

IGS ACC Update

- NASA, GA and MIT
 - With contributions from NRCAN, NRL and GFZ
- IGS Workshop 2026

2025 – 2028 ACC Partnership

- Operations Leads
 - Taylor Yates
 - Salim Masoumi
- Contributors
 - Rivers Lamb
 - Joshua Thuman
 - Tom Herring

2025 – 2028 ACC Partnership

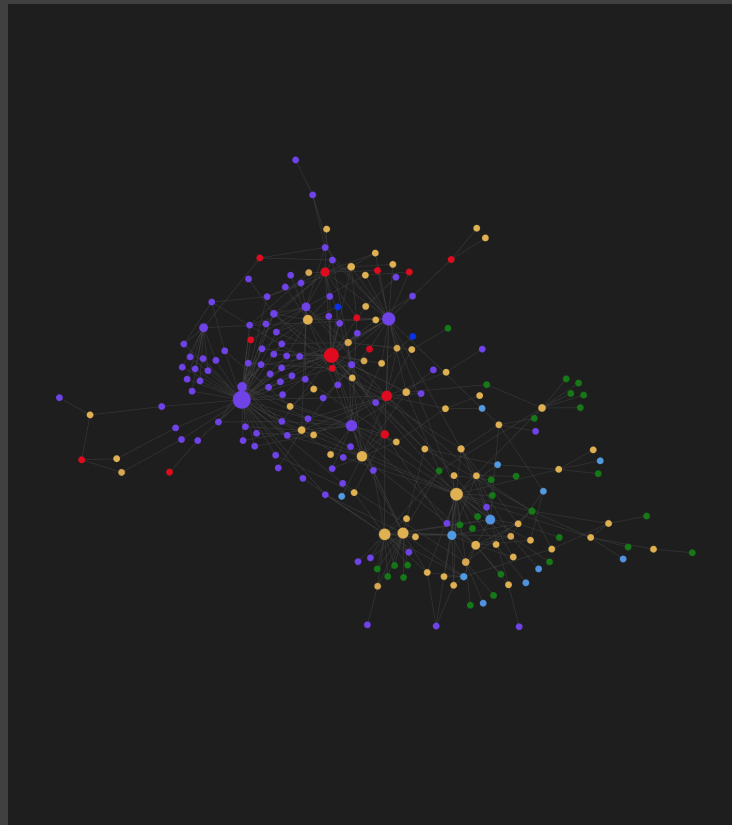
- ACC Transition and Multi-GNSS Phases:
 - Creation of new ACC team
 - Transition primary operations to NASA
 - Progression towards an operational Multi-GNSS ACC
 - Multi-GNSS operational products
 - Long-term evolution of the ACC
 - Improve reliability of process
 - Improve visualization of results

2025 – 2028 ACC Partnership

- ACC Transition and Multi-GNSS Phases:
 - Creation of new ACC team
 - Transition primary operations to NASA
 - Progression towards an operational Multi-GNSS ACC
 - Multi-GNSS operational products
 - Long-term evolution of the ACC
 - Improve reliability of process
 - Improve visualization of results

Legacy Software Improvements

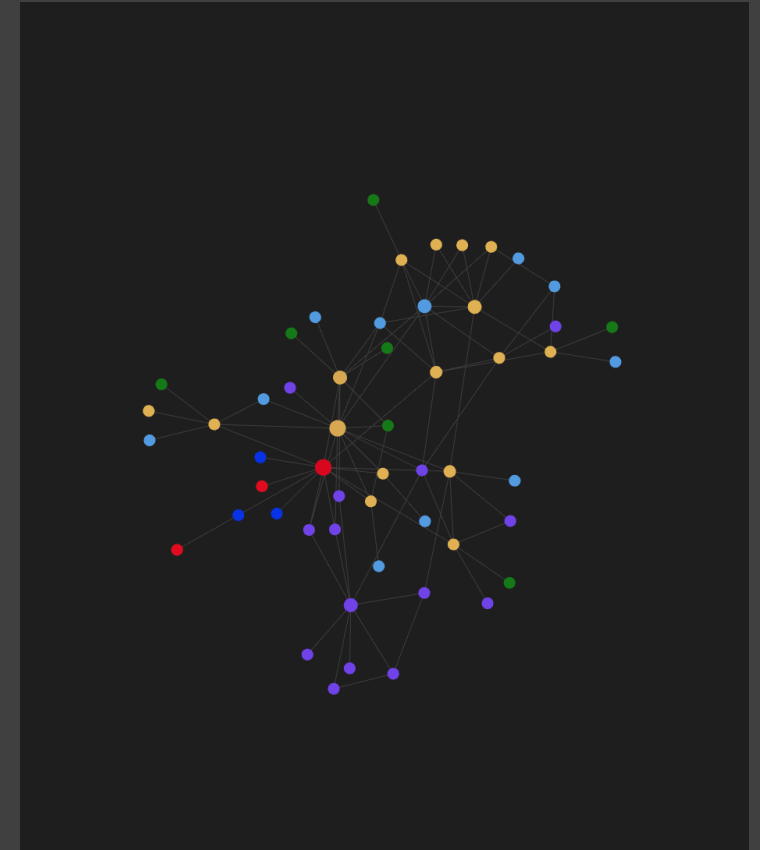
- Shell, Awk and Perl refactored to Python with error handling
 - Improved reliability, maintainability and security



