

Table of Contents

| | |
|--|------------|
| Preface..... | i |
| Acknowledgments..... | iii |
| Table of Contents..... | v |
| 1. Introduction and Executive Summary..... | 1-1 |
| 2. Instrumentation | 2-1 |
| 2.1. SUV-100 UV-Visible Spectroradiometer | 2-1 |
| 2.2. SUV-150B UV-Visible Spectroradiometer..... | 2-5 |
| 2.3. GUV Multi-Channel Filter Radiometers..... | 2-10 |
| 2.4. Ancillary Sensors | 2-13 |
| 2.4.1. Eppley Radiometers | 2-13 |
| 2.4.2. Total Scene Irradiance Sensor..... | 2-14 |
| 2.5. Operation, Maintenance and Calibration of SUV Systems..... | 2-14 |
| 2.6. Software for Instrument Operation and Data Reduction..... | 2-16 |
| 3. Network Sites..... | 3-1 |
| 3.1. McMurdo, Antarctica..... | 3-1 |
| 3.2. Palmer Station, Antarctica | 3-7 |
| 3.3. Amundsen-Scott South Pole Station, Antarctica..... | 3-12 |
| 3.4. Ushuaia, Argentina..... | 3-16 |
| 3.5. San Diego, California, USA..... | 3-20 |
| 3.6. Barrow, Alaska, USA..... | 3-24 |
| 3.7. Summit, Greenland | 3-28 |
| 4. Spectral Measurements and Data Analysis..... | 4-1 |
| 4.1. Types of Spectral Measurements of SUV-100 and SUV-150B Spectroradiometers | 4-1 |
| 4.1.1. Data Scan | 4-2 |
| 4.1.1.1. Data Scan SUV-100..... | 4-2 |
| 4.1.1.2. Data Scan SUV-150B | 4-5 |
| 4.1.2. Response Scan..... | 4-6 |
| 4.1.3. Internal Wavelength Scan | 4-6 |
| 4.1.4. External Wavelength Scan | 4-8 |
| 4.1.5. Absolute Scan | 4-9 |
| 4.1.5.1. Absolute Scan SUV-100 | 4-9 |
| 4.1.5.2. Absolute Scan SUV-150B | 4-10 |
| 4.2. Calibration and Data Processing | 4-11 |
| 4.2.1. Irradiance Calibration | 4-11 |
| 4.2.1.1. Interpolation of Values from Calibration Certificates of 200-Watt Standards | 4-11 |
| 4.2.1.2. Calibration of the Internal Irradiance Reference Lamp | 4-13 |
| 4.2.1.3. Determination of the System Responsivity and Calibration of Solar Data | 4-14 |
| 4.2.1.4. Comparison of Standards of Spectral Irradiance | 4-14 |
| 4.2.1.5. Calibration of Lamps | 4-16 |
| 4.2.2. Wavelength Calibration and Correction..... | 4-17 |
| 4.2.2.1. Wavelength Correction with Internal Mercury Scans, Volumes 1 - 6 | 4-17 |
| 4.2.2.2. Wavelength Calibration and Correction by the Fraunhofer-Correlation Method Implemented for Volume 7 – 14 | 4-19 |

