

PNT Moni Monthly Report

QZSS CLAS Performance Evaluation — Free Tier

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1 Revision History

Version	Date	Notes
1.0	2026-07-07	Initial edition
1.1	2026-07-07	Clarified PS-QZSS reference-value framing (no numerical change)
1.2	2026-07-08	Spatial-distribution colour scale changed to a continuous scale; methodology v1.0.1 (no numerical change)
1.3	2026-07-10	Visual redesign (unified brand system, ADR 0017); no numerical change. PDF moved to the new Typst cover
1.4	2026-07-11	Clarified TTFF measurement description (full filter reset to standalone; 30-second quantization); no numerical change
1.5	2026-07-18	Low-n cell display revision: blank suppression retired, low-n cells now shown with a dotted-ring reliability marking; methodology v1.0.2 (no numerical change)

Warning

Rapid edition: this report uses the **GSI Rapid series** (R5.1 from 2026-04 onward, R5 before that) as the reference coordinates. The Rapid series is a quick-look solution published 2–3 days after observation; once the Final series (F5/F5.1, published ~3 weeks after observation) is complete a **separate finalised edition will be issued**.

Rapid-vs-Final differences are usually at the mm level, but can widen briefly right after events such as earthquakes or equipment changes (methodology §3.2 / §8.5).

2 Introduction

This report summarises PNT Moni’s evaluation of QZSS CLAS (Centimeter Level Augmentation Service) performance for **June 2026**, using publicly available data and open-source tooling.

As an independent evaluation service for GNSS augmentation, PNT Moni continuously monitors CLAS performance at higher spatial and temporal resolution than the official Service Performance Report published by the Cabinet Office / Quasi-Zenith Satellite System Services Inc. (QSS). This monthly report complements the official semi-annual report, offering monthly cadence, an independent third-party assessment, and practically useful analytical depth. This Free-tier monthly report covers **national statistics only**; per-station analysis is provided in the **Pro tier**.

The “Methodology Version Tag” at the end of this report uniquely identifies the processing configuration that produced it. For the full methodology document see <https://pntmoni.com/methodology/clas/v1.0.2>.

3 Methodology

This section summarises the methodology; see the link above for the full document.

Data sources: 30-second RINEX observations from ~1,300 GEONET stations distributed by the Geospatial Information Authority of Japan (GSI) under PDL 1.0 (source: GSI GEONET data service), the CLAS L6 augmentation archive published on the web by QSS, and IGS broadcast ephemerides / Earth-rotation parameters from CDDIS.

Processing engine: pntmoni-claslib v0.8.3-pntmoni-1, PPP-RTK mode (*kinematic*, *l1+l2+l5*).

Reference coordinates: GSI daily coordinate solutions (the series matching the period — F5 era = ITRF2014, F5.1 era = ITRF2020; R5 / R5.1 when the Rapid series is used) are relativised to station 92110 (Tsukuba 1) and smoothed with a **±7-day (15 calendar-day) median filter** centred on the target day d (common-mode removal, Method B). Method version: gsi-daily-median15d-1.0.

Quality control (QC): teqc 2019Feb25 for 2026–2027, with migration to MRTKLIB’s `mrtk_qc` planned around 2027/Q4.

Statistical aggregation: 95% / 99% percentile errors are computed by **pooling the epoch errors of all stations and all days** in each aggregation cell (methodology §5.1, same rule as NAVIGATION 2026). TTFF uses a **15-minute reset** (continuity with NAVIGATION 2026, methodology §5.2); a 60-minute reset will be added in Phase 1.

Known structural differences from official QSS figures: PNT Moni’s methodology differs structurally from the official QSS Service Performance Report in four respects — sampling rate (30 s vs 1 s), a parameter set retuned for 30 s, CLASLIB version differences, and the resulting Kalman-filter behaviour. See [Shiono & Kubo \(2025, 2026\)](#). These are treated as **structural characteristics**, not bugs; comparing absolute values or equating the numbers is not meaningful (methodology §8.3). In direction, the lower epoch density at 30 s gives filter convergence and re-convergence intervals a relatively larger weight in the pooled statistics, pushing the tail percentiles (95% / 99%) **above**

the official evaluation. PS-QZSS standard values are accordingly used in this report as reference values only, never for compliance judgement (see the note in the Executive Summary).

3.1 Evaluation Network

CLAS divides the country into 12 networks; each station's network is determined by the Compact Network ID assigned by CLASLIB. Stations are further classified as **Inside Network** or **Outside Network** by a point-in-polygon test against the per-network polygons defined in the ION GNSS+ 2025 / NAVIGATION 2026 papers (Shiono & Kubo) — i.e. regions where augmentation is interpolated vs extrapolated. The network polygons below are updated only when the CLAS service area changes (rarely); the polygon version is recorded in the Methodology Version Tag at the end of this report.

