SEC-2024057 Rev.D
First Edition: 14 January 2025
Revision A: 13 March 2025
Revision B: 9 July 2025
Revision C: 6 August 2025
Revision D: 15 October 2025

Release notes for the EarthCARE/CPR Level-1b Product

All users of the EarthCARE/CPR Level 1b data should keep in mind the following descriptions related to the EarthCARE/CPR L1b product in Version vDa. D

Since the power calibration value was updated in version vCb on 13 March 2025, there has been a 1.6 dB difference before or after frame : 04483C. The primary purpose of the major update to vDa is to ensure that the same power calibration value is applied to all past data by reprocessing. D

<Change History>

--- Current Version Information ---

Product Version (baseline): vDa (operation from 16th October 2025 for forward processing, and reprocessing for all past observation data.) D

ProcessorVersion :3.0
ExecutableVersion :3.0
FormatVersion :0.15

The following are the modified points from vCd.

--- Changes in vDa from vCd --- D

All of the updates described below are minor changes. There are no major differences from the previous version (vCd).

1. Modification of the calculation method for binHeight

In the vDa, the calculation method for "binHeight" has been modified. However, JAXA confirmed that the difference before and after the change is negligible, as it is only on the order of centimeter. The reason for the correction is that the larger roll manoeuvre angles under the sea surface calibration mode result in relatively greater errors using the previous method. However, as sea surface calibration data is not included in the L1 product, all users of CPR L1b product do not need to be concerned about this. D

2. Selective usage of Doppler reference signal

The function of the L1b processor to correct the transmitter leakage signal using doppler reference data on the process of Doppler velocity calculation has been disabled in the vDa. The phase drift between the transmitted pulses is inherently very small, so it will not affect the quality of the Doppler velocity in L1b product.

The function of the initial Doppler bias correction using the transmitter leakage signal as Doppler reference has been modified to allow disabling and disabled as default setting in the vDa. This modification is as part of the investigation on ΔG gap*, which may be caused by switching the DopATT setting for acquiring the sufficient transmitter leakage signal level. As the phase drift between the two adjacent transmitted pulses is inherently very small, this will not affect the quality of the Doppler velocity in L1b product.

* the "ΔG gap" indicates the disturbance in the received power correction term described in No.6 of <caveats for the EarthCARE/CPR Level-1b product>.

3. Modification to ensure the same number of valid bins for External Calibration Mode D

Regarding the observation mode, the number of valid bins is fixed for each sub mode and that number is "216" for High sub-mode(20km), "194" for Middle sub-mode(18km), and "176" for Low sub-mode(16km) in vCd. On the other hand, the number of valid bins for external calibration mode was sometimes varied in each ray because the validity of bin in the external calibration mode was determined based on whether altitude of the bin was higher (=valid) or lower (=invalid) than -1km. L1b processor of vDa has been modified so that the number of valid bins in external calibration mode is fixed, and that value is set as "164" to cover the range of altitude from 15km to -1km.

<Caveats for the EarthCARE/CPR Level-1b product>

CPR Level-1b (CPR_NOM_1B) Product has the following known issues and limitations.

--- Known product quality limitations and points of note ---

1. Mirror Image

The "Mirror image" is a phenomenon in which an upside-down cloud pattern appears in a vertical symmetrical form to the direct echo from the target, due to backscattering from the target via reflection from the surface. When the returning timing of the signals of the mirror image to the EarthCARE/CPR overlaps to the receiving timing of the next pulse, the mirror image often appears upper-side of the actual cloud (direct echo from the cloud) as below figures.

EarthCARE/CPR adopts a higher PRF than CloudSat, so the mirror image appears at a lower altitude than that of the CloudSat. The mirror image affects not only echo data but also doppler data.

The mirror image has been implemented as flag information in the CPR L2 product (CPR_ECO_2A).

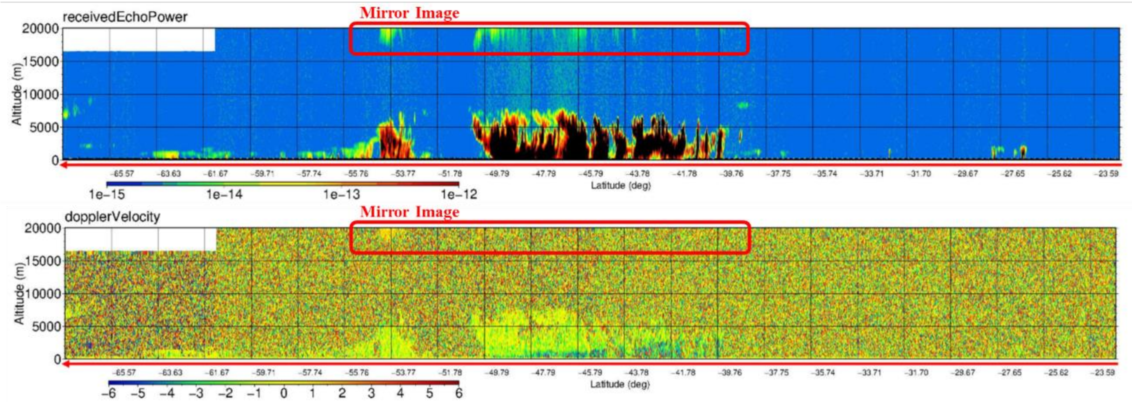


Figure 1-1:An example of the mirror images on the frame:03071F observed on 12 December 2024
(uppler image: receivedEchoPower, lower image: doppler velocity)

