flexibility for Shuttle manifesting.

DATA PROCESSING SEQUENCE

Processing Steps and Data Sets:

For the first three flights, in-flight tape recorded data, played back after flight, were used exclusively. For subsequent flights the primary data source was the ground acquired data where missing data may have been filled in from the tape recorder. The time tagged telemetry data are formatted and merged with orbit/attitude data from the User Calibrated Ancillary Tape (UCAT) a product produced by GSFC/Code 560 (reference). This merged data set is the Level 0 data product and is not archived. This data product is reformatted to a Level 1 product. This product is then run through the Ozone Product Processor to produce the Product Master File (PMF). A subset of the PMF is then reformatted into the AMES 1010 format and archived.

Derivation Techniques/Algorithms:

The techniques and algorithms employed for SSBUV are nearly identical to Nimbus SBUV/TOMS and NOAA SBUV/2. The details of the algorithm appears in the reference.

Special Corrections/Adjustments

Corrections and adjustments are the same as that done for SBUV and SBUV/2 except for diffuser degradation adjustments. TBD special procedures are required for SSBUV.

Processing Changes:

Improvements in the data analysis and algorithm are on-going task and are annotated in the AMES format archive file header.

QUALITY ASSESSMENT

Data validation:

SBUV total ozone and ozone profiles have been extensively validated using Dobson, Umkehr, balloon and rocket data. Some comparisons have been performed with SAGE ozone profiles. In general there is agreement among these measurements to within the errors of the measurements. These analysis appear in (the references). SSBUV data should be at least as accurate as these data.

Confidence Level/Accuracy:

Ultraviolet Albedos

Accuracy: 2% based o NIST absolute standards Wavelength dependent: 1% Precision: 0.5% Flight to flight precision: 1-2%

Total Ozone

Accuracy: 2% Precision: 0.5%

Ozone Profile:

Accuracy: 5% at 40 km increasing to 10% at upper and lower limits (50 and 25 km) Precision: 2%

CONTACTS

Ernest Hilsenrath - SSBUV PI
NASA/GSFC Code 916
Greenbelt MD 20771
301-286-6051
HILSENRATH@SSBUV.GSFC.NASA.GOV

Richard P. Cebula - SSBUV Co I
Hughes/STX Corporation
Lanham MD 20706
301-794-5419
CEBULA@SSBUV.GSFC.NASA.GOV

Thomas J. Kelly
Hughes/STX Corporation
Lanham MD 20706
301-286-3018
KELLY@SSBUV.GSFC.NASA.GOV

Paul W. Decamp
Hughes/STX Corporation
Lanham MD 20706
301-794-5430
DECAMP@SSBUV.GSFC.NASA.GOV

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