Before (cronjobs in red)

Lines Before	Language	Lines After
3,000	Python	5,000
21,000	Shell	8,000
11,000	Awk	500
54,000	Perl	8,000
60,000	FORTTRAN	60,000

FORTTRAN will be replaced
with Python for Multi-GNSS



After (cronjobs in red)

Software Improvements (continued)

- Downloads now self troubleshoot
 - Sourced from multiple datacenters
 - Retries download if bad checksum
 - Alerts the operations team in case of repeated issue
 - This reduces exposure to HTTPS or datacenter issues
- Logging system with millisecond telemetry
 - Helpful for diagnosing any issues and finding silent errors

```
2026-04-24 02:58:02,499|INFO|170|input_prep| starting input prep for ultra 20261130000
2026-04-24 02:58:02,499|INFO|172|input_prep| copying erp finals to erp_bull
2026-04-24 02:58:02,503|INFO|450|update_orbit_weight| updating orbit weights file
2026-04-24 02:58:02,503|DEBUG|457|update_orbit_weight| copying .wht to .wht.save
2026-04-24 02:58:02,516|DEBUG|461|update_orbit_weight| reading last line of .wht
2026-04-24 02:58:02,528|DEBUG|465|update_orbit_weight| last line: 61153.750 2415 4 2026 04 23
2026-04-24 02:58:02,528|DEBUG|469|update_orbit_weight| last epoch in file: 61153.75
2026-04-24 02:58:02,528|INFO|479|update_orbit_weight| copying last line's weights to new epoch
```

Logging example

Software Improvements (continued)

- Separate VMs for Ultra / Rapid / Final
 - Each capable of acting as fail safe for the others in case of issues
- Source Control and testing environments
 - Protects from unforeseen errors when introducing software updates
- NASA Cloud Environment
 - Enhanced cybersecurity with strict policies and patching schedules

Legacy Software Results

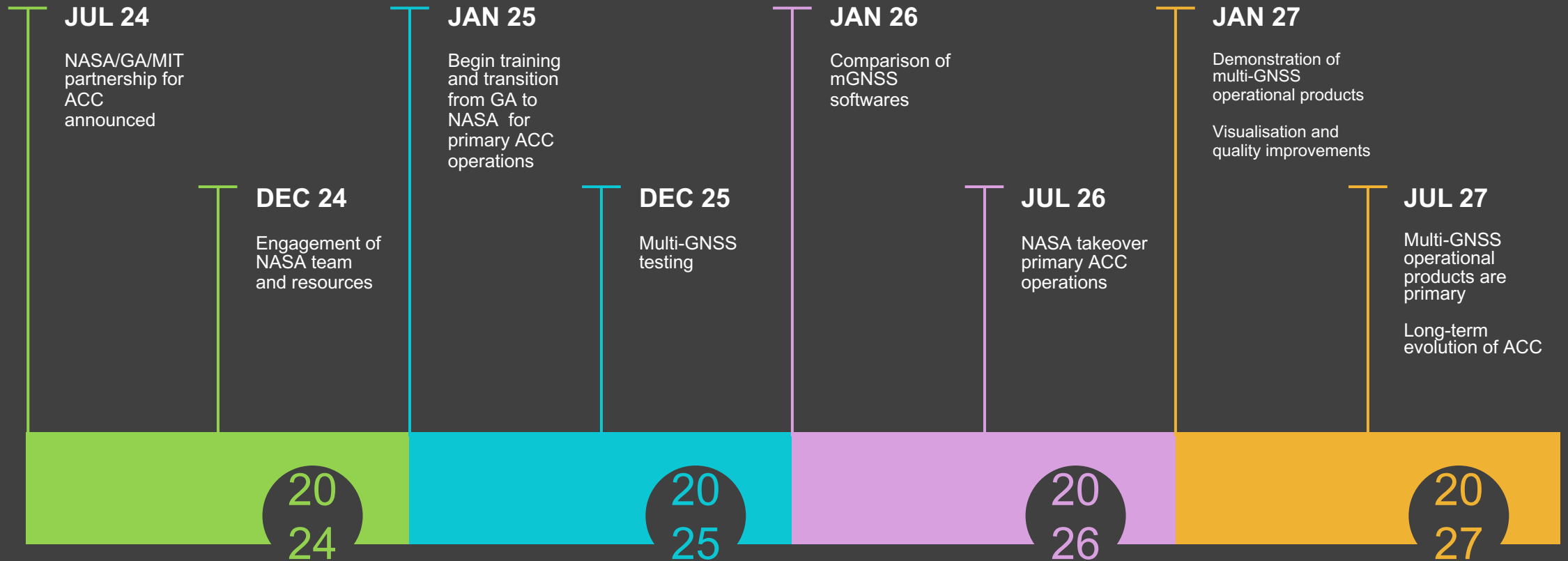
- Results comparable to those produced by GA