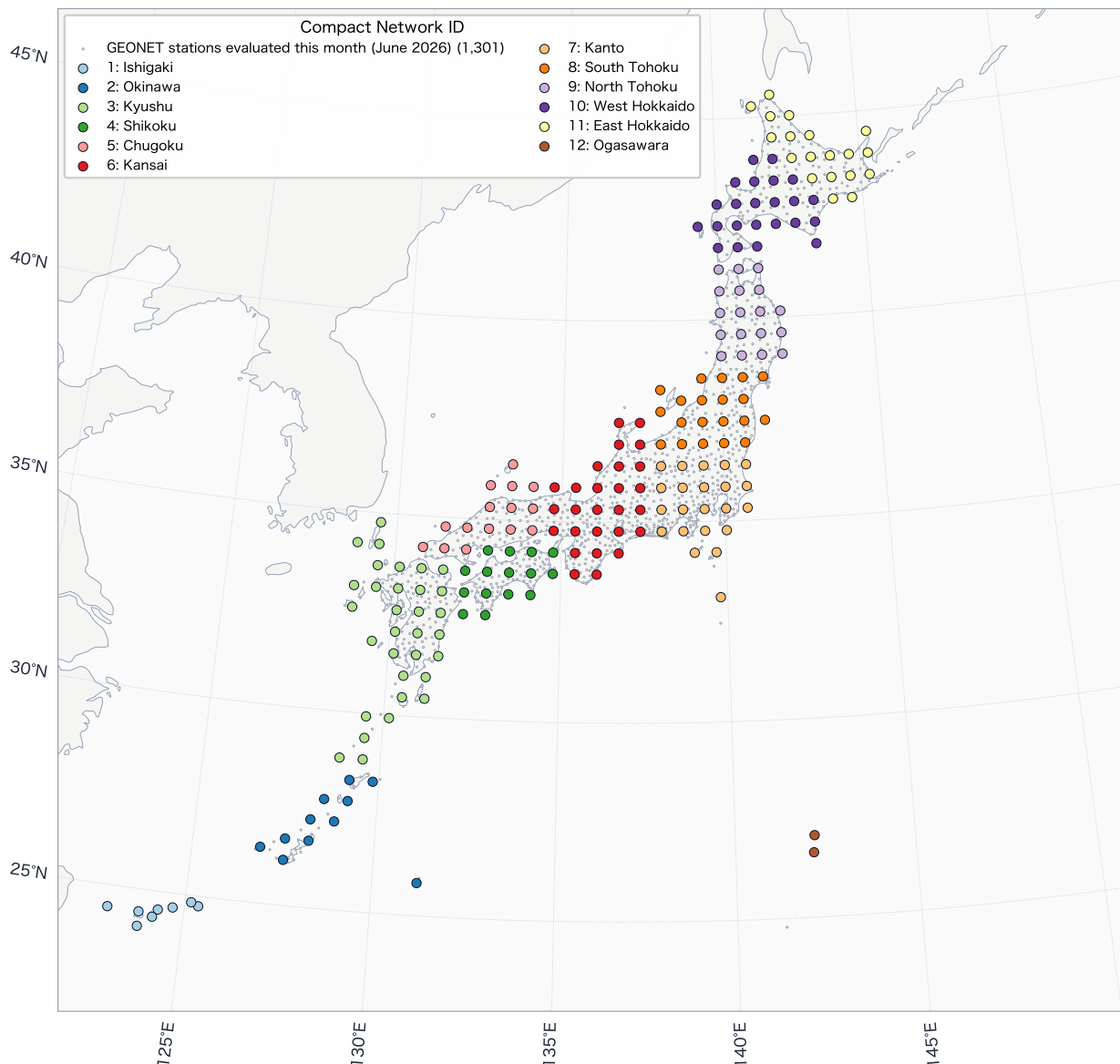


Figure 1: CLAS 12-network grid points and the GEONET stations evaluated this month.

The CLAS network polygons define the regions where the augmentation is intended to meet spec. Outside-Network stations receive corrections derived by extrapolation and may therefore have different error characteristics (Inside/Outside aggregate analysis is provided in the **Pro tier**).

4 Executive Summary

Table 1: Headline performance metrics.

	Metric	Value
0	Stations evaluated	1,115
1	Horizontal error 50% [cm]	2.50
2	Horizontal error 95% [cm]	13.28
3	Horizontal error 99% [cm]	22.81
4	Vertical error 95% [cm]	22.26
5	TTFF 50% [s, 15-min reset]	180.0
6	TTFF 95% [s, 15-min reset]	360.0
7	National fix rate (Q=4)	95.8 %

Highlights for June 2026:

- National horizontal error, 95th percentile: **13.28 cm**
- National vertical error, 95th percentile: **22.26 cm**
- TTFF (15-min reset, 95th percentile): **360.0 s**
- National fix rate (Q=4): **95.76%**
- L6 broadcast alerts: **0**

i Reading these values against the Performance Standard (PS-QZSS)

The QZSS Performance Standard (PS-QZSS) sets the CLAS kinematic positioning-accuracy standard at horizontal 95% 12 cm / vertical 95% 24 cm. Compliance with the standard is verified by QSS's official Service Performance Reports, whose evaluation is run under conditions that differ from this report's (1-s sampling, a fixed evaluation station set). PNT Moni's 30-s, ~1,100-station methodology (see Methodology) is known to produce structurally higher tail percentiles than the official evaluation ([Shiono & Kubo 2026, §4.1.2](#)). Whether a value in this report sits above or below a PS-QZSS standard value is therefore **not a compliance judgement**; the standard values appear in this report only as a reference scale (e.g. in the spatial distribution maps). Quantitative reconciliation against official figures is performed in the half-yearly Comparison Archive.

