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User's Guide for ERB 7 SEFDT

Volume III
Quality Control Report for Year-2.

K. L. Vasanth

NASA

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Contractor
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UNDER CONTRACT NO. NAS 5-28063
TASK ASSIGNMENT 03

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NIMBUS-7

SCIENCE QUALITY CONTROL (SQC) PROGRAM

EARTH RADIATION BUDGET (ERB)

SOLAR AND EARTH FLUX DATA TAPE (SEFDT)

DATA USER'S GUIDE

VOLUME III

APRIL, 1984

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PREFACE

This document will provide specific details regarding the scientific validity of the Nimbus-7 ERB Solar and Earth Flux Data Tapes (SEFDT) to the scientific user. The SEFDT data analyzed in this report covers the period from November, 1979 to October 31, 1980. The information given in this document was compiled from various sources, but primarily through the results of checking each SEFDT with the Nimbus-7 ERB SEFDT Science QC (SQC) program.

The author(s) would like to acknowledge Dr. H. Lee Kyle, Technical Monitor, for useful comments and guidance while preparing this document. Our thanks are also due to the Science and Applications Computing Center (SACC) of Goddard Space Flight Center for assistance in data processing. This work was supported by the NASA Contract No. NAS5-28063, Task 03.

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TERMS AND ABBREVIATIONS

CAT - Calibration Adjustment Table

DSAS - Digital Solar Aspect Sensor

ERB - Earth Radiation Budget

GSFC - Goddard Space Flight Center

MAT - Master Archival Tape

MSE - Minimum Solar Elevation

NASA - National Aeronautics and Space Administration

NET - Nimbus Experiment Team

NFOV - Narrow Field of View

PTM - Platinum Temperature Monitor

SEFDT - Solar and Earth Flux Data Tape

SQC - Science Quality Control

WFOV - Wide Field of View

TABLE OF CONTENTS

TABLE OF CONTENTS

(Continued)

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

SECTION 1. INTRODUCTION

1.1 OBJECTIVE OF SCIENCE QUALITY CONTROL

The objective of the Science Quality Control task is to check and validate the Nimbus-7 ERB SEFDT data to assure that it is physically reasonable and useful for scientific research. The present document has the results of the validation of Year-2 SEFDT data.

The approach employed in the Science Quality Control task was to establish criteria by which the climate product datasets could be tested for reasonableness and scientific validity. These criteria were used in the analysis of each monthly Solar and Earth Flux Data Tape (SEFDT). An important function of Science Quality Control is the identification, definition, and categorization of the exceptions to these reasonableness criteria. This document will provide the function. Problems found in the Science QC Analysis of the SEFDT will be discussed here. An overview of SEFDT problems also appears in the SEFDT Data User's Guide. Known problems in the MAT Level I data (used as input data to the SEFDT processing) are briefly described in Subsection 1.2 below. Discussions of the problems found in the Science QC Analysis of SEFDT follow in the other sections of this document. This information should prove helpful to users in the following ways:

1) Users will be able to determine which types of problems might impact specific scientific investigations.

2) Scientific users will be able to determine if they need to perform any special processing of the SEFDT data in order to work around problems described here.

1.2 SUMMARY OF KNOWN PROBLEMS ON THE MAT

In this subsection, several problems inherent in the Level I MAT dataset are discussed. These problems were not screened from SEFDT processing. Users of SEFDT must consider these problems for their possible influence on the scientific use of the data.

For a more detailed discussion of the scientific quality of MAT data, see Reference 1, the MAT Data User's Guide.

1.2.1 Solar Channel Degradation/Recovery

Immediately after launch, the ERB solar channels began to degrade. All channels, except Channels 1 and 10C, were affected. The ultraviolet channels (Channels 6 thru 9) were the most strongly affected. This degradation, and subsequent recovery, has been explained in a paper by Predmore, et al (Reference 2).

The degradation was probably due to deposition of an organic thin film on the ERB instrument optics during spacecraft outgassing. The recovery of the solar channels, as explained by Predmore, was due to a cleaning action caused by upper atmospheric oxygen ions. The rate of cleaning was related to the density of the oxygen ions which in turn was related to increased solar activity. The onset of the recovery of the solar channels was well correlated with the burst of solar activity occurring in January and February of 1979. The degradation/recovery is illustrated in Figure 3-1 thru 3-9 in the Data Validation Document of Year-1 (Reference 3). The behavior of the Solar Channels in Year-2 is illustrated in Figure 3-1 thru 3-9 in this document. Some users will find it necessary to perform special processing to "unfold" the degradation effects from the solar data. Others who may be interested in relative changes in solar activity on short time scales will not need any special processing.

1.2.2 Degradation of Channel 13

The Wide Field of View (WFOV) Channel 13 has been shown to degrade with time at a rate of about 5% over the first year (see Reference 4). Among the reasons given for this degradation are: (1) thin film deposition as mentioned above, and (2) radiation damage (aging) of the ERB instrument optical surfaces. A recalibration of the Channel 13 irradiances was performed by the application of the Channel 13 Calibration Adjustment Table (CAT). A major goal of the CAT was to correct this degradation. However, analysis of albedo parameters for MATRIX for Year-1 (see Reference 4) indicates that a degradation persists in the Year-1 Channel 13 irradiances after application of the CAT. This problem is under study at the time of this writing. Subsequent updates to this document will provide users with information on how this degradation may be handled.

1.2.3 ERB instrument Duty Cycle - Thermal Effects

During Nimbus Year-1 and Year-2, the ERB instrument was operated in a one day off - three days on duty cycle. This duty cycle was imposed on ERB by considerations of limited spacecraft power. At some times, the duty cycle was different but the important thing is that periodically the ERB instrument was powered off. When the instrument was turned on; a warmup period followed where the electronics approached an operating temperature. Users of SEFDT data need to be aware of this problem and will probably need to consider rejecting both solar and earth flux data taken below some temperature threshold (see Subsection 3.2.6).

It has been pointed out (Ardanuy, Phillip: ERB Working Group Meeting Report #43, May 21, 1982) that following this warmup period, the ERB instrument temperature does not remain stabilized. The thermal environment of ERB (other sensors, motors, other experiments, etc.) causes variations in the ERB instrument temperature which impact the measured irradiances. This will affect both solar and earth flux data, but Channel 13 appears to be the most heavily impacted ERB channel. The impact to users of the SEFDT data is that the measured irradiances show a cyclic behavior which follows the ERB duty cycle. A method has been suggested for removing this effect from the Channel 13 and 14 irradiances. This approach would add a variable offset to these irradiances which will force their values at satellite midnight to be identically zero.

Another study (see Reference 5) indicates that the Channel 13 and 14 irradiances are impacted by thermal transients within the ERB instrument. These thermal transients have been shown to be due to a time-delayed response to both long wave and short wave heating by the Sun and the WFOV scene. A software has been developed to create a special calibration tape (DELMAT) which will contain irradiance corrections for the above effects.

1.2.4 ERB PTM Coefficient Error

In the MATGEN program, the set of engineering coefficients were used in the calibration equations for the Platinum Temperature Monitors (PTM). The use of these coefficients in place of the laboratory calibration coefficients causes an error in ERB Channels 11 and 12 irradiances on the SEFDT. However, (see Reference 6) the application of the Channel 13 Calibration Adjustment Table propagates this error to all of the earth flux irradiances on SEFDT. In the above reference, the errors induced are estimated to be approximately .25% for Channels 11 and 12, and approximately 1.5% for Channels 13 and 14.

1.3 OVERVIEW OF SEFDT DATA FOR YEAR-2

A brief general description of the SEFDT dataset is presented here. This will cover important features of the solar and earth flux data quality.

1.3.1 Solar Data Overview

There are two areas of solar data quality in the SEFDT Year-2 dataset of which users of the data must be made aware. An area of solar data quality, which is important for high resolution solar studies, is the problem of solar channel assembly misalignment. Periods of misalignment have been defined by Mr. John R. Hickey as having a solar channel off-axis angle greater than 0.5 degree (this is covered in more detail in a later section). Detailed tables later in this document present the orbits which were affected. Solar data users may recover the precision of the solar orbital irradiances by developing an off-axis correction algorithm which may be applied to the affected orbits. A second general area of solar data quality of importance to the user covers a range of problems (data gaps, algorithm error, etc.) which are described in detail in the later sections of this document. Many of these data glitches are amenable to recovery by the user. Data gaps around the solar peak are the primary example of an unrecoverable problem.

1.3.2 Earth Flux Data Overview

The earth flux data on the SEFDT have been examined to assure consistency with the MATRIX product. Such a comparison has been done for all the months of Year-2 MATRIX. The two products were found to show close agreement. Operational constraints were encountered in this study which will be important to users of SEFDT earth flux data. An important consideration for users is the appropriate handling of data rejection for the various data acceptability criteria as employed in MATRIX processing algorithms. This data rejection removes earth flux data which may be contaminated by:

1) Sun Blip

2) Data Values Out-of-Limits

3) Instrument Warmup

4) Instrument Special Calibration Modes

For discussion of MATRIX processing and data rejection algorithms see Reference 7. Another constraint which may be important to earth flux users is the scarcity of subsatellite point location data (one subpoint location per major frame) on the SEFDT. Some users may wish to interpolate between major frames to provide a subsatellite point location for each irradiance observation (as is provided on the MAT). Special processing was required to handle these two constraints before close agreement between SEFDT and MATRIX was achieved.

Another important note on earth flux data quality is the apparent remaining degradation found in the irradiances even though a calibration adjustment has been applied (this was discussed earlier).

SECTION 2. SUMMARY OF ITEMS CHECKED BY THE SEFDT SCIENCE QC PROGRAM

A brief description of the items checked by the SEFDT SQC program will be presented here. A list of these items is presented in Table 2-1.

2.1 TAPE FORMATTING AND READABILITY CHECKS

2.1.1 Logical and Physical Record Checks

Logical and physical records are checked to assure that they have proper record lengths and legal record IDs, and that their record numbers advance properly.

2.1.2 Calibration Adjustment Table Checks

The Calibration Adjustment Tables on the SEFDT are checked against disc datasets. The integrity of these disc datasets is checked during production runs for the SEFDT.

2.1.3 Trailing Documentation File Checks

The TDF is dumped to give a record of the tapes used in production of the SEFDT.

2.1.4 Earth Flux Format Checks

The ordering of earth flux data records in the data file is checked. Counts of missing and duplicated earth flux frames are maintained.

2.1.5 Solar Record Format Checks

The solar records and solar orbital summary records are checked to assure proper ordering. Counts of missssing or duplicated solar frames are maintained. The solar calibration record is checked to assure that it is the last logical record in the data file.

TABLE 2-1.

List of Items Checked by ERB-7 SEFDT SQC Program

Tape Formatting and Readability Checks:

- Logical and Physical Record Checks
- Calibration Adjustment Table (CAT) Checks
- Trailing Documentation File (TDF) Checks
- Earth Flux Format Checks
- Solar Record Format Checks

Earth Flux Data Quality Checks:

- Limit Checks
- Statistics on Earth Flux Irradiances
- Quality Checks on Adjusted Irradiances
- Periods of ERB Special Modes

Solar Data Quality Checks:

- Limit Checks
- Quality Checks on Solar Counts

Solar Orbital Summary Data Quality Checks:

- Limit Checks
- Statistics on Mean Solar Counts and Irradiances
- Statistics on Mean Counts: Off-Axis
- T_0 Time Tests

- Sun-Earth Distance Calculation Check

2.2 EARTH FLUX DATA QUALITY CHECKS

2.2.1 Limit Checks

Solar azimuth angle, solar zenith angle, latitude, and longitude are checked against their tape specification limits and are also checked for reasonable change from frame to frame. Temperatures in the earth flux record are checked to assure that they are reasonable.

2.2.2 Quality Checks on Adjusted Irradiances

Limit checking is performed on the calibration adjusted irradiances for Channels 11 through 14. Latitude band averages are computed for SEFDT quantities which correspond to MATRIX scientific parameters. These band averaged quantities are then compared to their MATRIX counterparts. Finally, whenever Channel 11 is determined to be open, Channel 11 and 12 irradiances are averaged and compared.

2.2.3 Periods of ERB Special Modes

Start and stop times are recorded for the ERB special calibration modes.

2.3 SOLAR DATA QUALITY CHECKS

2.3.1 Limit Checks

All angles appearing in the solar data records are checked against their tape specification limits and are checked for reasonable change from frame to frame. Temperatures in the solar records are checked to assure that they are reasonable. The DSAS azimuth and elevation angles are flagged whenever they are equal. Channels 1 and 3 are flagged if their shutter status changes in the solar data.

2.3.2 Quality Checks on Solar Counts

Limit checking is performed on the raw counts data for solar Channels 1 through 10C.

2.4 SOLAR ORBITAL SUMMARY DATA QUALITY CHECKS

2.4.1 Limit Checks

The angles appearing in the solar orbital summary are checked against their tape specification limits. Temperatures are checked for reasonableness.

2.4.2 Statistics on Mean Solar Counts and Irradiances

The computed mean solar counts and mean irradiances are checked against limits to assure reasonableness. Output statistics also include daily means and standard deviations for both counts and irradiances.

2.4.3 Statistics on Mean Counts: Off-Axis

The computed mean pre- and post-peak solar counts are limit checked to assure reasonableness. Output statistics include daily means and standard deviations.

2.4.4 T_0 Time Checks

The pre- and post-peak times are checked to assure that they are 13 minutes away from T_0. The T_0 time is checked to assure that it is found close to the middle of the solar data records. The T_0 time is flagged if it falls more than 16 seconds away from the southern terminator time. Data records around the solar peak are checked for data gaps.

2.4.5 Sun-Earth Distance Calculation Check

The Sun-Earth distance is recomputed and compared with the value found on the SEFDT.

SECTION 3. SCIENCE QC DATA ANALYSIS REPORT

3.1 FORMAT CHECKS

No problems in the tape format were found.

3.1.1 Channel 13 CAT Correction

After 20 JUN 80, the Channel 13 CAT, written to SEFDT, contains slope of 1 and off-set equal to zero.

3.2 EARTH FLUX CHECKS

3.2.1 Solar Zenith Angle

The Solar Zenith Angle (SZA) of each earth flux record is checked for physical reasonableness with SEFDT specification limits and for proper incrementation between frames (< 2 degrees). Although most of the angles were within limits, a few frames have solar zenith angles that slightly exceeded the upper limit. This problem was caused by a round-off error in MATGEN code. The irradiances were not affected by this problem. The days and orbits when this occurred are listed in Appendix A.

3.2.2 Solar Azimuth Angle

The Solar Azimuth Angle was within the tape specification limits (± 180 degrees) for all Year-2. However, a change of sign occurred during successive frames which was physically unreasonable. The irradiances were not affected by this problem. A list of the orbits in which the sign change occurred is given in Appendix B.

3.2.3 Latitude and Longitude

The latitudes and longitudes were checked to be within physically reasonable limits and for proper incrementation between frames. The only occurrence of out-of-limit latitudes and longitudes was during periods when a mislocation problem occurred on the MAT which was subsequently filled (22222). The Julian Day and the specific orbits when this occurred are listed in Appendix C.

3.2.4 Temperatures

The temperatures are checked to be within the limit of reasonable values as specified in the SEFDT Tape Specification. The temperatures were out-of-limits mostly during ERB warmup. This phenomenon occurs after an "ERB-OFF" day when the instruments are heating up.

3.2.5 Limit Checking of Channels 11-14 Counts and Irradiances

Results of limit checking for Channels 11-14 counts and irradiances were compiled for categories within 10% of the lower and upper limits, less than 10% of the lower limit and exceeding 10% of the upper limit. Though there were occasions where some unreasonable values occurred, most of these out-of-limits values were caused by data quality losses, which were not properly handled for the first 8 months of Year-2.

3.2.6 Latitude Band Average - MATRIX Comparison

Latitude band averages of SEFDT earth flux quantities were computed for comparison with the corresponding MATRIX parameters. In order to make a reliable comparison, data rejection criteria (as employed in MATRIX) are also applied to the SEFDT data in the present study.

Several computational constraints were encountered, of which at least two will be important to users of the SEFDT Earth Flux data:

(1) The approach used to reject data during instrument warmup. This study used Channel 12 temperature, whereas MATRIX processing used Channel 2.

(2) The scarcity of subsatellite point location data on the SEFDT.

Analysis indicates that the comparison is quite close and could be made even closer if users wish to overcome the computational constraints mentioned above. The results are presented in Appendix D in the form of tables for all months in Year-2. Tables for June 1980 through October 1980 are the comparison of MATRIX versus SEFDTFIX earth flux data.