2. Radar reflectivity and received echo power [Improved in vCb]

The released EarthCARE/CPR L1b product reflects the results of calibrations during the commissioning phase. In vCa, the calibration factor was considered with assessment results for only CPR transmitter chain and it was confirmed that the echo power level of vCa was about 2dB lower than that of the CloudSat/CPR data. The calibration factor was updated in vCb by considering assessment results for both the CPR transmitter chain and receiver chain. This update increased the echo power level by 1.6dB from vCa, resulting in a value even closer to that of the CloudSat/CPR.

Until vCd, there had been a 1.6 dB difference before or after frame:04483C. However, it will be resolved by the reprocessing by the major update to vDa and it is estimated that reprocessing by vDa for the past data will be completed by the end of November 2025. D

3. Doppler velocity anomalies due to the Gap of orbit data

When orbit data has gap, its interpolation is not performed correctly, and an error of the doppler velocity appear like a rainbow pattern as the following figures. If the GPS orbit data gap is found after L1b data processing, the L1b data will be re-generated within a week using restituted orbit file. This is a very rare case, but please keep it in mind when you download data just after observation. By checking the following metadata items, you can see if data was regenerated using Reconstituted Orbit File;

- HeaderData/VariableProductHeader/SpecificProductHeader/orbitFileFlag
  - 0:PDGS Reconstructed Orbit File
  - 1:FOS Reconstituted Orbit File
  - 2:FOS Predicted Orbit File
- HeaderData/VariableProductHeader/MainProductHeader/processingStartTime
- HeaderData/VariableProductHeader/MainProductHeader/processingStopTime

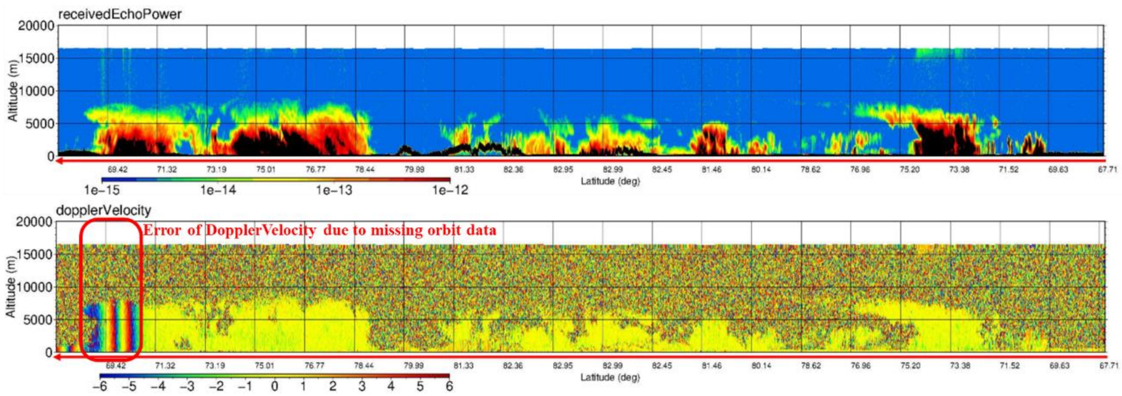


Figure 3-1:An example of Error of doppler velocity due to the partly missing of the orbit data missing
(upper image: receivedEchoPower, lower image: doppler velocity)

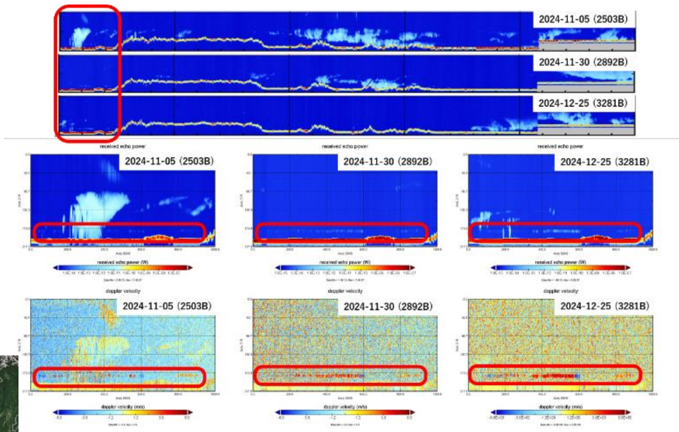
4. Anomalies observed over specific areas

JAXA found some echo/doppler anomalies that are not clouds in a specific area at the same relative orbit pass*. Here, two examples of the anomaly are shown. The mechanism by which the anomaly occurs has been investigated. And it is possible that other similar anomalies may be occurring in other areas. The cause of this anomaly has been identified to be mirror images from the EarthCARE satellite and the CPR (2nd trip echo) over smooth surface where sigma zero is very high and saturated. JAXA is preparing to incorporate this artifact information by flagging into the L2 algorithm.