5 Performance

5.1 National Overview

5.1.1 Error Distribution

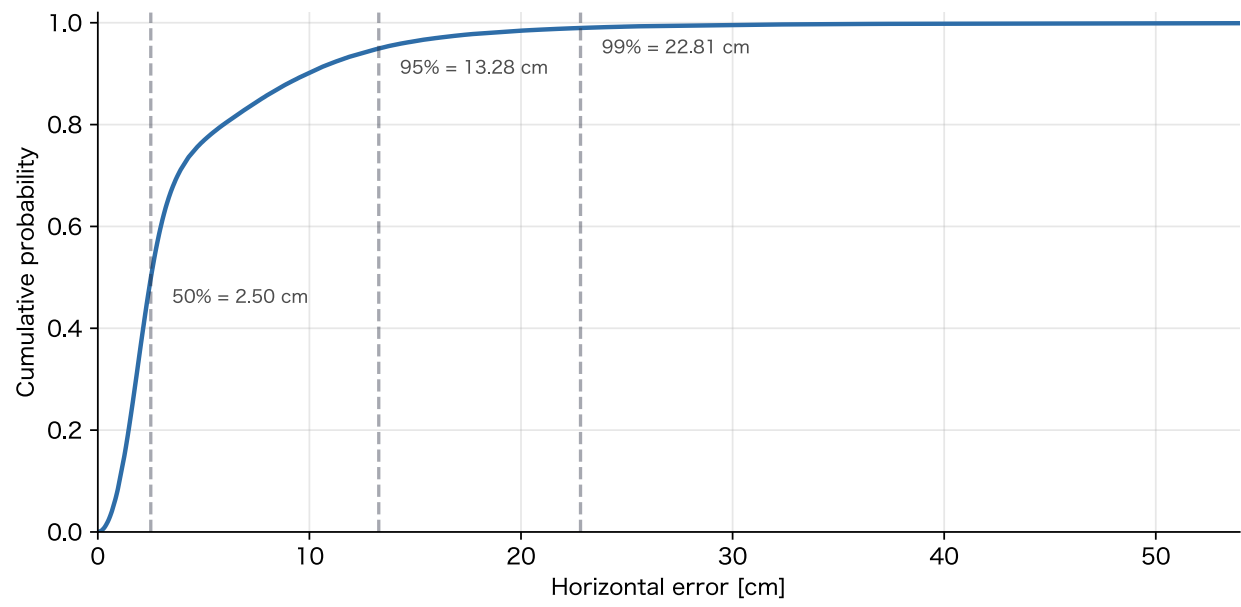


Figure 2: Cumulative distribution of horizontal error (epochs pooled over qualified stations).

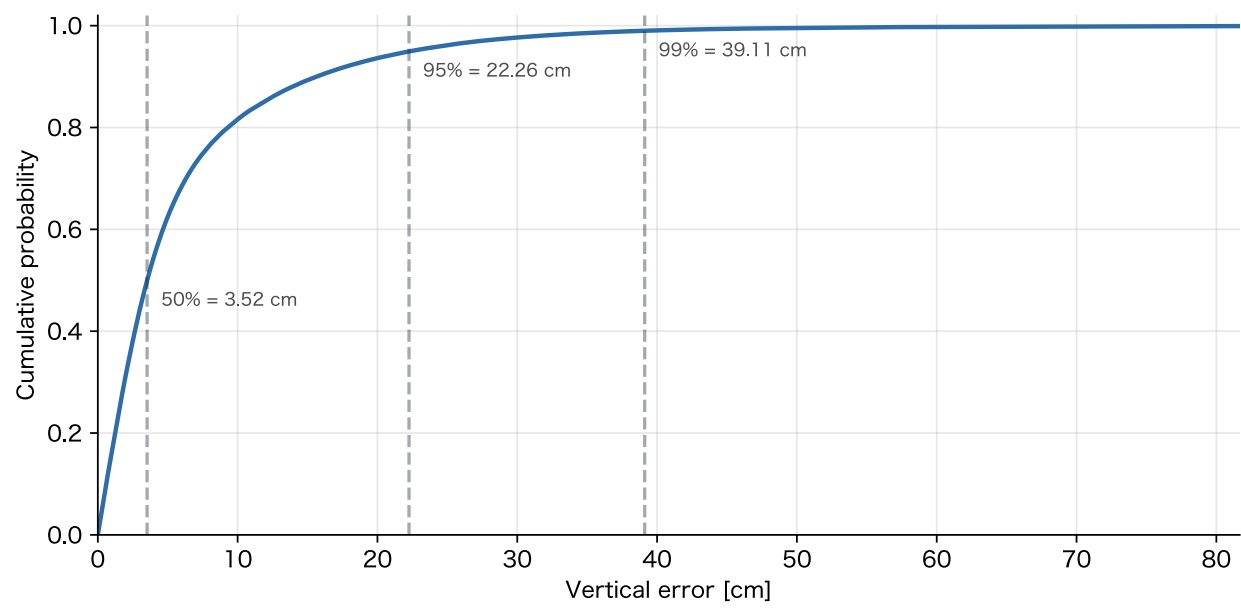


Figure 3: Cumulative distribution of vertical error (epochs pooled over qualified stations).