COMBINATION OF IGS PROCESSING ORBITS												
GPS week: 2412 Day: 2 MJD: 61130.000 Length: 1.0 day(s)												
PRN	cod	emr	esa	gfz	grg	igs	jgx	jpl	mit	ngs	sio	SIGMA
1X	1	1	1	---	1	0	1	1	1	2	2	1
2	1	1	1	1	1	0	1	1	1	1	2	0
3	1	1	1	1	1	0	1	1	1	1	1	0
4	1	1	1	1	1	0	1	1	1	1	1	0
5	1	1	1	1	1	0	1	1	1	1	1	0
6	1	1	1	1	1	0	1	1	1	1	1	0
7	1	1	1	1	1	0	1	1	1	2	1	0
8	1	1	1	1	1	0	1	0	1	1	1	0
9	1	1	1	1	1	0	1	1	1	1	1	0
10	1	1	1	1	1	0	1	1	1	1	2	0
11	1	1	1	1	1	0	1	1	1	1	2	0
12	1	1	1	2	1	0	1	1	2	1	3	1
13	1	1	1	1	1	0	1	1	1	1	1	0
14	1	1	1	1	1	0	1	1	1	2	1	0
15	0	1	1	0	1	0	1	1	1	1	1	0
16	1	1	1	1	2	0	1	1	1	1	1	0
17	0	1	1	1	1	0	1	0	1	1	1	0
18	1	1	1	1	1	0	1	2	1	1	1	0
19	0	1	1	1	1	0	1	1	1	1	1	0
20	1	1	1	1	1	0	0	1	1	1	1	0
21	1	1	0	1	1	0	1	1	1	1	1	0
22	0	1	1	1	1	0	1	1	1	1	1	0
23	1	1	1	1	1	0	1	2	1	1	2	0
24	0	1	1	1	1	0	1	1	1	1	1	0
25	1	1	1	1	2	0	1	1	1	1	1	0
26	1	1	1	2	2	0	1	1	1	1	1	0
27	1	1	1	1	1	0	1	1	1	1	1	0
28	0	1	0	1	1	0	1	1	1	1	1	0
29	1	1	0	1	1	0	1	1	1	1	2	0
30	1	1	1	1	1	0	1	1	1	2	1	0
31	1	1	1	1	1	0	1	1	1	1	1	0
32	0	1	1	1	1	0	1	1	1	1	1	0
WGT	1	1	1	1	---	---	---	1	1	---	---	---
RMS	1	1	1	1	1	0	1	1	1	1	1	---
WRMS	1	1	1	1	1	0	1	1	1	1	1	---

Remaining Work

- Validate automated clock exchange with NRL for Rapids / Finals
- Implement automated emails using the account acc@igs.org
- Begin automated uploads to datacenters
- Website graphics
 - Dependent on IGS Website transition to a nasa.gov address