> * The first ascending node crossing at 0.6 degree longitude, equivalent to the relative orbit 1, after reaching the reference orbit acquisition occurred as of absolute orbit 2087 on 10th October 2024. And there are 389 passes in one recurrence period. Therefore, the relationship between absolute orbit number (AbsOrbNo) and relative orbit number (RelOrbNo) after achieving the reference orbit can be addressed as below.
>
> **RelOrbNo = (AbsOrbNo - 2086) mod 389**

(a) Frame-B of the relative orbit pass no.=028 (around Bangladesh region)

Non-cloud patterns appear in the echo & doppler data at the same height near land surface around Bangladesh area on the frame B of the relative orbit pass no.=028 (Absolute pass no. =2503B, 2892B, 3281B).



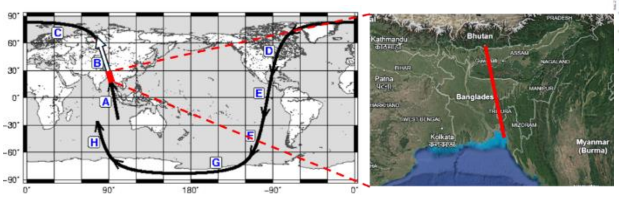
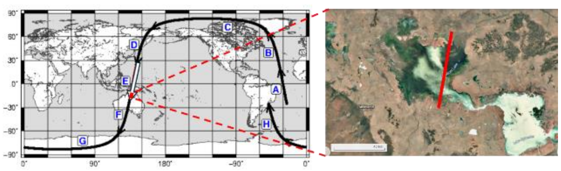


Figure 4-1:example of anomalies over Bangladesh

(b) Frame-E of the relative orbit pass no=049 (around the Tarrabool Lake in Australia) (Absolute pass no. =2524E, 2913E, 3302E).



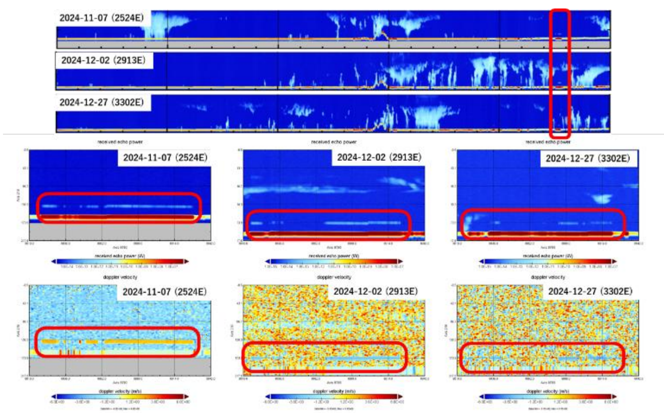


Figure 4-2: examples of anomaly over Tarrabool Lake

5. Antenna pointing correction is not implemented.

The CPR L1b processor will employ a method to compensate for antenna distortion due to thermal distortion of the Main Reflector (MREF) to improve antenna pointing accuracy, but this is not yet implemented in the current version.

6. Disturbance in the received power correction term.

In the current L1b software, the term of received echo power (ΔG) which is based on Y-factor method is adopted. It has been confirmed that the disturbance of the value of the ΔG occurs at a certain satellite altitude. The amount of this disturbance is at most about 0.5dB. JAXA is currently still continuing its investigation into the root cause and considering countermeasures.

7. Suspicion of incorrect surfaceElevation value

The value of "surfaceElevation" in the CPR L1b product is derived from the ACE-2 DEM (9 sec.). The following figures show an example of comparison with other DEM data. The red area in the figure on the left means significant difference between ACE-2 DEM and CPR detected surface altitude (CPR DEM). A significant difference was found when comparing the ACE2 DEM (center figure) and the AW3D (right figure) at the north of Greenland and around the Antarctic. JAXA and ESA will coordinate to replace it with a more reliable one in all EarthCARE products in the future. D

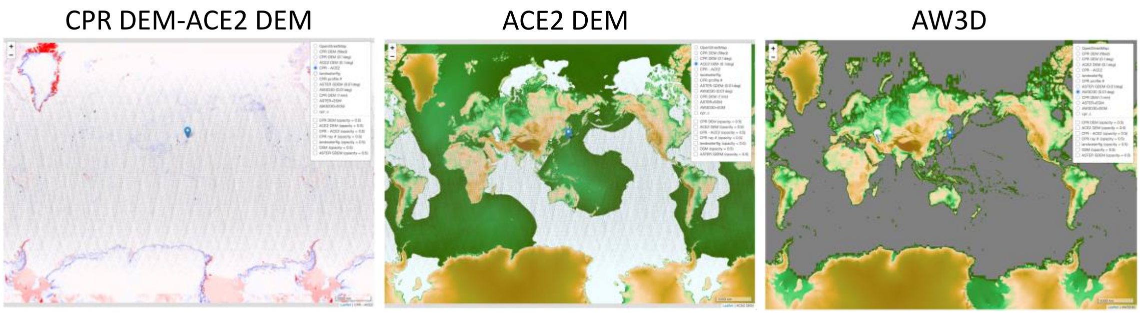


Figure 7-1: Comparison with ACE-2 DEM and AW3D (provided by NICT)