Table 2: TTFF percentiles (15-min reset, qualified stations, all days).

	Percentile	TTFF [s]
0	50%	180.0
1	90%	270.0
2	95%	360.0
3	99%	660.0

June 2026: TTFF success rate **93.83 %** (100,169/106,752 reset windows obtained a valid fix). At each reset the filter state is fully cleared and the solution re-initialized to standalone; TTFF is the time from that reset to the first fixed solution, recorded on the 30-second observation grid. A fix at the first epoch after reset is therefore recorded as 0 s (true TTFF $\leq$ 30 s), which is why P50/P95 are often 0 s; P99 reflects the convergence tail.

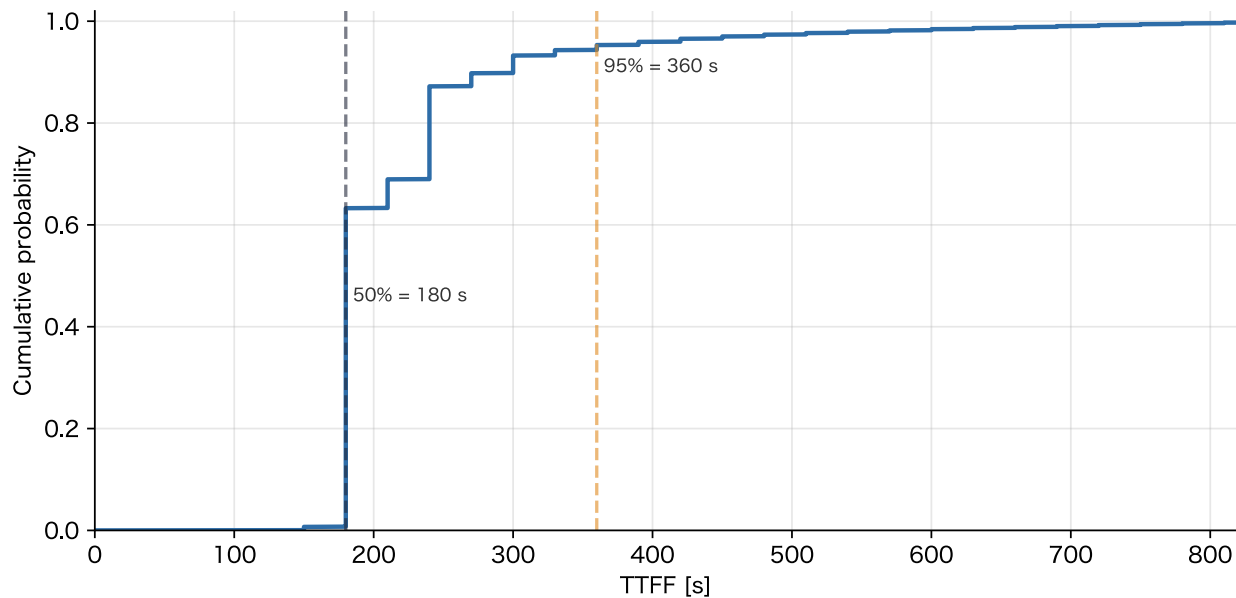


Figure 4: Cumulative distribution of TTFF (15-min reset, reset windows pooled nationwide over the period).

5.1.2 Spatial Distribution

Performance is visualised on hexagonal cells sized to the CLAS augmentation grid spacing (~60 km). Each cell's value is the **95th percentile computed over all stations and all epochs pooled within that cell** (same rule as methodology §5.1). Cells with no stations remain blank. **Cells backed by fewer than 3 distinct stations are drawn with a dotted inner ring** — a reliability marking: with so few stations the cell's percentile is statistically thin and station-local effects (multipath environment, antenna snow accretion) can colour the whole cell, so read those cells as indicative rather than representative (methodology §5.1, 2026-07-18 revision). Southern-island stations outside the CLAS service area (`out_of_service`) are excluded from cell evaluation.

Colour encodes error magnitude on a **perceptually-uniform continuous colormap** (purple = smaller error → yellow = larger error), with **no discrete boundaries** — the map shows the spatial gradient of performance, not a pass/fail classification. The scale spans a fixed range (0–40 cm horizontal, 0–60 cm vertical) set from PNT Moni's own historical error range, so maps stay comparable month to month; this range is **not** a Performance-Standard threshold and the colouring is **not** a compliance judgement (see Methodology and the Executive Summary note). Cells exceeding the range render at the top colour (colorbar top arrow).

