National Aeronautics and Space Administration
Goddard Earth Science
Data Information and Services Center (GES DISC)

README Document for the Geodetic Earth Orbiting Satellite (GEOS) 2 International Optical Beacon Data Input Product

GEOS2OBSINPUTINTL

Last Revised 12/18/2023

Goddard Earth Sciences Data and Information Services Center (GES DISC)
http://disc.gsfc.nasa.gov
NASA Goddard Space Flight Center
Code 610.2
Greenbelt, MD 20771 USA

Prepared By:

James E. Johnson	12/18/2023
Name GES DISC GSFC Code 610.2	Date

Reviewed By:

Name	mm/dd/yyyy
Name GSFC Code xxx	Date

Name	mm/dd/yyyy
Name GSFC Code xxx	Date

Goddard Space Flight Center

Greenbelt, Maryland

Revision History

Revision Date	***Changes***	***Author***
12/18/2023	Original	James E. Johnson

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1. Introduction

This document provides basic information on using the GEOS-2 International Optical Beacon Data Input product.

1.1 Data Product Description

The GEOS-2 International Optical Beacon Data Input product contains reduced raw geodetic optical observations obtained by various international camera systems. These data were used as input to the Quality Control Program to create the product called the International Optical Beacon Pass Summary Data, which in turn was used to create the final International Optical Beacon New Master Tape Data.

The data were written to a single file with 1689 data records, where each is a line of ASCII text. Unfortunately no documentation has been found which describes exactly what each value in a record represents. Time stamps for each record were determined at columns 19 to 30, each taken 4 seconds apart, although the data records are not all sorted in sequential order. The data for this product cover the time period from February 20, 1968 through October 3, 1968.

This product was previously available from the NASA National Space Science Data Center (NSSDC) under the name GEOS 2 International Optical Beacon Data Input, with the identifier ESGP-00112 (old id 68-002A-01N).

1.1.1 The Optical Beacon System

The optical beacon system, used for geometric geodesy studies, consisted of four xenon 670-W (1580 candle-second/flash) flash tubes housed in reflectors. These tubes were programmed to flash sequentially, in a series of five or seven flashes, at times when they could be optically observed from earth. Observations were made by SPEOPT MOTS 40-in. and 24-in. cameras, SAO (Smithsonian Astrophysical Observatory) Baker-Nunn and geodetic 36-in. cameras, USAF PC 1000 cameras, U.S. C&GS (Coast and Geodetic Survey) BC-4 cameras, and Army Map Service (AMS, now ETR) and international camera stations. The position of the satellite and the angle of elevation from each station were determined by using star charts as guides. If two of three stations had known positions, the coordinates of the third could be calculated by triangulation. Erratic operations in beacon no. 4 occurred soon after launch. This beacon was not used during the remainder of the operations. Data were obtained from the three other beacons until January 31, 1970. A previous version of this instrument flew on the first GEOS-1 satellite.

The principal investigator for the Optical Beacon System experiment was R. E. Williston from JHU/APL.

1.1.2 GEOS 2 Overview

The GEOS (Geodetic Earth Orbiting Satellite) 2 was a gravity-gradient-stabilized, solar-cell-powered spacecraft that carried electronic and geodetic instrumentation. GEOS 2 was also known as Explorer 36. The geodetic instrumentation systems included (1) four optical beacons, (2) two C-band radar transponders, (3) a passive radar reflector, (4) a sequential collation of range radio range transponder, (5) a Goddard range and range rate transponder, (6) laser reflectors, and (7) Doppler beacons. Non-geodetic systems included a laser detector and a Minitrack interferometer beacon. The objectives of the spacecraft were to optimize optical station visibility periods and to provide complementary data for inclination-dependent terms established by the Explorer 29 (GEOS 1) gravimetric studies. The spacecraft was placed into a retrograde orbit to accomplish these objectives. Operational problems occurred in the main power system, optical beacon flash system, and the spacecraft clock, and adjustments in scheduling resulted in nominal operations..