TIMELINE



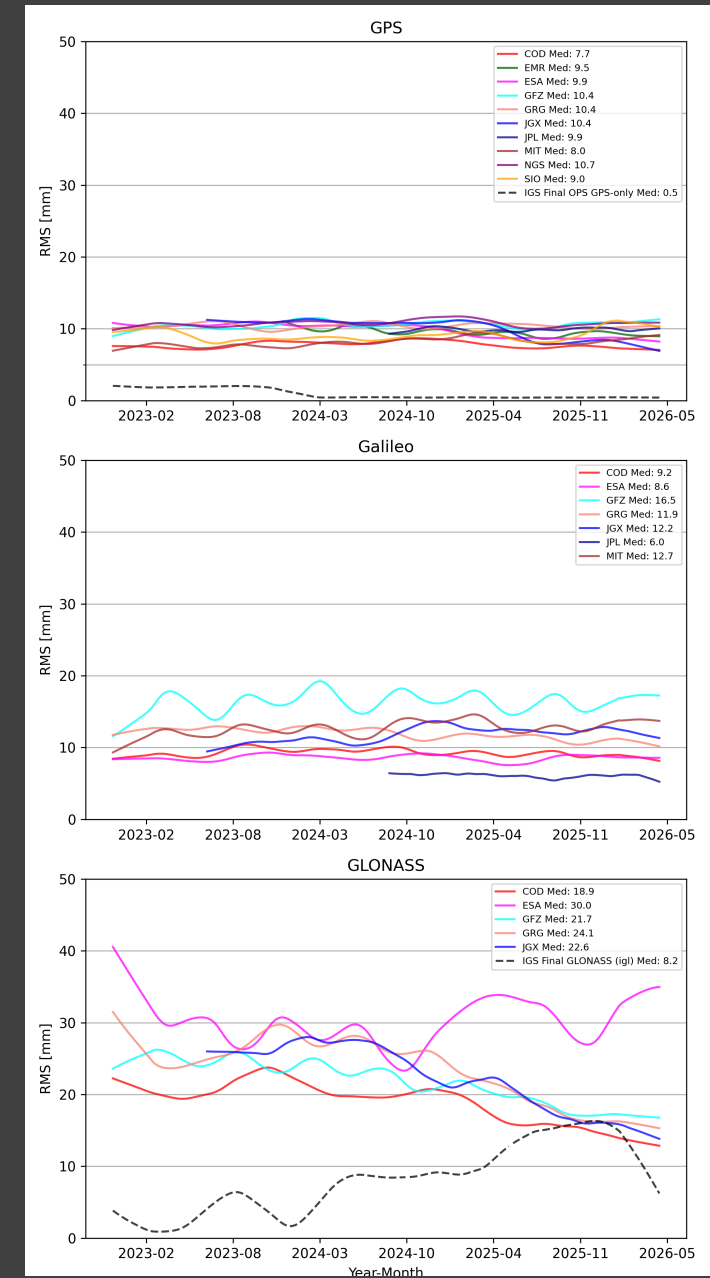
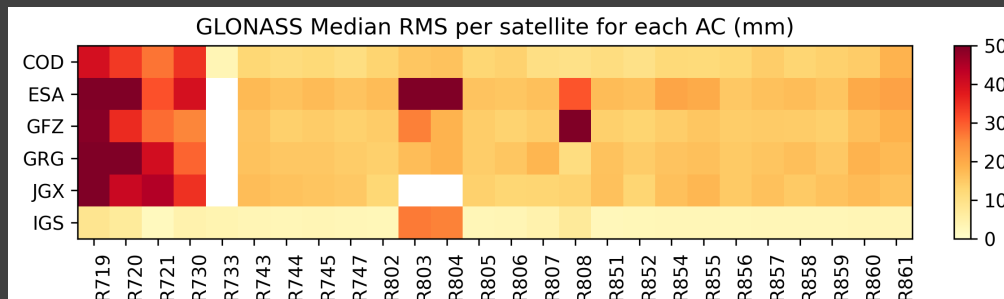
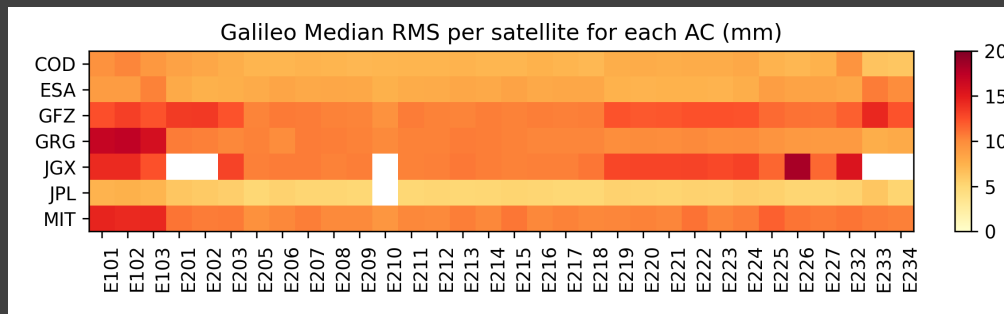
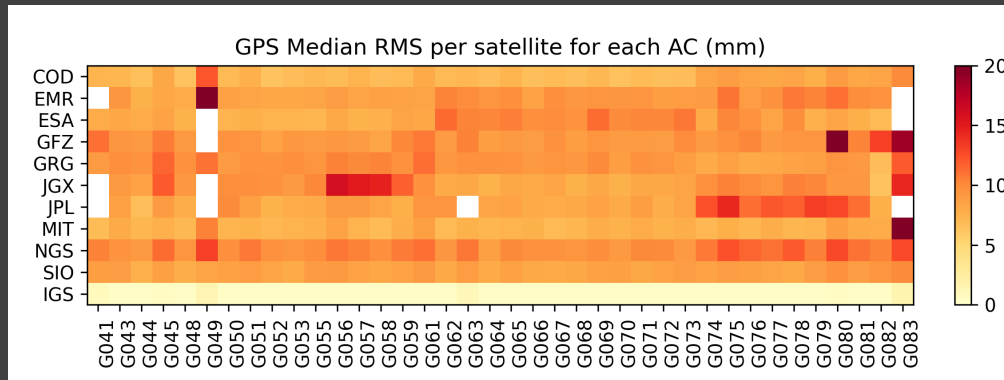
2025 – 2028 ACC Partnership

- ACC Transition and Multi-GNSS Phases:
 - Creation of new ACC team
 - Transition primary operations to NASA
 - Progression towards an operational Multi-GNSS ACC
 - Multi-GNSS operational products
 - Long-term evolution of the ACC
 - Improve reliability of process
 - Improve visualization of results