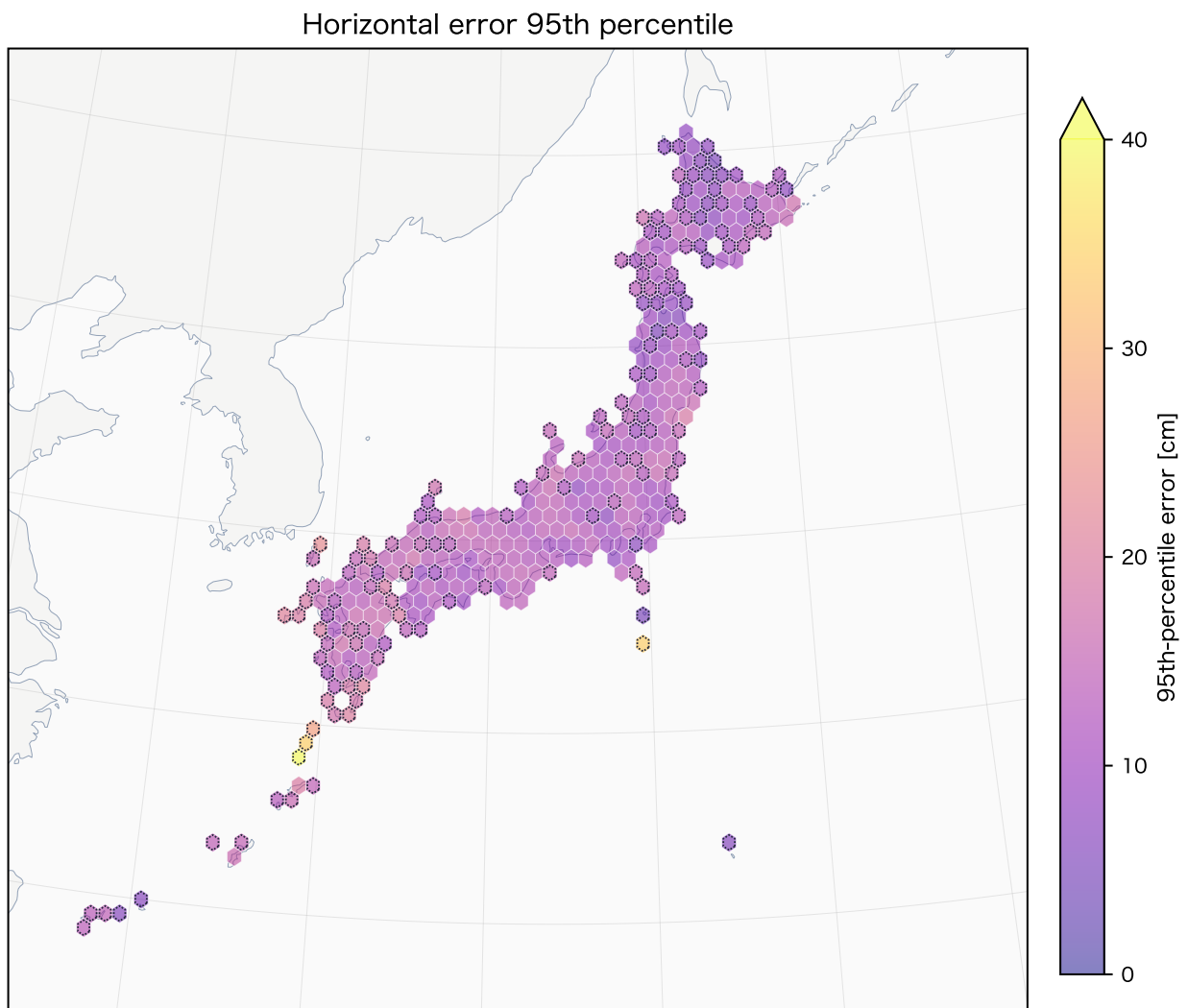


Figure 5: Spatial distribution of the horizontal-error 95th percentile (60 km hex cells, epochs pooled).
Dotted ring = cell backed by fewer than 3 stations (indicative).