| | | |
|-----------|--|------------|
| 4.2.3. | Biological Dose-Rate Calculations | 4-22 |
| 4.2.4. | Calculation of Daily Doses | 4-25 |
| 4.2.5. | Calculation of Solar Zenith and Azimuth Angles | 4-26 |
| 4.3. | Processing of Data from GUV Multichannel Radiometers..... | 4-26 |
| 4.3.1. | Calibration of GUV Radiometers..... | 4-26 |
| 4.3.1.1. | Calibration of GUV UV Channels..... | 4-26 |
| 4.3.1.2. | Calibration of GUV PAR Channel..... | 4-28 |
| 4.3.2. | Calculation of GUV Integrals and Dose Rates..... | 4-29 |
| 4.3.3. | Calculation of Total Column Ozone from GUV Measurements..... | 4-31 |
| 5. | Quality Control and Calibration Standards | 5-1 |
| 5.1. | McMurdo Station (02/09/04 – 1/25/05)..... | 5-5 |
| 5.1.1. | Irradiance Calibration | 5-5 |
| 5.1.2. | Instrument Stability..... | 5-7 |
| 5.1.3. | Wavelength Calibration | 5-9 |
| 5.1.4. | Missing Data | 5-11 |
| 5.1.5. | GUV Data | 5-12 |
| 5.2. | Palmer Station (6/5/04 – 4/13/06)..... | 5-14 |
| 5.2.1. | Irradiance Calibration | 5-15 |
| 5.2.2. | Instrument Stability..... | 5-17 |
| 5.2.3. | Wavelength Calibration | 5-22 |
| 5.2.4. | Missing Data | 5-25 |
| 5.2.5. | GUV Data | 5-25 |
| 5.3. | Amundsen-Scott South Pole Station (1/28/04–1/17/05)..... | 5-28 |
| 5.3.1. | Irradiance Calibration | 5-28 |
| 5.3.2. | Instrument Stability..... | 5-30 |
| 5.3.3. | Wavelength Calibration | 5-32 |
| 5.3.4. | Missing Data | 5-35 |
| 5.3.5. | GUV Data | 5-35 |
| 5.4. | Ushuaia, Argentina (3/16/02 – 6/2/05)..... | 5-37 |
| 5.4.1. | Irradiance Calibration | 5-37 |
| 5.4.2. | Instrument Stability..... | 5-39 |
| 5.4.3. | Wavelength Calibration | 5-43 |
| 5.4.4. | Missing Data | 5-47 |
| 5.5. | San Diego (10/8/04 – 8/23/05)..... | 5-48 |
| 5.5.1. | Irradiance Calibration | 5-49 |
| 5.5.2. | Instrument Stability..... | 5-50 |
| 5.5.3. | Wavelength Calibration | 5-52 |
| 5.5.4. | Missing Data | 5-54 |
| 5.5.5. | GUV Data | 5-56 |
| 5.6. | Barrow, Alaska(3/9/04 – 6/5/05) | 5-58 |
| 5.6.1. | Irradiance Calibration | 5-58 |
| 5.6.2. | Instrument Stability..... | 5-60 |
| 5.6.3. | Wavelength Calibration | 5-63 |
| 5.6.4. | Missing Data | 5-66 |
| 5.6.5. | GUV Data | 5-67 |
| 5.7. | Summit, Greenland (8/15/04 – 5/17/05)..... | 5-69 |
| 5.7.1. | Irradiance Calibration | 5-70 |
| 5.7.2. | Instrument Stability..... | 5-70 |
| 5.7.3. | Wavelength Calibration | 5-74 |
| 5.7.4. | Missing Data | 5-76 |
| 5.7.5. | GUV Data | 5-77 |

| | |
|---|------------|
| 6. Description of Published Data | 6-1 |
| 6.1. Overview..... | 6-1 |
| 6.2. Contents of Databases..... | 6-2 |
| 6.2.1. Database 1: Instrument Parameters during Solar Scans..... | 6-2 |
| 6.2.2. Database 2: Solar Spectral Irradiance at Selected Wavelengths..... | 6-4 |
| 6.2.3. Database 3: Spectral Integrals and Dose Weightings..... | 6-5 |
| 6.2.4. Database 4: General Interest (Short Form)..... | 6-7 |
| 6.2.5. Database 5: Instrument Parameters during Response Scans..... | 6-8 |
| 6.2.6. Daily Dose Database..... | 6-9 |
| 6.2.7. GUV Database 1..... | 6-11 |
| 6.2.8. GUV Database 2..... | 6-13 |
| 6.2.9. Glossary of Database Notation..... | 6-14 |
| 6.3. Format of Solar Irradiance Spectra Files..... | 6-15 |
| 6.4. Ozone Data..... | 6-17 |
| 6.5. CD-ROM Contents..... | 6-19 |
| | |
| 7. Examples of Network Data | 7-1 |
| 7.1. McMurdo Station..... | 7-2 |
| 7.2. Palmer Station..... | 7-6 |
| 7.3. Amundsen-Scott South Pole Station..... | 7-10 |
| 7.4. Ushuaia, Argentina..... | 7-14 |
| 7.5. San Diego, California..... | 7-18 |
| 7.6. Barrow, Alaska..... | 7-22 |
| 7.7 Summit, Greenland..... | 7-27 |
| 7.8. Differences Between Sites..... | 7-30 |
| 7.9. Trends in UV..... | 7-35 |
| 7.10. Factors Affecting UV Radiation..... | 7-35 |
| | |
| Appendices..... | A-1 |
| A.1. Errata..... | A-3 |
| A.2. References..... | A-3 |
| A.3. Code Fragments for Integrations and Dose Weightings..... | A-19 |
| A.3.1. Spectral (Non-weighted) Integrals..... | A-19 |
| A.3.2. Dose Weightings..... | A-20 |

