



# Surface Water and Ocean Topography (SWOT) Project

## SWOT Product Description


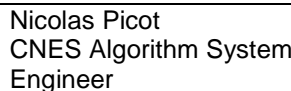
**Long Name: Level 1 DORIS Payload Tracking Data  
Product in RINEX Format**

**Short Name: L1\_DORIS\_RINEX**


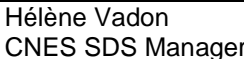
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September 30, 2020

Version 1.0

SWOT-IS-CDM-1508-CNES



## CHANGE LOG

VERSION	DATE	SECTIONS CHANGED	REASON FOR CHANGE
Baseline	2020-09-30	ALL	Initial Release

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## List of TBD Items

**These items are to be completed when document is ready to enter configuration control.**

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# 1 Introduction

## 1.1 Purpose

The purpose of this Product Description Document is to describe the Level 1 Doppler Orbitography and Radiopositioning Integrated by Satellite (DORIS) 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\_DORIS\_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\_DORIS\_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\_DORIS\_RINEX product is to provide DORIS tracking data measurements from the DORIS Payload receiver onboard SWOT. These tracking data are generated by the DORIS instrument using signals from the DORIS ground beacons. These DORIS tracking data are used to perform precise orbit determination of the SWOT spacecraft. The L1\_DORIS\_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\_DORIS\_RINEX data product is generated less than 2 days after the telemetry from the DORIS Payload is available to the SDS. The L1\_DORIS\_RINEX data product is generated using only information from the DORIS Payload telemetry.

## 3 Product Structure

### 3.1 Granule Definition

One L1\_DORIS\_RINEX data product data file is generated daily, merging all DORIS data acquired in the different telemetry files. If two successive DORIS telemetry files contain duplicate data, the DORIS L1 processing will remove any overlap, so that the corresponding L1\_DORIS\_RINEX data product files will not contain any duplicate data.

### 3.2 File Organization

The L1\_DORIS\_RINEX data product uses the DORIS Receiver INdependent Exchange (DORIS/RINEX) format established by the International DORIS Service (IDS), 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\_DORIS\_RINEX data product will follow the following pattern.

SWOT\_MEP\_1P<v>D<SensingDate>\_000000

- $v$  = product version format 'a'..'z'
- *SensingDate* is the Date of the DORIS data in the file (*format yyyyymmdd in UTC*)

Example:

SWOT\_MEP\_1PaD20210612\_000000

### 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 whole day. The SWOT DORIS receiver is nominally providing tracking data at a rate of once every 10 seconds (0.1 hertz).

### 3.5 Temporal Organization

The L1\_DORIS\_RINEX data products provide tracking data blocks in sequential temporal order spanning the day.

### 3.6 Spatial Organization

The L1\_DORIS\_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 L1\_DORIS\_RINEX data product file has a size of less than 5.0 Mbytes per day.

## 4 Qualitative Description

The L1\_DORIS\_RINEX data products are in the DORIS Receiver INdependent Exchange (DORIS/RINEX) format established by the International DORIS Service (IDS). This is an internationally recognized ASCII format for DORIS tracking data that is adopted by most precise orbit determination centers. This standard has been adopted for DORIS tracking data to ease use of DORIS data in the precise orbit determination centers.

The DORIS/RINEX file format includes a header followed by temporally ordered and time-tagged blocks of tracking data values. The time tags of the measurements provided in the L1\_DORIS\_RINEX data product are the receiver's time of the received DORIS signals, provided in TAI time.

DORIS observables include three fundamental quantities: Time, Phase, and Pseudo-Range. Details are provided by the IDS [2].

## **5 Detailed Product Description**

The header of the L1\_DORIS\_RINEX data product specifies the RINEX version that it follows.

The L1\_DORIS\_RINEX data product is provided in DORIS/RINEX 3 format. For a description of the DORIS/RINEX 3 data format, refer to the official format description provided by the IDS [2].

## 6 References

- [1] N. Picot, "SWOT Product Description Document: Precise and Medium-accuracy Orbit Ephemeris data product, SWOT-IS-CDM-0658-CNES," CNES, 2020.
- [2] A. Guerry, "About DORIS/RINEX format," International DORIS Service, 2020. [Online]. Available: <https://ids-doris.org/analysis-coordination/about-doris-rinex-format.html>.

## Appendix A. **Acronyms**

CNES	Centre National d'Études Spatiales
DORIS	Doppler Orbitography and Radiopositioning Integrated by Satellite
IDS	International DORIS 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