<Major event history related to EarthCARE/CPR observation>

The CPR off-nominal operations such as on-board parameter updates and some operation that would affect data quality are listed below and Table-1 until 09 January 2025.
Observation data loss may occur during planned operation, such as CPR Calibration Operations, Silent State Operation Over Radio Astronomy Sites (RAS), Satellite maneuvers, GS outage etc. Please refer the followings;

- CPR L1b Data Missing List (CPR Operation Status):
  https://www.eorc.jaxa.jp/EARTHCARE/data/operational_status_e.html
- RAS overpasses:
  https://ec-pdgs-monitor.eo.esa.int/flyover/passes/
- Overview of CPR Calibration Plan :
  https://www.eorc.jaxa.jp/EARTHCARE/data/calibration_e.html

--- IQ offset change history ---

(1)SPU-A IQ offset change history

As the result of internal calibration of SPU-A, IQ offset values and the reference temperature have been updated as necessary. A history of the IQ offset changes of SPU-B is as below.

1) **26-29 July 2024 IQ offset values and reference temperatures were updated**
   The updated IQ offset values failed to meet the criteria. Therefore, the doppler velocities for low echo level around -19dBz may not be accurate until the next IQ offset update on 01 August.

2) **01 August 2024 IQ offset values and reference temperatures were updated**
   The updated IQ offset values could pass the criteria at the confirmation on 02 August. However, it could not pass the criteria at the confirmation on 02 September. Therefore, the accuracy of the doppler velocity for low echo level near -19dBz were gradually getting wrong since 02 August to 05 September.

3) **08 October 2024 IQ offset values and reference temperatures were updated**
   The updated IQ offset values could pass the criteria at the confirmation just after update on the same date. However, it could not pass the criteria at the confirmation on 01 November. Therefore, the accuracy of the doppler velocity for low echo level near -19dBz were gradually getting wrong since 08 October to 01 November.

4) **14 November 2024　IQ offset values and reference temperatures were updated**
The updated IQ offset values could pass the criteria at the confirmation on 24 November. and it was valid until SPU was changed to SPU-B on 26 November.

(2)SPU-B IQ offset change history

JAXA confirmed that IQ offset values set before lunch could pass the criteria at the confirmation in orbit. However, in order to further improve accuracy of the doppler velocity, JAXA determined to update the IQ offset values. A history of the IQ offset changes of SPU-B is as below.

1) **04 December 2024　IQ offset values and reference temperatures were updated**
JAXA confirmed that the doppler pattern like a rainbow on the very low echo region (lower than -19dBz) was removed after IQ offset value update.

- Note -

From 2025-06-23T10:07:01 to 2025-06-26T13:01:54, the IQ offset values were temporally initialized during the HPT SWAR implementation process. After that IQ offset values were set back to the same as 1).

--- PRF table update history ---

(1)SPU-A PRF table update history

1) **12:49(UTC) 23 October 2024: PRF table for external calibration was updated**
The range of the observation height of the external calibration mode was changed from “-3km ~ 18km” to “-4km ~ 17km” (1km shifted lower).

(2)SPU-B PRF table update history

1) **12:05(UTC) 04 December 2024: PRF table for external calibration was updated**
This update was done during the startup process of SPU-B switching from SPU-A. The range of the observation height of the external calibration mode was changed from “-3km ~ 18km” to “-4km ~ 17km” (1km shifted lower).
2) **9 July 2025: PRF table for external calibration has been updated**
The range of the observation height of the external calibration mode has been changed to “-4km ~ 15km”, to correspond to the 18 km mode.

--- Other on-board update history affected to the performance ---

There are no other major on-board updates for both SPU-A and SPU-B

Table-1 Major events of EarthCARE/CPR (until 3rd August 2025)