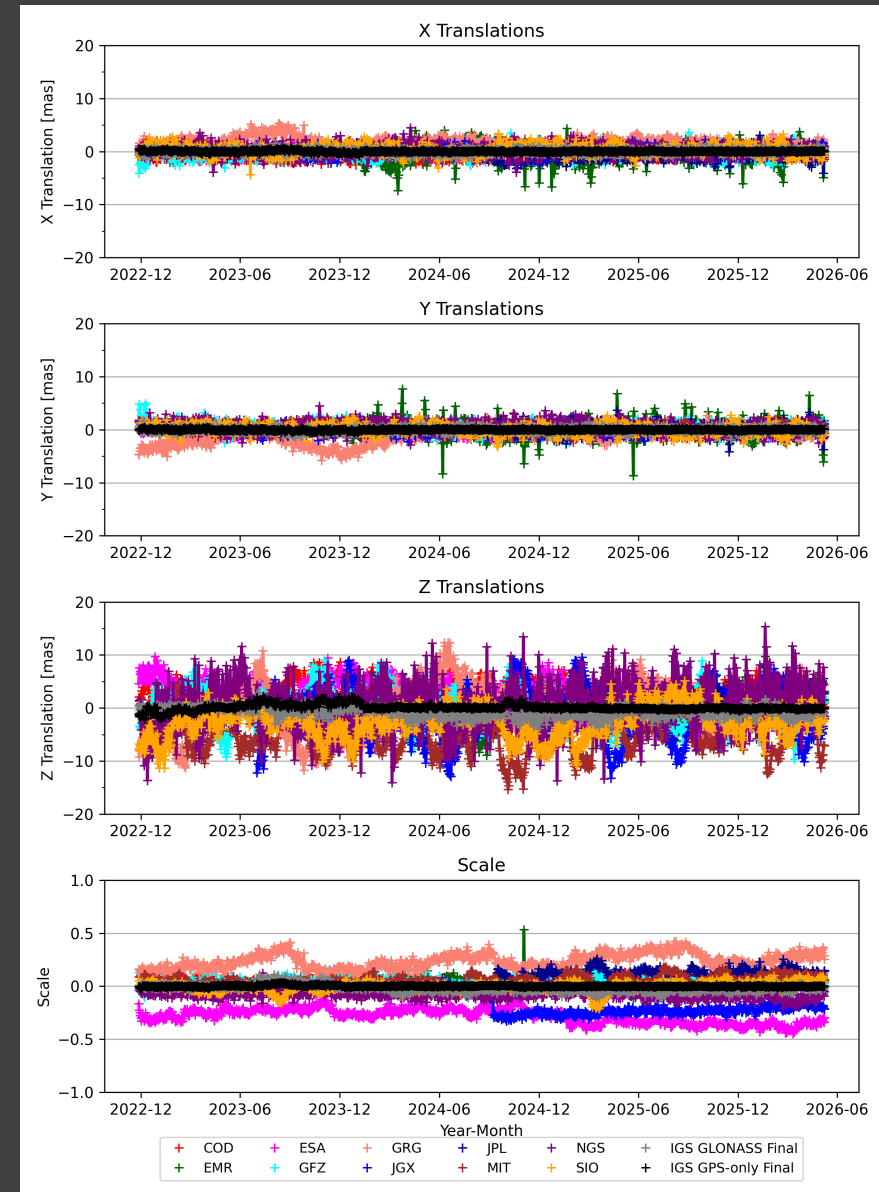
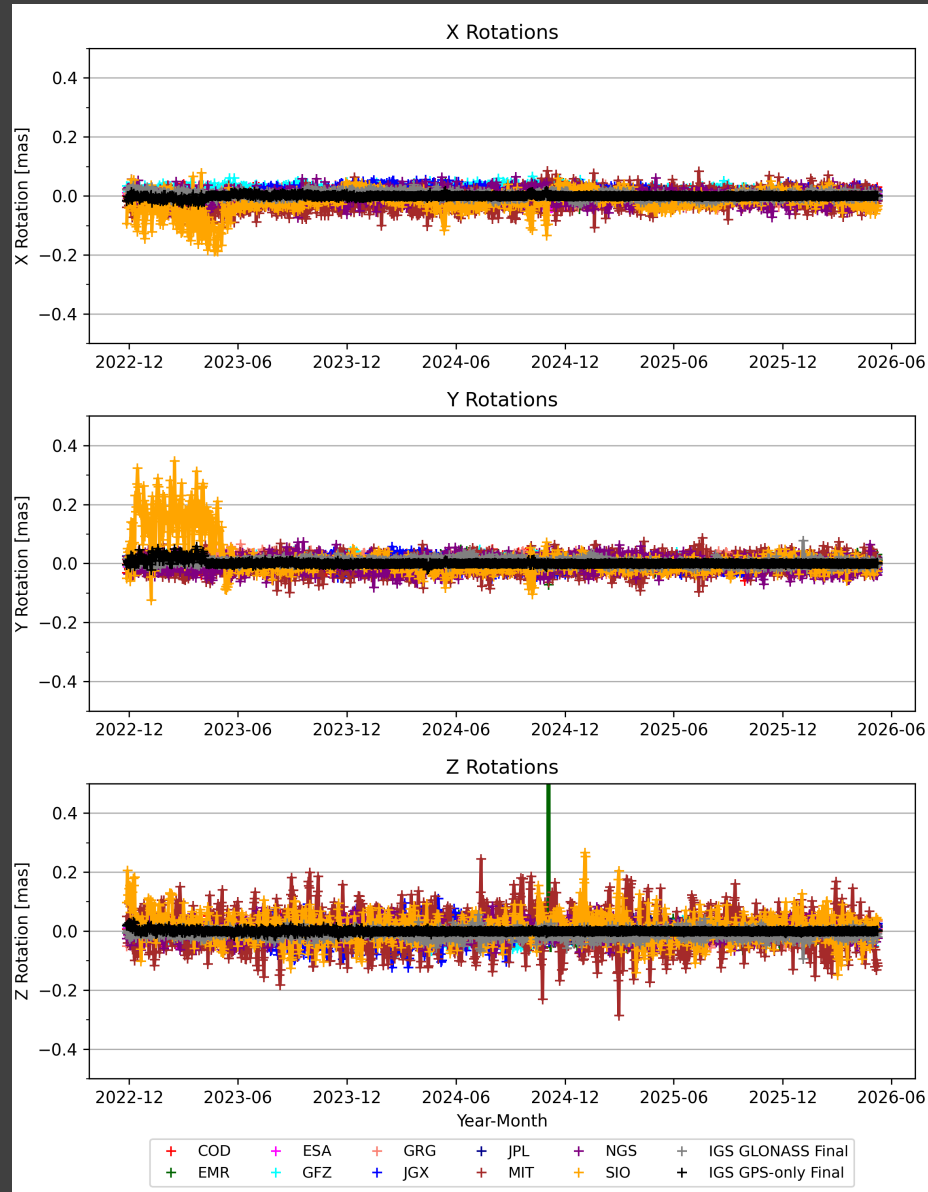
Multi-GNSS Final Products

