

# RTK Fix Ratio Under Tree Canopy and Rain

Screenshot-level field review of multi-receiver RTK logs: Eview HB56 (Septentrio mosaic-X5) and HB56H (Septentrio mosaic-H) under half-sky, tree canopy and rain

Technical review · Revision R1.3-EN · 21 October 2026 · By Jack W., Eview GNSS

Test data and photos: field test of 24 Aug 2023, supplied by the test team and used with permission. Sources and credits in Section 13.

**Quick answer:** Across 36 screenshots from three sessions, every record logged at about 10 Hz. Under trees with rain (16.4 km) and in half sky with rain (21.9 km), three of four record groups held a 100.0% Q=1 (fixed) share; the group in title position 4 – labelled as a third-party receiver – dropped to 88.5% and 83.3%. With no ground truth or raw data, this is a status review, not an accuracy ranking.

## Summary

This report reviews 36 screenshots of multi-receiver RTK logs recorded in August 2023 in three scenes: half sky with rain (21.9 km baseline as labelled), under trees with rain (16.4 km) and under trees with a third-party network RTK service (1.99 km). For every screenshot we read only what the status bar shows: the total epoch count N and the Q=1 / Q=2 / Q=4 split, and we flag whether each reading is complete. Every record group logged at about 10 Hz. In the two long-baseline scenes, the record group in title position 4 had a Q=1 share of 83.3% and 88.5%; all other record groups were at 100.0%. The Eview models in this campaign are the HB56 (mosaic-X5 inside) and HB56H (mosaic-H inside). Because ground truth, raw observations and processing settings were not supplied, the report gives no accuracy figures and does not rank devices.

**Keywords:** RTK fix ratio, RTK under trees, tree canopy GNSS, rain, Q=1 fixed solution, Eview HB56, Eview HB56H, Septentrio mosaic-X5, Septentrio mosaic-H, RTKLIB RTKPLOT, data integrity

Q values follow the RTKLIB / RTKPLOT convention: Q=1 fixed, Q=2 float, Q=4 DGPS. This review records the counts exactly as displayed and does not check whether the fix decisions were correct.

## 1. Background, aims and scope

Tree canopy, multipath and rain are the three most common reasons an RTK receiver loses its fixed solution. To see how several receivers behave under the same obstruction, the test team logged three sessions under roadside trees at an urban site and compiled screenshots from the logging software into a 22-page slide deck. This report is a technical review of those screenshots.

It has three aims: (1) turn every status-bar reading into a table that can be checked; (2) group records by epoch count N to see whether records in the same scene were synchronised; and (3) state clearly what this material can and cannot support.

Scope: only information visible in the screenshots is used. Raw observation files, processing settings, base coordinates and antenna heights were not supplied, so we do not compute RMS or CEP, we do not judge whether solution status was assigned correctly, and we do not rank devices. Scene descriptions (half sky, under tree, rain, third-party network RTK) are taken from the slide titles. The mapping between devices and title positions (1–4) is inferred from title order and was not confirmed with receiver serial numbers.

## 2. Test set-up (from the slide deck)

### 2.1 Devices

**Table 2-1 Devices and labels appearing in the deck**

| Label in the source deck                 | Notes                                                         |
|------------------------------------------|---------------------------------------------------------------|
| Eview HB56H (Septentrio mosaic-H inside) | Dual-antenna heading receiver                                 |
| Eview HB56 (Septentrio mosaic-X5 inside) | Multi-band RTK receiver                                       |
| Eview HB56 (mosaic-X5c platform)         | Kept separate from the line above; relationship not confirmed |
| Eview HB10 (Septentrio AsteRx-m3 inside) | Board-level receiver                                          |
| Third-party receiver (label A)           | Not an Eview product; name withheld                           |
| Third-party receiver (label B)           | Not merged with label A                                       |

Receivers were run as board-level setups built on the same Septentrio modules that Eview uses in the HB56, HB56H and HB10. Where the text refers to a specific record we use its title position (1–4), not a model name, so that page order is not mistaken for a verified model.

## 2.2 Scenes and baselines

**Table 2-2 Three scenes (slide titles)**

| # | Slide title                                  | Baseline (as labelled) | Slides | Figures |
|---|----------------------------------------------|------------------------|--------|---------|
| 1 | Half sky test with raining                   | 21.9 km                | 4–9    | 12      |
| 2 | Under tree test with raining                 | 16.4 km                | 10–18  | 18      |
| 3 | Under tree (third-party network RTK service) | 1.99 km                | 19–21  | 6       |

Baselines are the values written in the slide titles; they were not measured independently. Rain intensity, tree species, canopy density and correction-service settings were not recorded. Obstruction, baseline, site, correction source and weather all change between the three scenes, so this is not a controlled comparison and no difference can be attributed to one factor alone.

## 2.3 Site photos

Slide 3 has three site photos of the antenna and equipment set-up. Photo direction, antenna height, baseline end points and obstruction distance were not labelled. Two photos are reproduced below.



Figure 2-1 Antennas on the test vehicle (slide 3, left; registration and badges blurred)



Figure 2-2 Under-tree site with roadside canopy (slide 3, centre)

## 3. Reading method and data integrity

### 3.1 Time, duration and logging rate

**Table 3-1 Periods and logging rate**

| Scene                    | Period (GPST, as read) | Duration | N range                                    | Rate (est.) |
|--------------------------|------------------------|----------|--------------------------------------------|-------------|
| Half sky + rain          | ≈ 02:16-03:17          | ≈ 61 min | 36,328-36,678 (+1 group with incomplete N) | ≈ 10 Hz     |
| Under tree + rain        | ≈ 05:53-06:32          | ≈ 39 min | 23,268-23,439                              | ≈ 10 Hz     |
| Under tree + network RTK | ≈ 07:47-08:48          | ≈ 61 min | 36,489-36,546                              | ≈ 10 Hz     |

The rate is estimated as  $N \div \text{duration}$  and is only used to check that records were configured the same way, not as a measurement.

**Table 3-2 Spread of N within each scene**

| Scene                    | N min  | N max  | Difference | ≈ time at 10 Hz |
|--------------------------|--------|--------|------------|-----------------|
| Half sky + rain          | 36,328 | 36,678 | 350        | ≈ 35 s          |
| Under tree + rain        | 23,268 | 23,439 | 171        | ≈ 17 s          |
| Under tree + network RTK | 36,489 | 36,546 | 57         | ≈ 6 s           |

Records in the same scene have different N, so start/stop times or valid-epoch counts differ. Each record is compared using its own N as the denominator; epoch-by-epoch alignment cannot be assumed. Figure 4-4 is excluded from these calculations because the last two digits of N are unreadable.

### 3.2 Site coordinates

Coordinates read from the status bars place the half-sky site about 5.6 km from the under-tree site; the two under-tree sessions agree to about 1 m. Coordinates are published here rounded to 0.01° (half sky ≈ 40.05°N, 116.30°E; under tree ≈ 40.08°N, 116.35°E) and are not survey control.

### 3.3 Data integrity

Raw observation files (SBF, UBX etc.), base coordinates, antenna heights, elevation mask and ambiguity strategy were not supplied. The material therefore confirms when, where, for how long, how many epochs and how many epochs per status were logged; it cannot confirm that processing settings were identical or which receiver produced which N. Both are preconditions for a device-to-device comparison. Logging-software title bars and status-bar coordinates have been cropped from the figures in this edition.

## 4. Half sky + rain (21.9 km)

### 4.1 Scene

Slide title: “1. Half sky test with raining (baseline 21.9 km)”. ‘Half sky’ means the sky is only partly visible; the obstruction is not described. Six slides, 12 figures: slides 4–6 ground track, slides 7–9 time series. Eleven figures have status-bar readings; Figure 4-7 has none.

### 4.2 Readings per figure

**Table 4-1 Half-sky readings (denominator = each figure's N)**

| Fig. | Slide | Side | N      | Q=1              | Q=2          | Q=4           | Pos. | Reading       |
|------|-------|------|--------|------------------|--------------|---------------|------|---------------|
| 4-1  | 4     | L    | 36,328 | 36,328 (100.0%)  | 0*           | 0*            | 1    | Complete      |
| 4-2  | 4     | R    | 36,583 | 36,583 (100.0%)  | 0*           | 0*            | 3    | Complete      |
| 4-3  | 5     | L    | 36,328 | 36,328 (100.0%)  | 0*           | 0*            | 1    | Complete      |
| 4-4  | 5     | R    | 36,7xx | 36,7xx (100.0%)† | n/s          | n/s           | 2    | Partial†      |
| 4-5  | 6     | L    | 36,583 | 36,583 (100.0%)  | 0*           | 0*            | 3    | Complete      |
| 4-6  | 6     | R    | 36,678 | 30,547 (83.3%)   | 2,165 (5.9%) | 3,966 (10.8%) | 4    | Complete      |
| 4-7  | 7     | L    | n/s    | n/s              | n/s          | n/s           | 1    | No status bar |
| 4-8  | 7     | R    | 36,328 | 36,328 (100.0%)  | 0*           | 0*            | 2    | Complete      |
| 4-9  | 8     | L    | 36,583 | 36,583 (100.0%)  | 0*           | 0*            | 3    | Complete      |
| 4-10 | 8     | R    | 36,678 | 30,547 (83.3%)   | 2,165 (5.9%) | 3,966 (10.8%) | 4    | Complete      |
| 4-11 | 9     | L    | 36,328 | 36,328 (100.0%)  | 0*           | 0*            | 1    | Complete      |
| 4-12 | 9     | R    | 36,583 | 36,583 (100.0%)  | 0*           | 0*            | 3    | Complete      |

\* 0 = calculated as N – Q=1; not listed separately in the status bar. n/s = not shown in the screenshot (not treated as 0). ? = title position not determined. † Last two digits of N unreadable; the 100.0% is the share shown on the readable part.

### 4.3 Record groups by N

**Table 4-2 Half-sky record groups**

| Record group (N) | Q=1              | Q=2          | Q=4           | Check        | Figures             | Pos. |
|------------------|------------------|--------------|---------------|--------------|---------------------|------|
| 36,328           | 36,328 (100.0%)  | 0*           | 0*            | = N          | 4-1, 4-3, 4-8, 4-11 | 1    |
| 36,583           | 36,583 (100.0%)  | 0*           | 0*            | = N          | 4-2, 4-5, 4-9, 4-12 | 3    |
| 36,678           | 30,547 (83.3%)   | 2,165 (5.9%) | 3,966 (10.8%) | = N          | 4-6, 4-10           | 4    |
| 36,7xx†          | 36,7xx (100.0%)† | n/s          | n/s           | cannot check | 4-4                 | 2    |

Screenshots with the same N and consistent readings are treated as one record group. Grouping relies only on N, not on file names or serial numbers, so a record group is not a confirmed single receiver. † Last two digits unreadable; not merged and not used in timing calculations. Figure 4-8 (position 2) shows the same N as position 1; it is listed in the 36,328 group but not counted as an independent sample until the duplicate/mis-ordering is resolved.

## 4.4 Figures

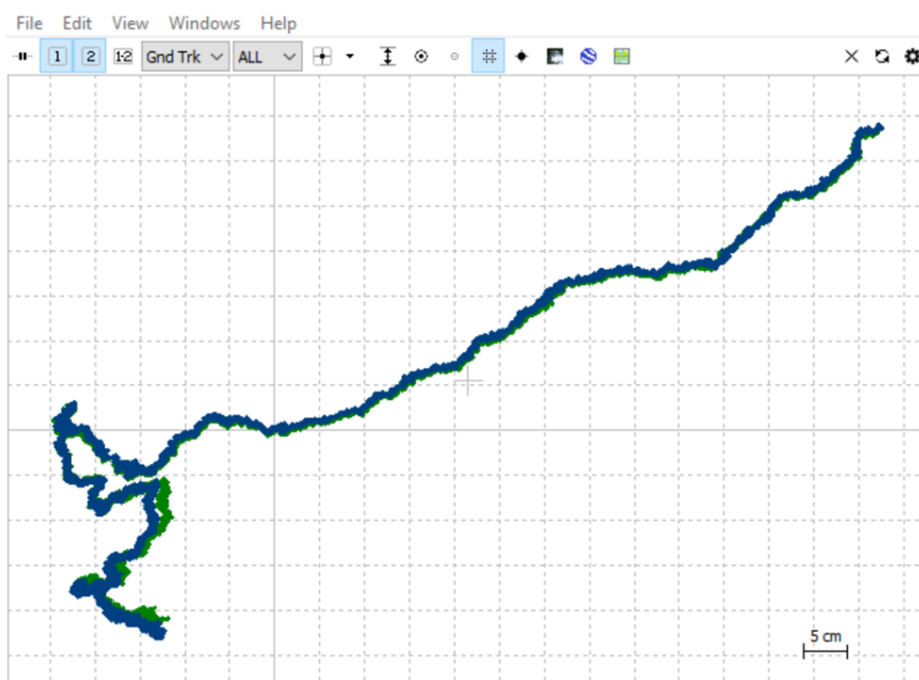


**Figure 4-1 Half sky + rain - ground track (original slide 4, left)**

Title position: 1 | View: Ground track | N = 36,328 | Q=1 36,328 (100.0%)

Track starts in the south-west and, after several turns, runs north-east.