The orbit of the satellite can be characterized by the following:

- perigee: 1082 km
- apogee: 1570 km
- period: 112.2 minutes
- inclination: 105.8 degrees
- eccentricity: 0.03165

1.2 Data Disclaimer

Users should cite this data product in their research.

Williston, R. E. (2023), GEOS-2 International Optical Beacon Data Input V001, Greenbelt, MD, USA, Goddard Earth Sciences Data and Information Services Center (GES DISC), Accessed: [Data Access Date], https://doi.org/10.5067/FAUEMZ7O9M5M.

1.3 Known Issues

No documentation has been found which describes the contents of the GEOS 2 International Optical Beacon Data Input data file.

2. Data Organization

2.1 File Naming Convention

The data product files are named according to the following convention:

<Platform>-<Product>_<StartDate>_<EndDate>_<Tape>.<Suffix>

GEOS2-OBSINPUTINTL_1968m0220_1968m1003_DR5673.TAP

where:

- Platform = name of the satellite (GEOS2)
- Product = abbreviation of the product (OBSINPUTINTL)
- StartDate/EndDate = Data start and end date in format <YYYY>m<MMDD> where
    1. YYYY = 4 digit year (1972)
    2. MM = 2 digit month (01-12)
    3. DD = 2 digit day of month (01-31)
- Tape = tape number (DR primary tape, DS backup tape plus 4 digit number)
- Suffix = the file format (always TAP, indicating binary data tape file)

`File name example: GEOS2-OBSINPUTINFL_1968m0220_1968m1003_DR5673.TAP`

2.2 File Format and Structure

The GEOS-2 International Optical Beacon Data Input product spans the time period from February 20, 1968 through October 3, 1968., There is a single file with 1689 data records, where each is a line of ASCII text. Each record, or line of text, is 84 characters long. Below is an example showing the first 5 lines of text in the file:

```
68002110000008030 6803182049000000  74122427-131949646804131104041l 204 46 63
68002110000008030 6803182049040000  73943223-124729546804131104041l 204 46 63
68002110000008030 6803182049080000  73802669-121426106804131104041l 204 46 63
68002110000008030 6803182049120000  73620552-114102246804131104041l 204 46 63
68002110000008030 6803182049160000  73436133-110704116804131104041l 204 46 63
```

This data collection consisted of data from a single primary tape (designated with a DR and four digits). There was just a single file on the DR tape.

3. Data Contents

3.1 Data Records

The data file contains 1689 data records each with a size 84 of bytes. Each record is a line of ASCII text. No documentation exists explaining what these data are (table below is a guess).

Table 3-1-2: Data Record

Column	Description
1 – 7	6800211 appears to be the Satellite International Identifier Code 68-002-A, with first 1 = 'A', second 1 = experiment (Optical Beacon System?)
8 – 13	almost always = 000000
14 – 17	appears to be a code identifying a sequence of measurements
18	blank space
19 – 30	Time Stamp (format = YYMMDDhhmmss)
31 – 34	unknown, usually = 0000, possible milliseconds of time stamp?
35	blank space (sometimes 0)
36 – 44	data value (longitude? azimuth angle?)
45 – 53	data value (latitude? zenith angle?)
54 – 57	a 4 digit or year/month code? (6803, 6804, 6805, 6806, 6807, 6808, 6809, 6810, 6811, 6812, 6901, 6902) for blocks of records
58 – 59	a 2 digit counter? (01 – 13) for blocks of records
60 – 61	a 2 digit code? (always 11)
62 – 63	a 2 digit code? (usually 04, sometimes 01)
64 – 65	a 2 digit code? (usually 04, sometimes 01)
66 – 67	a 2 digit code? (always 11)
68 – 71	a 4 digit code? (either ' 204' or '0204')
72 – 74	a 2 digit code or counter with a blank space or zero? (from ' 14' to ' 68')
75 – 77	a code counter with blank spaces or zeros? (from ' 7' to ' 68')
78 – 80	blanks (either ' ' or ' 00')
81 – 84	blank spaces

3.2 Metadata

The metadata are contained in a separate XML formatted file having the same name as the data file with .xml appended to it.