Event	UTC(From)	To	Duration		Obs. Data		SPU	Orbit/ Frame	Note
			Days	Time	Yes	No			
CPR First Turn-on	**2024-06-07T13:02:00**	-				✓	**B**	**—**	
Observation with B8 configuration	**2024-06-12T12:02:24**	**2024-07-16T11:44:28**	**33d**	**23h42m04s**	✓		**B**	**00226A-00386A**	**Start of CPR Obaservation.**
Observation with Initial IQ offset values	**2024-06-12T12:02:24**	**2024-07-16T11:44:28**	**33d**	**23h42m04s**	✓		**B**	**00226A-00386A**	**Initial IQ offset values were passed the criteria.**
Mode Transition Test	2024-06-13T09:51:58	2024-06-14T12:00:02	1d	02h08m04s		✓	B	00241H-00258G	For initial Checkout. Intenal Calibration is included.
Sub-mode Fix (Middle)	2024-06-14T12:00:03	2024-06-14T16:37:32	0d	04h37m29s	✓		B	00258G-00261G	For initial Checkout.
Sub-mode Fix (HIGH)	2024-06-14T16:37:33	2024-06-14T21:15:01	0d	04h37m28s	✓		B	00261G-00264G	For initial Checkout.
Sub-mode Fix (LOW)	2024-06-14T21:15:02	2024-06-17T12:45:26	2d	15h30m24s	✓		B	00264G-00305G	For initial Checkout. Long Silent State (10min.) is included.
Rx_ATT Change Operation	2024-06-17T13:57:57	2024-06-18T17:43:19	1d	03h45m22s	✓		B	00306F-00324E	For initial Checkout.
Mode Transition Test	2024-06-19T10:54:32	2024-06-19T13:27:08	0d	02h32m36s		✓	B	00335F-00337C	For initial Checkout. Intenal Calibration is included.
Contingency Mode Test1	2024-06-20T12:34:02	2024-06-20T14:19:57	0d	01h45m55s	(✓)	(✓)	B	00351F-00353D	For initial Checkout. Partly observed in CONT(Obs.) & CONT(Ext.).
Contingency Mode Test2	2024-06-20T15:41:02	2024-06-20T15:43:18	0d	00h02m16s	(✓)	(✓)	B	00354C	For initial Checkout. Partly observed in CONT(Obs.) & CONT(Ext.).
Observation Interruption	**2024-06-22T16:41:07**	**2024-07-16T11:44:28**	**23d**	**19h03m21s**		✓	**B**	**00386A-00755F**	**HPT-B OFF is occurred and CPR transits to Standby-refuse mode.**
Preparation of SPU Swithing to SPU-A	**2024-07-16T11:44:29**	**2024-07-17T14:58:02**	**1d**	**03h13m33s**		✓	**-**	**00755F-00773C**	
Observation with A8 configuration	**2024-07-17T14:58:03**	**2024-11-25T13:33:19**	**130d**	**22h35m16s**	✓		**A**	**00773C-02801E**	
Observation with Initial IQ offset values	**2024-07-17T14:58:03**	**2024-07-29T10:29:13**	**11d**	**19h31m10s**	✓		**A**	**00773 - 00956H**	**Before IQ offset adjustment (Doppler accuracy is not good)**
Observation Interruption	**2024-07-22T01:06:26**	**2024-07-24T13:49:41**	**2d**	**12h43m15s**		✓	**A**	**00842A-00881D**	**HPT-B OFF is occurred and CPR transits to Standby-refuse mode.**
Observation with 1st Updated IQ offset values	**2024-07-29T10:29:15**	**2024-08-01T15:22:03**	**3d**	**04h52m48s**	✓		**A**	**00956H-00959H**	
Sub-mode Fix (Middle)	2024-07-29T10:29:15	2024-07-29T15:06:43	0d	04h37m28s	✓		A	00956H-00959H	For initial Checkout.
Sub-mode Fix (HIGH)	2024-07-29T15:06:44	2024-07-29T19:44:14	0d	04h37m30s	✓		A	00959H-00962H	For initial Checkout.
Sub-mode Fix (LOW)	2024-07-29T19:44:15	2024-07-30T07:59:32	0d	12h15m17s	✓		A	00962H-00970F	For initial Checkout.
Rx_ATT Change Operation	2024-07-30T07:59:33	2024-07-31T11:54:20	1d	03h54m47s	✓		A	00970G-00988H	For initial Checkout.
Contingency Mode Test	2024-07-31T13:39:18	2024-07-31T15:27:04	0d	01h47m46s	(✓)	(✓)	A	00990A-00991C	For initial Checkout. Partly observed in CONT(Obs.) & CONT(Ext.).
Observation with 2nd Updated IQ offset values	**2024-08-01T15:22:04**	**2024-10-08T13:59:05**	67d	22h37m01s		✓	**A**	**01006G-02063F**	
Observation Interruption	**2024-08-28T16:18:11**	**2024-08-30T07:43:38**	**1d**	**15h25m27s**		✓	**A**	**01425C-01453C**	**HPT-B OFF is occurred and CPR transits to Standby-refuse mode.**
Observation Interruption	**2024-09-02T09:58:52**	**2024-09-03T12:51:28**	**1d**	**02h52m36s**		✓	**A**	**01500H-01518D**	**HPT-B OFF is occurred and CPR transits to Standby-refuse mode.**
Rx_ATT Change Operation	2024-09-06T06:30:03	2024-09-06T20:25:50	0d	13h55m47s	✓		A	01560H-01569H	For initial Checkout.
Rx_ATT Change Operation	2024-09-06T23:30:50	2024-09-07T13:29:56	0d	13h59m06s	✓		A	01571H-01581A	For initial Checkout.