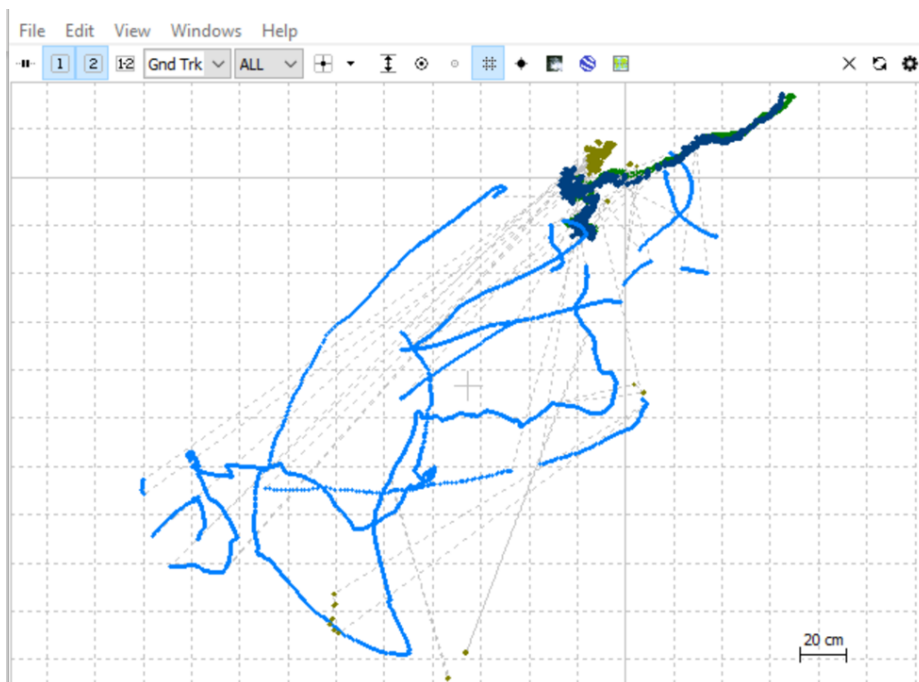


**Figure 4-2 Half sky + rain - ground track (original slide 4, right)**

Title position: 3 | View: Ground track | N = 36,583 | Q=1 36,583 (100.0%)

Several out-and-back and looping segments over a wider area.

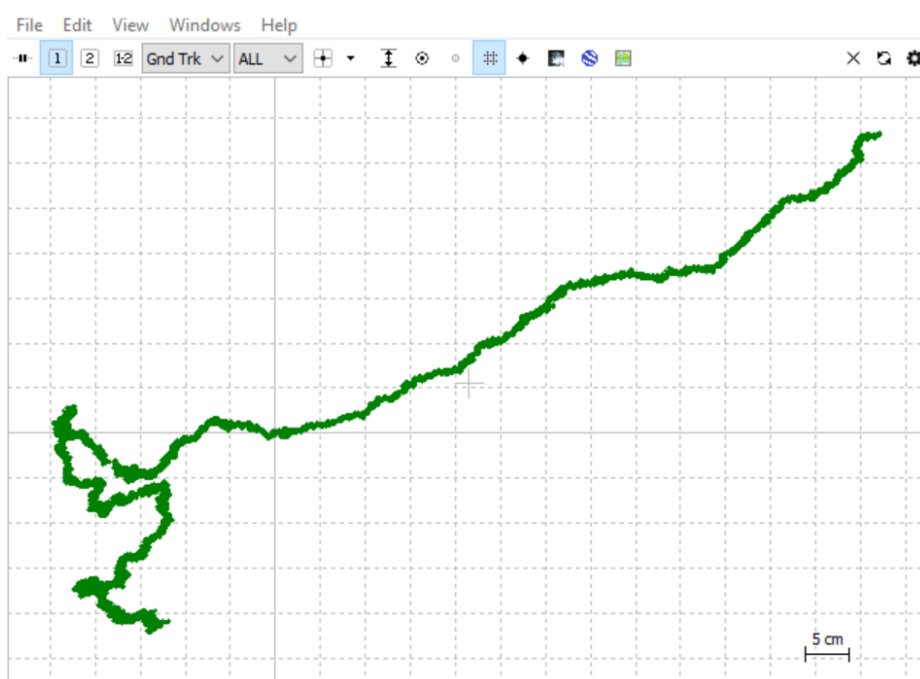


**Figure 4-3 Half sky + rain - ground track (original slide 5, left)**

Title position: 1 | View: Ground track | N = 36,328 | Q=1 36,328 (100.0%)

Track runs south-west to north-east with a short out-and-back near the start.

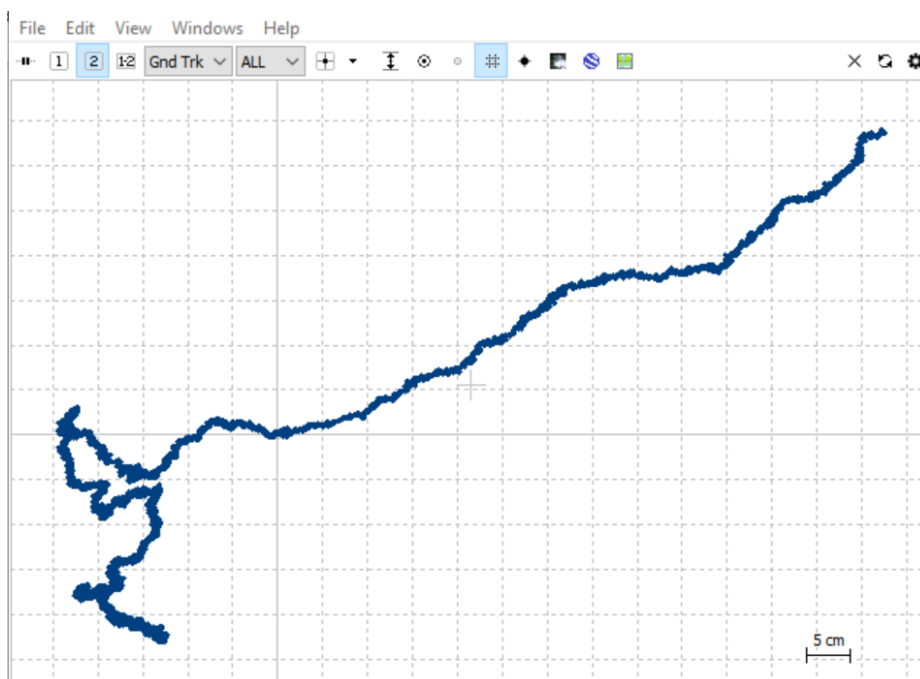


**Figure 4-4 Half sky + rain - ground track (original slide 5, right)**

Title position: 2 | View: Ground track | N = 36,7xx | Q=1 36,7xx (100.0%)†

Continuous track from south-west to north-east; last two digits of N unreadable.

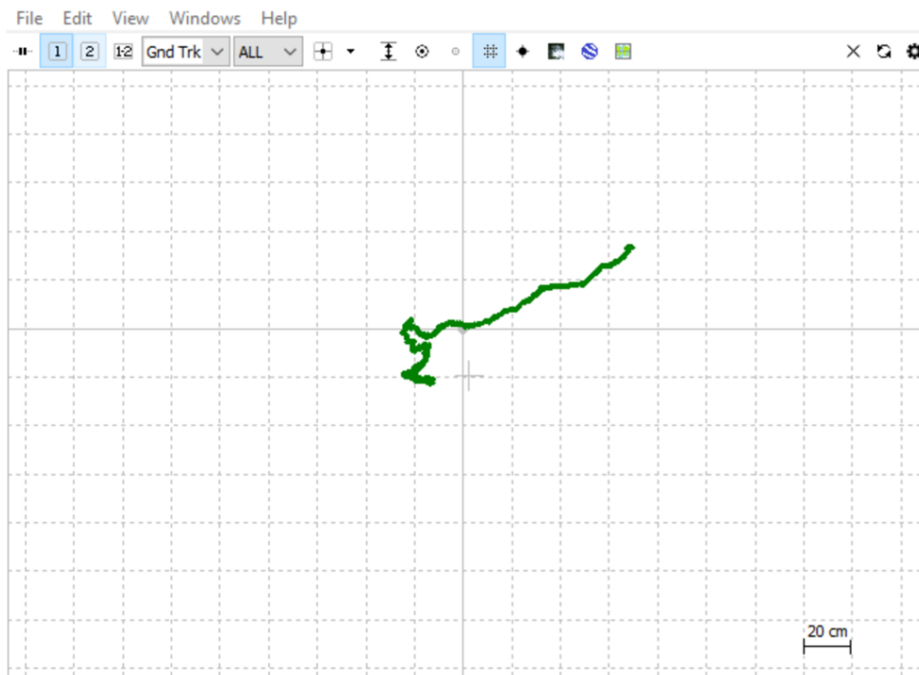


**Figure 4-5 Half sky + rain - ground track (original slide 6, left)**

Title position: 3 | View: Ground track | N = 36,583 | Q=1 36,583 (100.0%)

Starts in the south-west, doubles back lower left, then runs north-east.

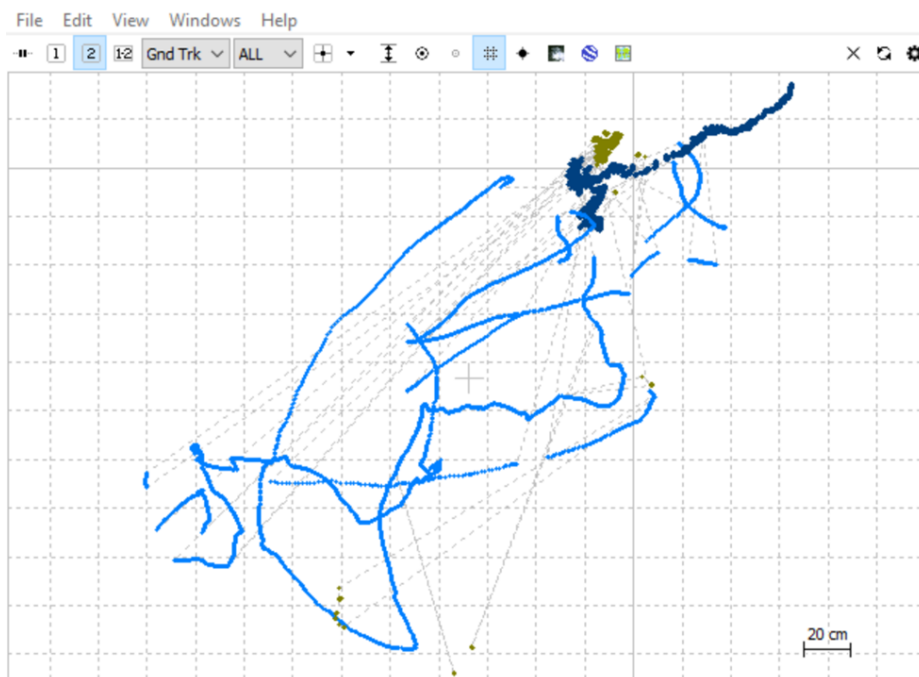


**Figure 4-6 Half sky + rain - ground track (original slide 6, right)**

Title position: 4 | View: Ground track | N = 36,678 | Q=1 30,547 (83.3%); Q=2 2,165 (5.9%); Q=4 3,966 (10.8%)

Ground track concentrated in the upper right, showing a short continuous path.