3.2.7 Channels 11 and 12 Comparison

When Channels 11 and 12 were both OPEN, straight averages of their irradiances and of the Channel 11/12 difference were computed. Special mode activity (ECAL, GO/NO GO, Channel 12 Narrow, etc.) was screened before the averaging was performed. The results of this check are given in Appendix Q. The comparison yields anomalous results when there are occurrences of small sample counts, like 4 or 8 samples in a day. The cause of this anomaly is not known. Possible causes include:

(1) Spacecraft Anomaly

(2) Status Work Anomaly

(3) VIP Data Quality Loss

Because of this anomaly, users who intend to make Channel 11/12 comparison studies should reject samples having large Channel 11/12 differences.

3.2.8 Periods of Occurrence of ERB Special Modes

To aid in the analysis, start and stop times of special mode activity were recorded for the following ERB special modes:

(1) Electronic Calibration

(2) GO/NO GO Heater

(3) Channel 12 Shuttered

(4) Channel 12 Narrow

Due to its large volume, this data will not be presented here.

3.3 SOLAR FLUX CHECKS

3.3.1 DSAS Elevation (Alpha) and Azimuth (Beta)

The DSAS alpha and beta angles were checked for physically reasonable values and realistic incrementation between frames. Three problems have been found:

(1) Alpha was being set equal to beta near the solar peak. (A list of the affected orbits and days is given in Appendix E).

(2) Beta angle was out of limits. (A list of affected days and orbits is given in Appendix F).

(3) Some occurrences of rapid beta angle incrementation for the orbits are listed in Appendix G.

3.3.2 Data Gaps in the Solar Data

The SEFDT normally should contain 110 solar data records for each orbit of data. Data gaps in the solar data are handled by taking adjacent frames. Some orbits may have gross data gaps such that the total amount of data available for the orbit will not produce the required 110 solar data records. These orbits are listed in Appendix M. Users should reject these orbits from use in any scientific investigations.

3.4 SOLAR ORBITAL SUMMARY CHECKS

The solar orbital summary record was checked for various parameters, specifically for the proper choice of MSE time. Listed below are some of the items the user should be aware of in regard to the solar orbital summary records:

(1) If no valid time of minimum solar elevation has been found for an orbit, T_0 will be set to the Southern Terminator time and the orbital summary record will have the following dataset to a fill value (-10,000):

a) Hours/Minutes
b) Seconds
c) Thermopile Base Temperatures
d) Mean Counts
e) Channels 1-10 Net Irradiances

(2) If NO valid MSE or southern terminator time was found, no solar data records were written and the orbital summary record was filled, except for orbit number.

(3) During orbits in which Channel 1 was open, Channel 3 picked up a solar count value which was within limits. This resulted as an incorrect irradiance for Channel 3. Listed in Appendix H are the orbits in which the Channel 1 and Channel 3 shutter status changed. The user should be advised that not all of the orbits listed were affected, depending on when Channel 1 was open.

3.4.1 DSAS Alpha and Beta

The alpha angle was occassionally set to equal to the beta angle near MSE time. Since the orbital summary record was extracted from the solar data records, some of the orbits listed in Appendix E could have affected the solar orbital summary record.

3.4.2 T_0 Time Checks

There were a variety of problems which occurred with the selection of MSE time. Below is a summary of those problems for the users information:

(1) Due to a flaw in the MSE algorithm, the electronic calibration spike was occasionally picked as the solar peak. This problem was corrected for data beginning October, 1980. The affected orbits are listed below:

JULIAN DAY	ORBIT	JULIAN DAY	ORBIT
312	5250	7	6078
324	5415	9	6245
337	5607	31	6410
347	5737	55	6742
348	5747	136	7872
360			

(2) The times in the T_0-13 solar frames were more than 13 minutes away from the solar peak due to a data gap. This could slightly affect the irradiance calculation. The affected orbits are listed in Appendix I.

(3) The times in the T_0+13 solar frames were more than 13 minutes away from the solar peak due to a data gap. This could slightly affect the irradiance calculation. The affected orbits are listed in Appendix J.

(4) The solar irradiance calculation may have been affected by data gaps occurring within ± 3 minutes of the solar peak for the orbits listed in Appendix K.

(5) The difference between the Southern Terminator Time and the time selected by the solar peak algorithm was greater than 16 seconds for the orbits listed in Appendix L. The main reason for this discrepancy was the misalignment of the solar channel assembly so that a well-defined solar peak could not be determined.

3.4.3 Daily Averaged Solar Irradiances

Daily averaged solar irradiances were computed for all channels across Year-2. These are plotted for all but Channel 1 in Figures 3-1 through 3-9.

Days on which large standard deviation in the daily average solar irradiance occurred are listed below:

312, 324, 348, 360, 361, 6, 11, 19, 31, 32, 55, 76, 115, 135, 136, 167, 168, 224, 226, 228, 230, 236, 244, 248, 259, 266, 267, 272, 280, 287, 288, 298, 300, 303

3.4.4 Off-Axis Angle Checks

The off-axis angle measures the angular deviation of the pointing vector of the solar channel assembly from the position of the Sun (see Figure 3-10). The angle is adjusted by ground commands in order to account for changes in the DSAS β (solar azimuth) angle. Thus, at the time of Minimum Solar Elevation (MSE), the off-axis angle is just the difference in these two angles. Because of scaling and sign conventions within the SEFDT (Reference 8), this becomes:

$$\Psi_{\text{off-axis}} = \gamma + 0.1 * \beta_{\text{DSAS}}$$

The operational goal was to adjust the γ angle in order to keep the computed off-axis angle less than 0.5 degree. This was not always accomplished. If the off-axis angle exceeds 0.5 degree, users requiring high precision solar data must consider correcting the data for off-axis effects. These corrections are beyond the scope of this document. Users should probably reject orbital data for which the off-axis angle exceeds 1 degree.

Periods of misalignment usually ended when angle adjustments were performed. Appendix N contains a detailed listing of orbits which had off-axis angle greater than 0.5 degree. Appendix O contains a list of orbits which had off-axis angles greater than one degree.

FIGURE 3-1.

Year-2 Daily Averaged Solar Irradiances - Channel 2

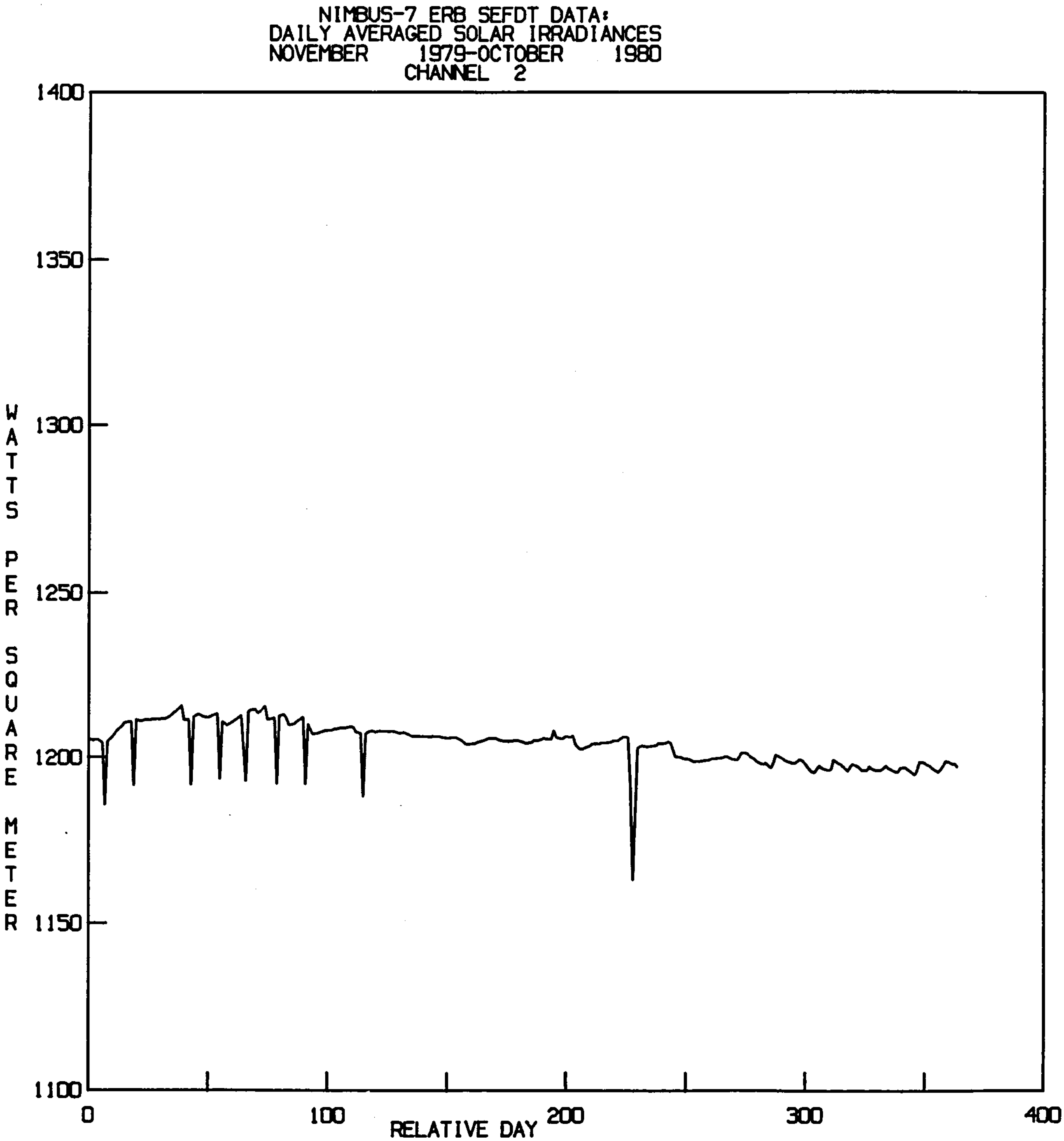


FIGURE 3-2.

Year-2 Daily Averaged Solar Irradiances - Channel 3

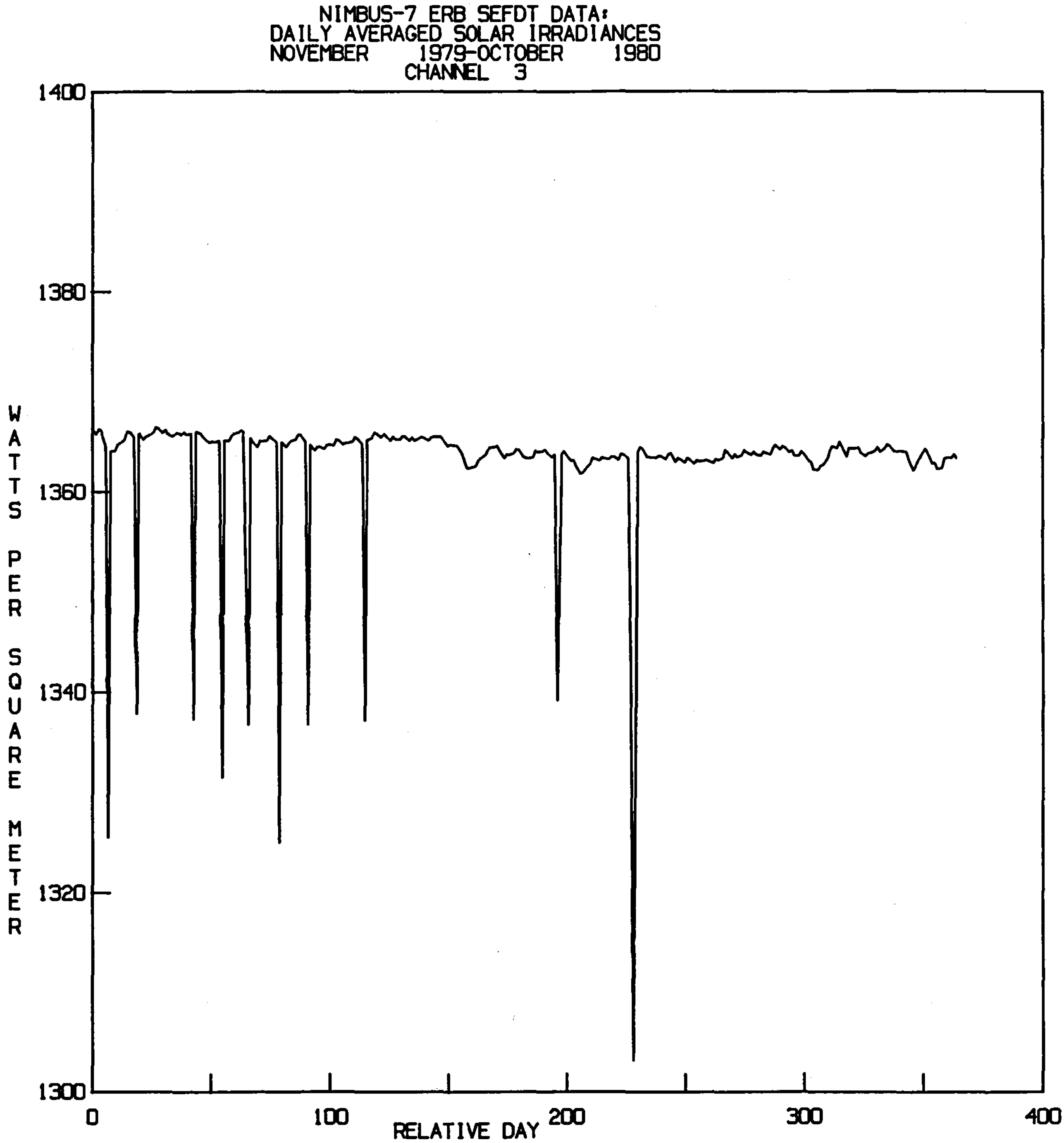


FIGURE 3-3.

Year-2 Daily Averaged Solar Irradiances - Channel 4

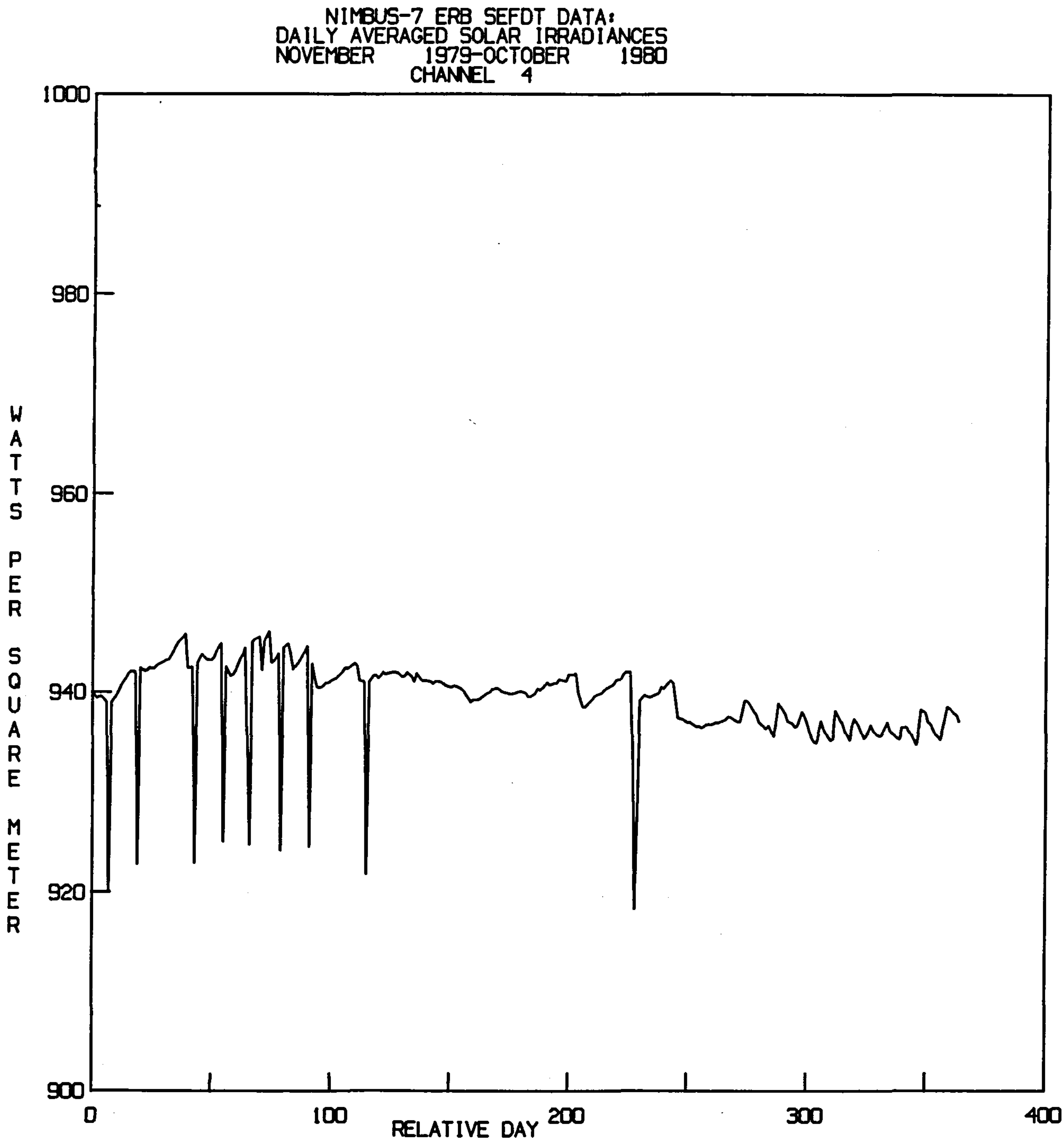


FIGURE 3-4.