- IGS combined demonstration multi-GNSS (GPS + Galileo + GLONASS) **Final** products (**IGS0DEMFIN**) now available with continuous coverage from repro3 (from 2022 doy 331 / GPS week 2238) [[IGSMail-8682](#)]
- Products made available on a routine basis since March 2026 with the same schedule as for IGS00PSFIN (12-19 days latency; every Friday)
- Orbits: ROCS (Geoscience Australia) <https://github.com/GeoscienceAustralia/ROCS>
- Reference attitudes: GROOPS (TU Graz) <https://github.com/groops-devs/groops>
- Clocks and biases : SPARKCombo (NRCAN): <https://link.springer.com/article/10.1007/s00190-019-01335-w>
- [GFZ's SPOCC (<https://gnss.gfz.de/services/spocc>) under evaluation]

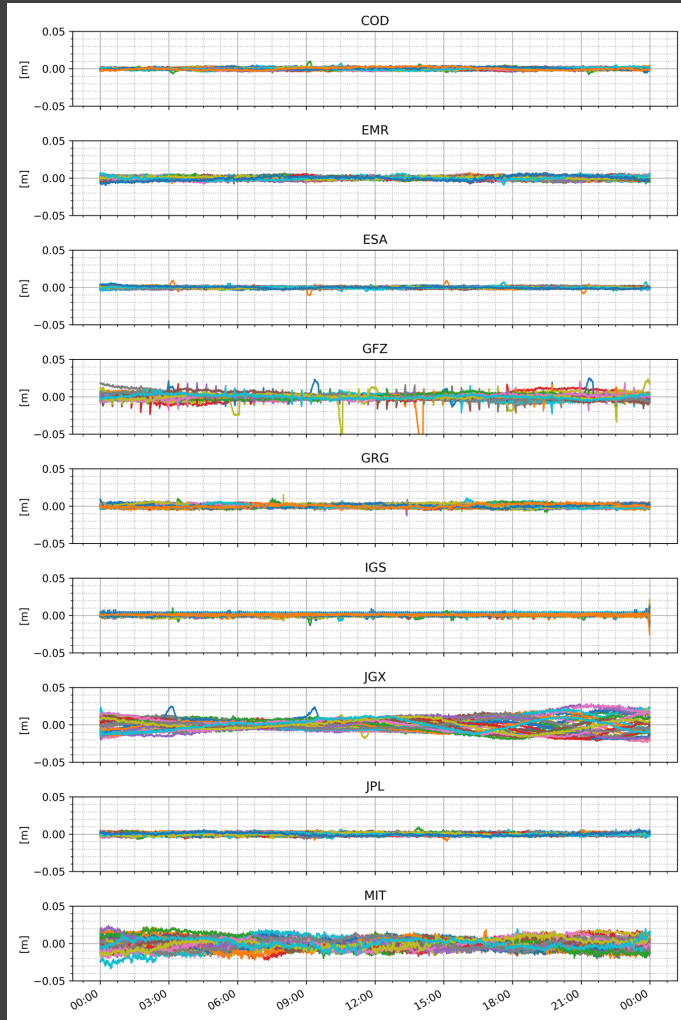
Multi-GNSS Final Orbits



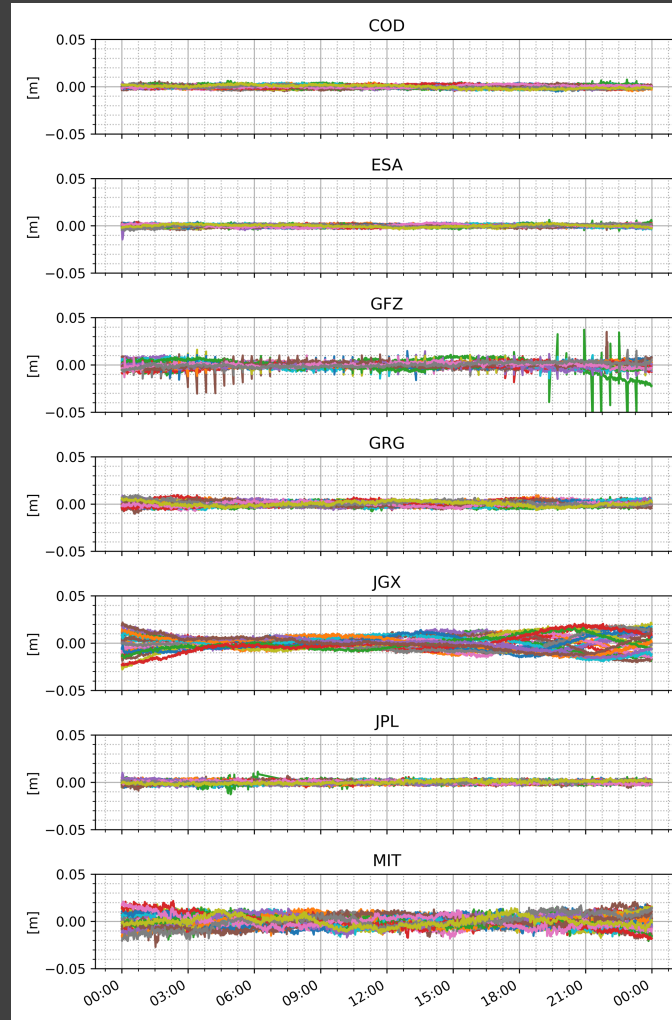
IGS0DEMFIN Orbit Helmert comparisons



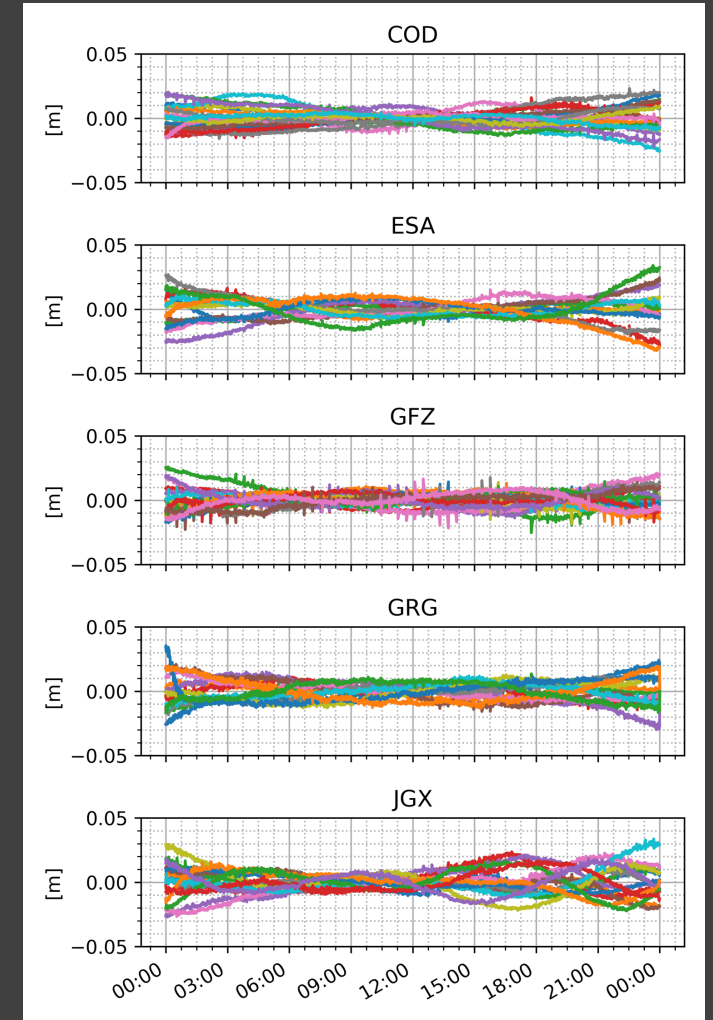
Multi-GNSS Final Clocks (graphics from SPARKCombo)



