WAAS Technical Report
William J. Hughes Technical Center
Pomona, New Jersey
11/8/07

Author(s): Brendan McDonnell

DR# 57: Inconsistent Satellite Tracking of PRN 25 by Non-G2 WAAS Receivers Following NANU 2007060

GPS Week/Day: Week 1424 Day 4 (4/26/07)

Discussion:

On April 25, 2007, a NANU was issued by the Coast Guard concerning an outage of SV PRN 25:

```
NOTICE ADVISORY TO NAVSTAR USERS (NANU) 2007060
SUBJ: SVN25 (PRN25) UNUSABLE JDAY 112/1010 - JDAY 115/2240
1.    NANU TYPE: UNUSABLE
      NANU NUMBER: 2007060
      NANU DTG: 252246Z APR 2007
      REFERENCE NANU: 2007059
      REF NANU DTG: 221026Z APR 2007
      SVN: 25
      PRN: 25
      START JDAY: 112
      START TIME ZULU: 1010
      START CALENDAR DATE: 22 APR 2007
      STOP JDAY: 115
      STOP TIME ZULU: 2240
      STOP CALENDAR DATE: 25 APR 2007

2.  CONDITION: GPS SATELLITE SVN25 (PRN25) WAS UNUSABLE ON JDAY 112
   (22 APR 2007) BEGINNING 1010 ZULU UNTIL JDAY 115 (25 APR 2007)
   ENDING 2240 ZULU.

3.  POC: CIVILIAN - NAVCEN AT 703-313-5900, HTTP://WWW.NAVCEN.USCG.GOV
   MILITARY - GPS OPERATIONS CENTER at HTTP://GPS.AFSPC.AF.MIL/GPSOC,
DSN 560-2541,
   COMM 719-567-2541, gps_support@schriever.af.mil,
HTTP://gps.afspc.af.mil/gps
   MILITARY ALTERNATE - JOINT SPACE OPERATIONS CENTER, DSN 276-9994,
   COMM 805-606-9994, JSPOCCOMBATOPS@VANDENBERG.AF.MIL
```

The outage began on GPS Week 1424 day 0 (April 22), and finished near the end of 1424 day 3 (April 25). On the next day, April 26, WAAS legacy WRS's (those with non-G2 receivers) exhibited inconsistent tracking of SV PRN 25.

Figure 1 shows the elevation of PRN 25 as observed from select G2 WRE's. Any point along each line is only plotted if PRN 25 was tracked, and it was used in the position solution at the respective site, at the given time. Figure 2 shows the same for select non-G2 WRE's. Since PRN 25 has only one arc per day at most sites, the time PRN 25 can be tracked is limited to that arc.

Figure 1. SV PRN 25 Validity with Elevation, as Tracked By G2 WRE's.