Event	UTC(From)	To	Duration		Obs. Data		SPU	Orbit/Frame	Note
			Days	Time	Yes	No			
Observation Interruption	**2024-09-21T09:24:14**	**2024-09-23T10:04:34**	**2d**	**00h40m20s**		**✓**	**A**	**01796B-01827G**	**HPT-B OFF is occurred and CPR transits to Standby-refuse mode.**
Observation Interruption	**2024-10-01T03:01:33**	**2024-10-04T12:19:44**	**3d**	**09h18m11s**		**✓**	**A**	**01947F-02000D**	**HPT-B OFF is occurred and CPR transits to Standby-refuse mode.**
IQ Offset re-adjustment Operation	2024-10-08T12:24:25	2024-10-08T12:26:45	0d	00h02m20s		✓	A	02062F	For IQ offset values update
IQ Offset re-adjustment Operation	2024-10-08T13:56:54	2024-10-08T13:59:05	0d	00h02m11s		✓	A	02063F	For Reference Temperature Update
Observation with 3rd Updated IQ offset values	**2024-10-08T13:59:05**	**2024-11-14T14:24:53**	**37d**	**00h25m48s**	**✓**		**A**	**02063F-02639F**	
Observation Interruption	**2024-10-11T12:58:56**	**2024-10-14T14:26:35**	**3d**	**01h27m39s**		**✓**	**A**	**02109D-02157D**	**HPT-B OFF is occurred and CPR transits to Standby-refuse mode.**
Observation Interruption	**2024-10-17T12:50:19**	**2024-10-18T14:04:42**	**1d**	**01h14m23s**		**✓**	**A**	**02203A-02219D**	**HPT-B OFF is occurred and CPR transits to Standby-refuse mode.**
Update of the PRF table for External Calibration	2024-10-23T12:38:14	2024-10-23T12:49:37	0d	00h11m23s		✓	A	02296C	for SPU-A
Observation Interruption	**2024-10-26T18:20:46**	**2024-10-28T10:40:23**	**1d**	**16h19m37s**		**✓**	**A**	**02346F-02372G**	**HPT-B OFF is occurred and CPR transits to Standby-refuse mode.**
HPT auto restarst during observation	2024-10-28T13:05:35	2024-10-28T13:07:39	0d	00h02m04s	✓*		A	02374C-02374D	HPT-B auto restart is occurred (Operation based on design, not anomaly. *Observation was continued but RF is OFF in this period.
Sub-mode Fix (Low)	2024-11-05T21:00:01	2024-11-09T00:00:02	3d	03h00m01s	✓		A	02503H-02552E	
Sub-mode Fix (Middle)	2024-11-09T00:00:03	2024-11-12T11:50:48	3d	11h50m45s	✓		A	02552E-02606H	
Observation with 4th Updated IQ offset values	**2024-11-14T14:24:54**	**2024-11-26T12:45:40**	**11d**	**22h20m46s**	**✓**		**A**	**02639F-2810C**	
Zerro Doppler observation	2024-11-15T10:38:12	2024-11-16T11:06:32	1d	00h28m20s	✓		A	02652G-02668F	
Preparation of SPU Swiching to SPU-B	**2024-11-25T13:33:20**	**2024-11-26T12:45:40**	**0d**	**23h12m20s**		**✓**	**-**	**02810C-02825D**	**Including update of the PRF table for External calibration (SPU-B)**
Observation with B8 configuration	**2024-11-26T12:45:41**	**Continue**	**-**	**-**	**✓**		**B**	**Continue**	**Observation Sub-mode: MIX in usual**
Observation with Initial IQ offset values	**2024-11-26T12:45:41**	**2024-12-04T12:05:58**	**7d**	**23h20m17s**	**✓**		**B**	**02825D-02949D**	**Initial IQ offset were passed the criteria (Quality of the Doppler is good.)**
Observation Interruption	**2024-11-27T12:08:09**	**2024-11-28T10:07:24**	**0d**	**21h59m15s**		**✓**	**B**	**02840E-02854G**	**HPT-B OFF is occurred and CPR transits to Standby-refuse mode.**
Observation Interruption	**2024-11-28T10:15:13**	**2024-11-29T09:17:12**	**0d**	**23h01m59s**		**✓**	**B**	**02854H-02869G**	**HPT-B OFF is occurred and CPR transits to Standby-refuse mode.**
HPT auto restart during observation	2024-11-29T09:20:22	2024-11-29T09:22:28	0d	00h02m06s	✓*		B	02869G	HPT-B auto restart is occurred (Operation based on design, not anomaly. *Observation was continued but RF is OFF in this period.
IQ Offset adjustment Operation	2024-12-04T12:05:02	2024-12-04T12:05:58	0d	00h00m56s		✓	B	02949D	For update of the IQ offset values & Reference Temperatures.