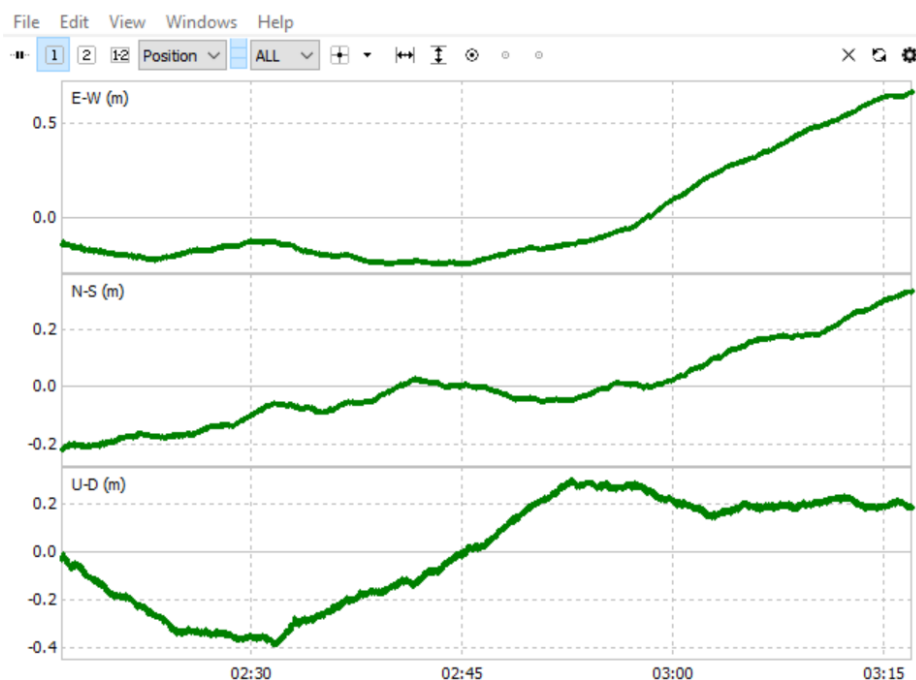


**Figure 4-7 Half sky + rain - position time series (original slide 7, left)**

Title position: 1 | View: Position time series | N = n/s | Q=1 n/s

E, N and U components; E rises late, N increases, U dips then recovers. No status bar in the screenshot.

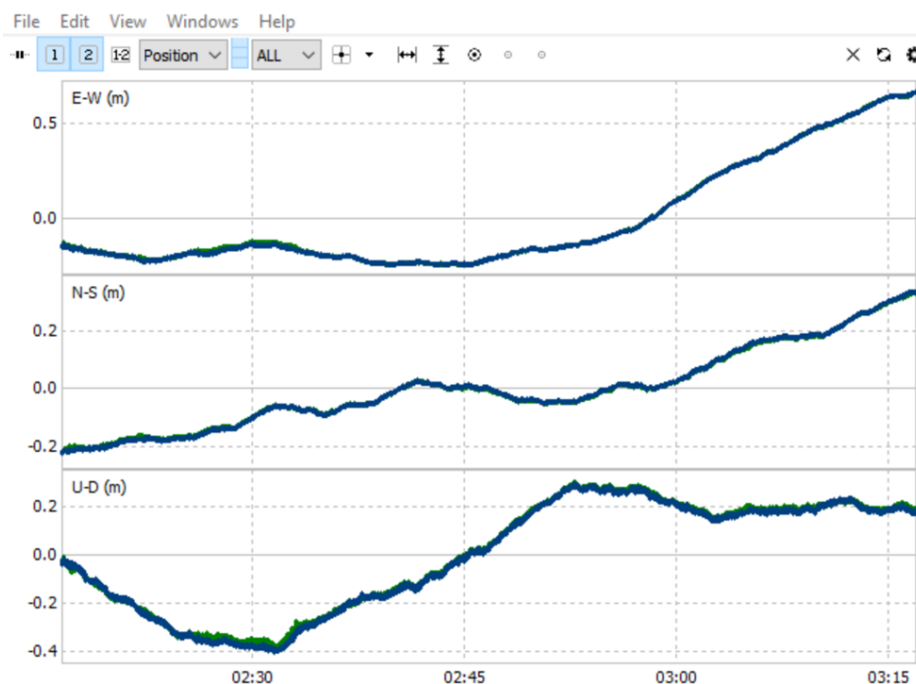


**Figure 4-8 Half sky + rain - position time series (original slide 7, right)**

Title position: 2 | View: Position time series | N = 36,328 | Q=1 36,328 (100.0%)

E and N rise in the later part; U dips then recovers.

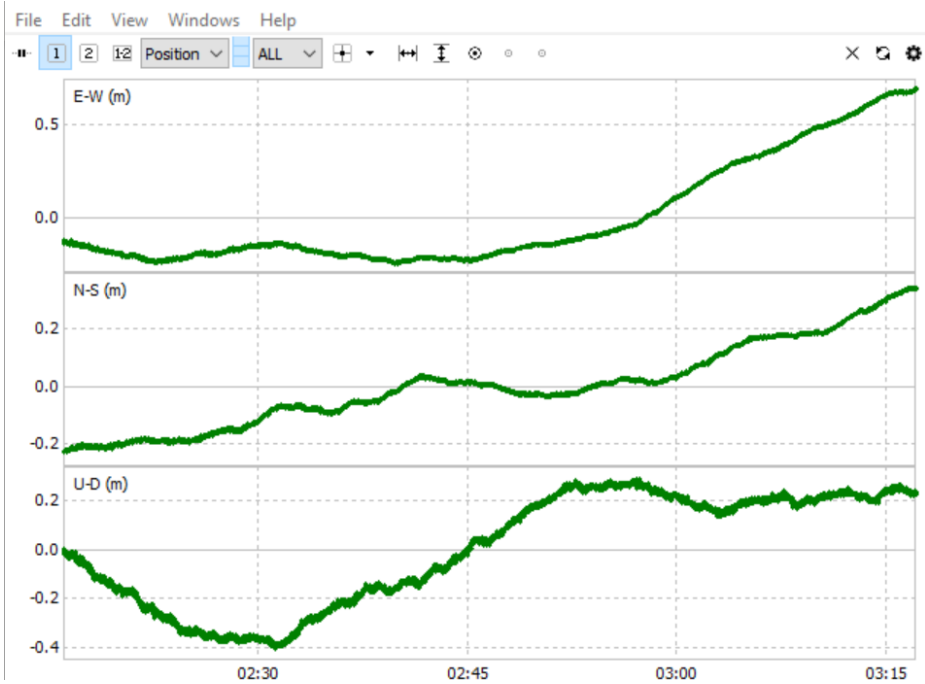


**Figure 4-9 Half sky + rain - position time series (original slide 8, left)**

Title position: 3 | View: Position time series | N = 36,583 | Q=1 36,583 (100.0%)

E and N rise later; U dips then settles.

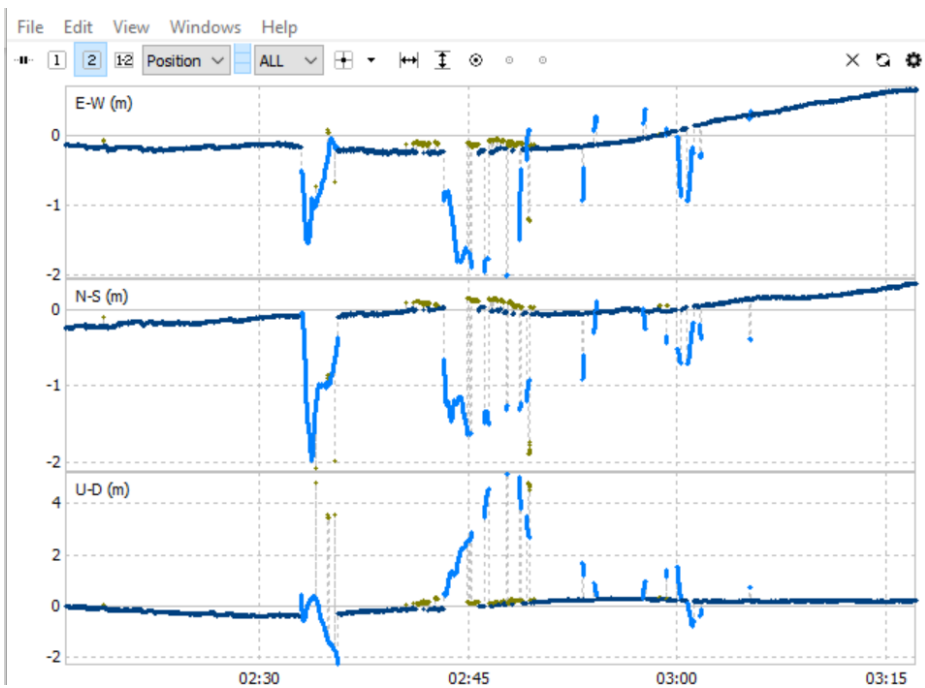


**Figure 4-10 Half sky + rain - position time series (original slide 8, right)**

Title position: 4 | View: Position time series | N = 36,678 | Q=1 30,547 (83.3%); Q=2 2,165 (5.9%); Q=4 3,966 (10.8%)

Several abrupt changes in all three components early in the session, then a calmer period.

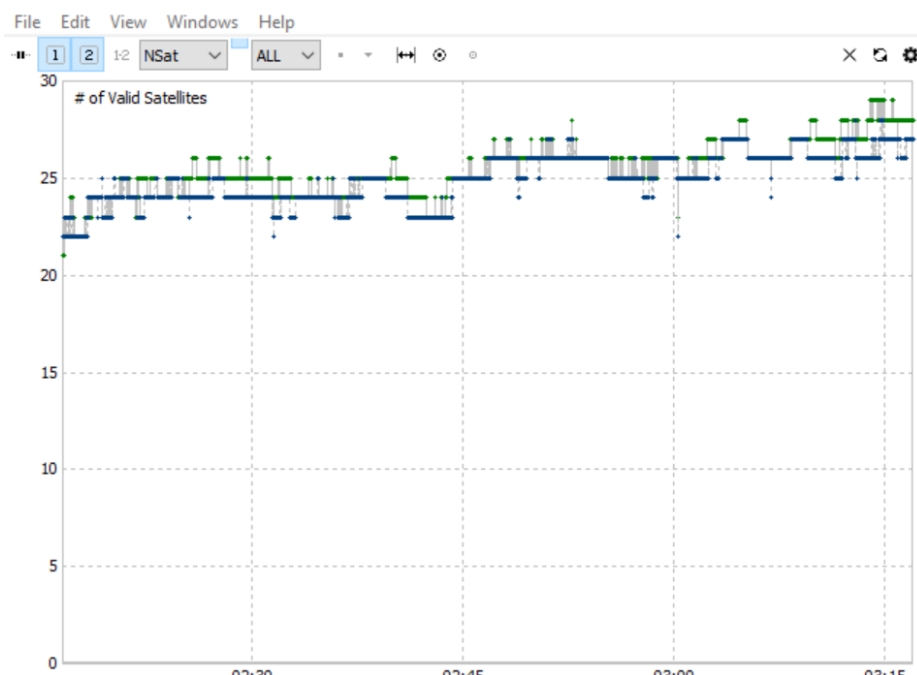


**Figure 4-11 Half sky + rain - satellites used (original slide 9, left)**

Title position: 1 | View: Satellites used | N = 36,328 | Q=1 36,328 (100.0%)

Satellites used vary between about 20 and 30, rising slightly late in the session.

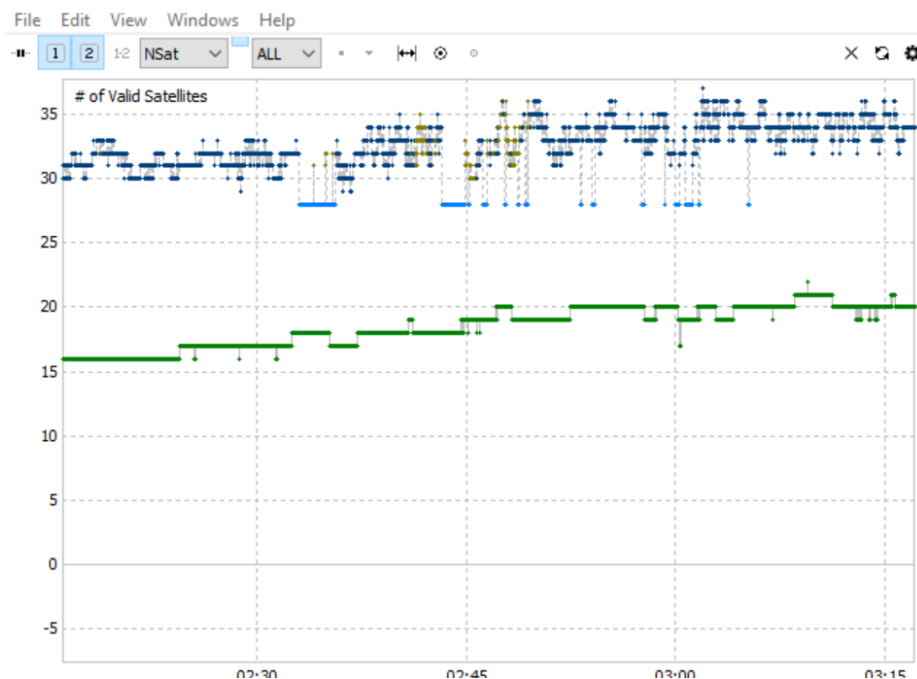


**Figure 4-12 Half sky + rain - satellites used (original slide 9, right)**

Title position: 3 | View: Satellites used | N = 36,583 | Q=1 36,583 (100.0%)

Two series rise slowly through the session.