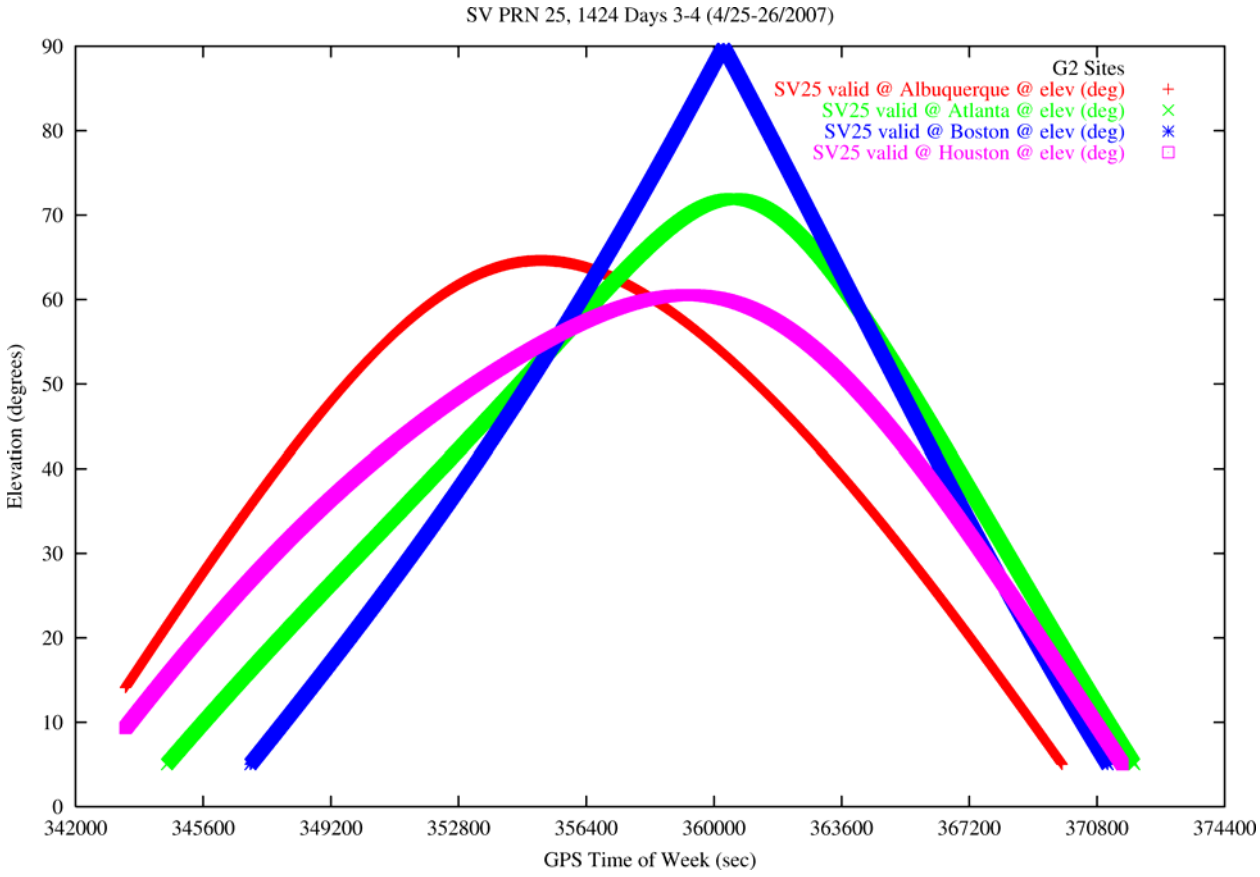
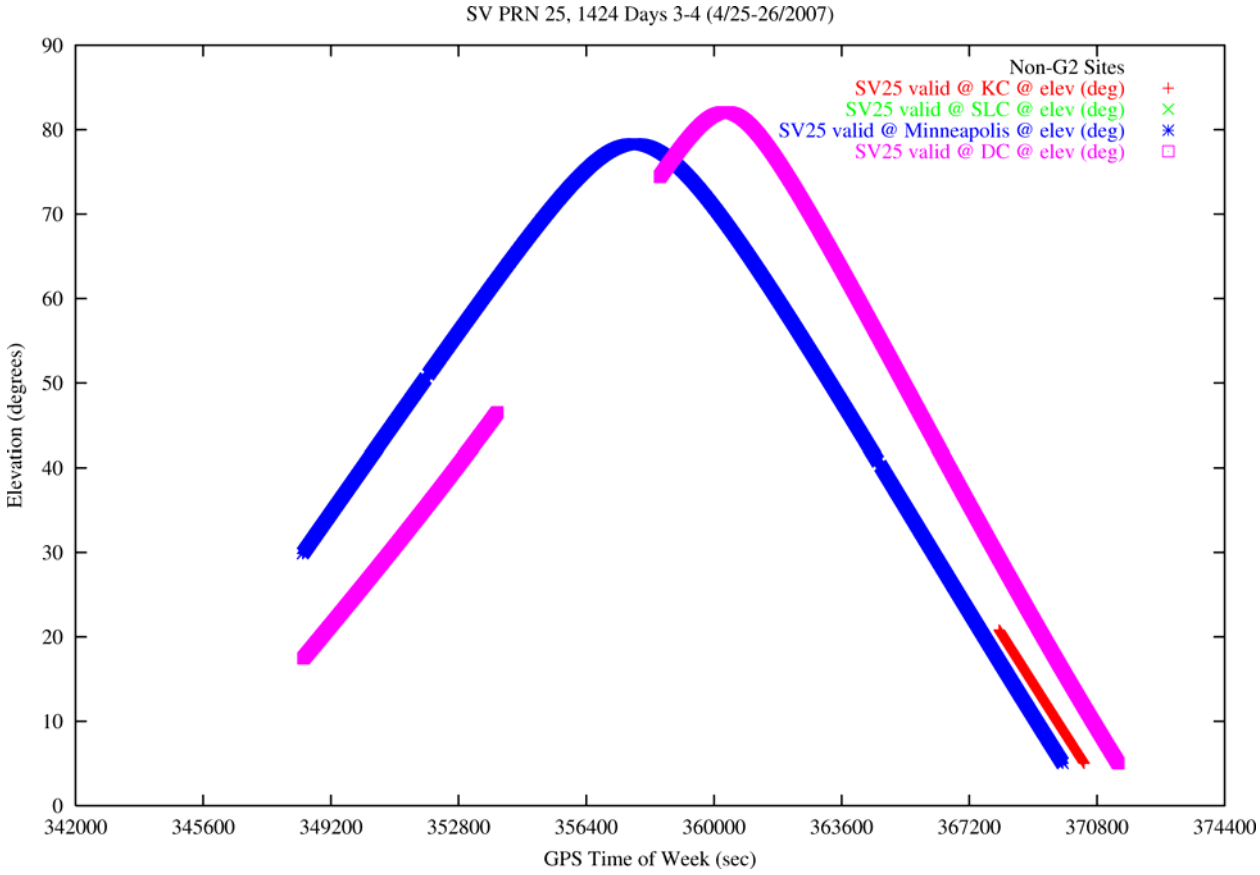