A

Event	UTC(From)	To	Duration		Obs. Data		SPU	Orbit/ Frame	Note
			Days	Time	Yes	No			
Observation with 1st Updated IQ offset values	**2024-12-04T12:05:59**	**2025-06-23T10:07:01**	**200d**	**22h01m02s**	✓		**B**	**02949D-06075G**	**Quality of the doppler is even better than before IQ offset update.**
Stop the observation for satellite Manoeuvre (Regular weekly work)	2024-12-10T17:48:21	2024-12-10T18:45:21	0d	00h57m00s		✓	B	03046E-03047A	CPR is in Internal Calibration Mode during the Satellite Manoeuvre
Observation Interruption	**2024-12-14T08:11:10**	**2024-12-19T12:55:23**	**5d**	**04h44m13s**		✓	**B**	**03102E-03183C**	**HPT-B OFF is occurred and CPR transits to Standby-refuse mode.**
Observation Interruption	**2024-12-21T23:27:14**	**2024-12-23T10:04:29**	**1d**	**10h37m15s**		✓	**B**	**03221C-03243H**	**HPT-B OFF is occurred and CPR transits to Standby-refuse mode.**
HPT auto restart during observation	2024-12-24T11:35:46	2024-12-24T11:41:59	0d	00h06m13s	✓*		B	03260C -03260D	HPT-B auto restart is occurred (Operation based on design, not anomaly. *Observation was continued but RF is OFF in this period.
Observation Interruption	**2024-12-28T03:51:40**	**2024-12-30T10:12:07**	**2d**	**06h20m27s**		✓	**B**	**03317E-03352G**	**HPT-B OFF is occurred and CPR transits to Standby-refuse mode.**
HPT auto restart during observation	2024-12-30T10:14:48	2024-12-30T10:16:54	0d	00h02m06s	✓*		B	03352G	HPT-B auto restart is occurred (Operation based on design, not anomaly. *Observation was continued but RF is OFF in this period.
Observation Interruption	**2025-01-01T22:20:31**	**2025-01-02T14:39:15**	**0d**	**16h18m44s**		✓	**B**	**03391G-03402C**	**HPT-B OFF is occurred and CPR transits to Standby-refuse mode.**
HPT auto restart during observation	2025-01-02T14:43:37	2025-01-02T14:45:42	0d	00h02m05s	✓*		B	03402D	HPT-B auto restart is occurred (Operation based on design, not anomaly. *Observation was continued but RF is OFF in this period.
HPT auto restart during observation	2025-01-13T10:37:15	2025-01-13T10:43:29	0d	00h06m14s	✓*		B	03570H	HPT-B auto restart is occurred (Operation based on design, not anomaly. *Observation was continued but RF is OFF in this period.
Rx_ATT Change Operation (17.5[dB])	2025-01-19T19:40:01	2025-01-19T19:45:21	0d	00h05m20s	✓	(✓)	B	03670A-03670B	Observation was implemented with high Rx_ATT setting (17.5[dB]). This time range includes the durations of the IDLE mode for changing the RxATT setting to 17.5[dB] before
Observation Interruption	**2025-01-20T18:39:13**	**2025-01-22T15:52:39**	**1d**	**21h13m26s**		✓	**B**	03685A-03714C	**HPT-B OFF is occurred and CPR transits to Standby-refuse mode.**
HPT auto restart during observation	2025-01-22T16:02:37	2025-01-22T16:04:43	0d	00h02m06s	✓*		B	03714D	HPT-B auto restart is occurred (Operation based on design, not anomaly. *Observation was continued but RF is OFF in this period.
HPT auto restart during observation	2025-03-05T12:43:52	2025-03-05T12:45:56	0d	00h02m04s	✓*		B	04365G	HPT-B auto restart is occurred (Operation based on design, not anomaly. *Observation was continued but RF is OFF in this period.
Observation Interruption	**2025-03-06T21:36:44**	**2025-03-07T14:52:26**	**0d**	**17h15m42s**		✓	**B**	04387B-04398C	**HPT-B OFF is occurred and CPR transits to Standby-refuse mode.**
Observation Interruption	**2025-03-27T12:04:12**	**2025-03-28T13:41:28**	**1d**	**01h37m16s**		✓	**B**	04707F-04724C	**HPT-B OFF is occurred and CPR transits to Standby-refuse mode.**