## 5. Under tree + rain (16.4 km)

### 5.1 Scene

Slide title: “2. Under tree test with raining (baseline 16.4 km)”. The site is essentially the same as in Section 6 ( $\approx 1$  m apart by screenshot coordinates); baseline and correction source differ. Nine slides, 18 figures: slides 10–12 ground track, slides 13–18 time series. All 18 have status-bar readings.

### 5.2 Readings per figure

**Table 5-1 Under-tree readings (denominator = each figure’s N)**

| Fig. | Slide | Side | N      | Q=1             | Q=2          | Q=4          | Pos. | Reading  |
|------|-------|------|--------|-----------------|--------------|--------------|------|----------|
| 5-1  | 10    | L    | 23,268 | 23,268 (100.0%) | 0*           | 0*           | 1    | Complete |
| 5-2  | 10    | R    | 23,329 | 23,329 (100.0%) | 0*           | 0*           | 3    | Complete |
| 5-3  | 11    | L    | 23,268 | 23,268 (100.0%) | 0*           | 0*           | 1    | Complete |
| 5-4  | 11    | R    | 23,439 | 23,439 (100.0%) | 0*           | 0*           | 2    | Complete |
| 5-5  | 12    | L    | 23,329 | 23,329 (100.0%) | 0*           | 0*           | 3    | Complete |
| 5-6  | 12    | R    | 23,386 | 20,690 (88.5%)  | 1,092 (4.7%) | 1,604 (6.9%) | 4    | Complete |
| 5-7  | 13    | L    | 23,268 | 23,268 (100.0%) | 0*           | 0*           | 1    | Complete |
| 5-8  | 13    | R    | 23,439 | 23,439 (100.0%) | 0*           | 0*           | 2    | Complete |
| 5-9  | 14    | L    | 23,329 | 23,329 (100.0%) | 0*           | 0*           | 3    | Complete |
| 5-10 | 14    | R    | 23,386 | 20,690 (88.5%)  | 1,092 (4.7%) | 1,604 (6.9%) | 4    | Complete |
| 5-11 | 15    | L    | 23,268 | 23,268 (100.0%) | 0*           | 0*           | 1    | Complete |
| 5-12 | 15    | R    | 23,329 | 23,329 (100.0%) | 0*           | 0*           | 3    | Complete |
| 5-13 | 16    | L    | 23,268 | 23,268 (100.0%) | 0*           | 0*           | 1    | Complete |
| 5-14 | 16    | R    | 23,268 | 23,268 (100.0%) | 0*           | 0*           | 2    | Complete |
| 5-15 | 17    | L    | 23,329 | 23,329 (100.0%) | 0*           | 0*           | 3    | Complete |
| 5-16 | 17    | R    | 23,386 | 20,690 (88.5%)  | 1,092 (4.7%) | 1,604 (6.9%) | 4    | Complete |
| 5-17 | 18    | L    | 23,329 | 23,329 (100.0%) | 0*           | 0*           | 3    | Complete |
| 5-18 | 18    | R    | 23,386 | 20,690 (88.5%)  | 1,092 (4.7%) | 1,604 (6.9%) | 4    | Complete |

\* 0 = calculated as  $N - Q=1$ ; not listed separately in the status bar. n/s = not shown in the screenshot (not treated as 0). ? = title position not determined.

### 5.3 Record groups by N

**Table 5-2 Under-tree record groups**

| Record group (N) | Q=1             | Q=2          | Q=4          | Check | Figures                         | Pos. |
|------------------|-----------------|--------------|--------------|-------|---------------------------------|------|
| 23,268           | 23,268 (100.0%) | 0*           | 0*           | = N   | 5-1, 5-3, 5-7, 5-11, 5-13, 5-14 | 1    |
| 23,329           | 23,329 (100.0%) | 0*           | 0*           | = N   | 5-2, 5-5, 5-9, 5-12, 5-15, 5-17 | 3    |
| 23,439           | 23,439 (100.0%) | 0*           | 0*           | = N   | 5-4, 5-8                        | 2    |
| 23,386           | 20,690 (88.5%)  | 1,092 (4.7%) | 1,604 (6.9%) | = N   | 5-6, 5-10, 5-16, 5-18           | 4    |

Figure 5-14 (position 2) shows the same N as position 1; listed in the 23,268 group but not counted as an independent sample until verified. Screenshots for Figures 5-1 to 5-3 are not reproduced in this edition; their readings come from the original slide deck.

## 5.4 Figures

Screenshot not reproduced in this edition; reading taken from the original slide deck.

### Figure 5-1 Under tree + rain - ground track (original slide 10, left)

Title position: 1 | View: Ground track | N = 23,268 | Q=1 23,268 (100.0%)

Track runs from upper left to the right, flattens mid-way and ends in dense back-and-forth.

Screenshot not reproduced in this edition; reading taken from the original slide deck.

### Figure 5-2 Under tree + rain - ground track (original slide 10, right)

Title position: 3 | View: Ground track | N = 23,329 | Q=1 23,329 (100.0%)

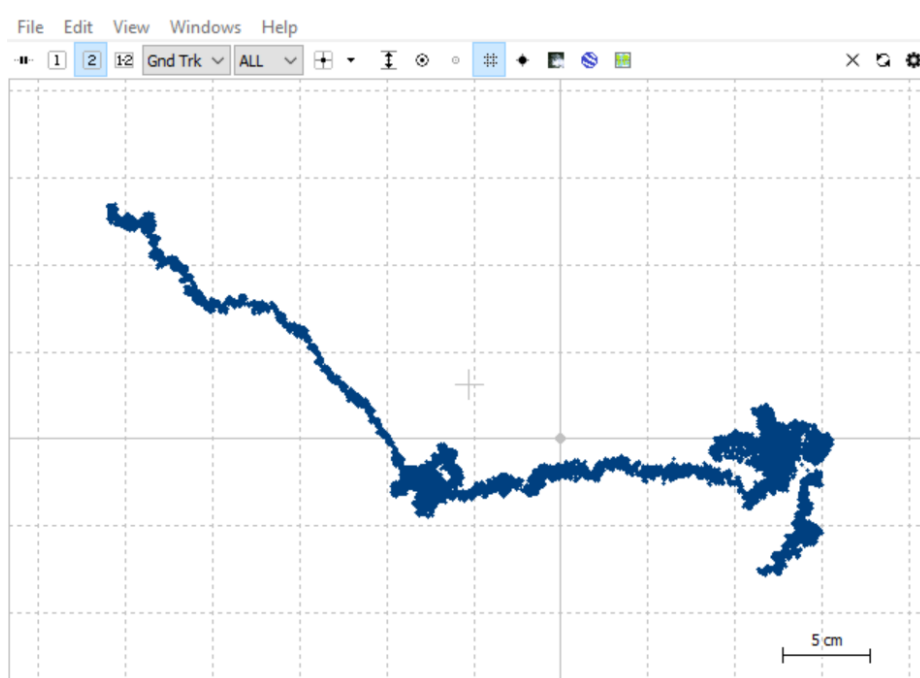
Several out-and-back and looping sections, mainly centre and lower area.

Screenshot not reproduced in this edition; reading taken from the original slide deck.

### Figure 5-3 Under tree + rain - ground track (original slide 11, left)

Title position: 1 | View: Ground track | N = 23,268 | Q=1 23,268 (100.0%)

Upper left to lower right with a clear turn mid-way; dense back-and-forth at the right end.



### Figure 5-4 Under tree + rain - ground track (original slide 11, right)

Title position: 2 | View: Ground track | N = 23,439 | Q=1 23,439 (100.0%)

Upper left to the right, turning mid-way and continuing near-horizontally.

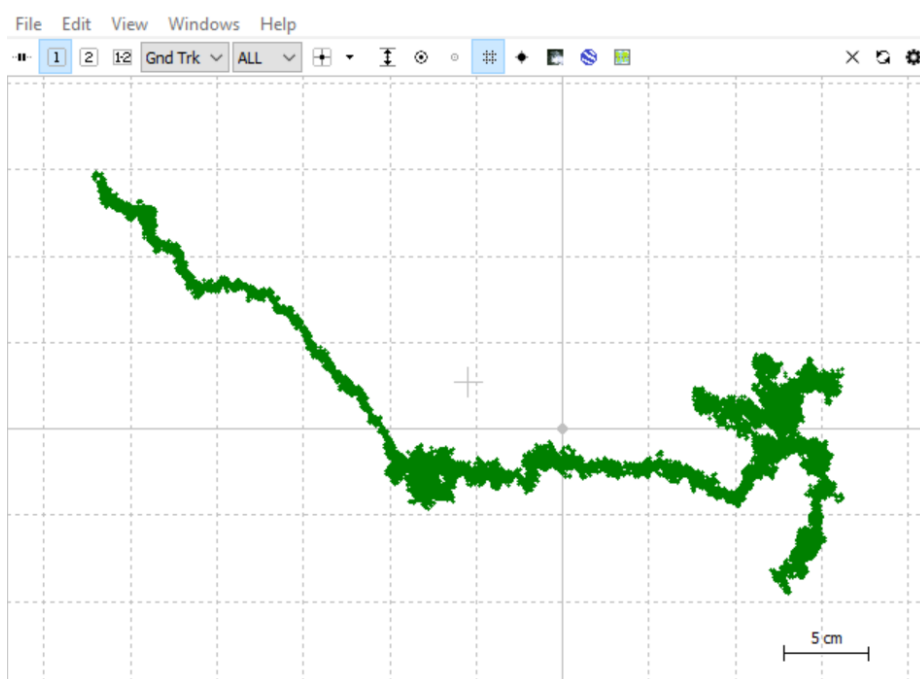


**Figure 5-5 Under tree + rain - ground track (original slide 12, left)**

Title position: 3 | View: Ground track | N = 23,329 | Q=1 23,329 (100.0%)

Upper left to lower right with repeated bends; denser at the right end.

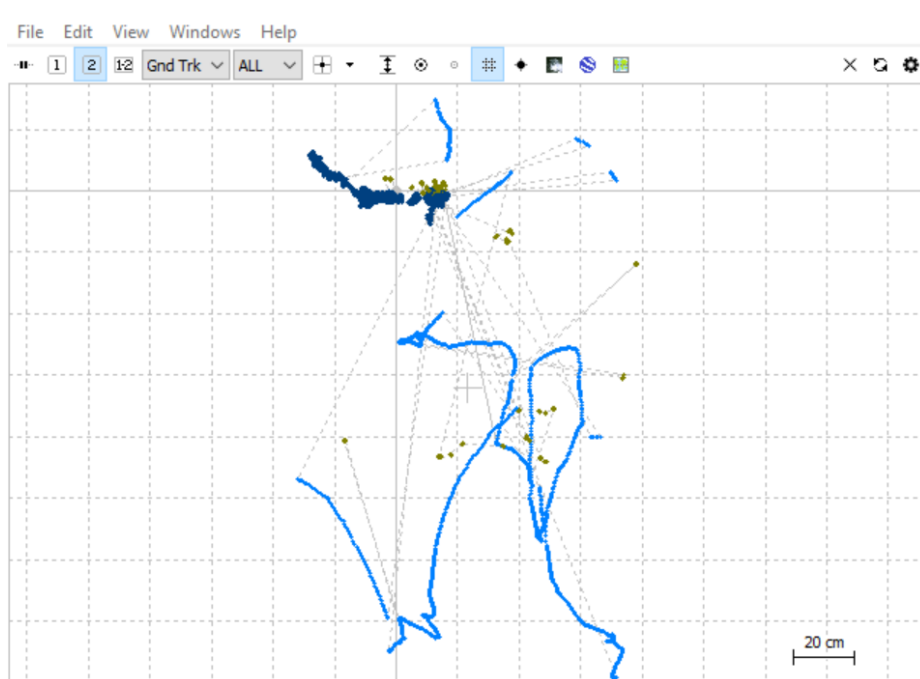


**Figure 5-6 Under tree + rain - ground track (original slide 12, right)**

Title position: 4 | View: Ground track | N = 23,386 | Q=1 20,690 (88.5%); Q=2 1,092 (4.7%); Q=4 1,604 (6.9%)

Irregular out-and-back segments, centre to lower area.