Year-2 Daily Averaged Solar Irradiances - Channel 5

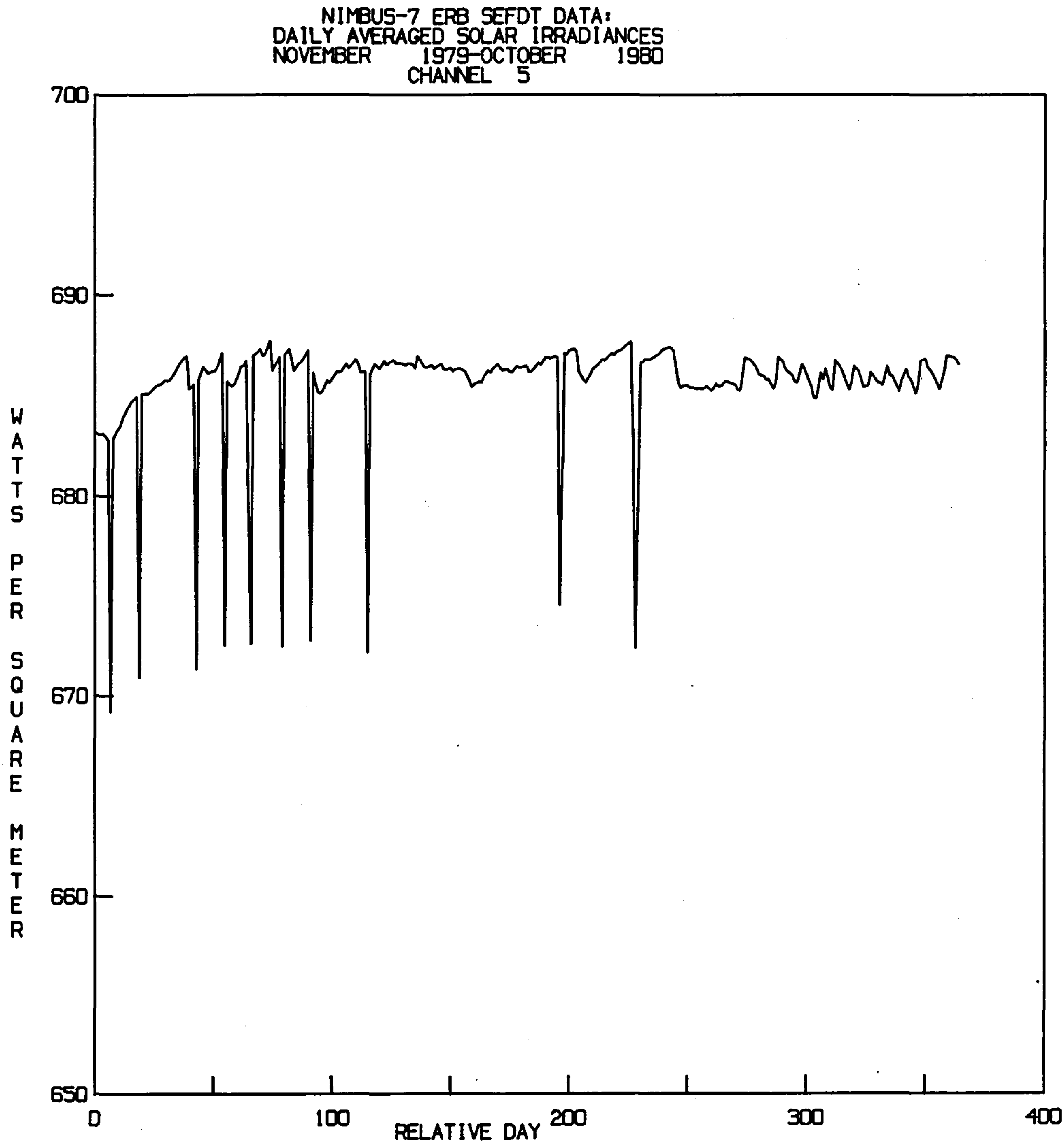


FIGURE 3-5.

Year-2 Daily Averaged Solar Irradiances - Channel 6

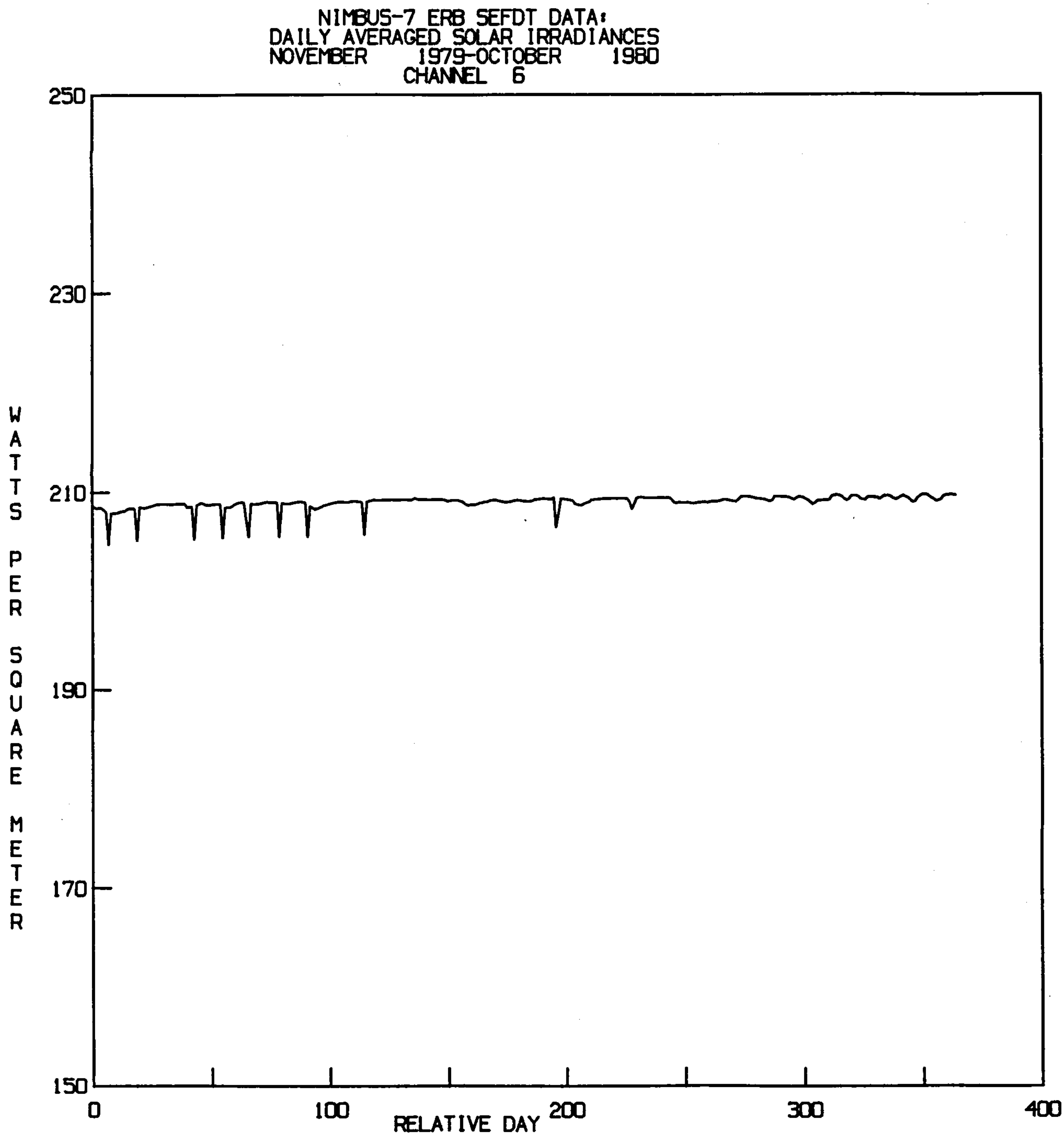


FIGURE 3-6.

Year-2 Daily Averaged Solar Irradiances - Channel 7

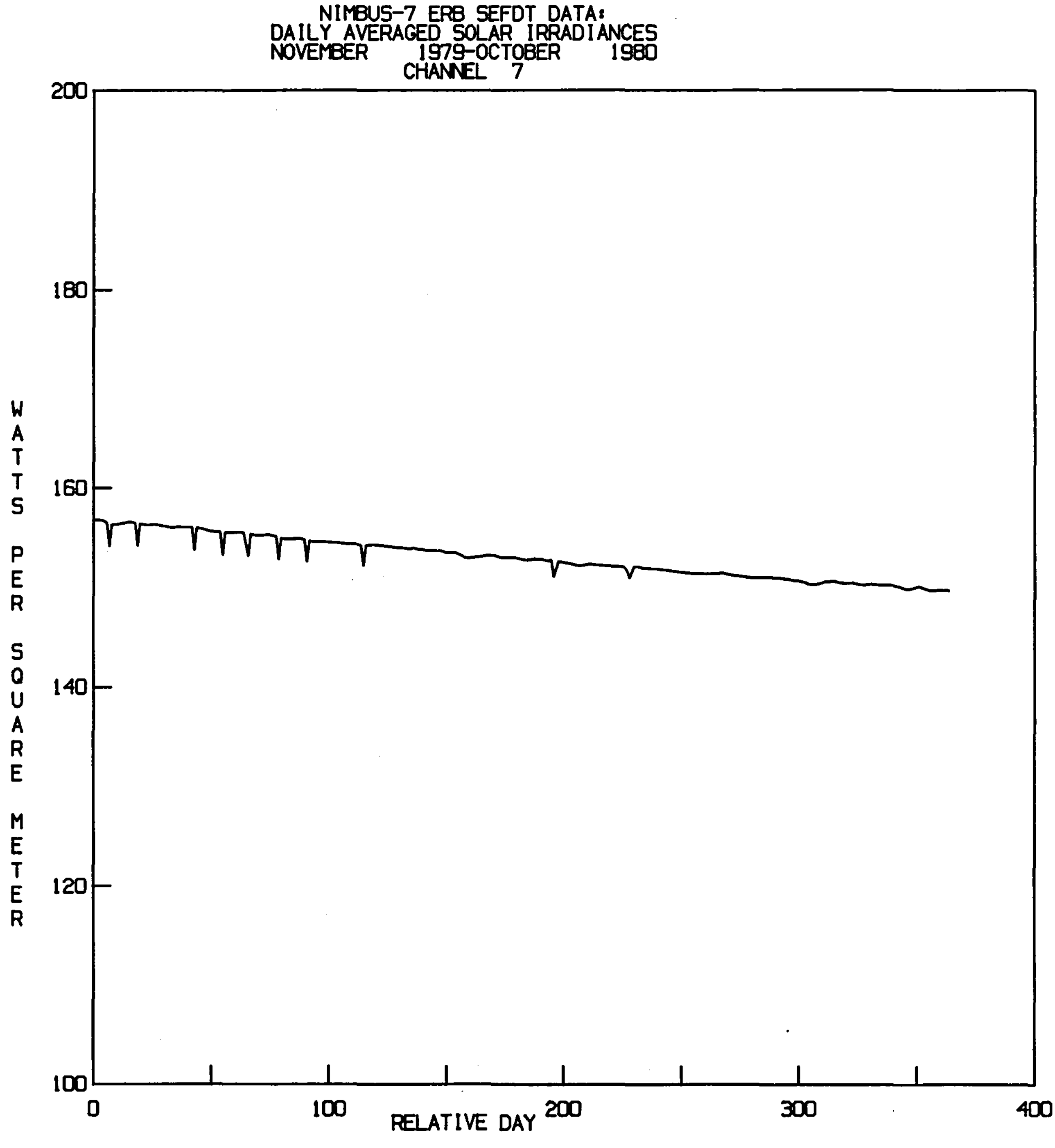


FIGURE 3-7.

Year-2 Daily Averaged Solar Irradiances - Channel 8

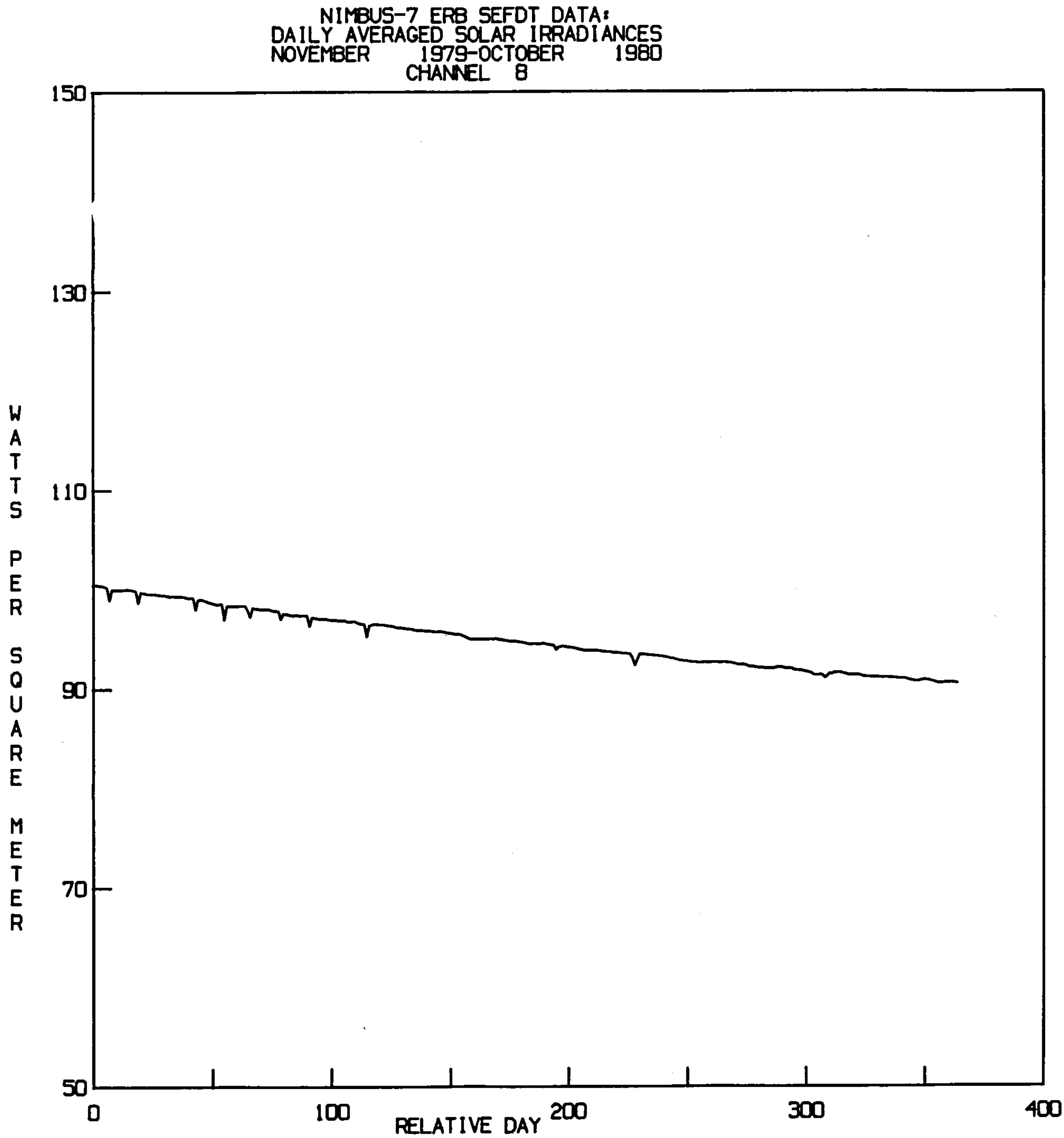


FIGURE 3-8.