Figure 2. SV PRN 25 Validity with Elevation, as Tracked By Non-G2 WRE's.



SV 25 was not tracked by SLC until the next arc, at the end of day 4.

During the course of investigation, it was noted that WAAS broadcast large corrections for PRN 25 through nearly the first half of its arc over CONUS. Figure 3 shows the fast corrections, the portion of the long correction in the line-of-sight to SV 25, the clock correction, and the sum of these as observed from Atlanta WRE-B. Note that the sum of the corrections remains under two meters.

Figure 3. SV PRN 25 Corrections.

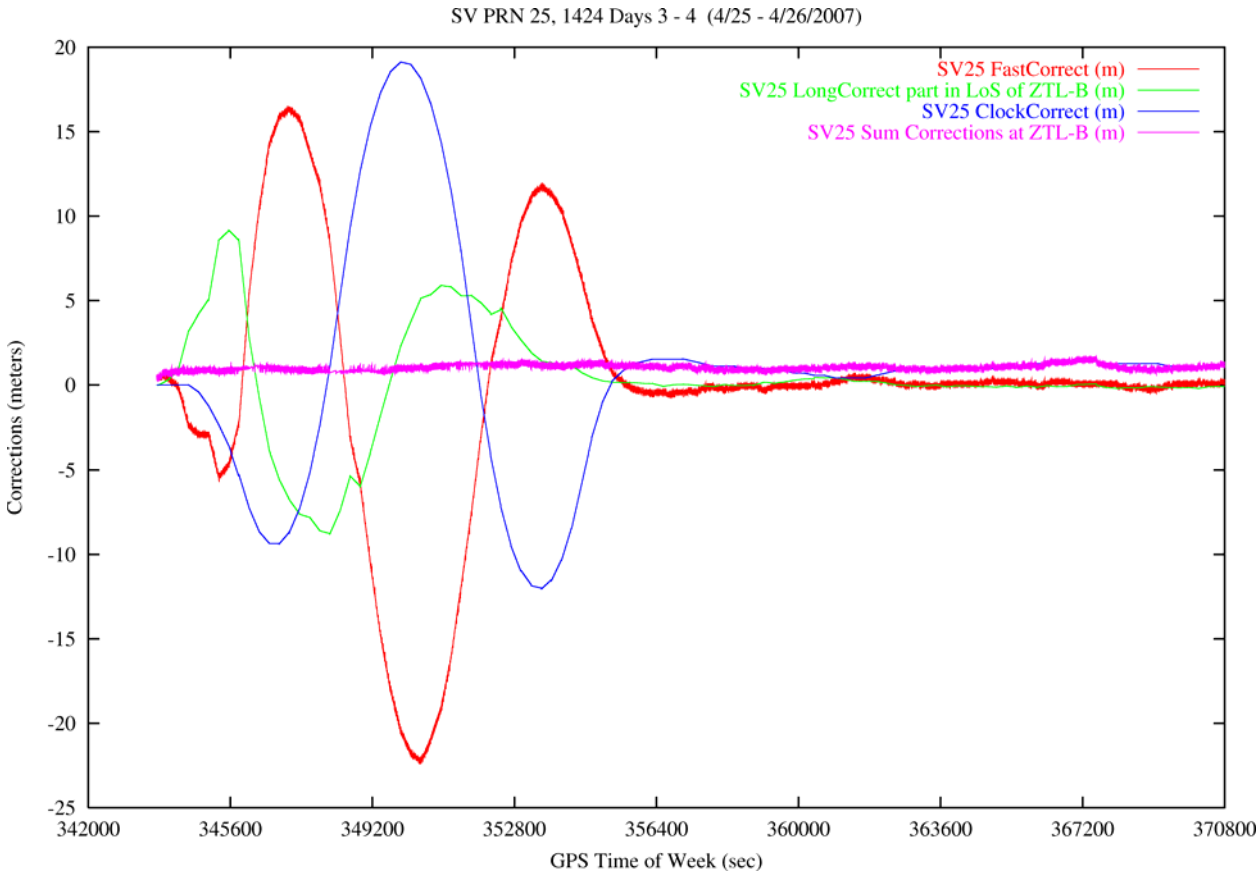
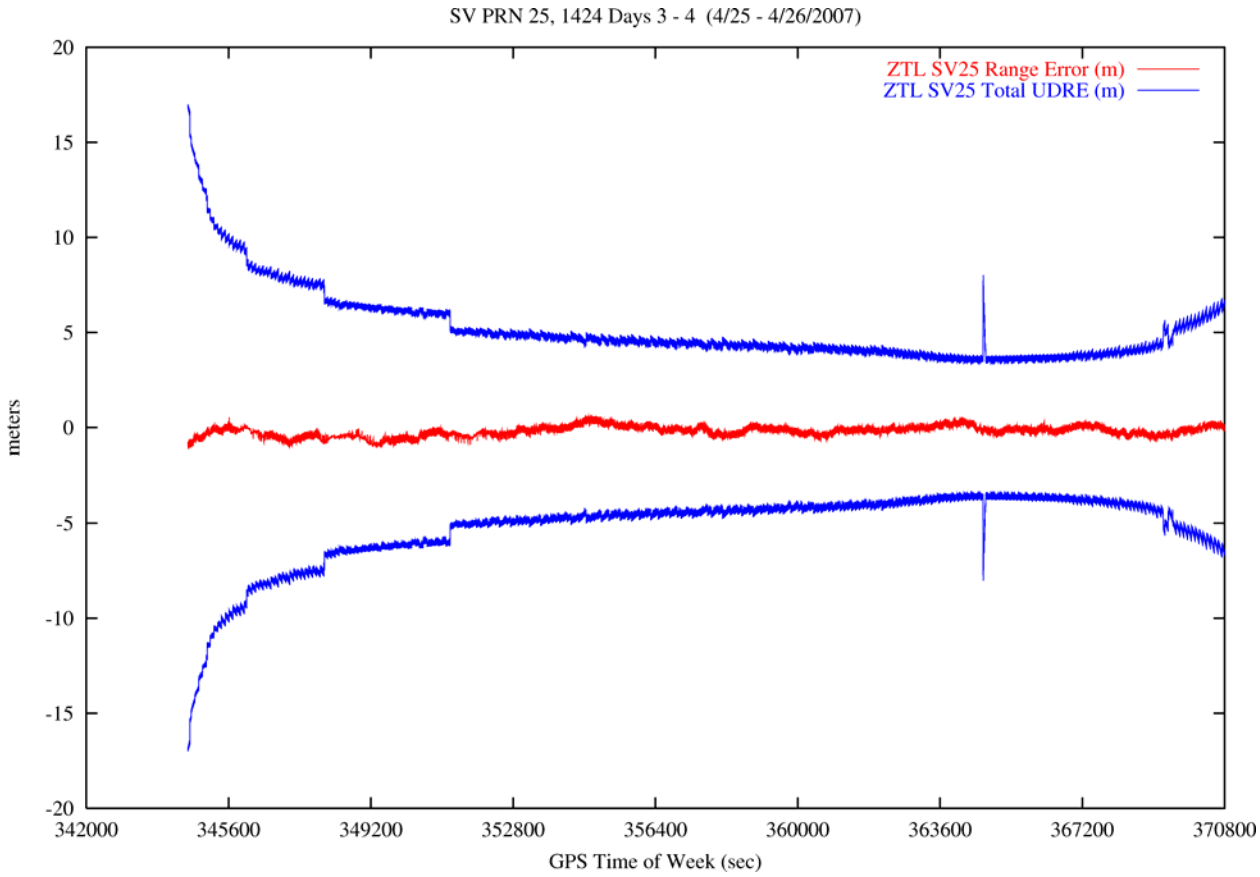


Figure 4 shows that the SV25 WAAS-corrected pseudorange (using the corrections shown in Figure 3) remained well-bounded by the total UDRE.

Figure 4. SV PRN 25 Range Error.



Conclusion:

On GPS Week 1424 Day 4, WAAS legacy WRS's did not consistently track SV PRN 25. This occurred during SV 25's first arc over CONUS after the end of a satellite outage, per NANU 2007060. It should be noted that at the time of this writing, there are no longer any legacy receivers in any WRS's in the WAAS—all receivers are G2's.

Also observed during this time were large fast, long, and clock corrections. These peaked around 20-25 meters, but mostly cancelled each other out. SV 25 pseudorange errors remained bounded by the UDRE, and position errors were unaffected.