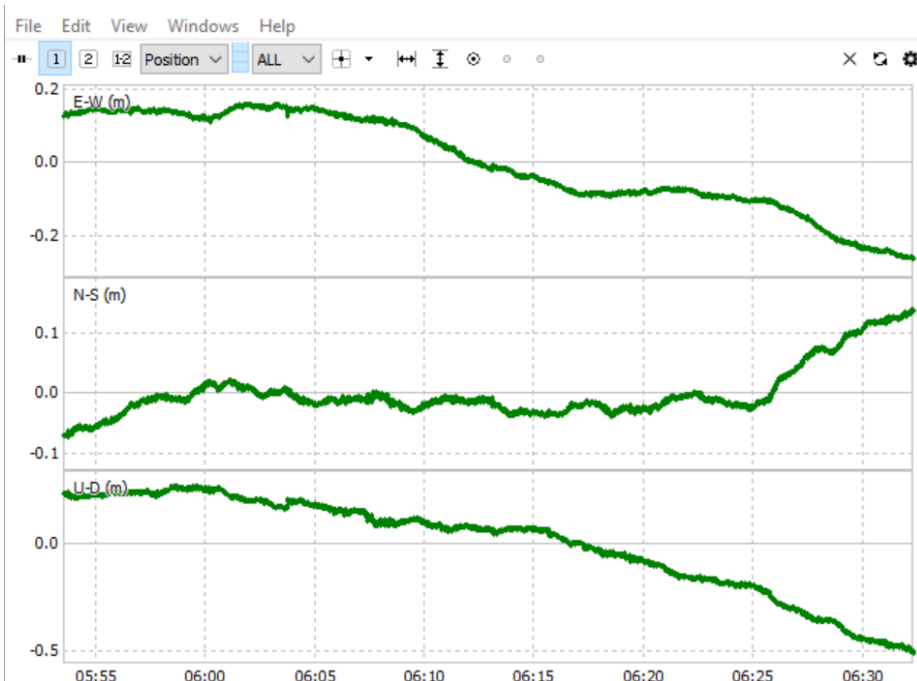


**Figure 5-7 Under tree + rain - position time series (original slide 13, left)**

Title position: 1 | View: Position time series | N = 23,268 | Q=1 23,268 (100.0%)

E falls gradually, N rises at the end, U falls overall.

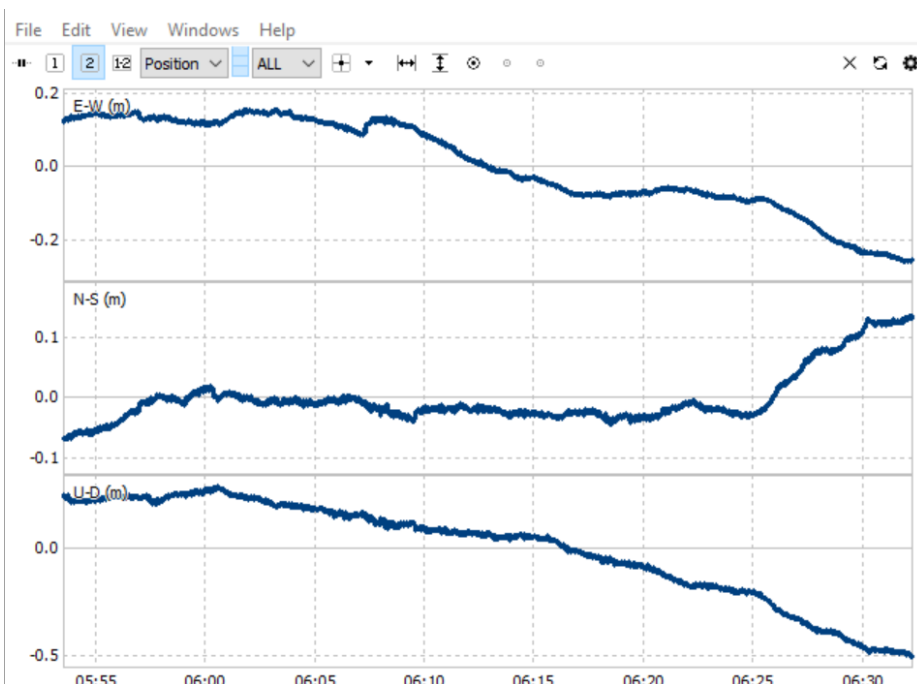


**Figure 5-8 Under tree + rain - position time series (original slide 13, right)**

Title position: 2 | View: Position time series | N = 23,439 | Q=1 23,439 (100.0%)

E falls slowly, N rises clearly at the end, U falls steadily.

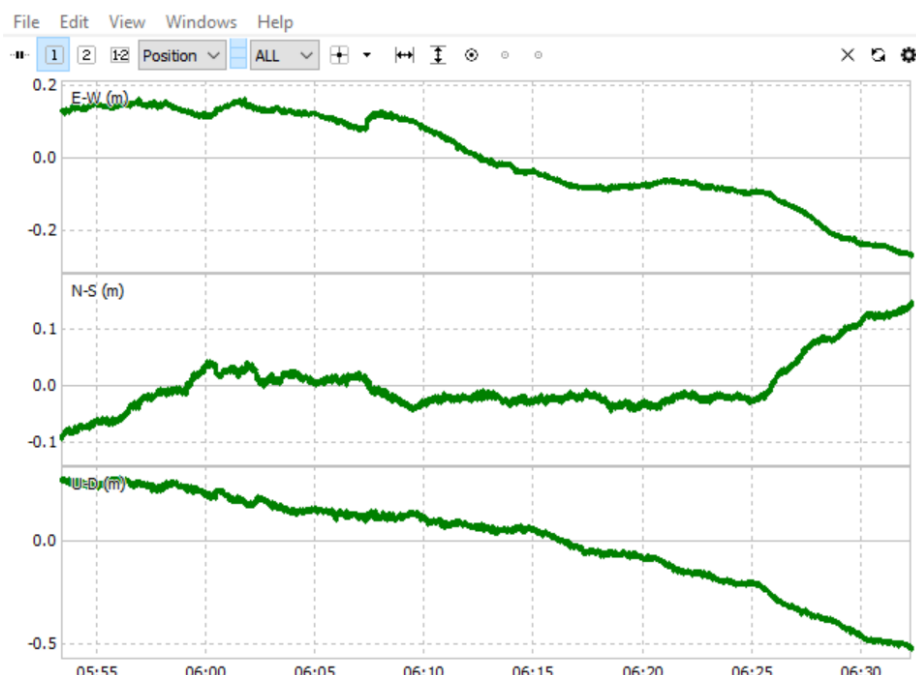


**Figure 5-9 Under tree + rain - position time series (original slide 14, left)**

Title position: 3 | View: Position time series | N = 23,329 | Q=1 23,329 (100.0%)

All three components vary; N rises more clearly at the end.

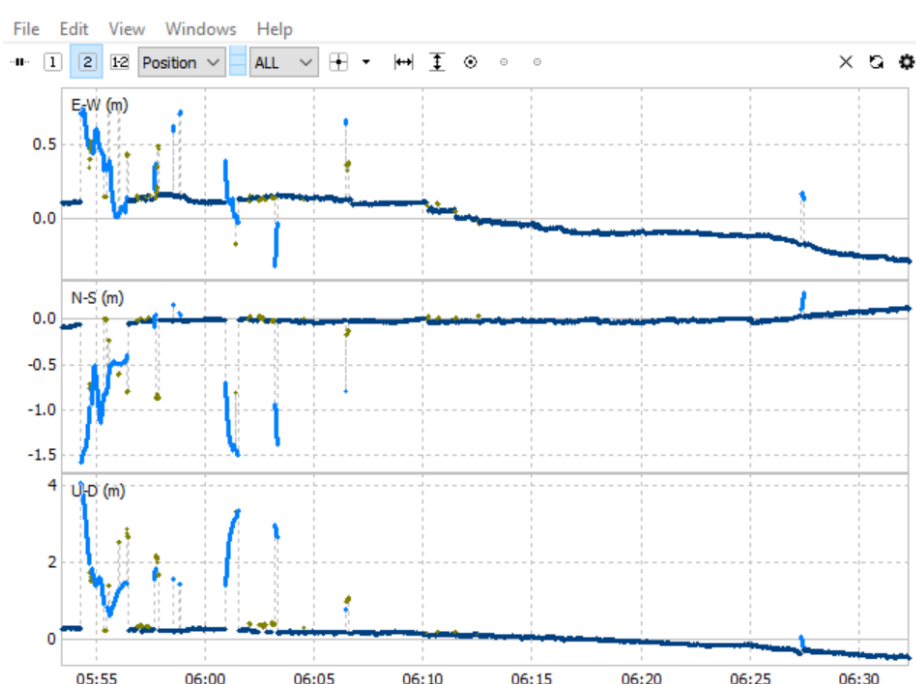


**Figure 5-10 Under tree + rain - position time series (original slide 14, right)**

Title position: 4 | View: Position time series | N = 23,386 | Q=1 20,690 (88.5%); Q=2 1,092 (4.7%); Q=4 1,604 (6.9%)

Jumps at the start of the session, then smaller, slower changes.

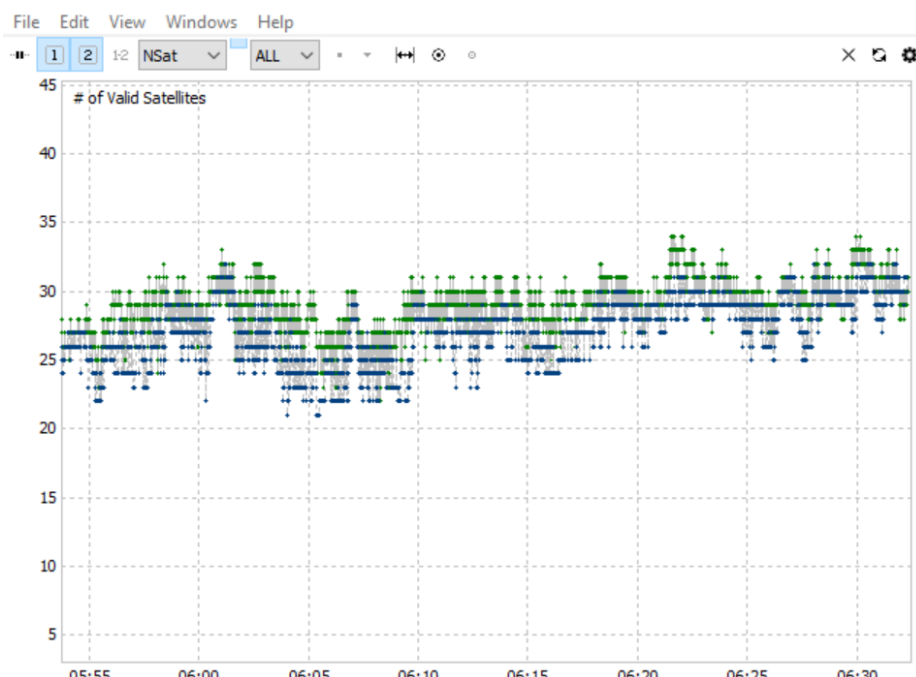


**Figure 5-11 Under tree + rain - satellites used (original slide 15, left)**

Title position: 1 | View: Satellites used | N = 23,268 | Q=1 23,268 (100.0%)

Several series between about 20 and 35 satellites.



**Figure 5-12 Under tree + rain - satellites used (original slide 15, right)**

Title position: 3 | View: Satellites used | N = 23,329 | Q=1 23,329 (100.0%)

Two series, near 40 and near 20 satellites, with small changes.