Year-2 Daily Averaged Solar Irradiances - Channel 9

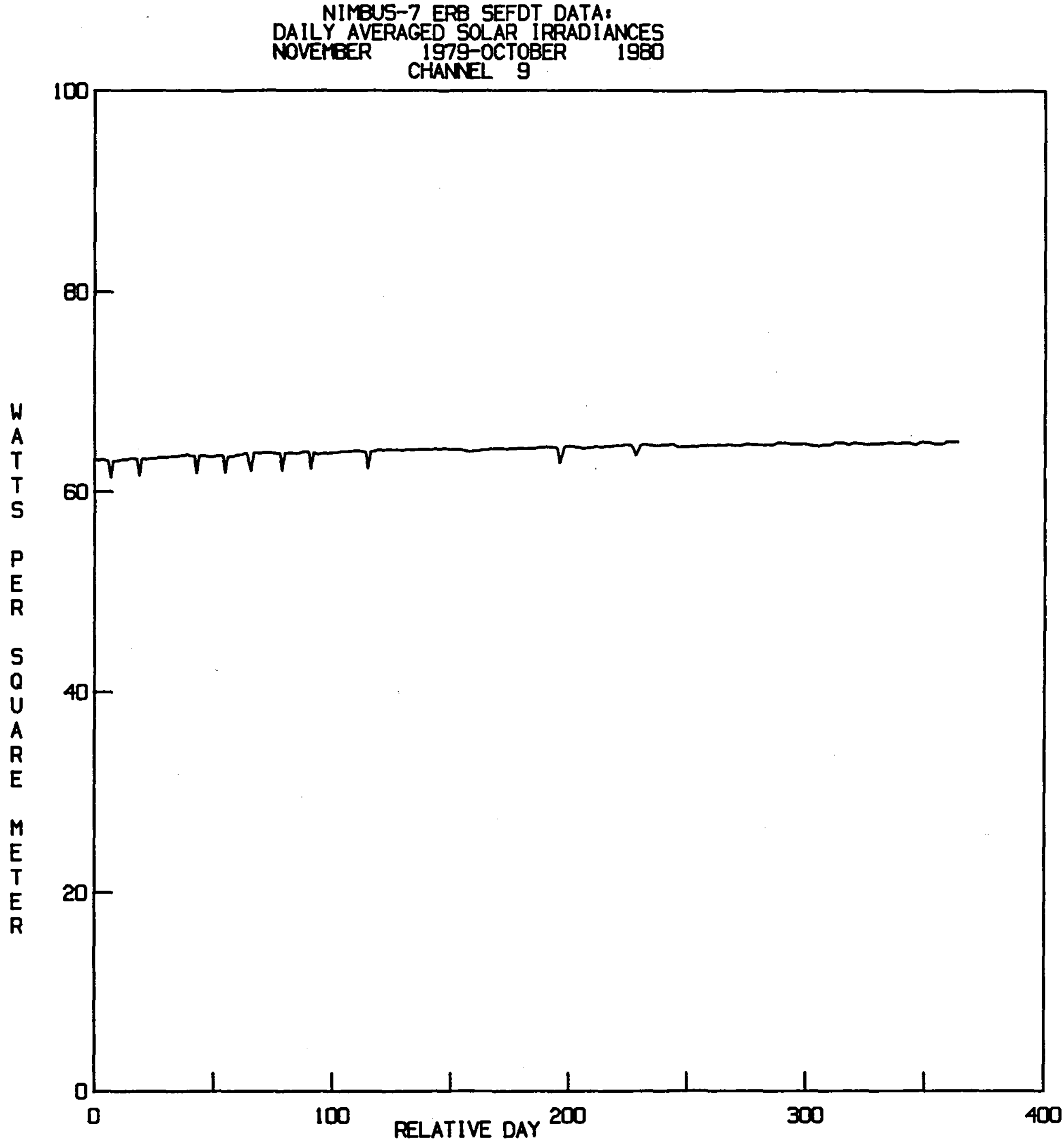


FIGURE 3-9.

Year-2 Daily Averaged Solar Irradiances - Channel 10

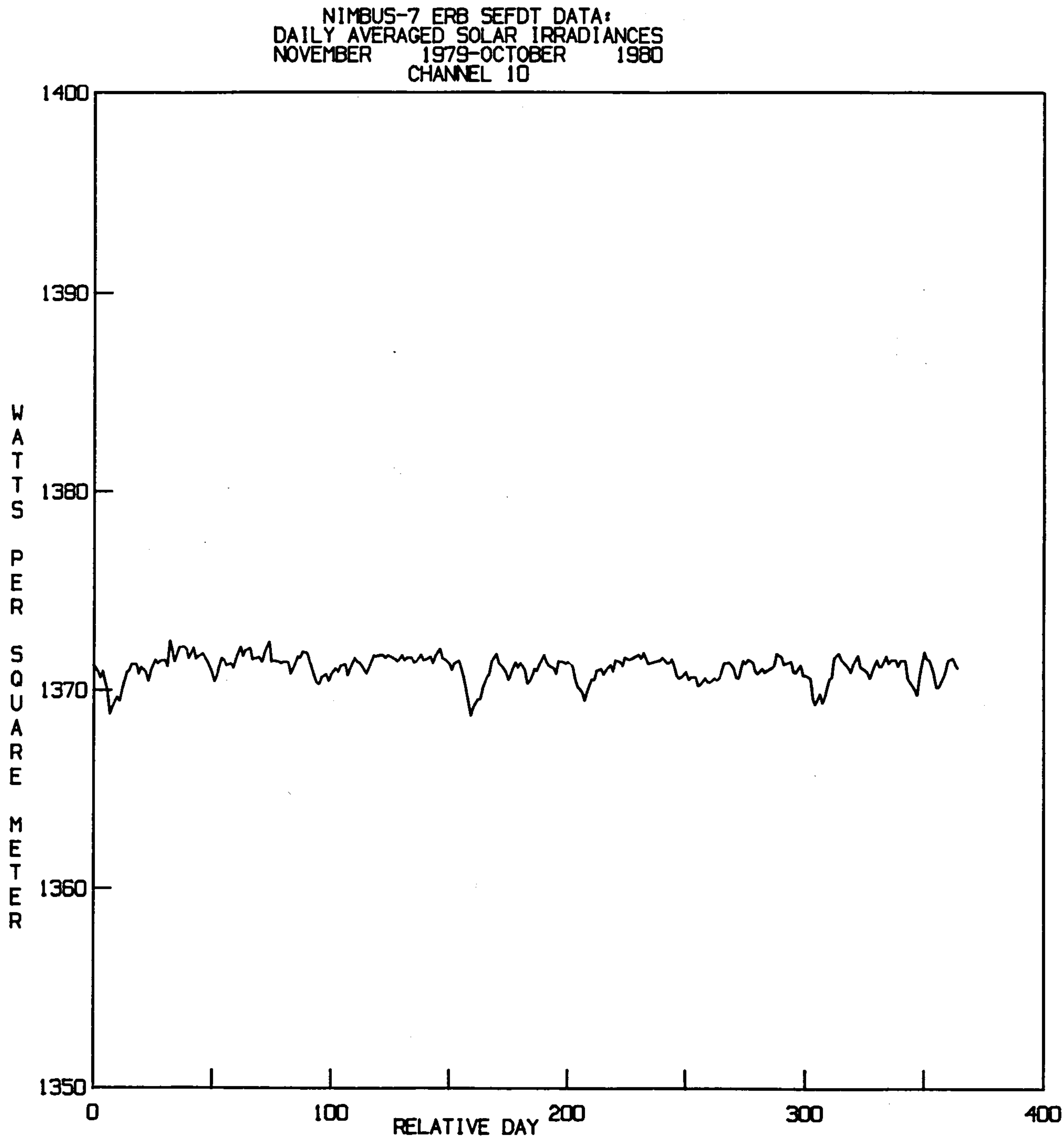
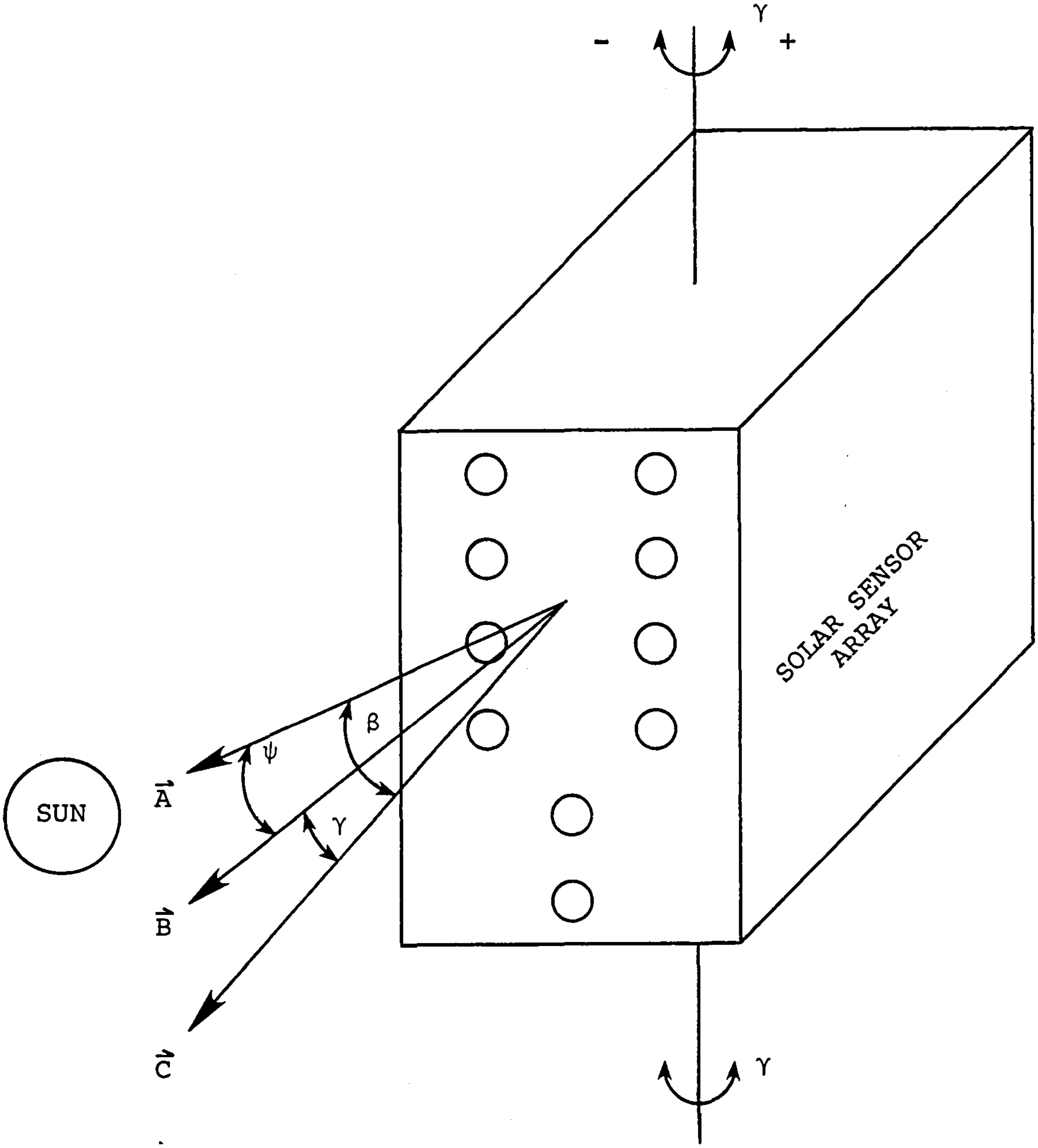


FIGURE 3-10. Definition of the Off-Axis Angle



$\vec{A}$ is a vector pointing from the Solar Sensor Array to the Sun.

$\vec{B}$ is a vector perpendicular to the face of the Solar Sensor Array and defines the pointing direction of the array.

$\vec{C}$ is a vector which lies along the direction of flight of the Spacecraft.

3.4.5 DSAS Solar Elevation Checks

As pointed out by Mr. John R. Hickey (NET Member), misalignment of the solar channel assembly by more than 1 degree produces off-axis effects not well understood. Appendix P presents a detailed list of orbits having DSAS Solar Elevation angle greater than 1 degree. This list also corresponds roughly to the major periods of off-axis angle misalignment. It is suggested that users reject this data from use in scientific investigation.

SECTION 4. CONCLUSIONS

4.1 USE OF THE EARTH FLUX DATA

(A) For the first 8 months of Year-2, the earth flux data on the SEFDT has been shown to be consistent with the corresponding data output on the MATRIX product.

(B) Users are reminded that there are degradation and duty cylce effects remaining in the data. A calibration approach for handling these are under intense study at this time.

(C) No earth flux data is rejected from the SEFDT. Each user must determine if the data rejection criteria applied are appropriate for his particular investigation.

4.2 USE OF THE SOLAR DATA

Several problems in the solar data have been discussed which may require special processing by the user to: (1) reject orbits with unrecoverable data problems, and (2) recover data with minor flaws. Unrecoverable data problems include the following:

1) Data Gaps (see Appendices J, K, and M)

2) Shutter Status Change (see Appendix H)

3) Misalignment $>1^{o}$ (see Appendices O and P)

4) ECAL Spikes (see Subsection 3.4.2)

Minor flaws which are amenable to recovery by user processing include:

1) Warmup Data Rejection

2) DSAS Azimuth and Elevation Angles Equal

3) Invalid DSAS Angles

4) Solar Channel Assembly Misalignment

All users of the solar data should reject the unrecoverable orbits as indicated above. Users requiring high precision solar data must also consider processing the recoverable items listed above. The most important of these is Item 4, the correction for off-axis effects.

APPENDIX A.

Solar Zenith Angle "Out-of-Limits"

The solar zenith angle was out-of-limits for at least one major frame in the orbits listed below. The angles were slightly above the upper limit of 180 degrees. This, however, did not affect any irradiances.

JULIAN DAY	ORBITS
6	6065, 6068, 6069, 6070, 6072-74, 6077
7	6078
10	6120-22, 6124-26, 6129-31
11	6134, 6135, 6139, 6140, 6144
266	9665, 9668, 9669
267	9671-73, 9675, 9676, 9678-80, 9682, 9683
268	9684-97, 9693-97
270	9714-16, 9718, 9719, 9722, 9723, 9725
271	9726, 9729, 9730, 9733

APPENDIX B.

Solar Azimuth Sign Change

The solar azimuth angle changed sign abruptly in at least one major frame in the following orbits. This problem did not affect any irradiances.

JULIAN DAY	ORBIT(S)
363	5958-5967
364	5967-5980
365	5981-5994
2	ALL
3	ALL
4	ALL
6	ALL
7	ALL
8	ALL
9	6105
10	ALL
11	ALL
12	ALL
14	ALL
15	ALL
16	ALL
18	ALL
19	ALL
20	ALL
21	6271
22	ALL
23	ALL
24	ALL
26	ALL
27	ALL
28	ALL
29	6382
30	ALL
31	ALL
32	6424-6437
33	6437
34	6452-6458
256	9520-9532
258	9547-9560
259	ALL
260	ALL
262	ALL
263	ALL
264	ALL
266	9658-9670
267	ALL
268	ALL

JULIAN DAY	ORBIT(S)
269	9698
270	ALL
271	ALL
272	ALL
273	9753
274	ALL
275	ALL
276	ALL
277	9809
278	ALL
279	ALL
280	ALL
281	9864
282	9879-9883

APPENDIX C.

Latitude and Longitude Filled

Due to a mislocation problem on the input MATs, the following orbits had latitudes and longitudes set to a fill value (22222) for at least one major frame:

JULIAN DAY	ORBIT(S)
59	6810
60	6810
64	6879
65	6879
66	6907
67	6907
144	7975
148	8027

APPENDIX D.