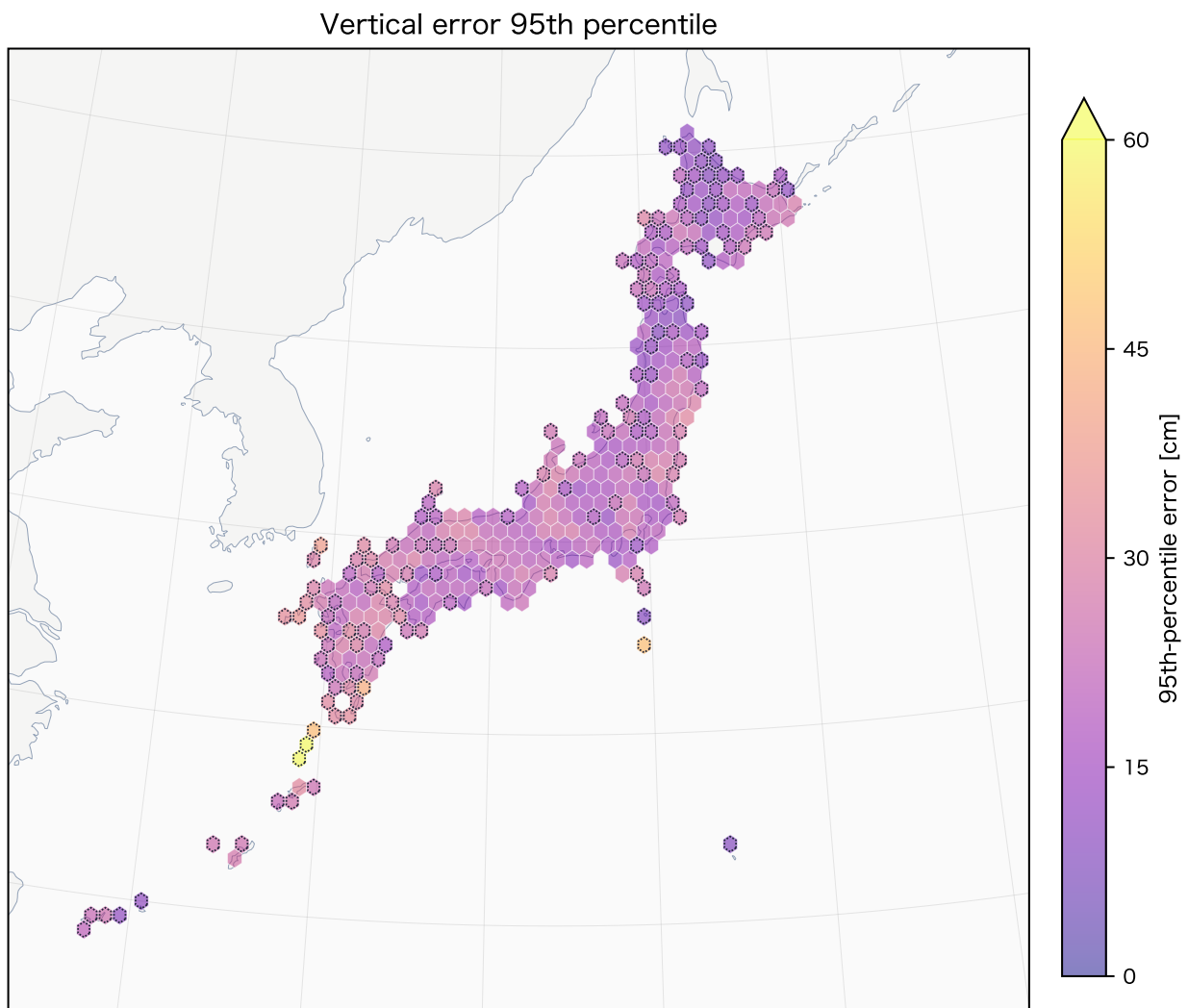


Figure 6: Spatial distribution of the vertical-error 95th percentile (60 km hex cells, epochs pooled).
Dotted ring = cell backed by fewer than 3 stations (indicative).

5.1.3 Recent-Month Trend

Coming Soon. This section will show the past 13 months of national 95th-percentile horizontal/vertical error, with the current month highlighted and a comparison marker for the same month last year. The trend view becomes meaningful once the Phase 0 / Phase 1 backfill has filled in everything from April 2025 onward; until then the table above shows the current month's values only.

5.2 Cross-Validation

i Note

Coming Soon (Phase 1+)

Cross-validation will report agreement statistics between the primary CLASLIB-based processing and the parallel evaluation engine MRTKLIB on a sample of ~100 stations. It demonstrates that PNT Moni's evaluation agrees across independent OSS implementations, in preparation for making MRTKLIB primary in 2027/Q4.

Phase 1 goal: publish cross-validation on the parallel sample stations. Phase 2 goal (2027/Q4): role reversal — MRTKLIB primary, CLASLIB as historical reference.

6 Data Availability

6.1 Overview

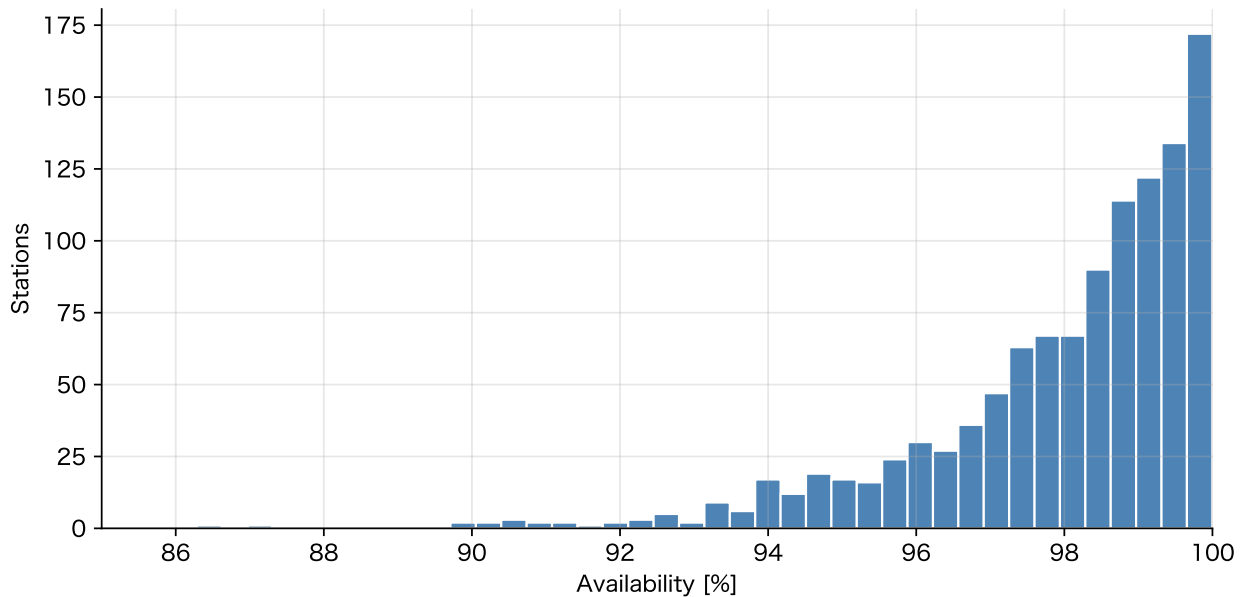


Figure 7: Distribution of data availability across stations.