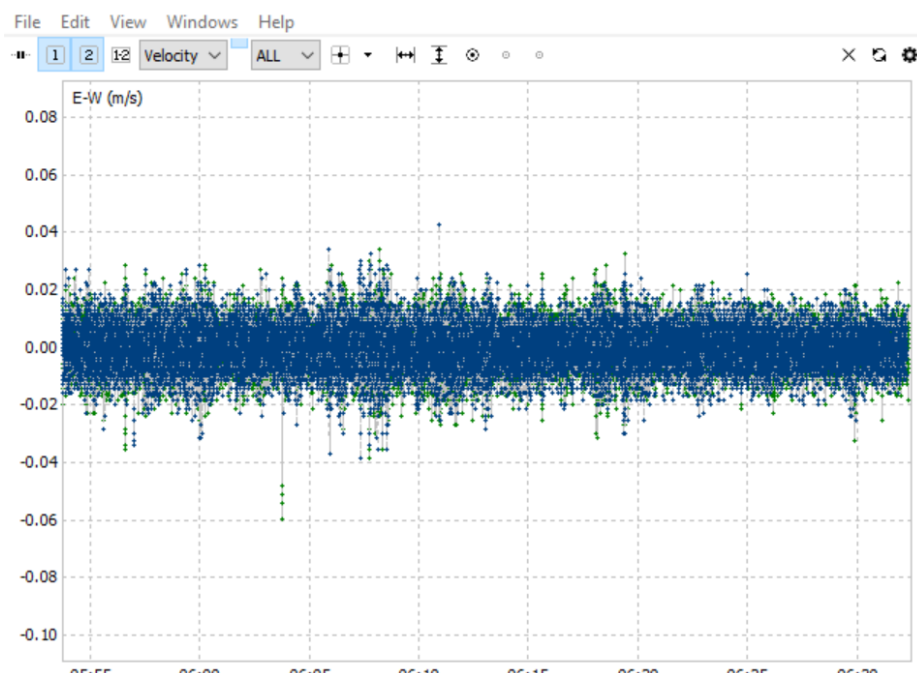


**Figure 5-13 Under tree + rain - position scatter (original slide 16, left)**

Title position: 1 | View: Position scatter | N = 23,268 | Q=1 23,268 (100.0%)

Per-epoch E/N/U points tightly grouped around each centre value.

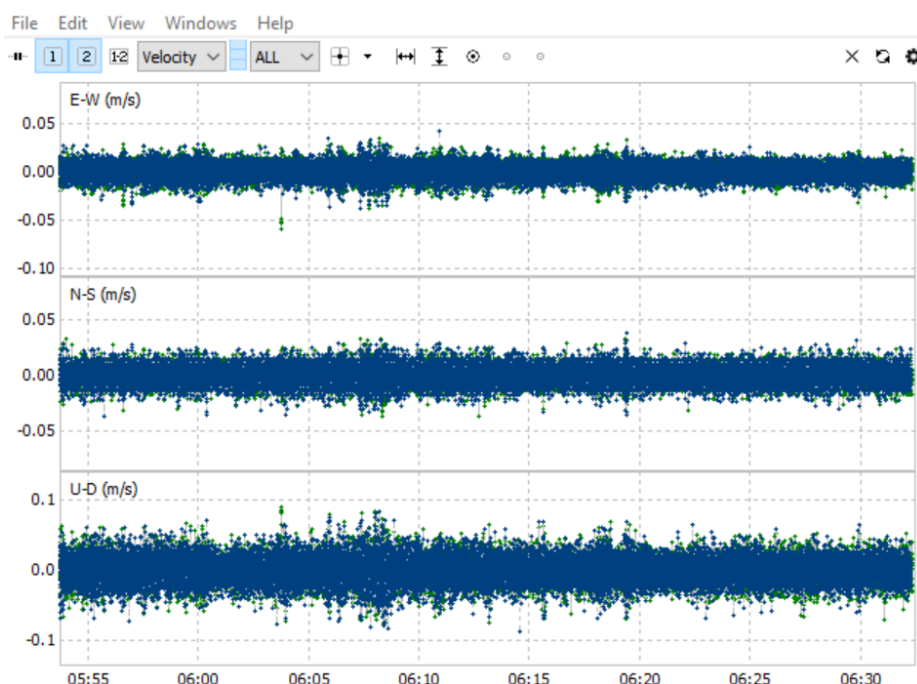


**Figure 5-14 Under tree + rain - position scatter (original slide 16, right)**

Title position: 2 | View: Position scatter | N = 23,268 | Q=1 23,268 (100.0%)

Points grouped around centre values with a few outliers. Same reading as Figure 5-13; grouping to be verified.

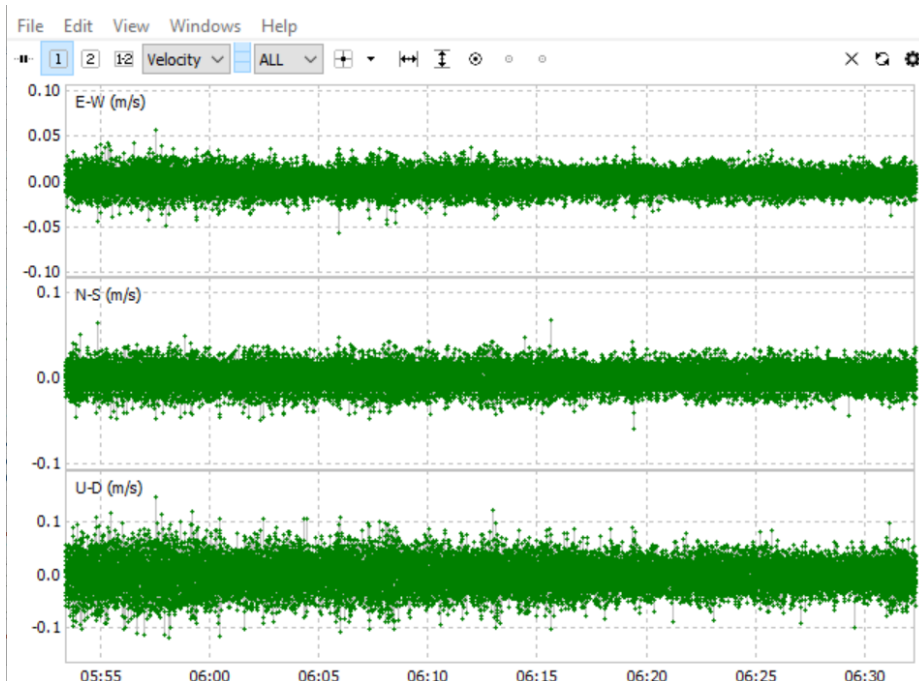


**Figure 5-15 Under tree + rain - position scatter (original slide 17, left)**

Title position: 3 | View: Position scatter | N = 23,329 | Q=1 23,329 (100.0%)

Points grouped around centre values with a few outliers.

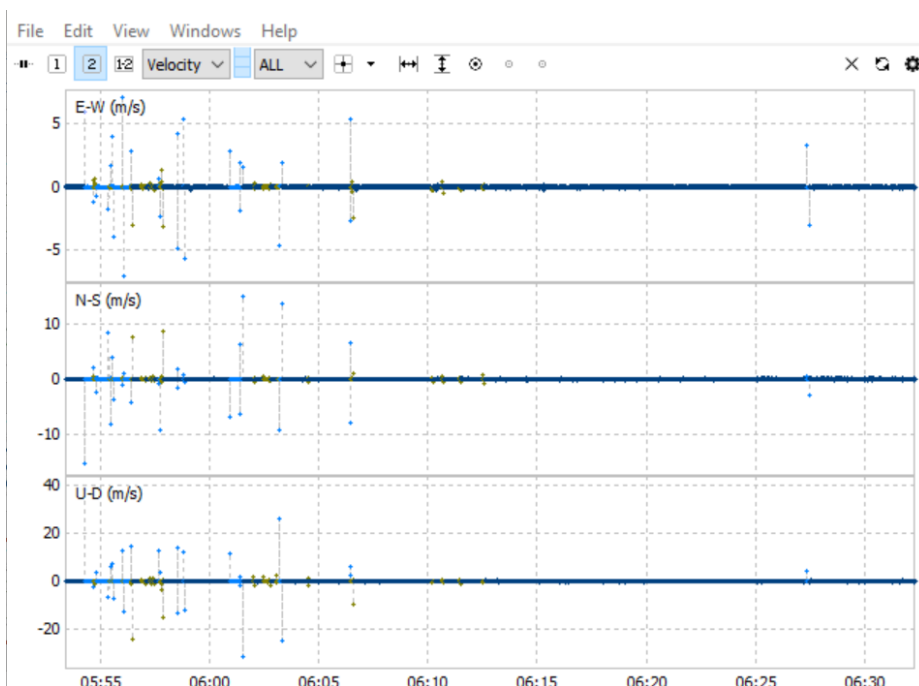


**Figure 5-16 Under tree + rain - position scatter (original slide 17, right)**

Title position: 4 | View: Position scatter | N = 23,386 | Q=1 20,690 (88.5%); Q=2 1,092 (4.7%); Q=4 1,604 (6.9%)

Wide scatter early on, then all three components settle into a narrow band.

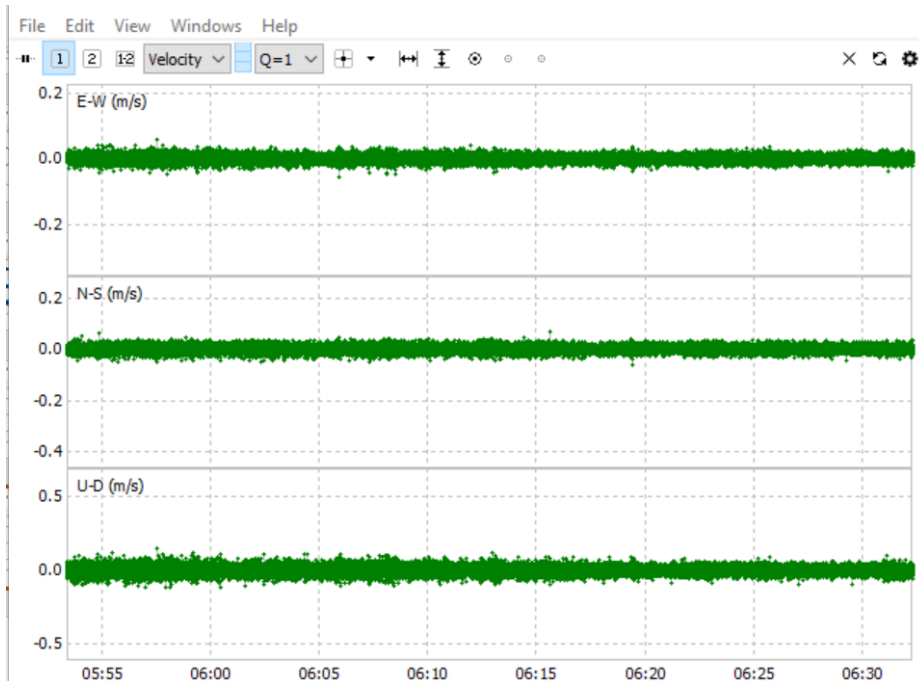


**Figure 5-17 Under tree + rain - position scatter (original slide 18, left)**

Title position: 3 | View: Position scatter | N = 23,329 | Q=1 23,329 (100.0%)

Points grouped around centre values; stable through the session.

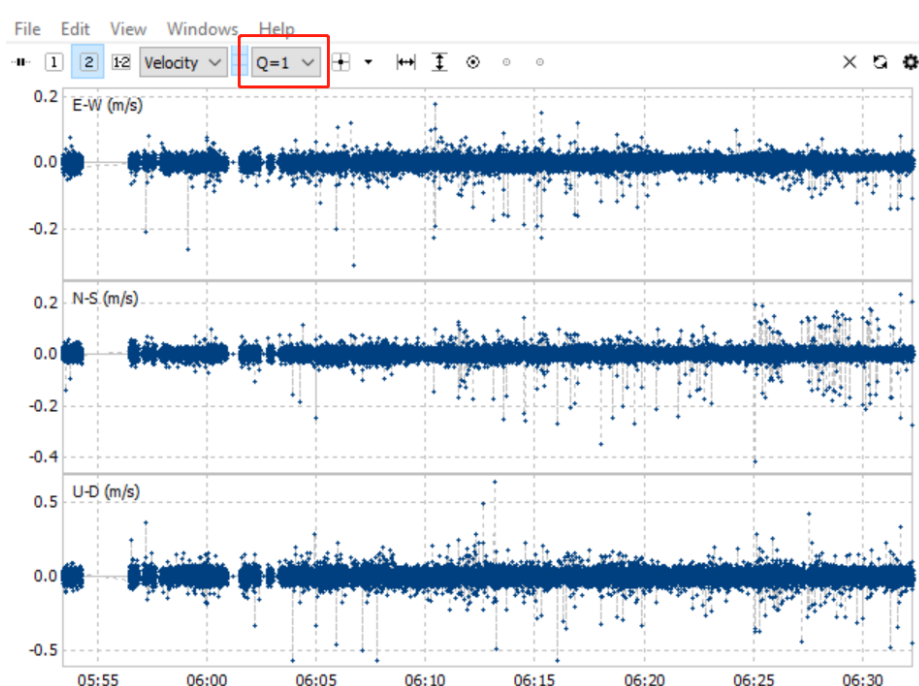


**Figure 5-18 Under tree + rain - position scatter (original slide 18, right)**

Title position: 4 | View: Position scatter | N = 23,386 | Q=1 20,690 (88.5%); Q=2 1,092 (4.7%); Q=4 1,604 (6.9%)

Points around centre values with noticeably more outliers.