Event	UTC(From)	To	Duration		Obs. Data		SPU	Orbit/ Frame	Note	
			Days	Time	Yes	No				
Observation Interruption	**2025-03-31T19:20:28**	**2025-04-01T13:20:03**	**0d**	**17h59m35s**		✓	**B**	04774F-04786C	**HPT-B OFF is occurred and CPR transits to Standby-refuse mode.**	
Observation Interruption	**2025-04-30T05:12:52**	**2025-04-30T15:06:36**	**0d**	**09h53m44s**		✓	**B**	05232C-05238F	**HPT-B OFF is occurred and CPR transits to Standby-refuse mode.**	
Observation Interruption	**2025-05-08T22:52:32**	**2025-05-09T10:27:13**	**0d**	**11h34m41s**		✓	**B**	05368C-05378C	**HPT-B OFF is occurred and CPR transits to Standby-refuse mode.** (L1b product exists for 05375G because CPR temporaly transited to NOM mode for a short period of time in the process of the recovery. Its duration was less than 30 seconds.)	
HPT auto restart during observation	2025-05-16T12:10:31	2025-05-16T12:12:36	0d	00h02m05s	✓*		B	05485G	HPT-B auto restart is occurred (Operation based on design, not anomaly. *Observation was continued but RF is OFF in this period.	
HPT auto restart during observation	2025-06-03T00:17:34	2025-06-03T00:19:39	0d	00h02m05s	✓*		B	05758B	HPT-B auto restart is occurred (Operation based on design, not anomaly. *Observation was continued but RF is OFF in this period.	
Observation with Initial IQ offset values	**2025-06-23T10:07:01**	**2025-06-26T13:01:54**	**3d**	**02h54m53s**	✓		**B**	**06075G-06124C**	**IQ offset values were temporally initialized during the HPT SWAR implementation process.**	C
CPR onboard software update for the implementation of the HPT Software Auto Restart (SWAR) function	2025-06-23T10:07:01	2025-06-26T12:06:25	3d	01h59m24s	✓**		B	06075G-06123F	In this Event, CPR turned to Nominal observation mode sevral times. However, the accuracy of the Doppler velocity of the Nominal observation data was not optimized since the IQ offset settings were initialized by the SPU-B turn off at the first step of this event.	C
IQ offset value setting	2025-06-26T12:06:26	2025-06-26T13:01:54	0d	00h55m28s	✓**		B	06123F-06124C	same IQ offset values were set as 1st update on 4th December 2024.	
Observation with 1st Updated IQ offset values	**2025-06-26T13:01:55**	**Continued**	**-**	**-**	✓		**B**	**06124C ~ Continue**	**Quality of Doppler velocity is equivalent to observations from 4th December 2024 to 23rd June 2025 with the same IQ offset values.**	
Internal caclibration-2 for the verification of IQ offset value setting by SOR	2025-06-26T15:11:32	2025-06-26T16:44:11	0d	01h32m39s		✓	B	06125F-06126F	A full-orbit internal Calibraiton operated via SOR for the velification of IQ Offset adustment after IQ offset value setting.	
HPT Software Auto restart (SWAR) during observation	2025-06-29T01:55:43	2025-06-29T02:17:51	0d	00h22m08s	✓*		B	06163G-06164A	The HPT SWAR function, which had been installed on 26th June 2025, worked succussfully. *Observation was continued but RF is OFF in this period.	
HPT Software Auto restart (SWAR) during observation	2025-07-04T07:46:25	2025-07-04T08:06:32	0d	00h20m07s	✓*		B	06245D-06245E	*Observation was continued but RF is OFF in this period.	
Change of the observation hight setting of the MIX submode in observation mode and Update of the PRF table of the extenal clibration mode by SOR.	2025-07-08T10:52:10	2025-07-08T11:04:16	0d	00h12m06s		✓	B	06309F	The observation hight setting was changed from 20km to 18km for the latitude ragne between -60deg. to +60deg. in the MIX submode. And the PRF table for the external calibration mode was also updated to	C

Event	UTC(From)	To	Duration		Obs. Data		SPU	Orbit/ Frame	Note	
			Days	Time	Yes	No				
External Calibration for the verification of the PRF table update by SOR	2025-07-08T12:08:18	2025-07-08T12:08:38	0d	00h00m20s	✓		B	06310D	This exteanl calibration was done for the verification of PRF table update.	C
HPT Software Auto restart (SWAR) during observation	2025-07-19T14:21:49	2025-07-19T15:20:10	0d	00h58m21s	✓*		B	06483A-06483F	*Observation was continued but RF is OFF in this period.	C
HPT Software Auto restart (SWAR) during observation	2025-08-14T18:29:11	2025-08-14T18:49:16	0d	00h20m05s	✓*		B	06890C-06890E	*Observation was continued but RF is OFF in this period.	
HPT Software Auto restart (SWAR) during observation	2025-08-14T18:49:58	2025-08-14T19:10:05	0d	00h20m07s		✓	B	06890E-06890F	*Observation was continued but RF is OFF in this period. The BOC that triggerred this SWAR occurred 42 seonds after restarting observation by the previous SWAR.	
HPT Software Auto restart (SWAR) during observation	2025-08-20T07:44:34	2025-08-20T08:04:41	0d	00h20m07s	✓*		B	06976F-06976H	*Observation was continued but RF is OFF in this period.	
HPT Software Auto restart (SWAR) during observation	2025-09-10T11:11:11	2025-09-10T11:31:16	0d	00h20m05s	✓*		B	07305F-07305H	*Observation was continued but RF is OFF in this period.	
HPT auto restart during observation	2025-09-10T11:32:52	2025-09-10T11:34:58	0d	00h02m06s	✓*		B	07305H	HPT-B auto restart is occurred (Operation based on design, not anomaly. *Observation was continued but RF is OFF in this period.	
HPT auto restart during observation	2025-09-21T04:08:36	2025-09-21T04:12:45	0d	00h04m09s	✓*		B	07472C	HPT-B auto restart is occurred (Operation based on design, not anomaly. *Observation was continued but RF is OFF in this period.	
HPT auto restart during observation	2025-10-10T12:40:38	2025-10-10T12:42:42	0d	00h02m04s	✓*		B	07773D	HPT-B auto restart is occurred (Operation based on design, not anomaly. *Observation was continued but RF is OFF in this period.	
～Continue the observation										

✓* : The observation data was obtained but RF was OFF during in this period.

✓** : Although the observation data was obtained, the accuracy of the Doppler velocity was not optimized because the IQ offset value setting was temporarily reset during this period. C

(✓): The observation data was obtained during part of this period.