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CPR L1b processor & product overview

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1. CPR L1b product release history and current version

CPR L1 Product release

- CPR observation started from June 12 2024, and CPR Level 1 product has been generated since then.
- Since Sep.20 2024, CPR L1b (vAe to vBb) product was released to the validation team for its initial validation.
- In December, JAXA including Japanese Scientists have confirmed that CPR L1product can be released to public.
- JAXA released CPR L1 product (vCa) to public 14th January. The reprocessing of the data from 12th June(#00227F) was completed.
- JAXA has released the CPR L1 product (vCb) from 13th January (#04483C~). This version is out of scope for reprocessing old data.

CPR L1 Product current Version (vCb)

- ProcessorVersion :2.1
- ExecutableVersion :2.1
- FormatVersion :0.14

2. CPR L1b product update points in vCb from vCa

- **Changes in vCb from vCa**

1. Modification of the radiometric values

- By reflecting the results of further external calibrations, the radiometric values (radar reflectivity, received echo power, etc.) increased by about 1.6 dB compared with vCa, and the modified values in vCb are more consistent with Cloudsat data. (*Details are described in next page)*

2. Modification of the "rayHeaderRangeBinSize"

- The values of the "rayHeaderRangeBinSize" included in Geo/ScienceData is correctly modified values as 99.93082m in vCb because this values in vCa was expressed as an ideal nominal values of 100.0m.

3. Modification of the "degradedQualityFlag"

- The "degradedQualityFlag" is an boolean flag to assess the overall product quality identifying the presence of significant errors within the product. The definition of the quality flags 0 and 1 was reversed in vCb (0: No degraded product, 1: Degraded product.)

2. CPR L1b product update points in vCb from vCa

➢ Modification of the radiometric values using CPR External Calibration results

■ Reflection of the results from External Calibration to L1b processing.

- Evolution of power calibration factors:

	vBa	vBb	vCa	vCb	Remark
Tx chain [dB]	N/A	N/A	-2.40	-1.94	
Rx chain [dB]	N/A	N/A	N/A	-2.06	
Subtotal [dB]	N/A	N/A	-2.40	-4.00	
Others [dB]	(TBC)	~+0.45	~+0.35	~+0.35	See notes*
Total [dB]	(TBC)	~+0.45	~-2.05	~-3.65	

* Notes: including receiver calibration figure which may vary depending on temperature.

- The update from vCa to vCb increased the echo power level by 1.6dB, resulting in a value even closer to the radar reflectivity of the CloudSat/CPR.

- The details of External calibration will be presented by NICT in this session.

3. CPR Major event history (After 1st validation WS in January)

➢ Major event history

- There are no Major update such as IQ offset changes, PRF table updates etc., after vCa release.
- The following table shows major events after the 1st validation WS in January. All histories from stat of the observation are listed in Table-1 of the CPR L1b release note (SEC-2024057 Rev.A)

Major events of EarthCARE/CPR (picked up after the 1st WS in January 2025)

Event	UTC(From)	To	Duration		Obs. Data		SPU	Orbit/ Frame	Note	
			D	Time	Y	N				
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.	A
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	A
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**	A
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.	A
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.	A
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**	A
~Cotinue the observation	2025-03-07T14:52:27	-								A