SEFDT and MATRIX Intercomparison Results

SEFDT SCIENCE QC RESULTS:

LATITUDE BAND AVERAGE INTERCOMPARISON RESULTS
POPULATION WEIGHTED MATRIX RESULTS VS.
SEFDT SCIENCE QC RESULTS: NOVEMBER, 1979

MEANS OF DIFFERENCES:

DAY	P3	P4	P9	P10	P11	P12
305	0.3	0.8	0.3	-2.0	0.1	-0.2
307	-0.4	0.9	-0.8	-1.1	-0.4	-0.2
308	0.3	0.7	0.4	-1.8	0.1	-0.3
309	0.3	0.7	0.4	-2.7	0.2	-0.3
311	-0.7	0.8	0.6	-1.5	0.2	-0.3
312	0.4	0.7	0.4	-2.0	0.1	-0.3
313	0.3	0.7	0.4	-2.9	0.2	-0.3
315	-0.0	0.2	1.3	-0.8	0.7	-0.2
316	0.4	0.7	0.5	-2.3	0.2	-0.3
317	0.3	0.7	0.4	-2.8	0.2	-0.4
319	0.4	-0.4	0.2	-1.4	0.1	-0.3
320	0.4	0.6	0.5	-1.9	0.2	-0.3
321	0.4	0.6	0.5	-2.6	0.2	-0.3
323	0.9	0.2	0.3	-1.6	0.1	-0.3
324	0.5	0.6	0.5	-2.1	0.2	-0.4
325	0.5	0.5	0.6	-2.8	0.2	-0.3
327	-0.1	0.0	-0.7	-1.5	-0.5	-0.3
328	0.6	0.7	0.5	-2.0	0.2	-0.3
329	0.6	0.8	0.6	-2.9	0.2	-0.3
331	0.9	-0.1	-0.7	-1.7	-0.3	-0.4
332	0.8	0.4	0.7	-2.5	0.3	-0.4
333	0.6	0.3	0.6	-3.1	0.2	-0.4

SEFDT SCIENCE QC RESULTS:

LATITUDE BAND AVERAGE INTERCOMPARISON RESULTS
POPULATION WEIGHTED MATRIX RESULTS VS.
SEFDT SCIENCE QC RESULTS: NOVEMBER, 1979

ST. DEVIATIONS OF DIFFERENCES:

DAY	P3	P4	P9	P10	P11	P12
305	0.5	0.7	1.6	2.7	0.7	0.8
307	1.5	1.4	2.6	2.3	1.4	0.8
308	0.6	0.7	1.8	2.9	0.7	0.8
309	0.6	0.7	1.7	3.0	0.7	0.8
311	2.0	1.2	3.5	2.8	1.5	0.9
312	0.6	0.6	1.7	2.8	0.7	0.9
313	0.6	0.6	1.7	2.8	0.7	0.8
315	1.3	2.1	3.4	2.2	1.5	0.9
316	0.6	0.7	1.8	2.7	0.8	0.8
317	0.6	0.7	1.7	3.1	0.8	0.9
319	0.7	2.3	2.7	2.8	1.5	0.9
320	0.7	0.6	1.7	2.7	0.8	0.8
321	0.6	0.6	1.6	2.7	0.7	0.8
323	0.9	1.2	2.8	2.8	1.3	0.9
324	0.7	0.7	1.6	2.7	0.7	0.9
325	0.6	0.7	1.6	2.8	0.7	0.8
327	0.7	1.4	2.7	2.6	1.4	0.8
328	0.6	1.4	1.7	2.6	0.7	0.8
329	0.6	1.8	1.7	2.6	0.7	0.8
331	1.4	1.7	2.3	2.8	1.0	0.9
332	1.2	0.6	1.7	2.9	0.7	0.9
333	0.6	0.6	1.6	2.8	0.7	0.9

SEFDT SCIENCE QC RESULTS:

LATITUDE BAND AVERAGE INTERCOMPARISON RESULTS
POPULATION WEIGHTED MATRIX RESULTS VS.
SEFDT SCIENCE QC RESULTS: DECEMBER, 1979

MEANS OF DIFFERENCES:

DAY	P3	P4	P9	P10	P11	P12
335	0.4	-0.2	0.9	-1.7	0.4	-0.4
336	0.7	0.5	0.6	-2.1	0.3	-0.4
337	0.7	0.4	0.6	-2.6	0.2	-0.4
339	1.1	-0.2	0.4	-1.5	0.3	-0.3
341	-0.3	0.5	1.8	-1.7	0.6	-0.3
343	0.6	0.3	0.2	-1.4	0.0	-0.3
344	0.8	0.3	0.6	-2.4	0.3	-0.4
345	0.8	0.3	0.6	-2.7	0.2	-0.4
347	0.8	0.1	0.4	-1.6	0.1	-0.4
348	0.9	0.2	0.6	-2.6	0.2	-0.3
349	0.9	0.2	0.7	-2.9	0.3	-0.4
351	1.0	-0.9	0.6	-1.3	0.3	-0.3
353	1.0	-0.6	0.9	-1.5	0.5	-0.3
355	0.8	-0.9	0.5	-1.7	0.2	-0.4
356	0.9	0.1	0.6	-2.0	0.2	-0.3
357	1.0	0.2	0.6	-2.8	0.2	-0.4
359	1.1	0.1	-0.1	-1.6	-0.1	-0.3
360	1.0	0.1	0.6	-2.2	0.2	-0.4
361	0.9	0.1	0.6	-2.6	0.2	-0.3
363	0.6	-0.5	1.1	-1.5	0.5	-0.4
364	0.9	0.1	0.6	-2.4	0.3	-0.4
365	1.0	0.1	0.6	-2.7	0.2	-0.4

SEFDT SCIENCE QC RESULTS:

LATITUDE BAND AVERAGE INTERCOMPARISON RESULTS
POPULATION WEIGHTED MATRIX RESULTS VS.
SEFDT SCIENCE QC RESULTS: DECEMBER, 1979

ST. DEVIATIONS OF DIFFERENCES:

DAY	P3	P4	P9	P10	P11	P12
335	1.0	1.6	2.4	2.5	1.1	0.9
336	0.5	0.9	1.5	2.3	0.7	0.8
337	0.6	0.6	1.6	2.4	0.6	0.8
339	0.9	1.6	3.1	2.5	1.3	0.8
341	1.7	0.9	3.1	2.5	1.3	0.8
343	0.6	0.7	2.1	2.5	0.9	0.8
344	0.6	0.7	1.6	2.5	0.7	0.8
345	0.5	0.7	1.5	2.6	0.7	0.8
347	0.5	1.0	2.1	2.3	0.9	0.8
348	0.5	0.7	1.5	2.4	0.7	0.7
349	0.6	0.6	1.5	2.4	0.6	0.8
351	0.7	2.4	2.0	2.0	1.0	0.7
353	0.8	1.5	2.3	2.2	1.2	0.8
355	0.7	2.1	2.4	2.3	1.1	0.8
356	0.5	0.8	1.4	2.3	0.6	0.7
357	0.4	0.8	1.4	2.3	0.6	0.7
359	0.5	1.0	2.2	2.4	0.9	0.8
360	0.6	0.8	1.5	2.4	0.7	0.8
361	0.6	0.9	1.4	2.1	0.6	0.7
363	1.0	1.8	2.9	2.2	1.4	0.8
364	0.6	0.9	1.4	2.2	0.6	0.8
365	0.6	0.9	1.7	2.4	0.7	0.8

SEFDT SCIENCE QC RESULTS:

LATITUDE BAND AVERAGE INTERCOMPARISON RESULTS
POPULATION WEIGHTED MATRIX RESULTS VS.
SEFDT SCIENCE QC RESULTS: JANUARY, 1980

MEANS OF DIFFERENCES:

DAY	P3	P4	P9	P10	P11	P12
2	0.5	0.6	1.0	-1.4	0.5	-0.3
3	1.0	0.1	0.6	-2.0	0.2	-0.4
4	0.9	0.1	0.6	-2.6	0.2	-0.4
6	0.9	-0.3	-0.1	-1.4	-0.1	-0.3
7	0.9	0.1	0.6	-2.8	0.2	-0.4
8	1.0	0.1	0.6	-2.4	0.2	-0.4
10	-0.1	0.6	1.8	-1.3	0.6	-0.3
11	1.0	0.1	0.6	-2.3	0.2	-0.4
12	0.9	0.2	0.6	-2.5	0.2	-0.3
14	0.1	0.6	1.3	-1.2	0.3	-0.3
15	0.9	0.2	0.5	-1.8	0.2	-0.3
16	0.9	0.1	0.6	-2.7	0.2	-0.4
18	0.8	0.1	0.7	-1.3	0.2	-0.3
19	0.9	0.1	0.6	-2.0	0.2	-0.4
20	0.9	0.1	0.6	-2.8	0.2	-0.3
22	0.8	0.4	0.2	-1.4	0.0	-0.3
23	0.8	0.2	0.5	-2.0	0.2	-0.4
24	0.9	0.2	0.5	-2.8	0.2	-0.3
26	0.3	0.6	-0.5	-1.2	-0.6	-0.3
27	0.8	0.3	0.5	-2.0	0.2	-0.3
28	0.7	0.3	0.5	-2.7	0.2	-0.3
30	-0.2	0.2	0.5	-1.1	-0.0	-0.2
31	0.7	0.4	0.5	-1.8	0.2	-0.3

SEFDT SCIENCE QC RESULTS:

LATITUDE BAND AVERAGE INTERCOMPARISON RESULTS
POPULATION WEIGHTED MATRIX RESULTS VS.
SEFDT SCIENCE QC RESULTS: JANUARY, 1980

ST. DEVIATIONS OF DIFFERENCES:

DAY	P3	P4	P9	P10	P11	P12
2	1.3	1.1	3.9	2.3	1.9	0.8
3	0.6	1.0	1.4	2.5	0.6	0.8
4	0.5	0.9	1.5	2.4	0.7	0.8
6	0.5	1.3	2.2	2.3	1.0	0.7
7	0.5	0.9	1.4	2.5	0.6	0.8
8	0.6	0.9	1.4	2.4	0.6	0.8
10	1.9	1.1	3.3	2.2	1.4	0.7
11	0.5	1.0	1.5	2.4	0.6	0.8
12	0.5	1.1	1.5	2.4	0.6	0.8
14	1.1	1.2	3.1	2.1	1.4	0.8
15	0.6	1.1	1.4	2.3	0.6	0.7
16	0.6	1.1	1.5	2.1	0.7	0.7
18	0.5	1.0	1.9	2.0	0.8	0.7
19	0.6	1.0	1.4	2.5	0.6	0.8
20	0.6	1.0	1.4	2.3	0.6	0.7
22	0.6	1.8	1.9	2.1	0.6	0.8
23	0.6	1.0	1.5	2.5	0.7	0.8
24	0.7	1.0	1.5	2.6	0.6	0.8
26	1.3	1.2	3.3	2.3	1.6	0.8
27	0.6	1.1	1.4	2.5	0.6	0.8
28	0.7	1.1	1.5	2.4	0.6	0.7
30	1.5	1.3	3.3	2.2	1.5	0.7
31	0.7	1.1	1.6	2.2	0.7	0.7

SEFDT SCIENCE QC RESULTS:

LATITUDE BAND AVERAGE INTERCOMPARISON RESULTS
POPULATION WEIGHTED MATRIX RESULTS VS.
SEFDT SCIENCE QC RESULTS: FEBRUARY, 1980

MEANS OF DIFFERENCES:

DAY	P3	P4	P9	P10	P11	P12
32	0.7	0.4	0.5	-2.1	0.2	-0.3
34	0.5	0.3	1.9	0.9	0.8	0.2
35	0.6	0.4	0.4	-1.5	0.2	-0.3
36	0.6	0.3	0.5	2.5	0.2	0.3
38	-0.5	0.6	1.9	-1.0	0.7	-0.2
39	0.6	0.4	0.4	2.2	0.2	0.3
40	0.6	0.4	0.4	-2.7	0.1	-0.3
42	0.6	0.6	0.6	0.8	0.0	0.1
43	0.5	0.5	0.4	-1.7	0.1	-0.3
44	0.5	0.5	0.4	1.9	0.1	0.2
46	-0.4	0.2	1.3	-0.7	0.6	-0.1
47	0.5	0.6	0.3	1.6	0.1	0.3
48	0.5	0.6	0.3	-2.3	0.1	-0.2
50	0.4	0.6	0.1	0.8	0.0	0.2
51	0.4	0.7	0.3	-2.0	0.1	-0.2
52	0.4	0.6	0.3	2.7	0.1	0.2
54	-0.1	0.8	1.4	-0.7	0.8	-0.1
55	0.4	0.7	0.2	1.4	0.1	0.2
56	0.3	0.7	0.3	-1.8	0.1	-0.2
58	0.7	0.6	0.9	0.5	0.1	0.1
59	0.3	0.7	0.2	-1.0	0.1	-0.2
60	0.3	0.7	0.2	1.5	0.1	0.1

SEFDT SCIENCE QC RESULTS:

LATITUDE BAND AVERAGE INTERCOMPARISON RESULTS
POPULATION WEIGHTED MATRIX RESULTS VS.
SEFDT SCIENCE QC RESULTS: FEBRUARY, 1980

ST. DEVIATIONS OF DIFFERENCES:

DAY	P3	P4	P9	P10	P11	P12
32	0.7	1.0	1.6	2.5	0.7	0.7
34	1.1	1.7	3.0	2.1	1.5	0.7
35	0.7	1.0	1.5	2.1	0.7	0.7
36	0.6	1.2	1.4	2.4	0.6	0.8
38	2.3	1.2	3.8	2.2	1.6	0.7
39	0.7	1.1	1.6	2.6	0.7	0.7
40	0.7	1.0	1.7	2.6	0.7	0.7
42	1.7	0.9	3.0	2.1	1.4	0.7
43	0.7	1.0	1.5	2.5	0.7	0.7
44	0.7	1.1	1.7	2.4	0.8	0.7
46	2.3	1.5	3.8	2.1	1.9	0.7
47	0.6	1.0	1.7	2.5	0.7	0.7
48	0.6	1.0	1.7	2.6	0.7	0.7
50	0.6	1.0	2.0	1.8	0.8	0.6
51	0.7	1.2	1.8	2.2	0.8	0.6
52	0.7	1.0	1.6	2.8	0.7	0.7
54	2.0	1.6	2.8	1.8	1.5	0.6
55	0.6	1.0	1.7	2.6	0.7	0.6
56	0.7	1.0	1.8	2.8	0.7	0.7
58	1.3	1.1	2.5	1.9	1.1	0.6
59	0.7	0.9	1.6	2.0	0.7	0.6
60	0.6	1.0	1.9	2.4	0.8	0.6

SEFDT SCIENCE QC RESULTS:

LATITUDE BAND AVERAGE INTERCOMPARISON RESULTS
POPULATION WEIGHTED MATRIX RESULTS VS.
SEFDT SCIENCE QC RESULTS: MARCH, 1980

MEANS OF DIFFERENCES:

DAY	P3	P4	P9	P10	P11	P12
62	0.3	1.0	0.1	-0.3	-0.0	-0.1
63	0.3	0.8	0.2	1.0	0.1	0.1
64	0.3	0.8	0.2	-1.4	0.1	-0.2
66	0.4	0.8	0.5	0.3	-0.3	0.1
67	0.3	0.7	0.1	-0.8	0.0	-0.1
68	0.3	0.7	0.1	1.1	0.1	0.1
70	-0.4	1.2	1.1	-0.0	0.3	0.0
71	0.3	0.7	0.1	0.6	0.0	0.1
72	0.3	0.8	0.1	-0.6	0.0	-0.0
74	0.9	1.5	1.0	0.2	0.2	0.0
75	0.3	0.8	0.0	-0.3	0.0	0.0
76	0.3	0.8	0.1	0.7	0.0	0.0
78	0.4	0.8	-0.1	0.0	-0.1	0.0
79	0.3	0.8	0.1	0.1	0.0	0.0
80	0.3	0.7	-0.0	0.0	-0.0	0.0
82	0.2	0.8	0.8	0.1	0.3	0.1
83	0.3	0.7	0.0	0.1	-0.0	0.1
84	0.3	0.6	0.0	0.2	-0.0	0.1
86	-0.4	0.8	0.1	0.2	-0.1	0.1
87	0.4	0.7	0.0	0.2	-0.0	0.1
88	0.4	0.7	0.0	0.6	-0.0	0.1
90	0.1	0.7	0.4	0.2	-0.3	0.1
91	0.4	0.6	-0.0	0.3	-0.0	0.1

SEFDT SCIENCE QC RESULTS:

LATITUDE BAND AVERAGE INTERCOMPARISON RESULTS
POPULATION WEIGHTED MATRIX RESULTS VS.
SEFDT SCIENCE QC RESULTS: MARCH, 1980

ST. DEVIATIONS OF DIFFERENCES:

DAY	P3	P4	P9	P10	P11	P12
62	0.7	1.1	2.0	1.4	0.9	0.5
63	0.6	0.9	1.6	1.9	0.7	0.5
64	0.6	1.0	1.7	2.0	0.7	0.5
66	0.6	0.9	2.3	1.0	1.0	0.4
67	0.6	0.9	1.8	2.0	0.8	0.5
68	0.6	0.9	1.7	2.2	0.7	0.5
70	1.3	0.7	2.8	1.0	1.4	0.4
71	0.6	0.7	1.7	1.6	0.8	0.4
72	0.6	0.9	1.7	1.7	0.8	0.4
74	1.8	1.4	3.6	0.9	1.8	0.4
75	0.6	0.9	1.6	1.2	0.7	0.4
76	0.7	0.8	1.7	1.8	0.7	0.4
78	0.6	1.0	1.8	0.8	0.8	0.3
79	0.7	0.8	1.9	1.1	0.9	0.3
80	0.6	1.3	1.7	2.0	0.8	0.4
82	1.2	0.9	2.8	0.7	1.4	0.3
83	0.7	0.7	1.6	1.3	0.7	0.3
84	0.6	0.7	1.6	2.0	0.7	0.4
86	1.9	0.7	4.4	0.7	2.1	0.3
87	0.7	0.8	1.7	1.4	0.7	0.4
88	0.7	0.7	1.7	2.1	0.7	0.4
90	0.6	0.9	2.6	0.9	1.4	0.4
91	0.7	0.7	1.7	1.4	0.7	0.4

SEFDT SCIENCE QC RESULTS:

LATITUDE BAND AVERAGE INTERCOMPARISON RESULTS
POPULATION WEIGHTED MATRIX RESULTS VS.
SEFDT SCIENCE QC RESULTS: APRIL, 1980

MEANS OF DIFFERENCES:

DAY	P3	P4	P9	P10	P11	P12
92	0.4	0.6	-0.1	0.6	-0.0	0.1
94	0.6	0.7	-0.8	0.3	-0.4	0.1
96	0.9	0.6	-0.1	0.3	0.1	0.1
98	0.4	1.0	0.0	0.5	-0.0	0.2
99	0.5	0.6	-0.1	0.7	-0.1	0.2
100	0.5	0.5	-0.1	1.1	-0.1	0.2
102	0.5	0.4	-0.1	0.8	-0.1	0.2
103	0.5	0.6	-0.1	0.8	-0.0	0.2
104	0.6	0.4	-0.2	1.1	-0.1	0.2
106	0.4	0.2	0.2	0.6	0.1	0.2
107	0.6	0.5	-0.2	1.0	-0.1	0.2
108	0.6	0.5	-0.2	1.7	-0.1	0.2
110	0.5	0.3	-0.5	0.4	-0.3	0.2
111	0.6	0.4	-0.2	1.1	-0.1	0.3
112	0.7	0.5	-0.2	2.0	-0.1	0.2
114	0.6	0.5	0.3	1.0	0.2	0.2
115	0.7	0.6	-0.2	1.1	-0.1	0.3
116	0.7	0.5	-0.2	2.2	-0.1	0.3
118	0.6	0.5	-0.1	0.5	0.1	0.3
119	0.7	0.4	-0.3	1.0	-0.1	0.3
120	0.8	0.4	-0.3	2.4	-0.1	0.3

SEFDT SCIENCE QC RESULTS:

LATITUDE BAND AVERAGE INTERCOMPARISON RESULTS
POPULATION WEIGHTED MATRIX RESULTS VS.
SEFDT SCIENCE QC RESULTS: APRIL, 1980

ST. DEVIATIONS OF DIFFERENCES:

DAY	P3	P4	P9	P10	P11	P12
92	0.7	0.7	1.7	1.8	0.7	0.4
94	0.8	0.8	2.1	0.9	0.9	0.4
96	1.2	0.7	1.8	1.0	0.8	0.4
98	0.7	1.1	1.8	1.1	1.0	0.5
99	0.7	0.8	1.6	1.6	0.7	0.5
100	0.7	0.7	1.7	1.9	0.7	0.5
102	0.7	0.8	1.7	1.8	0.8	0.5
103	0.7	0.8	1.7	1.6	0.7	0.5
104	0.7	1.1	1.6	2.1	0.7	0.5
106	1.0	1.2	2.0	1.4	1.0	0.5
107	0.6	0.6	1.5	1.6	0.6	0.5
108	0.6	0.7	1.5	2.0	0.6	0.5
110	0.7	0.7	1.9	1.2	1.0	0.5
111	0.6	0.8	1.6	2.1	0.7	0.6
112	0.6	0.8	1.6	2.3	0.7	0.5
114	0.7	0.9	2.0	1.8	1.1	0.6
115	0.6	1.5	1.5	2.0	0.6	0.6
116	0.6	0.8	1.5	2.4	0.6	0.6
118	0.8	1.0	1.5	1.4	0.8	0.6
119	0.6	0.8	1.4	1.8	0.6	0.6
120	0.7	0.8	1.6	2.3	0.7	0.6

SEFDT SCIENCE QC RESULTS:

LATITUDE BAND AVERAGE INTERCOMPARISON RESULTS
POPULATION WEIGHTED MATRIX RESULTS VS.
SEFDT SCIENCE QC RESULTS: MAY 1980

MEANS OF DIFFERENCES:

DAY	P3	P4	P9	P10	P11	P12
122	0.5	0.4	-0.5	0.5	-0.3	0.2
123	0.8	0.3	-0.3	1.3	-0.1	0.3
124	0.8	0.4	-0.3	1.8	-0.1	0.3
126	0.3	0.6	0.1	0.5	0.2	0.3
127	0.8	0.4	-0.4	1.2	-0.1	0.3
128	0.8	0.4	-0.3	2.2	-0.1	0.3
130	0.9	0.4	-0.2	0.6	0.0	0.3
131	0.8	0.4	-0.4	0.9	-0.2	0.3
132	0.8	0.6	-0.3	1.9	-0.1	0.3
134	0.5	0.5	-0.0	0.5	0.0	0.3
135	0.8	0.4	-0.4	1.1	-0.2	0.4
136	0.7	0.4	-0.4	2.1	-0.2	0.3
138	0.5	0.5	0.1	0.6	0.0	0.3
139	0.8	0.5	-0.4	1.4	-0.1	0.3
140	0.8	0.4	-0.4	1.9	-0.2	0.3
142	0.2	0.5	0.8	0.5	0.4	0.3
143	0.7	0.5	-0.4	1.1	-0.2	0.4
144	0.7	0.7	-0.5	1.7	-0.2	0.4
146	0.0	0.2	-0.1	0.6	0.0	0.3
147	0.7	0.4	-0.4	1.3	-0.2	0.4
148	0.7	0.5	-0.4	2.1	-0.2	0.4
150	0.1	0.7	0.2	0.6	0.1	0.4
151	0.7	0.5	-0.4	1.5	-0.2	0.4
152	0.7	0.6	-0.4	2.0	-0.2	0.3

SEFDT SCIENCE QC RESULTS:

LATITUDE BAND AVERAGE INTERCOMPARISON RESULTS
POPULATION WEIGHTED MATRIX RESULTS VS.
SEFDT SCIENCE QC RESULTS: MAY 1980

ST. DEVIATIONS OF DIFFERENCES:

DAY	P3	P4	P9	P10	P11	P12
122	0.9	1.1	1.9	1.3	1.0	0.6
123	0.5	0.9	1.5	2.0	0.6	0.6
124	0.5	0.8	1.4	2.1	0.5	0.6
126	1.1	1.1	1.7	1.4	1.0	0.6
127	0.5	0.9	1.4	2.0	0.6	0.6
128	0.5	0.8	1.4	2.3	0.6	0.6
130	0.6	1.0	1.6	1.4	0.8	0.6
131	0.7	0.9	1.4	1.8	0.6	0.6
132	0.5	1.2	1.5	2.2	0.6	0.6
134	1.0	1.0	2.1	1.4	1.0	0.6
135	0.5	1.0	1.4	1.9	0.6	0.6
136	0.4	0.9	1.5	2.2	0.6	0.6
138	0.8	1.2	2.1	1.5	0.9	0.6
139	0.4	1.1	1.4	2.1	0.6	0.7
140	0.4	0.9	1.3	2.2	0.5	0.7
142	1.0	1.2	2.6	1.3	1.3	0.6
143	0.4	0.9	1.3	1.8	0.6	0.6
144	0.5	1.5	1.6	1.9	0.7	0.6
146	1.5	2.0	2.9	1.4	1.4	0.6
147	0.4	1.2	1.3	1.9	0.6	0.6
148	0.5	1.0	1.5	2.3	0.6	0.7
150	0.9	1.2	1.7	1.5	0.8	0.6
151	0.5	0.9	1.4	2.0	0.6	0.7
152	0.5	1.0	1.2	2.1	0.5	0.6

SEFDT SCIENCE QC RESULTS:

LATITUDE BAND AVERAGE INTERCOMPARISON RESULTS
POPULATION WEIGHTED MATRIX RESULTS VS.
SEFDT SCIENCE QC RESULTS: JUNE, 1980

MEANS OF DIFFERENCES:

DAY	P3	P4	P9	P10	P11	P12
154	0.3	0.7	0.6	0.4	-0.3	0.3
155	0.6	0.6	-0.4	0.5	-0.2	0.3
156	0.6	0.6	-0.4	0.5	-0.2	0.3
158	0.7	0.7	-0.4	0.5	-0.1	0.3
159	0.5	0.7	-0.4	0.5	-0.2	0.3
160	0.5	0.6	-0.4	0.5	-0.2	0.3
162	0.2	1.0	-0.3	0.4	-0.2	0.3
163	0.5	0.7	-0.4	0.5	-0.2	0.3
164	0.5	0.7	-0.4	0.5	-0.2	0.3
166	0.4	0.8	-0.7	0.5	-0.3	0.3
167	0.4	0.8	-0.4	0.5	-0.2	0.3
168	0.4	0.8	-0.4	0.5	-0.2	0.3
170	0.5	0.8	-0.9	0.4	-0.3	0.3
171	0.4	0.8	-0.4	0.5	-0.2	0.3
172	0.3	0.8	-0.4	0.5	-0.2	0.3
174	-0.6	0.8	-1.8	0.4	-1.0	0.3
178	-1.1	-1.0	2.3	0.4	1.4	0.3
179	0.3	0.9	-0.4	0.4	-0.2	0.3
180	**					
182	-0.3	1.3	0.3	0.4	0.3	0.2

SEFDT SCIENCE QC RESULTS:

LATITUDE BAND AVERAGE INTERCOMPARISON RESULTS
POPULATION WEIGHTED MATRIX RESULTS VS.
SEFDT SCIENCE QC RESULTS: JUNE, 1980

ST. DEVIATIONS OF DIFFERENCES:

DAY	P3	P4	P9	P10	P11	P12
154	1.0	1.1	2.6	1.1	1.1	0.5
155	0.4	1.0	1.3	1.2	0.6	0.5
156	0.5	1.1	1.2	1.2	0.5	0.6
158	0.6	1.1	1.4	1.2	0.7	0.5
159	0.5	1.1	1.3	1.2	0.6	0.6
160	0.4	1.1	1.2	1.3	0.5	0.6
162	0.9	1.1	2.2	1.1	1.2	0.6
163	0.6	1.0	1.5	1.3	0.6	0.6
164	0.5	1.0	1.1	1.2	0.5	0.6
166	0.9	1.1	1.6	1.2	0.7	0.5
167	0.5	1.0	1.0	1.2	0.5	0.6
168	0.6	1.0	1.3	1.1	0.6	0.5
170	0.9	1.0	1.8	1.0	0.8	0.5
171	0.6	1.0	1.3	1.1	0.6	0.5
172	0.6	1.1	1.4	1.2	0.6	0.5
174	1.5	1.8	5.1	1.2	3.3	0.6
178	5.8	3.8	11.2	1.0	6.5	0.4
179	0.5	1.0	1.0	1.1	0.5	0.5
180	******	******	******	******	******	******
182	1.3	1.5	2.4	1.0	1.1	0.4

SEFDT SCIENCE QC RESULTS:

LATITUDE BAND AVERAGE INTERCOMPARISON RESULTS
POPULATION WEIGHTED MATRIX RESULTS VS.
SEFDT SCIENCE QC RESULTS: JULY, 1980

MEANS OF DIFFERENCES:

DAY	P3	P4	P9	P10	P11	P12
183	0.2	1.0	-0.4	0.4	-0.1	0.3
184	0.2	1.0	-0.4	0.4	-0.1	0.2
186	0.0	1.4	0.0	0.4	0.2	0.2
187	0.2	1.0	-0.3	0.4	-0.1	0.2
188	0.2	1.0	-0.4	0.4	-0.2	0.3
190	0.1	1.1	-0.2	0.4	0.1	0.3
191	0.2	1.0	-0.4	0.4	-0.2	0.3
192	0.1	1.0	-0.4	0.4	-0.1	0.2
194	0.3	1.1	-0.5	0.4	-0.2	0.3
195	0.1	1.1	-0.3	0.4	-0.1	0.2
196	0.1	1.1	-0.3	0.4	-0.1	0.2
198	-0.4	1.1	0.9	0.4	0.4	0.2
199	0.1	1.1	-0.3	0.4	-0.1	0.2
200	0.1	1.1	-0.4	0.3	-0.1	0.2
202	0.2	1.6	-1.7	0.3	-0.8	0.2
203	0.1	1.1	-0.3	0.4	-0.1	0.2
204	0.1	1.1	-0.3	0.3	-0.1	0.2
206	-0.2	2.0	-0.6	0.3	-0.2	0.2
207	0.1	1.1	-0.3	0.3	-0.1	0.2
208	0.3	1.1	-0.4	0.4	-0.1	0.2
210	0.4	1.8	-2.3	0.3	-1.2	0.2
211	0.1	1.3	-0.4	0.3	-0.1	0.2
212	0.1	0.7	-0.3	0.4	-0.1	0.2

SEFDT SCIENCE QC RESULTS:

LATITUDE BAND AVERAGE INTERCOMPARISON RESULTS
POPULATION WEIGHTED MATRIX RESULTS VS.
SEFDT SCIENCE QC RESULTS: JULY, 1980

ST. DEVIATIONS OF DIFFERENCES:

DAY	P3	P4	P9	P10	P11	P12
183	0.5	0.9	1.1	1.0	0.6	0.4
184	0.7	1.0	1.3	0.9	0.6	0.4
186	0.9	0.8	1.7	0.9	0.8	0.4
187	0.6	0.9	1.4	0.9	0.6	0.4
188	0.6	0.9	1.2	1.0	0.6	0.4
190	0.8	0.9	1.5	0.9	0.9	0.4
191	0.5	0.9	1.1	1.0	0.5	0.5
192	0.6	0.9	1.3	0.9	0.6	0.4
194	0.8	0.8	1.6	0.9	0.7	0.4
195	0.5	0.8	1.3	1.0	0.6	0.4
196	0.6	0.8	1.2	0.9	0.5	0.4
198	1.7	0.8	3.1	0.9	1.4	0.4
199	0.7	0.8	1.2	0.9	0.6	0.4
200	0.6	0.8	1.2	0.9	0.6	0.4
202	1.4	1.1	1.9	0.8	1.1	0.4
203	0.7	0.8	1.3	0.9	0.6	0.4
204	0.7	0.7	1.3	0.8	0.6	0.4
206	1.4	2.4	2.5	0.9	1.5	0.4
207	0.7	0.7	1.2	0.8	0.6	0.4
208	1.0	0.8	1.1	0.9	0.5	0.4
210	1.2	1.4	3.1	0.9	1.7	0.4
211	0.6	1.7	1.2	0.9	0.5	0.4
212	0.6	1.8	1.2	0.8	0.5	0.4

SEFDT SCIENCE QC RESULTS:

LATITUDE BAND AVERAGE INTERCOMPARISON RESULTS
POPULATION WEIGHTED MATRIX RESULTS VS.
SEFDT SCIENCE QC RESULTS: AUGUST,1980

MEANS OF DIFFERENCES:

DAY	P3	P4	P9	P10	P11	P12
214	0.7	0.6	-2.0	0.3	-0.8	0.2
215	0.2	1.0	-0.3	0.3	-0.1	0.2
216	0.2	1.0	-0.3	0.3	-0.1	0.2
218	0.2	0.9	-0.5	0.3	-0.1	0.2
219	0.2	1.1	-0.3	0.3	-0.1	0.2
220	0.2	1.1	-0.3	0.3	-0.1	0.2
222	-0.5	1.4	-0.3	0.3	-0.1	0.2
223	0.2	1.0	-0.2	0.3	-0.1	0.1
224	0.3	0.9	-0.3	0.3	-0.1	0.2
226	-0.1	0.9	-0.3	0.3	-0.2	0.2
227	0.3	0.9	-0.2	0.3	-0.1	0.2
228	0.3	0.9	-0.2	0.3	-0.1	0.2
230	-0.3	1.0	-0.2	0.3	0.0	0.2
231	0.4	0.8	-0.2	0.3	-0.1	0.2
232	0.4	0.8	-0.2	0.3	-0.1	0.2
234	-0.1	0.8	0.1	0.3	0.0	0.2
235	0.4	0.6	-0.2	0.2	-0.1	0.2
236	0.4	0.7	-0.2	0.2	-0.1	0.2
238	-0.2	1.0	0.6	0.2	0.4	0.1
239	0.4	0.7	-0.2	0.2	-0.1	0.1
240	0.4	0.6	-0.2	0.2	-0.1	0.1
242	0.2	0.5	0.7	0.2	0.5	0.1
243	0.5	0.6	-0.1	0.2	-0.0	0.1
244	0.5	0.6	-0.1	0.2	-0.0	0.1