GPS clocks



Galileo clocks

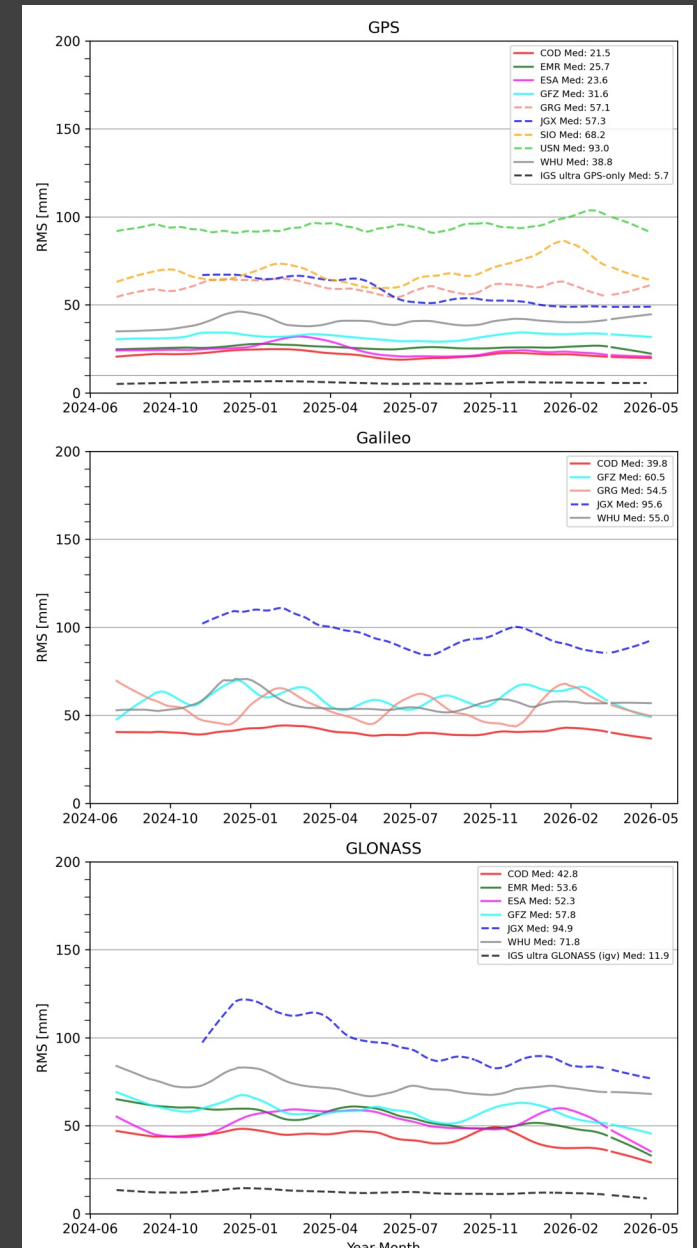
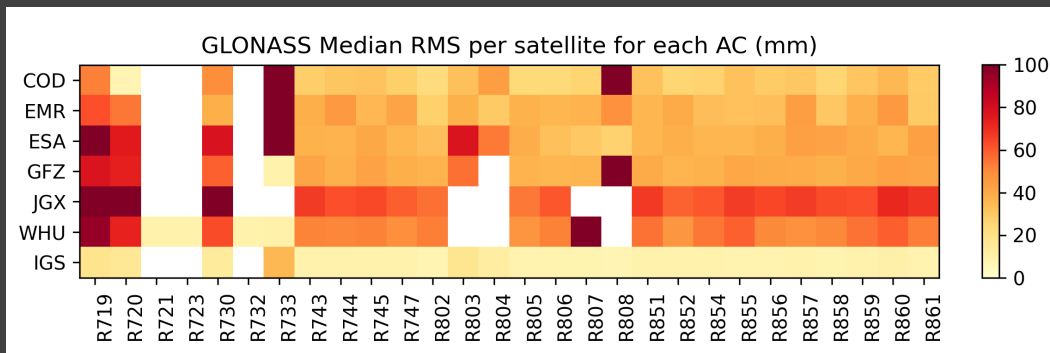
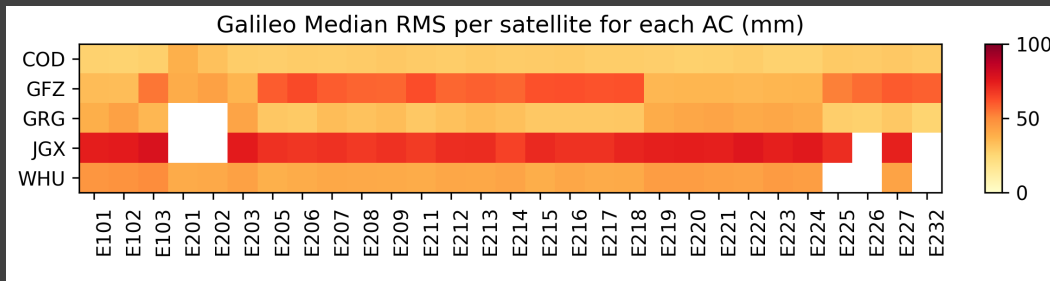
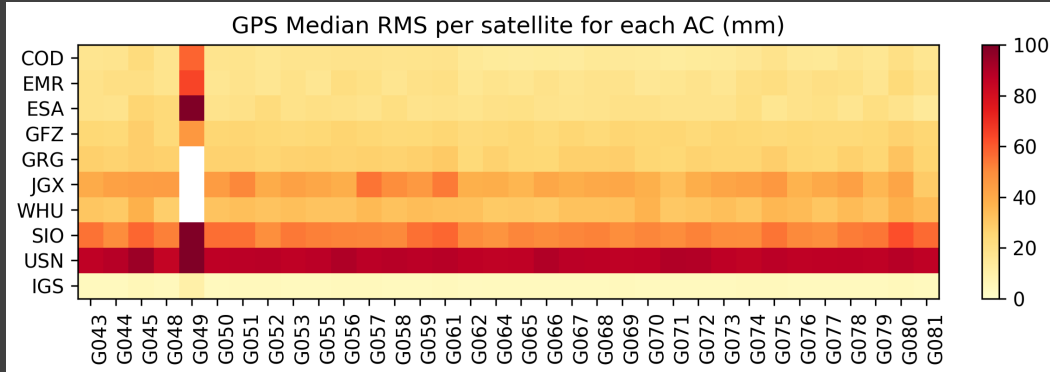


GLONASS clocks

Multi-GNSS Ultra-Rapid Products

- IGS combined demonstration multi-GNSS (GPS + Galileo + GLONASS) **Ultra-Rapid** products (**IGS0DEMULT**) available since 2023, doy 358 / GPS week 2294) [[IGSMail-8413](#)]
- Products made available on a routine basis with similar schedule as for IGS0DEMULT (4 times a day; ~20 minutes after IGS0DEMULT; 3-9 hours latency; 24-hr observed + 24-hr predicted)
- Orbits: ROCS (Geoscience Australia) <https://github.com/GeoscienceAustralia/ROCS>

Multi-GNSS Ultra-Rapid Orbits



IGS0DEMULT Orbit comparisons