3. CPR Major event history (After 1st validation WS in January)

➢ Major event history

- 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.htm/

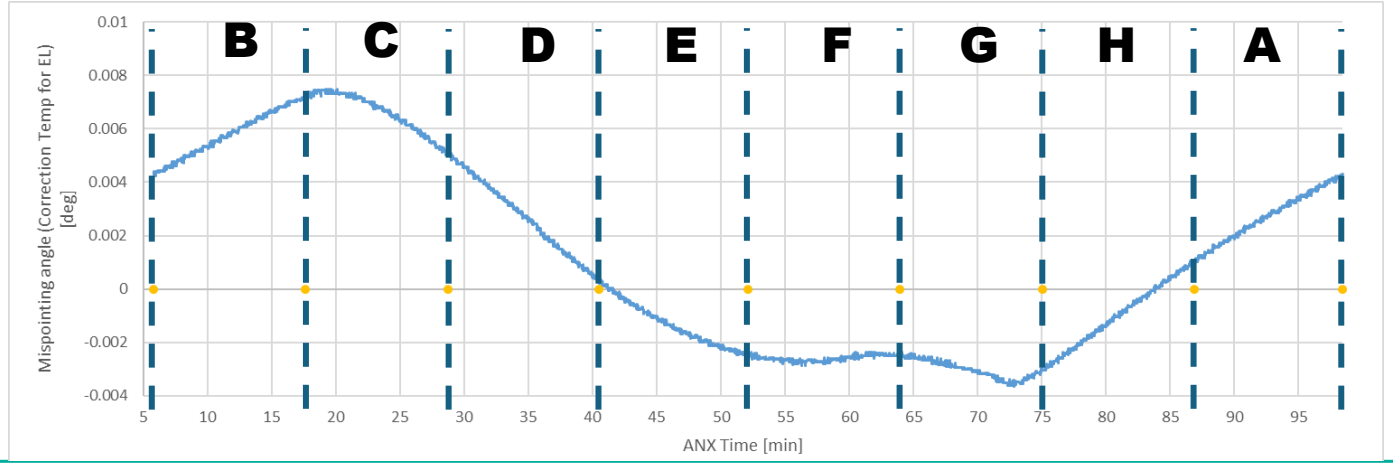
4. Antenna beam pointing correction

➢ L1b update plan related to antenna beam pointing correction

- In current L1b version (vCb), the antenna beam pointing correction (Elimination of the effects of thermal deformation) has not been implemented.
- The modified correction formula uses 3 types of MREF temperatures (temperature every second, average temperature for one full-orbit, and the average temperature for one day). JAXA has already quickly checked the effect of the correction (See next page).
- JAXA is currently evaluating whether the effect of the correction can be achieved the accuracy using 3 different-season data.
- After the evaluation of the correction formula, JAXA will start the modification of the function of the antenna beam pointing correction in L1b processor considering the impact to the L2 processor through the discussion in QWG.

Example of calculated miss-pointing angle during one orbit (about 92.5min) by the correction formula

from: 2024-08-07T11:1957
to: 2024-08-07T12:56:32

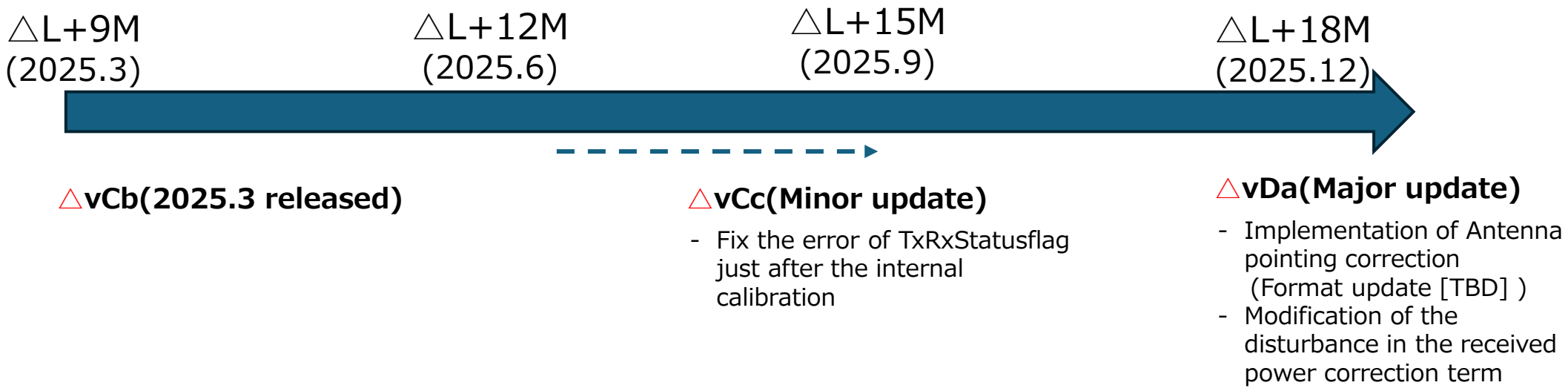


5. CPR L1b update schedule

- **Other known items should be updated.**
  - Disturbance in the received power correction term.
  - Error of TxRxStatusflag just after the internal calibration.

  *Details of these topics are described in the EarthCARE/CPR L1b release note (SEC-2024057 Rev.A)

- **Estimated Schedule.**



6. Target Accuracy check plan

Target Accuracy

JAXA has set target accuracy to be achieved by the end of the project (L+3Y), and JAXA and NICT will continue to verify the accuracy of the following items through calibration and validation work during routine operations. **JAXA plans to announce its first confirmation results by L+18.**

< Items to be verified (using 10km-integrated data)>

- Minimum detectable sensitivity : -35 dBz (pre-requisite)
- Received power, Radar reflectivity : < 2.7 dB
- Doppler Velocity : < 1.3m/s (under uniform clouds with radar reflectivity of -19 dBZ or more)