SEFDT SCIENCE QC RESULTS:

LATITUDE BAND AVERAGE INTERCOMPARISON RESULTS
POPULATION WEIGHTED MATRIX RESULTS VS.
SEFDT SCIENCE QC RESULTS: AUGUST, 1980

ST. DEVIATIONS OF DIFFERENCES:

DAY	P3	P4	P9	P10	P11	P12
214	0.7	1.5	3.0	0.9	1.6	0.4
215	0.7	0.7	1.1	0.8	0.5	0.4
216	0.6	0.7	1.1	0.8	0.5	0.4
218	1.2	1.1	2.5	0.8	1.2	0.4
219	0.6	0.8	1.2	0.9	0.5	0.4
220	0.8	1.1	1.6	0.8	0.7	0.4
222	1.6	1.0	3.1	0.8	1.8	0.4
223	0.7	0.7	1.2	0.8	0.6	0.4
224	0.6	0.8	1.1	0.8	0.5	0.4
226	1.8	0.8	3.1	0.8	1.3	0.4
227	0.7	0.8	1.3	0.8	0.6	0.4
228	0.6	0.7	1.4	0.8	0.6	0.4
230	1.7	1.8	2.4	0.8	1.0	0.4
231	0.7	0.6	1.2	0.7	0.6	0.4
232	0.7	0.7	1.1	0.8	0.5	0.4
234	1.5	1.5	2.4	0.7	1.3	0.4
235	0.7	0.8	1.2	0.7	0.5	0.4
236	0.7	0.6	1.2	0.7	0.6	0.4
238	1.9	1.1	2.3	0.7	1.0	0.4
239	0.7	0.7	1.1	0.7	0.5	0.4
240	0.7	0.7	1.2	0.6	0.6	0.3
242	2.6	1.6	5.0	0.7	2.0	0.4
243	0.7	0.8	1.4	0.6	0.6	0.3
244	0.7	0.8	1.2	0.6	0.6	0.3

SEFDT SCIENCE QC RESULTS:

LATITUDE BAND AVERAGE INTERCOMPARISON RESULTS
POPULATION WEIGHTED MATRIX RESULTS VS.
SEFDT SCIENCE QC RESULTS: SEPTEMBER,1980

MEANS OF DIFFERENCES:

DAY	P3	P4	P9	P10	P11	P12
246	0.5	0.5	-1.3	0.2	-0.5	0.1
250	-0.0	0.5	-0.2	0.2	0.1	0.1
251	0.6	0.5	-0.1	0.1	-0.0	0.1
252	0.6	0.4	-0.1	0.1	-0.0	0.1
254	-0.3	0.4	-0.3	0.2	-0.1	0.1
255	0.7	0.4	-0.0	0.1	-0.0	0.1
256	0.7	0.4	-0.1	0.1	-0.1	0.1
258	-0.2	-0.1	1.3	0.1	0.8	0.1
259	0.7	0.3	0.0	0.1	0.0	0.1
260	0.7	0.4	-0.1	0.1	-0.0	0.1
262	1.0	-0.6	-3.6	0.0	-1.5	0.0
263	0.7	0.3	0.0	0.1	-0.0	0.1
264	0.7	0.2	0.0	0.1	0.0	0.1
266	-0.3	0.6	-0.5	0.1	-0.1	0.1
267	0.9	-0.1	-0.1	0.0	-0.0	0.0
268	1.2	0.1	-0.2	0.1	-0.1	0.0
270	-0.4	-0.1	-0.9	0.0	-0.2	0.1
271	0.8	-0.0	0.1	0.0	0.0	0.0
272	0.8	0.3	0.1	-0.0	0.0	0.0
274	0.6	-0.4	-1.3	-0.2	-0.3	-0.1

SEFDT SCIENCE QC RESULTS:

LATITUDE BAND AVERAGE INTERCOMPARISON RESULTS
POPULATION WEIGHTED MATRIX RESULTS VS.
SEFDT SCIENCE QC RESULTS: SEPTEMBER,1980

ST. DEVIATIONS OF DIFFERENCES:

DAY	P3	P4	P9	P10	P11	P12
246	2.5	1.9	2.5	0.6	1.3	0.3
250	2.7	1.7	5.2	0.6	2.5	0.3
251	0.6	0.7	1.3	0.6	0.6	0.3
252	0.6	0.8	1.2	0.6	0.6	0.4
254	3.3	2.0	4.8	0.6	2.0	0.4
255	0.5	0.8	1.3	0.5	0.6	0.3
256	0.6	0.8	1.2	0.5	0.5	0.3
258	2.2	1.8	3.3	0.5	1.5	0.3
259	0.6	0.8	1.3	0.5	0.6	0.3
260	0.6	0.8	1.6	0.5	0.7	0.3
262	2.7	1.9	4.6	0.6	2.1	0.3
263	0.5	0.8	1.4	0.6	0.6	0.3
264	0.5	0.7	1.5	0.5	0.7	0.3
266	2.6	2.0	7.6	0.4	3.2	0.2
267	0.6	1.0	1.7	0.4	0.7	0.2
268	1.3	0.7	2.0	0.4	0.9	0.3
270	5.1	3.1	4.8	0.3	2.0	0.1
271	0.6	1.2	1.7	0.5	0.7	0.3
272	0.6	1.0	1.5	0.5	0.6	0.3
274	4.1	4.5	4.8	1.2	2.0	0.6

SEFDT SCIENCE QC RESULTS:

LATITUDE BAND AVERAGE INTERCOMPARISON RESULTS
POPULATION WEIGHTED MATRIX RESULTS VS.
SEFDT SCIENCE QC RESULTS: OCTOBER,1980

MEANS OF DIFFERENCES:

DAY	P3	P4	P9	P10	P11	P12
275	0.8	0.3	0.1	-0.0	0.0	-0.0
276	0.8	0.2	0.1	-0.0	0.0	-0.0
278	-0.8	-1.3	3.5	-0.7	1.9	-0.4
279	0.9	0.1	0.1	-0.1	0.0	-0.0
280	0.8	0.2	0.2	-0.1	0.1	-0.0
282	0.3	-1.0	-1.3	-0.9	-0.4	-0.5
283	0.7	0.1	0.2	-0.1	0.1	-0.0
284	1.0	0.2	-0.5	0.0	-0.3	-0.1
286	-0.6	0.2	1.1	-1.0	0.7	-0.6
287	0.7	0.3	0.2	-0.1	0.1	-0.1
288	0.7	-0.1	0.2	-0.1	0.1	-0.1
290	0.1	0.2	0.5	-0.0	0.4	0.0
291	0.7	0.3	0.2	-0.2	0.1	-0.1
292	0.7	0.2	0.2	-0.1	0.1	-0.1
294	-0.5	0.5	0.8	-0.8	0.5	-0.7
295	0.6	0.3	0.3	-0.1	0.1	-0.1
296	0.7	0.3	0.2	-0.2	0.1	-0.2
298	0.2	0.4	0.3	-0.6	0.2	-0.5
299	0.6	0.5	0.3	-0.3	0.1	-0.1
300	0.6	0.4	0.3	-0.2	0.1	-0.2
302	0.7	0.6	0.2	-0.6	0.3	-0.4
303	0.6	0.5	0.3	-0.3	0.1	-0.2
304	0.5	0.4	0.3	-0.3	0.1	-0.1

SEFDT SCIENCE QC RESULTS:

LATITUDE BAND AVERAGE INTERCOMPARISON RESULTS
POPULATION WEIGHTED MATRIX RESULTS VS.
SEFDT SCIENCE QC RESULTS: OCTOBER, 1980

ST. DEVIATIONS OF DIFFERENCES:

DAY	P3	P4	P9	P10	P11	P12
275	0.5	1.1	1.7	0.6	0.7	0.3
276	0.5	1.1	1.7	0.5	0.7	0.3
278	2.2	3.4	5.6	3.5	2.4	1.9
279	0.7	0.9	1.5	0.7	0.7	0.3
280	0.4	0.9	1.6	0.7	0.7	0.4
282	3.2	2.8	4.7	4.7	1.9	2.4
283	0.4	0.9	1.5	0.7	0.6	0.4
284	1.1	2.6	3.0	0.5	1.5	0.4
286	2.2	2.7	5.4	5.3	2.3	2.8
287	0.4	1.0	1.7	0.8	0.8	0.4
288	0.5	0.7	1.6	0.7	0.7	0.4
290	1.2	1.8	5.5	0.1	2.6	0.1
291	0.5	1.0	1.8	1.0	0.8	0.5
292	0.5	0.8	1.7	0.7	0.8	0.3
294	3.6	2.7	5.0	4.7	2.2	2.6
295	0.5	1.0	1.8	0.9	0.8	0.4
296	0.5	1.0	1.5	1.2	0.6	0.7
298	1.9	2.7	3.1	2.5	1.4	1.5
299	0.5	1.3	1.7	1.1	0.7	0.6
300	0.5	1.1	1.5	1.1	0.7	0.6
302	3.1	3.8	4.7	4.0	1.9	2.1
303	0.5	1.1	1.7	1.3	0.8	0.6
304	0.4	1.0	1.5	1.2	0.6	0.6

SECTION 4. CONCLUSIONS

4.1 USE OF THE EARTH FLUX DATA

(A) For the first 8 months of Year-2, the earth flux data on the SEFDT has been shown to be consistent with the corresponding data output on the MATRIX product.

(B) Users are reminded that there are degradation and duty cylce effects remaining in the data. A calibration approach for handling these are under intense study at this time.

(C) No earth flux data is rejected from the SEFDT. Each user must determine if the data rejection criteria applied are appropriate for his particular investigation.

4.2 USE OF THE SOLAR DATA

Several problems in the solar data have been discussed which may require special processing by the user to: (1) reject orbits with unrecoverable data problems, and (2) recover data with minor flaws. Unrecoverable data problems include the following:

1) Data Gaps (see Appendices J, K, and M)

2) Shutter Status Change (see Appendix H)

3) Misalignment >1^{o} (see Appendices O and P)

4) ECAL Spikes (see Subsection 3.4.2)

Minor flaws which are amenable to recovery by user processing include:

1) Warmup Data Rejection

2) DSAS Azimuth and Elevation Angles Equal

3) Invalid DSAS Angles

4) Solar Channel Assembly Misalignment

All users of the solar data should reject the unrecoverable orbits as indicated above. Users requiring high precision solar data must also consider processing the recoverable items listed above. The most important of these is Item 4, the correction for off-axis effects.

APPENDIX E.

DSAS Alpha and Beta Angles Having Equal Values

The DSAS alpha angle was equal to the beta angle in at least one major frame in each of the orbits listed below. This was due to a problem in the Level 0 product (ILT). This problem did not affect any solar irradiances.

JULIAN DAY	ORBIT(S)
305	5156, 5158, 5161, 5162, 5165
307	5182, 5184, 5187, 5190, 5192
308	5195, 5197, 5203, 5205, 5207
309	5220
311	5237, 5240, 5241, 5246, 5248
312	5258
313	5265, 5267, 5274
315	5297, 5300, 5303
316	5314, 5316
317	5321, 5322, 5326, 5331
319	5346, 5348, 5351, 5352, 5356, 5357
320	5369
321	5374, 5378, 5381
323	5401, 5404
325	5430, 5442
327	5459, 5460
328	5470
329	5494
331	5512, 5514, 5518, 5525
332	5529, 5530, 5537
333	5542, 5548
335	5567, 5568, 5572, 5577
336	5589, 5594
337	5599, 5602
339	5623, 5625, 5634
341	5655, 5658, 5659
343	5678, 5682, 5687, 5688
344	5691
345	5709, 5711
347	5742, 5744
348	5749, 5753, 5754
349	5762
351	5789, 5790, 5793, 5796
353	5816, 5829
355	5848
356	5857, 5861, 5866
357	5879
359	5900
360	5916, 5920, 5922, 5925
361	5930, 5932
363	5958, 5961, 5962, 5963
364	5975, 5980

JULIAN DAY	ORBIT(S)
365	5985, 5989
2	6010, 6016, 6017, 6018, 6020
3	6023, 6029, 6036
4	6041, 6045, 6047, 6049
6	6069
7	6083, 6084, 6087-6089
8	6093, 6097, 6102, 6103, 6105
10	6121-23
11	6136, 6137, 6140
12	6150, 6151, 6155, 6159
14	6183, 6186, 6188
15	6196, 6197, 6198, 6200, 6202
16	6204, 6207, 6210, 6211, 6214
18	6231, 6232, 6241, 6242
19	6246, 6250, 6253
20	6262, 6264, 6270
22	6289, 6294, 6295
23	6299, 6301, 6308, 6309
24	6314, 6318, 6324, 6325
26	6343, 6345, 6347, 6353
27	6360, 6361, 6362
28	6372-74, 6377-79
30	6397, 6402, 6407
31	6411, 6412, 6421, 6423
32	6427
34	6455, 6460
35	6467, 6469, 6471
36	6482
39	6521, 6523, 6528, 6532
40	6537, 6538, 6543, 6546, 6547
42	6572, 6575
43	6586
44	6591, 6597, 6602
46	6618, 6629
47	6637
48	6651
50	6676, 6677, 6684
51	6688, 6698
52	6704, 6708
54	6731, 6737, 6739
55	6746, 6754
56	6755, 6764, 6765
58	6785, 6789
59	6800, 6805, 6806
60	6815, 6817, 6820-22
62	6841, 6848, 6851
63	6861
64	6873, 6877
66	6897, 6902
67	6918
68	6921-24, 6929
70	6949, 6959, 6960
71	6963, 6964, 6968, 6974

JULIAN DAY	ORBIT(S)
72	6978, 6984, 6988, 6989
74	7009-11
75	7024
76	7035, 7041
78	7060, 7062, 7066-68
79	7086
80	7096
82	7116, 7124
83	7133
84	7149
86	7172, 7175
87	7190
88	7209
90	7235, 7236
91	7239, 7243, 7245, 7246, 7250
92	7255
94	7283, 7293
96	7318, 7319
98	7338, 7341, 7342, 7345, 7349
99	7350, 7353, 7356, 7358, 7359
100	7365, 7368
102	7396, 7397, 7401, 7404
103	7412, 7416
104	7419, 7420, 7423, 7428
106	7457, 7458
107	7462, 7472, 7473
108	7481, 7486
110	7503, 7505, 7510, 7513
111	7516, 7520, 7525
112	7534, 7535
115	7577
116	7584
122	7670, 7680
123	7684
124	7695, 7696, 7703
126	7723, 7725, 7731, 7734
127	7737, 7738, 7741, 7743, 7746, 7747
128	7757, 7762
130	7789
131	7797, 7798
132	7808, 7811
134	7834, 7835, 7840
135	7849, 7858
136	7872
138	7890
139	7907, 7908, 7913
140	7916, 7921, 7927
142	7948, 7953, 7955
143	7959, 7962, 7968
144	7975, 7976, 7981, 7982
146	8000, 8003, 8009, 8011
147	8016, 8020, 8021
148	8027, 8030, 8033

JULIAN DAY	ORBIT(S)
149	8040
150	8058
151	8080
152	8084, 8085, 8087
154	8114, 8118, 8120
155	8127, 8136
156	8140, 8144, 8145, 8149
158	8167, 8170, 8171, 8176, 8178
159	8180, 8187, 8188
160	8200, 8201
162	8223, 8226, 8231, 8232
163	8243, 8244
164	8249, 8256
166	8280
167	8289, 8291, 8292, 8300, 8301
170	8335
171	8349, 8350, 8356
172	8363, 8371
174	8387, 8392, 8396
178	8442, 8444, 8445, 8449
179	8457, 8466
180	8471, 8473, 8477, 8479, 8481
182	8501, 8502
183	8511, 8515
184	8524
186	8552, 8557, 8564, 8565
187	8567, 8574, 8576
188	8583-85, 8587
190	8608, 8609, 8620
191	8632
192	8648
194	8668
195	8676, 8679, 8682, 8685, 8687, 8688
196	8691, 8695, 8697, 8703
198	8721, 8725, 8726, 8730
199	8733, 8734, 8737, 8742
200	8753, 8757
202	8777, 8785
203	8791, 8797, 8800
204	8805, 8812
206	8834
207	8845, 8849
208	8857, 8858, 8860, 8862, 8865, 8867
210	8885, 8894
211	8900, 8901, 8906, 8907, 8909
212	8911, 8914, 8923
214	8940, 8941, 8944, 8945, 8948, 8949
215	8954, 8959, 8963, 8965
218	8996, 8998, 9006
219	9016, 9019
220	9031, 9032, 9034
222	9055
223	9074

JULIAN DAY	ORBIT(S)
224	9078, 9083, 9086
226	9111, 9112
227	9128, 9130
228	9133-36, 9139, 9145
230	9169, 9170
231	9176, 9184
232	9191, 9192
234	9220, 9225
235	9229, 9233-35, 9239
236	9250, 9255
238	9275, 9279, 9280, 9283
239	9294
240	9300, 9302, 9304, 9309
242	9330, 9332
243	9341, 9347-49, 9351
244	9363, 9364
246	9385, 9388, 9393
247	9396, 9399, 9602, 9403
248	9410, 9414, 9415, 9418, 9419
250	9442, 9447
251	9450, 9453, 9454, 9462
252	9464, 9471, 9472
254	9494, 9495, 9501, 9502
255	9505, 9509, 9511, 9517
256	9520, 9522, 9525, 9529, 9530, 9532
258	9551, 9554, 9558, 9559
259	9565, 9566, 9571, 9573
260	9577, 9578, 9580, 9581, 9585, 9587
262	9611, 9612
263	9616, 9622, 9626, 9629
264	9637
266	9661, 9664, 9668, 9670
267	9675, 9676, 9680
268	9688, 9690-92, 9694, 9697
270	9713, 9714, 9717, 9718, 9720, 9721
271	9727, 9731, 9735, 9738, 9741
272	9743-45, 9753
274	9768, 9777
275	9791, 9792
276	9799, 9802
278	9828, 9831
279	9843, 9850
280	9859, 9864
282	9888
283	9896
284	9907, 9913, 9914
286	9938, 9942, 9946
287	9950
288	9964, 9966, 9967
290	9989, 10002
291	10007, 10014
292	10018, 10021, 10025, 10028
294	10045, 10057

JULIAN DAY	ORBIT(S)
295	10064, 10068, 10071
296	10072, 10075, 10078
298	10100, 10103, 10106, 10110, 10112
299	10121
300	10127, 10129, 10135, 10139
302	10157, 10164, 10168
303	10170, 10171, 10176, 10179, 10182
304	10189, 10193

APPENDIX F.