## 6. Under tree + third-party network RTK (1.99 km)

### 6.1 Scene

Slide title: “3. Under tree (baseline 1.99 km, third-party network RTK service)”. Weather not stated. Same site as Section 5. Three slides, 6 figures: slide 19 ground track, slides 20–21 time series.

### 6.2 Readings per figure

**Table 6-1 Network-RTK readings**

| Fig. | Slide | Side | N      | Q=1             | Q=2 | Q=4 | Pos. | Reading  |
|------|-------|------|--------|-----------------|-----|-----|------|----------|
| 6-1  | 19    | L    | 36,489 | 36,489 (100.0%) | 0*  | 0*  | ?    | Complete |
| 6-2  | 19    | R    | 36,546 | 36,546 (100.0%) | 0*  | 0*  | ?    | Complete |
| 6-3  | 20    | L    | 36,489 | 36,489 (100.0%) | 0*  | 0*  | ?    | Complete |
| 6-4  | 20    | R    | 36,546 | 36,546 (100.0%) | 0*  | 0*  | ?    | Complete |
| 6-5  | 21    | L    | 36,489 | 36,489 (100.0%) | 0*  | 0*  | ?    | Complete |
| 6-6  | 21    | R    | 36,546 | 36,546 (100.0%) | 0*  | 0*  | ?    | Complete |

\* 0 = calculated as  $N - Q = 1$ ; not listed separately in the status bar. n/s = not shown in the screenshot (not treated as 0). ? = title position not determined.

The six figures show only two distinct N values (36,489 and 36,546), i.e. two record groups. Although each slide title lists four devices, this scene cannot be used to compare four devices. The two N differ by 57 epochs ( $\approx 6$  s at 10 Hz): 36,489 runs 07:47:28–08:48:17, 36,546 runs 07:47:21–08:48:15. Durations and rates match but start/stop times are not identical.

### 6.3 Figures

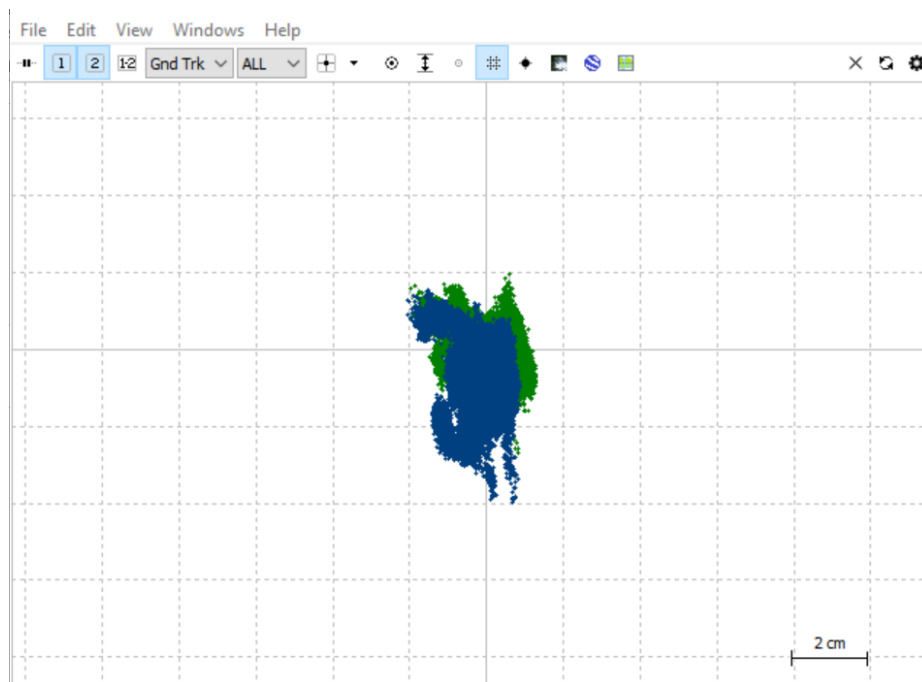


**Figure 6-1 Under tree + network RTK - ground track (original slide 19, left)**

Title position: ? | View: Ground track | N = 36,489 | Q=1 36,489 (100.0%)

Points cluster at the site; two coloured tracks overlap.

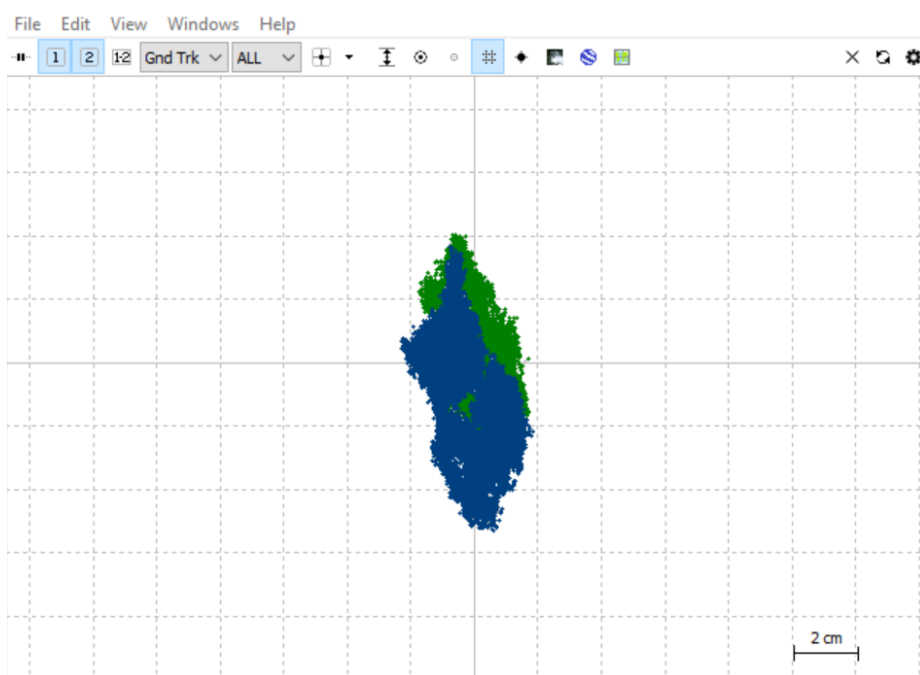


**Figure 6-2 Under tree + network RTK - ground track (original slide 19, right)**

Title position: ? | View: Ground track | N = 36,546 | Q=1 36,546 (100.0%)

Slightly wider spread than 6-1; tracks still overlap.

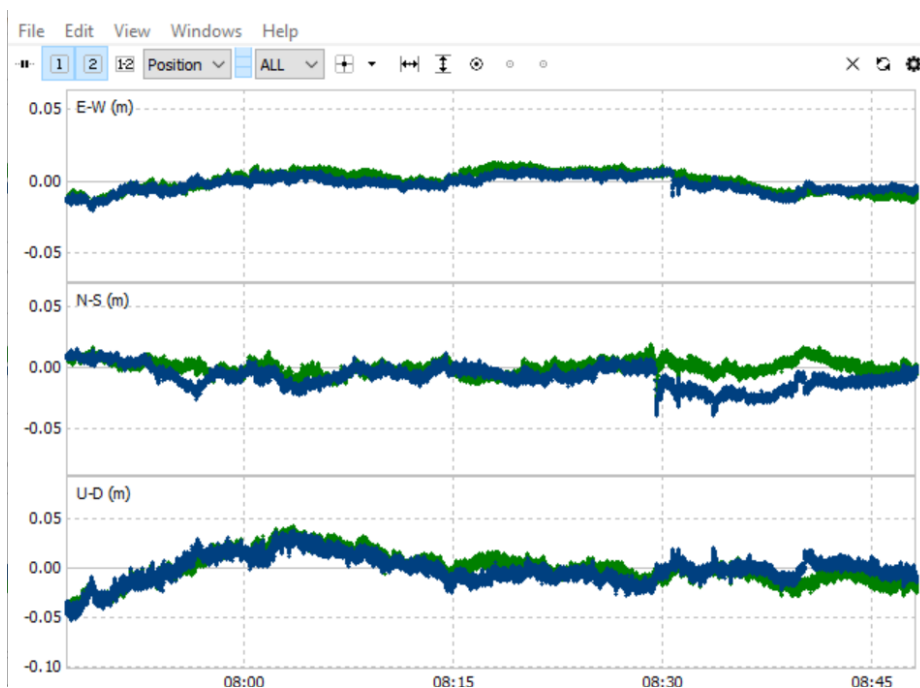


**Figure 6-3 Under tree + network RTK - position time series (original slide 20, left)**

Title position: ? | View: Position time series | N = 36,489 | Q=1 36,489 (100.0%)

Two sets of E/N/U curves close together with small variations.

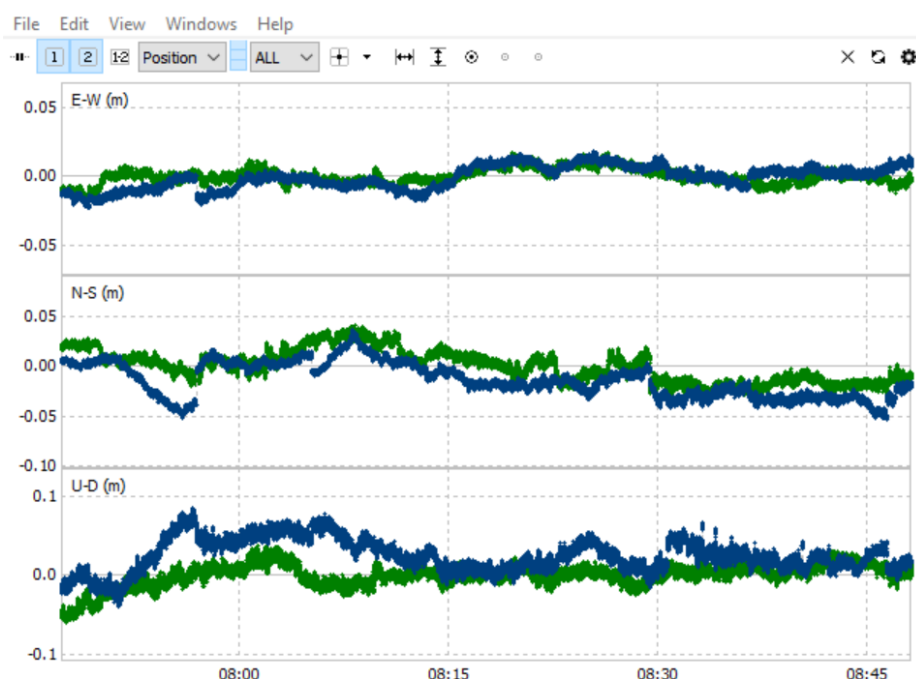


**Figure 6-4 Under tree + network RTK - position time series (original slide 20, right)**

Title position: ? | View: Position time series | N = 36,546 | Q=1 36,546 (100.0%)

E and N change little; U rises then falls mid-session.

