Surface Water and Ocean Topography (SWOT) Project

SWOT Product Description
Long Name: Level 1 GPS Payload Tracking Data Product in RINEX Format
Short Name: L1_GPSP_RINEX

Revision A

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HANGE LOG

VERSION	DATE	SECTIONS CHANGED	REASON FOR CHANGE
-	2018-04-02	ALL	Initial Release Approved for export (LRR-034563)
Revision A	2020-02-03	2.2, 3.3, 5	Product is specified to be in RINEX 3.03 format. Approved for public release (URS290675/CL#20-0916)

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1 Introduction

1.1 Purpose

The purpose of this Product Description Document is to describe the Level 1 Global Positioning System Payload (GPSP) tracking data product in RINEX format from the Surface Water Ocean Topography (SWOT) mission. This data product is also referenced by the short name L1_GPSP_RINEX.

1.2 Document Organization

Section 2 provides a general description of the product, including its purpose, the relevant requirements, and latency.

Section 3 provides the structure of the product, including granule definition, file organization, spatial resolution, temporal and spatial organization of the content, and the size and data volume.

Section 4 provides qualitative descriptions of the information provided in the product.

Section 5 provides the data format of the L1_GPSP_RINEX product.

Appendix A provides a listing of the acronyms used in this document.

1.3 Document Conventions

When the specific names of data variables and groups of the data product are given in the body text of this document, they are usually represented in italicized text.

2 Product Description

2.1 Purpose

The primary objective of the L1_GPSP_RINEX product is to provide GPS tracking data measurements from the GPS Payload (GPSP) receiver onboard SWOT. These tracking data are generated by the GPSP using signals from the GPS constellation of satellites. These GPS tracking data are used to perform precise orbit determination of the SWOT spacecraft. The L1_GPSP_RINEX standard data products are publicly available for use by orbit determination users. They are also used by the project to compute the precise orbit ephemeris (POE), and the medium-accuracy orbit ephemeris (MOE) for the SWOT mission [1].

2.2 Latency

The L1_GPSP_RINEX data product is generated less than 2 days after the telemetry from the GPS Payload is available to the SDS. The L1_GPSP_RINEX data product is generated using only information from the GPSP Payload telemetry.

3   Product Structure

3.1   Granule Definition

One L1_GPSP_RINEX data product data file is generated for each GPSP telemetry file, regardless of temporal coverage. For example, if two successive GPSP telemetry files contain duplicate data, the corresponding L1_GPSP_RINEX data product files will also contain duplicate data.

3.2   File Organization

The L1_GPSP_RINEX data product uses the Receiver INdependent Exchange (RINEX) format established by the International GNSS Service (IGS), as described in section 5. This format consists of a header followed by time-ordered tracking data blocks for each measurement epoch.

3.3   File Naming Convention

The file naming convention for the L1_GPSP_RINEX data product will follow the following pattern.

SWOT_L1_GPSP_RINEX_1280_<*BeginDateTime*>_<*EndDateTime*>_<CRID>_<ProductCounter>.rnx

- *L1_GPSP_RINEX* is the product short name.
- *1280* is the Application Identifier (APID) number of GPSP raw telemetry packets.
- *RangeBeginningDateTime* is the Date & Time of the first GPSP data in this file (format *YYYYMMDD*T*hhmmss)* in UTC.
- *RangeEndingDateTime* is the Date & Time of the last GPSP data in this file (format *YYYYMMDD*T*hhmmss)* in UTC.
- *CRID*: The Composite Release Identifier incorporates changes to any processing software that *might* impact product results.
- *ProductCounter* is a version number for when data products are generated multiple times from the same software.

Example:
SWOT_L1_GPSP_RINEX_1280_20210612T072103_20210612T072153_PGA2_03.rnx

3.4   Spatial Sampling and Resolution

The tracking data blocks are provided at the temporal resolution at which the receiver is operating, and spanning the duration of data available in the GPSP telemetry files. The SWOT GPSP receiver is nominally providing tracking data at a rate of once every 10 seconds (0.1 hertz). However, if data are available in the GPSP telemetry file at a higher rate, these higher-rate data will be included in the L1_GPSP_RINEX data product.

3.5 Temporal Organization

The L1_GPSP_RINEX data products provide tracking data blocks in sequential temporal order spanning the coverage of data in the corresponding GPSP telemetry files.

3.6   Spatial Organization

The L1_GPSP_RINEX data product files do not contain geolocation information. The tracking data blocks are provided in sequential temporal order as received along the satellite ground track.

3.7 Volume

Each GPSP_RINEX data product file has a size of less than 5.0 Mbytes per 1-hour duration of tracking data.

4   Qualitative Description

The L1_GPSP_RINEX data products are in the Receiver INdependent Exchange (RINEX) format established by the International GNSS Service. This is an internationally recognized ASCII format for GPS tracking data that is adopted by most precise orbit determination centers.

The RINEX file format includes a header followed by temporally ordered and time-tagged blocks of pseudorange (C1, P1 and P2) and carrier phase (L1 and L2) tracking data. The time tags of the measurements provided in the GPSP_RINEX data product are the receiver's time of the received GPS signals, provided in GPS time.

5 Detailed Product Description

The header of the L1_GPSP_RINEX data product specifies the RINEX version that it follows.

The L1_GPSP_RINEX data product is provided in RINEX 3 format. For a description of the RINEX 3 data format, refer to the official RINEX file format description from the IGS [2].

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6   References

[1] N. Picot, "SWOT Product Description Document: Precise and Medium-accuracy Orbit Ephemeris data product, SWOT-IS-CDM-0658-CNES," CNES, 2019.

[2] "RINEX 3.03 Release Notes," International GNSS Service, 28 October 2019. [Online]. Available: https://kb.igs.org/hc/en-us/articles/206482558-RINEX-3-03-Release-Notes.

Appendix A.   **Acronyms**

CNES	Centre National d'Études Spatiales
GPS	Global Positioning System
GPSP	Global Positioning System Payload
IGS	International GNSS Service
JPL	Jet Propulsion Laboratory
MOE	Medium-accuracy Orbit Ephemeris
NASA	National Aeronautics and Space Administration
POD	Precise Orbit Determination
POE	Precise Orbit Ephemeris
RINEX	Receiver Independent Exchange
SWOT	Surface Water Ocean Topography
TBC	To Be Confirmed
TBD	To Be Determined