National-statistics availability for June 2026: **95.8%**.

GEONET maintenance events affecting availability: no major maintenance events are recorded for June 2026.

For the latest GEONET maintenance notices see GSI's official notices page (<https://terras.gsi.go.jp/>).

7 Anomaly Detection

7.1 L6 Broadcast Alerts

The L6 broadcast Alert flag, carried in the CLAS augmentation stream (CSSR data part), signals a known issue detected on the generation side. This section aggregates it monthly to surface the broadcaster's self-reported health.

June 2026: 0 alerts across all L6 broadcasts (no message had the Alert flag set).

8 Appendix

8.1 GNSS System Notices: NAGU / NANU / NAQU

Notices issued against GNSS constellation operations during June 2026, recorded for cross-referencing against anomaly events and signal availability.

Table 3: GNSS system notices within the reporting period.

	Date	Satellite	Notice	Type	Severity
0	2026-06-04 02:59 UTC	QZS PRN200	NAQU 2026174, NAQU 2026184	scheduled_ maintenance	total
1	2026-06-04 06:00 UTC	GPS PRN17	NANU 2026045, NANU 2026046	scheduled_ maintenance	total
2	2026-06-08 04:16 UTC	QZS PRN205	NAQU 2026186, NAQU 2026188	other	partial
3	2026-06-08 04:17 UTC	QZS PRN195	NAQU 2026185, NAQU 2026187	other	partial
4	2026-06-18 19:59 UTC	QZS PRN195	NAQU 2026189, NAQU 2026195	scheduled_ maintenance	total
5	2026-06-15 03:59 UTC	QZS PRN199	NAQU 2026190, NAQU 2026191	scheduled_ maintenance	total
6	2026-06-18 06:00 UTC	GAL	NAGU 2026034, NAGU 2026039	scheduled_ maintenance	informational
7	2026-06-17 08:00 UTC	GAL	NAGU 2026035, NAGU 2026037	scheduled_ maintenance	informational
8	2026-06-17 08:00 UTC	GAL	NAGU 2026036, NAGU 2026038	scheduled_ maintenance	informational
9	2026-06-23 02:59 UTC	QZS PRN200	NAQU 2026192, NAQU 2026198	scheduled_ maintenance	total

	Date	Satellite	Notice	Type	Severity
10	2026-06-16 08:01 UTC	QZS	NAQU 2026193, NAQU 2026194	other	partial
11	2026-06-20 15:01 UTC	QZS	NAQU 2026196, NAQU 2026197	other	partial
12	2026-06-22 08:05 UTC	GAL	NAGU 2026040	other	total
13	2026-06-26 16:12 UTC	GPS PRN11	NANU 2026048, NANU 2026049	other	total
14	2026-06-28 17:48 UTC	QZS PRN200	NAQU 2026200, NAQU 2026202	other	partial
15	2026-06-28 17:48 UTC	QZS PRN210	NAQU 2026199, NAQU 2026201	other	partial

June 2026: **16 notice(s)** detected. Collected from the official NAGU (Galileo), NANU (GPS) and NAQU (QZSS) notices.

8.2 List of Satellites

A **snapshot of the constellation operators' official pages** (state at fetch time). Sources: GPS = USCG NAVCEN, QZSS = QSS DoD, Galileo = GSC Europa.

Fetchd at: 2026-07-07 11:13 UTC

8.2.1 GPS

Table 4: GPS satellite constellation status.

	PRN	SVN	Block	Slot	Clock	Status	Notice
0	G16	56	IIR	B1	RB	Operational	FCSTSUMM
1	G29	57	IIR-M	C1	RB	Operational	FCSTSUMM
2	G02	61	IIR	D1	RB	Operational	FCSTSUMM
3	G24	65	IIF	A1	RB	Unusable	UNUSABLE
4	G03	69	IIF	E1	RB	Operational	FCSTDV
5	G32	70	IIF	F1	RB	Operational	FCSTDV
6	G31	52	IIR-M	A2	RB	Operational	FCSTSUMM