DSAS Beta Angle Out-of-Limits

The DSAS beta angle was out-of-limits ($\pm 180^{\circ}$) for at least one major frame in the following orbits. The origin of the error is the Level 0 product (ILT). Solar irradiances were not affected.

JULIAN DAY	ORBIT(S)
3	6024, 6035, 6036
4	6037, 6039
6	6067, 6068, 6070, 6071
7	6083, 6085, 6086, 6087
8	6098
268	9687, 9693
270	9716, 9718
271	9730

APPENDIX G.

DSAS Beta Angle Incrementing Rapidly

The DSAS beta angle changed too rapidly (2^{o}/Major Frame) for at least one major frame in the following orbits. The origin of the error is the Level O product. However, solar irradiances were not affected.

	JULIAN DAY	ORBIT(S)
	359	5908
YEAR 1980:		
	200	8750
	252	9468
	270	9716, 9718
	271	9730
	272	9742

APPENDIX H.

Channels 1 and 3 Shutter Status Change

The Channel 1/Channel 3 shutter status changed in the solar data for the orbits listed below. This can cause a problem because irradiance data from the shuttered channel may have contributed to the computer mean irradiances in the solar orbital summary records.

JULIAN DAY	ORBIT(S)
312	5253
336	5585
360	5915, 5917
4	6038
15	6192
19	6248
22	6288
43	6580
64	6866
67	6912
91	7243
115	7575
138	7895
139	7907
140	7916
144	7973
160	8193
163	8239
187	8571
211	8902
259	9564
283	9896

APPENDIX I.

Times in T_0-13 Frames > 13 Minutes from the Solar Peak

The time in the T_0-13 frames were more than 13 minutes from the solar peak due to a data gap for the following orbits. This could have sightly affected the irradiance calculation.

JULIAN DAY	ORBIT(S)
320	5371
325	5438
337	5607
349	5762
361	5926

YEAR
1980:

22	6286
27	6355
35	6474
42	6562
43	6576
66	6904
68	6921
96	7313
102	7391
130	7778
131	7800
183	8511
200	8750
204	8800
216	8968
236	9244
252	9468
266	9658
300	10140

APPENDIX J.

Times in T_0+13 Frames > 13 Minutes from the Solar Peak

The time in the T_0+13 frames were more than 13 minutes from the solar peak due to a gap for the following orbits. This could have slightly affected the irradiance calculation.

JULIAN DAY	ORBIT
344	5692
359	5908

YEAR 1980:

JULIAN DAY	ORBIT
14	6178
28	6370
50	6674
66	6904
67	6908
94	7285
104	7420
160	8193
202	8774

APPENDIX K.

Data Gap at T_0

The following orbits had a data gap within ± 3 minutes of the solar peak which could have affected the irradiance calculation:

JULIAN DAY	ORBIT(S)
305	5160
312	5252, 5259, 5262
316	5316
317	5319
320	5373
344	5703
345	5717
349	5764
355	5851
359	5908
365	5994

YEAR
1980:

10	6130
11	6135
20	6261
26	6349
34	6463
51	6688
52	6710, 6712
55	6744
64	6871
66	6895, 6904
68	6923
74	7014
76	7044
78	7072
82	7120
90	7238
92	7265
96	7313, 7315, 7316
108	7476
115	7573, 7580
116	7594
119	7632, 7636
122	7669
123	7683
128	7753
130	7779
142	7952
147	8017, 8018, 8024
150	8062

JULIAN DAY	ORBIT(S)
155	8131
162	8231, 8233
166	8276, 8283
178	8443, 8453
179	8459
180	8469
182	8509
184	8528
190	8609, 8614
191	8623
195	8687
198	8724
203	8800
207	8854
210	8885, 8894
212	8912
214	8940
215	8964
224	9079
231	9179, 9186
235	9232
236	9243
243	9350
251	9451, 9453
254	9497
263	9619, 9629
264	9634
266	9664, 9668
270	9722, 9728
276	9797
278	9834
282	9880
286	9934
288	9963
290	9990
294	10050
295	10060
296	10074
299	10115

APPENDIX L.

Southern Terminator/MSE Time Difference > 16 Seconds

The difference between the Southern Terminator time and the MSE time was greater than 16 seconds for the orbits listed below:

JULIAN DAY	ORBIT(S)
312	5250, 5259
324	5415
348	5747
359	5908
360	5915

YEAR
1980:

7	6078
19	6245
31	6410
34	6463
55	6742
66	6904
76	7033
96	7313
136	7872
266	9669

APPENDIX M.

Orbits Missing Solar Data

Orbits that have less than 110 solar data records are listed below. There is a possibility that these orbits are severly impacked by data gaps. It is recommended that these be rejected from use in any scientific investigation.

JULIAN DAY	ORBIT	RECORD COUNT
311	5245	106
52	6710	106
76	7033	106
162	8221	96
180	8470	106
267	9673	86

APPENDIX N.

Orbits with Off-Axis Angle > 0.5 Degree

The orbits listed below had off-axis angles greater than 0.5^{o}. The accuracy of the solar irradiances was severely impacted by solar channel assembly misalignment. It is recommended that users perform corrections for these off-axis effects before using this data.

JULIAN DAY	ORBIT(S)
308	5203
311	5239-44
312	5250, 5252-58
313	5266-72
315	5293-5300
316	5308-5314
317	5322-28
319	5349-56
320	5362-71
321	5377-78, 5380-82
323	5404-11
324	5415, 5418-23
325	5434-37
327	5461-65
337	5595
339	5623, 5633-35
341	5650-54, 5658-63
343	5678-90
344	5691-5704
345	5705
348	5747, 5760
349	5762
351	5789-91, 5798-5801
353	5816
357	5872, 5874, 5884
359	5899, 5900, 5909, 5911, 5912
360	5913-17, 5921, 5923-25
361	5926, 5928-30
364	5981
365	5982
2	6009-12, 6020-22
3	6023-27, 6033-36
4	6037-43, 6045-49
6	6065-77
7	6078-91
8	6092-6105
10	6120-27, 6130-33
11	6134-36, 6144-46
12	6147, 6148, 6150, 6151, 6156, 6160
14	6175-88
15	6189

JULIAN DAY	ORBIT(S)
18	6231, 6243
19	6244, 6245, 6254-57
20	6258, 6259, 6269-71
22	6286-91, 6293-98
23	6299-6308
27	6367
30	6396-98, 6406-09
31	6410-13, 6419-23
32	6424-29
38	6520
40	6546
42	6562, 6563, 6574, 6575
43	6576, 6577, 6586-89
44	6590-92, 6600-02
46	6618-21, 6623-25, 6627-30
47	6631-35, 6638, 6641-44
48	6645-50, 6652, 6653, 6655-58
50	6673-85
51	6686-96
55	6742
58	6784
62	6839, 6850
64	6878
67	6907, 6908
68	6921-23
71	6964, 6975
72	6976, 6977, 6988
73	6990
75	7030
76	7044
78	7061, 7072
79	7074, 7085
80	7099
82	7115
87	7186
92	7253
132	7806
134	7835, 7845
135	7848, 7859
136	7861, 7872-74
138	7889, 7895
139	7914, 7915
140	7916-19, 7927-29
142	7944-46, 7954-57
143	7958-60, 7962, 7969, 7970
144	7971-74, 7979-81
155	8136
156	8137, 8150
158	8177, 8178
159	8191
160	8192-95, 8204
161	8206
162	8220, 8230, 8232, 8233
163	8234-35, 8237-38, 8243-44, 8246-47

JULIAN DAY	ORBIT(S)
164	8248-54, 8257, 8259-61
166	8276-84, 8286-88
167	8289-8302
168	8303-14
178	8442, 8453, 8454
179	8455, 8456, 8467, 8468
180	8469, 8482
182	8497-99, 8507-09
183	8511-14, 8520, 8522, 8523
184	8524-27, 8535, 8536
186	8557, 8559-61
187	8571, 8572, 8574, 8577
188	8587, 8588
190	8612
191	8627
192	8640
194	8672
195	8681, 8685
196	8698
200	8752, 8755
203	8796
204	8808
206	8835, 8838
207	8853
208	8861, 8863-65
210	8887-89, 8891, 8892
211	8903-06, 8908
212	8915-8922
214	8939, 8950-52
215	8953, 8954, 8964, 8965
216	8966, 8967, 8978, 8979
218	8994, 8995
219	9008
220	9034
226	9108, 9113
227	9121-27, 9130, 9131
228	9132-34, 9144, 9145
230	9160-63
235	9236
236	9249-51, 9254, 9255
238	9271-73, 9282, 9283
239	9284-86, 9296, 9297
240	9299
244	9360, 9361, 9365, 9366
246	9381-83
247	9408
250	9444
251	9457, 9458, 9461
252	9464-0467, 9475
255	9505
258	9553-55
259	9564-68, 9572, 9573
260	9574-76

JULIAN DAY	ORBIT(S)
262	9602
264	9637
266	9660-64, 9669, 9670
267	9671, 9672, 9683, 9684
270	9715, 9716, 9718
271	9730, 9733, 9737
272	9742, 9744-49, 9752, 9753
274	9768-70, 9780
275	9782
279	9845
280	9856-59, 9862-64
287	9955, 9957, 9959, 9960
288	9961-65, 9971, 9973, 9974
290	9989, 10001
291	10004
296	10077-80
298	10103-6, 10109-12
299	10113-17, 10124-26
300	10127-30, 10140
302	10155, 10167, 10168
303	10169, 10170, 10181

APPENDIX O.

Orbits with Off-Axis Angle > 1.0 Degree

The orbits listed below had off-axis angles greater than 1^{0}. These orbits are judged to be unrecoverable. Users should reject them from any scientific investigations.

JULIAN DAY	ORBIT(S)
312	5250
324	5415
332	5532
343	5684
344	5691-94, 5702-04
345	5705
348	5747, 5760
357	5874
359	5912
360	5915
364	5981
3	6024, 6027, 6035, 6036
4	6039, 6048
6	6067, 6068, 6071, 6077
7	6078-80, 6085, 6089-91
8	6092-95, 6098, 6102-05
10	6120-27
11	6134
14	6187, 6188
19	6245, 6254
23	6299-6301
31	6410
46	6629
47	6643
48	6646, 6656, 6657
50	6673, 6683-85
51	6686, 6687, 6696
55	6742
87	7186
92	7253
138	7895
166	8276
167	8299-8302
168	8303-8314
244	9365
270	9715, 9716, 9718
271	9730, 9737
272	9742

APPENDIX Q.

Channel 11/12 Comparison

This appendix contains the results of the Channel 11/12 comparison. Irradiances and differences have units of $Watts/m^2$.

DAY	CHANNEL 11	CHANNEL 12	DIFFERENCE	SAMPLES
308	382.70	50.97	331.72	4
331	331.10	- 101.03	432.12	4
339	342.40	- 129.33	471.72	4
353	387.90	412.02	- 24.13	4
355	331.00	- 405.80	736.80	4
10	344.45	- 403.80	748.25	4
19	307.37	303.90	3.47	2400
30	-308.00	-1000.00	692.00	4
32	391.85	414.07	- 22.23	4
38	359.25	- 266.22	625.47	4
43	309.88	307.15	2.73	2272
44	382.67	391.62	- 8.95	4
47	364.90	- 408.43	773.32	4
72	392.47	414.47	- 22.08	4
80	392.47	414.40	- 21.93	4
90	339.55	400.60	- 61.05	4
91	284.23	281.14	3.14	2420
98	336.50	- 316.35	652.85	4
104	383.77	404.85	- 21.08	4
115	286.95	283.89	3.06	2400
116	369.60	- 406.75	776.35	4
131	366.90	402.09	- 35.19	8
135	368.12	166.15	201.97	4
138	334.25	273.21	61.04	68
139	294.87	291.71	3.16	2412
143	226.69	223.01	3.68	584
144	365.70	- 436.37	802.07	4
146	212.97	233.89	- 20.91	8
155	355.95	- 305.12	661.07	4
160	188.07	- 56.11	244.19	24
163	298.83	295.65	3.17	2416
174	387.47	409.77	- 22.30	4
178	388.55	408.67	- 20.13	4
187	296.46	293.59	2.87	2412
194	345.65	- 143.78	489.42	8
210	349.82	294.96	54.86	1044
211	354.61	277.15	77.45	1352
215	364.00	442.92	- 78.92	4
230	284.99	282.15	2.84	6528
235	294.35	290.62	3.72	2420
236	358.20	486.02	-127.83	4
238	4.07	- 663.10	667.17	8

DAY	CHANNEL 11	CHANNEL 12	DIFFERENCE	SAMPLES
259	286.9	283.89	3.01	2408
262	356.90	400.75	- 43.85	4
279	347.41	283.80	63.61	8
282	303.83	299.82	4.01	1060
283	294.57	291.43	3.14	1320

REFERENCES

1. Groveman, Brian S.: "User's Guide for ERB-7 MAT", CR-170514, Contract No. NAS5-26123, Goddard Space Flight Center, Greenbelt, Maryland 20771, April 1984.

2. Predmore, R.E., H. Jacobowitz and J.R. Hickey: "Exospheric Cleaning of the Earth Radiation Budget Solar Radiometer during Solar Maximum" (DATE).

3. Ray, Surendra N., Richard J. Tighe and Steven A. Scherrer: "User's Guide for ERB-7 SEFDT", Volumes I and II, CR-170616, Contract No. NAS5-28063, Goddard Space Flight Center, Greenbelt, Maryland 20771, April 1984.

4. Tighe, Richard J. and Maria Y.H. Shen: "User's Guide for ERB-7 MATRIX", Volume I, CR-170619, Contract No. NAS5-28063, Goddard Space Flight Center, Greenbelt, Maryland 20771, April 1984.

5. Maschoff, R.H. and James Swedberg: "ERB Instrument Study", Minutes of the ERB Calibration Workshop, NASA/Goddard Space Flight Center, Greenbelt, Maryland 20771, August 4-5, 1982.

6. Minutes of the ERB Calibration Workshop, NASA/Goddard Space Flight Center, Greenbelt, Maryland 20771, August 4-5, 1982.

7. Tighe, Richard J.: "Nimbus-7 ERB MATRIX Scientific Algorithms", NASA Reference Publication, Contract No. NAS5-26773, Goddard Space Flight Center, Greenbelt, Maryland 20771, January 1983.

8. Hickey, John R.: Private communications.

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