Table 3-2: Metadata attributes associated with the data file.

Name	Description
LongName	Long name of the data product.
ShortName	Short name of the data product.
VersionID	Product or collection version.
GranuleID	Granule identifier, i.e. the name of the file.
Format	File format of the data file.
CheckSumType	Type of checksum used.
CheckSumValue	The value of the calculated checksum.
SizeBytesDataGranule	Size of the file or granule in bytes.
InsertDateTime	Date and time when the granule was inserted into the archive. The format for date is YYYY-MM-DD and time is hh-mm-ss.
RangeBeginningDate	Begin date when the data was collected in YYYY-MM-DD format.
RangeBeginningTime	Begin time of the date when the data was collected in hh-mm-ss format.
RangeEndingDate	End date when the data was collected in YYYY-MM-DD format.
RangeEndingTime	End time of the date when the data was collected in hh-mm-ss format.
PlatformShortName	Short name or acronym of the platform or satellite
InstrumentShortName	Short name or acronym of the instrument
SensorShortName	Short name or acronym of the sensor
WestBoundingCoordinate	The westernmost longitude of the bounding rectangle (-180.0)
NorthBoundingCoordinate	The northernmost latitude of the bounding rectangle (+90.0)
EastBoundingCoordinate	The easternmost longitude of the bounding rectangle (+180.0)
SouthBoundingCoordinate	The southernmost latitude of the bounding rectangle (-90.0)
Elapsed_Days	Duration in days of data collected during mission

4. Reading the Data

The data are written in a binary record-oriented format. Each record represents one line of ASCII text.

5. Data Services

5.1 GES DISC Search

The GES DISC provides a keyword, spatial, temporal and advanced (event) searches through its unified search and download interface:

https://disc.gsfc.nasa.gov/

5.2 Documentation

The data product landing page provides information about the data product, as well as links to download the data files and relevant documentation:

https://disc.gsfc.nasa.gov/datacollection/GEOS2OBSINPUTINTL_001.html

5.3 Direct Download

The data product is available for users to download directly using HTTPS:

https://acdisc.gesdisc.eosdis.nasa.gov/data/GEOS/GEOS2OBSINPUTINTL.001/

6. More Information

6.1 Contact Information

Name: GES DISC Help Desk
URL: https://disc.gsfc.nasa.gov/
E-mail: gsfc-help-disc@lists.nasa.gov
Phone: 301-614-5224
Fax: 301-614-5228
Address: Goddard Earth Sciences Data and Information Services Center
Attn: Help Desk
Code 610.2
NASA Goddard Space Flight Center
Greenbelt, MD 20771, USA

6.2 References

"Proceedings of the GEOS-2 Program Review Meeting. Volume 1 - Gravimetric and geometric investigations with GEOS-1 and GEOS-2", NASA GSFC, November 1970

"Proceedings of the GEOS-2 Program Review Meeting. Volume 2 - Tracking system intercomparisons with GEOS-2", NASA GSFC, November 1970

"A Performance Evaluation of GEOS-II", NASA GSFC, September 1968

7. Appendices

7.1 Acknowledgements

The Nimbus data recovery task at the GES DISC is funded by NASA's Earth Science Data and Information System program.

7.2 Acronyms

EOS: Earth Observing System
ESDIS: Earth Science and Data Information System
GEOS: Geodetic Earth Orbiting Satellite
GES DISC: Goddard Earth Sciences Data and Information Services Center
GSFC: Goddard Space Flight Center
NASA: National Aeronautics and Space Administration
NGSP: National Geodetic Satellite Program
EDSC: Earthdata Search Client
QA: Quality Assessment
UT: Universal Time