	PRN	SVN	Block	Slot	Clock	Status	Notice
7	G15	55	IIR-M	F2	RB	Operational	FCSTSUMM
8	G25	62	IIF	B2	RB	Operational	FCSTSUMM
9	G27	66	IIF	C2	RB	Operational	FCSTSUMM
10	G10	73	IIF	E2	RB	Operational	FCSTSUMM
11	G01	80	III	D2	RB	Unusable	UNUSABLE
12	G22	44	IIR	B3	RB	Operational	FCSTSUMM
13	G05	50	IIR-M	E3	RB	Operational	FCSTSUMM
14	G30	64	IIF	A3	RB	Operational	FCSTSUMM
15	G09	68	IIF	F3	RB	Operational	FCSTSUMM
16	G08	72	IIF	C3	RB	Operational	FCSTSUMM
17	G07	48	IIR-M	A4	RB	Operational	FCSTSUMM
18	G17	53	IIR-M	C4	RB	Operational	FCSTSUMM
19	G12	58	IIR-M	B4	RB	Operational	FCSTSUMM
20	G06	67	IIF	D4	RB	Operational	FCSTDV
21	G04	74	III	F4	RB	Operational	FCSTDV
22	G13	43	IIR	A5	RB	Decommissioned	DECOM
23	G20	82	III	F5	RB	Operational	FCSTSUMM
24	G19	59	IIR	C5	RB	Operational	FCSTSUMM
25	G26	71	IIF	B5	RB	Operational	FCSTSUMM
26	G23	76	III	E5	RB	Operational	FCSTSUMM
27	G11	78	III	D5	RB	Unusable	UNUSABLE
28	G21	81	III	E6	RB	Operational	FCSTSUMM
29	G18	75	III	D6	RB	Operational	FCSTSUMM
30	G14	77	III	B6	RB	Operational	FCSTSUMM
31	G28	79	III	A6	RB	Unusable	UNUSABLE

8.2.2 QZSS (Michibiki)

Table 5: QZSS satellite constellation status.

	PRN	SVN	Block	Signals	Status	Notice
0	J194	002	II-Q	L1C/A, L1C, L2C, L5, L1S, L5S, L6D, L6E	Operational	
1	J199	003	II-G	L1C/A, L1C, L2C, L5, L1S, L5S, L1Sb, L6D, L6E,...	Outage	NAQU 2026203
2	J195	004	II-Q	L1C/A, L1C, L2C, L5, L1S, L5S, L6D, L6E	Operational	

	PRN	SVN	Block	Signals	Status	Notice
3	J196	005	II A-Q	L1C, L2C, L5, L1C/B, L1S, L5S, L6D, L6E	Operational	
4	J200	007	III-G	L1C, L5, L1C/B, L5S, L1Sb, L6D, L6E	Operational	

8.2.3 Galileo

Table 6: Galileo satellite constellation status.

	E#	GSAT	Clock	Status	Notice
0	E11	GSAT0101	RAFS	Operational	
1	E12	GSAT0102	RAFS	Operational	
2	E19	GSAT0103	RAFS	Operational	
3	E18	GSAT0201	PHM	Unusable	GENERAL 2021008
4	E14	GSAT0202	RAFS	Unusable	GENERAL 2021008
5	E26	GSAT0203	PHM	Operational	
6	E22	GSAT0204	RAFS	Unusable	GENERAL 2017045
7	E30	GSAT0206	PHM	Operational	
8	E07	GSAT0207	PHM	Operational	
9	E08	GSAT0208	PHM	Operational	
10	E09	GSAT0209	RAFS	Operational	
11	E01	GSAT0210	RAFS	Unusable	GENERAL 2023048
12	E02	GSAT0211	PHM	Operational	
13	E03	GSAT0212	PHM	Operational	
14	E04	GSAT0213	RAFS	Operational	
15	E05	GSAT0214	PHM	Operational	
16	E21	GSAT0215	PHM	Operational	
17	E25	GSAT0216	PHM	Operational	
18	E27	GSAT0217	PHM	Operational	
19	E31	GSAT0218	PHM	Operational	
20	E36	GSAT0219	PHM	Operational	
21	E13	GSAT0220	PHM	Operational	
22	E15	GSAT0221	PHM	Operational	
23	E33	GSAT0222	PHM	Operational	
24	E34	GSAT0223	PHM	Operational	
25	E10	GSAT0224	PHM	Operational	
26	E29	GSAT0225	PHM	Operational	
27	E23	GSAT0226	PHM	Operational	

	E#	GSAT	Clock	Status	Notice
28	E06	GSAT0227	PHM	Operational	
29	E16	GSAT0232	PHM	Operational	
30	E28	GSAT0233	PHM	Operational	
31	E32	GSAT0234		Commissioning	LAUNCH 2025061

PNT Moni's evaluation also covers the Galileo signals received at GEONET stations.

8.3 Methodology Version Tag

Item	Value
Methodology version	1.0.2
Pipeline config hash	1cc762826566ae71
Engine	pntmoni-claslib v0.8.3-pntmoni-1
QC tool	teqc 2019Feb25
Reference-coordinate method version	gsi-daily-median15d-1.0
Evaluation stream	rapid
Reporting period	June 2026
Data mode	trial

For the full methodology document see <https://pntmoni.com/methodology/clas/v1.0.2>.

Note

Sources & terms of use: GEONET data is distributed by GSI under PDL 1.0 (source: GSI GEONET data service). The official QSS Service Performance Report is governed by the [Government Standard Terms of Use v2.0](#).

About PNT Moni: PNT Moni is an independent service providing continuous evaluation of GNSS augmentation, starting from QZSS CLAS. The monthly report complements the official semi-annual report in cadence, independence and analytical depth; a semi-annual Comparison Archive synced to the official cycle is provided separately.

Contact: hello@pntmoni.com · <https://pntmoni.com>