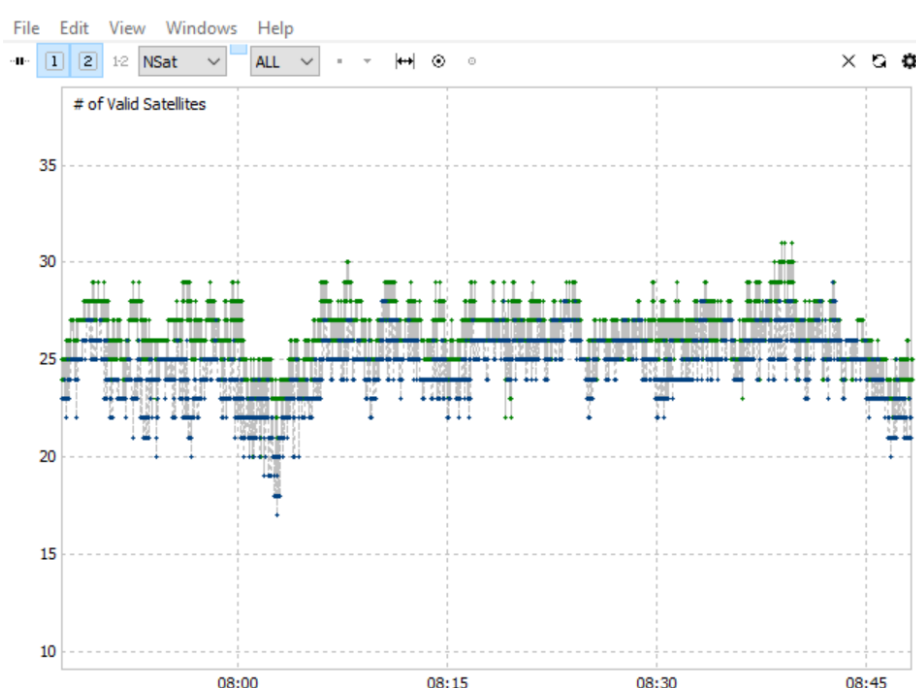


**Figure 6-5 Under tree + network RTK - satellites used (original slide 21, left)**

Title position: ? | View: Satellites used | N = 36,489 | Q=1 36,489 (100.0%)

Several series between about 20 and 35 satellites.

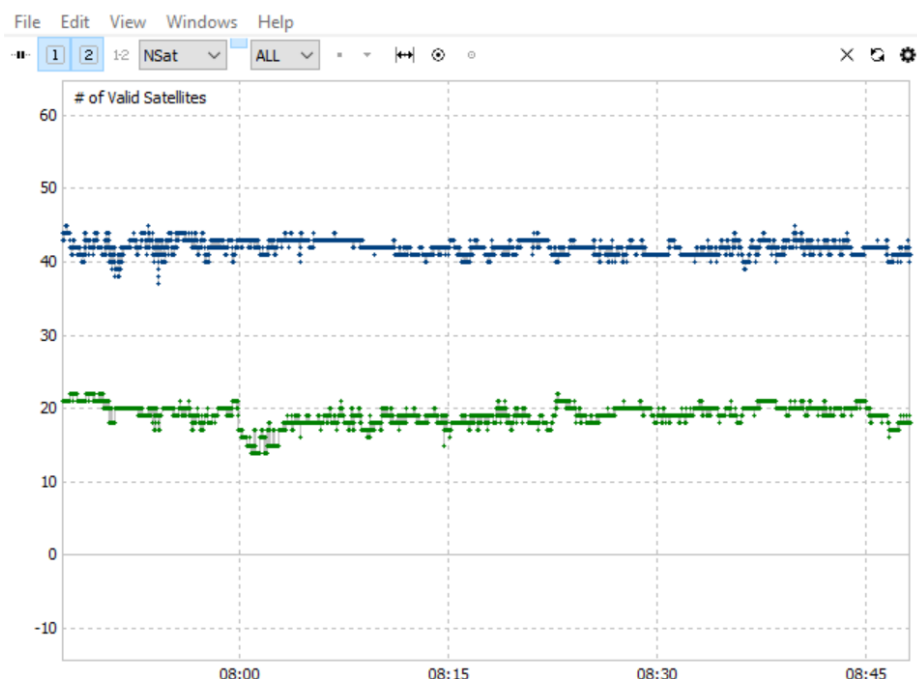


**Figure 6-6 Under tree + network RTK - satellites used (original slide 21, right)**

Title position: ? | View: Satellites used | N = 36,546 | Q=1 36,546 (100.0%)

Two series near 40 and near 20 satellites; little change.

## 7. Cross-scene discussion

### 7.1 Three scenes side by side

Table 7-1 Checkable parameters per scene

| Scene                    | Baseline | Period (GPST) | N range                       | Groups           | Groups with Q=1 < 100% |
|--------------------------|----------|---------------|-------------------------------|------------------|------------------------|
| Half sky + rain          | 21.9 km  | 02:16-03:17   | 36,328-36,678 (+1 incomplete) | 4 (1 incomplete) | 36,678: 83.3%          |
| Under tree + rain        | 16.4 km  | 05:53-06:32   | 23,268-23,439                 | 4                | 23,386: 88.5%          |
| Under tree + network RTK | 1.99 km  | 07:47-08:48   | 36,489-36,546                 | 2                | none                   |

### 7.2 Q=1 share and supporting figures

Both long-baseline scenes show the same pattern: of the four title positions, only the record group in position 4 has a Q=1 share below 100.0%; all others are at 100.0%. Because the pattern repeats across two scenes, there is a stable link between that title position and the reading.

This is a position link, not a model conclusion. In the slide titles, position 4 is labelled with the third-party receiver, but no serial numbers or full file names were supplied to confirm which physical unit it was. We therefore write “the record group in title position 4”, not “model X performed worse”.

A Q=1 share describes the status distribution of the logged record. It does not show that positions were close to the truth or that status was assigned correctly. Without ground truth, baseline vectors and raw observations, this report does not compute RMS, CEP or horizontal error, and does not rank devices.

### 7.3 Scene factors

Table 7-2 Factors and attributability

| Factor            | Half sky                              | Under tree 16.4 km                             | Under tree 1.99 km      | Attributable alone?                    |
|-------------------|---------------------------------------|------------------------------------------------|-------------------------|----------------------------------------|
| Obstruction       | ‘Half sky’; obstruction not described | ‘Under tree’; species and canopy not described | Same                    | No (changes with baseline and service) |
| Weather           | ‘Raining’; intensity not recorded     | ‘Raining’; intensity not recorded              | Not stated              | No (no dry control)                    |
| Baseline          | 21.9 km                               | 16.4 km                                        | 1.99 km                 | No (tied to service)                   |
| Correction source | Not stated                            | Not stated                                     | Third-party network RTK | No                                     |
| Site              | ≈ 40.05°N                             | ≈ 40.08°N (≈ 5.6 km away)                      | Same                    | No (site changed)                      |

The design supports “status observed under this combination of conditions”, not causal claims such as “trees cause X error” or “rain lowers the Q=1 share by Y”. Those need a wet/dry control at the same site, baseline and correction source, and repeats on several days.

### 7.4 Strength of evidence and attribution limits

- **Sample:** one device and one session per title position, so unit-to-unit and model-to-model differences cannot be separated.
- **Attribution:** record group ↔ model is inferred from title order and N, not confirmed by serial number.
- **Possible mis-ordering:** Figures 4-8 and 5-14 show the same N as position 1 on the same slide; not counted as independent samples.
- **Configuration:** elevation mask, ambiguity strategy and multipath settings were not recorded and could explain part of any difference.

- **Correlation:** adjacent 10 Hz epochs are correlated, so N is not the number of independent samples; no confidence intervals or significance tests are given.

## 8. Material limitations

The chain of evidence ends at the screenshot status bar. The missing items below mean that nothing beyond the status distribution can be answered.

**Table 8-1 Missing material and impact**

| Missing item                        | Impact                                                     | Needed                                                    |
|-------------------------------------|------------------------------------------------------------|-----------------------------------------------------------|
| Ground truth / baseline vector      | No positioning error; status correctness cannot be checked | Control-point coordinates or static baseline solution     |
| Raw observations and solution files | Cannot reprocess or check readings                         | .sbf / .ubx / RINEX and .pos / .txt                       |
| Serial numbers and file names       | Cannot tie record groups to devices                        | Original files and device list                            |
| Processing settings                 | Cannot confirm a common processing basis                   | Elevation mask, ambiguity strategy, correction parameters |
| Heading data                        | Dual-antenna heading not verified                          | Heading output files                                      |
| Environment log                     | Repeatability cannot be assessed                           | Rain intensity, obstruction, canopy, antenna height       |

Until these are supplied, any conclusion about accuracy, performance or which model is better has no basis.

## 9. Key findings and limitations

**Table 9-1 Key findings**

| # | Finding                                                                                                                 | Evidence                          | Limitation                                  |
|---|-------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------------------|
| 1 | Source is a 22-slide screenshot compilation: slide 2 set-up, slide 3 photos, slides 4-21 36 screenshots, slide 22 blank | Whole deck                        | No conclusion slide, no raw data            |
| 2 | All record groups logged at $\approx 10$ Hz; N differs by 57-350 epochs within a scene                                  | Tables 3-1, 3-2                   | Records not synchronised                    |
| 3 | 16.4 km: 3 of 4 record groups at Q=1 100.0%, 1 group at 88.5% (Q=2 4.7%, Q=4 6.9%)                                      | Figs 5-1 - 5-18; Table 5-2        | Group $\leftrightarrow$ model not confirmed |
| 4 | 21.9 km: 3 of 4 groups at 100.0%, 1 group at 83.3% (Q=2 5.9%, Q=4 10.8%)                                                | Figs 4-1 - 4-12; Table 4-2        | One group has incomplete N                  |
| 5 | 1.99 km: only 2 record groups, both 100.0%; four devices cannot be compared                                             | Figs 6-1 - 6-6; Table 6-1         | Two devices' screenshots missing            |
| 6 | In both long-baseline scenes the lower-Q=1 group is in title position 4 (third-party receiver label)                    | Figs 4-6/4-10; 5-6/5-10/5-16/5-18 | No serial numbers; not a model verdict      |
| 7 | Obstruction, baseline, site, correction source and weather all change between scenes                                    | Table 7-2                         | Not a controlled test                       |
| 8 | Material cannot support accuracy figures or a device ranking                                                            | —                                 | No truth, observations or settings          |

**In one line: this is a review of solution status and data integrity based on screenshots. It can tell you which record showed which status distribution in which period; it cannot tell you which device is more accurate.**

## 10. Recommendations

### 10.1 Complete the material (priority)

- Recover the original .txt / .pos solution files and observation files, and rebuild the record-group ↔ device table from file names and serial numbers.
- Confirm the physical identity of each labelled unit (including both third-party labels and the two mosaic-X5 labels) and record firmware versions.
- Supply processing settings for all three scenes: elevation mask, ambiguity strategy, correction source and base coordinates.
- Check whether Figures 4-8 and 5-14 are duplicates or mis-ordered, and complete the missing devices in the 1.99 km scene.

### 10.2 Reprocessing and acceptance metrics

For acceptance testing or public claims, reprocess from the original files and report at least: Q=1 share (denominator N), Q=2 / Q=4 shares, horizontal and vertical RMS and 95th percentile, time to first fix (first Q=1), and solution availability. State the time window and how epoch correlation was handled.

### 10.3 Retest design for public conclusions

- **Control:** same site, baseline and correction source; cross dry/wet with open-sky/under-tree; at least 3 repeats per cell.
- **Truth:** a known control point or a long static baseline solution, with the coordinate frame stated.
- **Logging:** antenna height, canopy photos, rain intensity, temperature, firmware, processing settings, satellites used, PDOP, C/N0.
- **Sample:** at least two units per model; dual-antenna units should log heading at the same time.
- **Analysis:** decimate to 1 Hz before statistics, state the effective sample size and do not derive confidence intervals from raw N.

## 11. Frequently asked questions

### What is the difference between the Eview HB56 and HB56H?

The HB56 is built on the Septentrio mosaic-X5: single antenna, multi-band, multi-constellation RTK with AIM+ interference protection. The HB56H is built on the mosaic-H and supports dual-antenna heading, giving heading and pitch or roll directly. Both use the same Septentrio solution and status scheme, so the Q=1 / Q=2 / Q=4 counting in this report applies to both.

### Why can't the three scenes be compared directly?

Obstruction, baseline length, site, correction source and weather all changed between the three sessions, so this is not a controlled test. Differences between scenes cannot be attributed to any single factor; the report only describes the status distribution observed under each combination.

### Is the Q=1 share the same as the RTK fix rate?

In RTKLIB's convention Q=1 means a fixed solution, so the Q=1 share is the fix rate as reported by the logging software. It describes the status distribution only; it does not show that positions were close to the truth or that the fix decisions were correct.

### Why can't this data show which receiver is better?

Each title position had one device and one session, so unit and model differences cannot be separated. Record groups were matched to devices by title order and epoch count, not by serial number, and without ground truth any accuracy ranking would have no basis.

## What logging rate should I use under tree canopy?

The  $\approx 10$  Hz in this report is estimated from N and duration and is only used to check that records were set up the same way. Under canopy and multipath, the fix rate depends mainly on observation quality, elevation mask and multipath mitigation; higher rates mainly help you reconstruct when the fix was lost and recovered.

## What is needed to use this review for acceptance or public claims?

Raw observation and solution files, base coordinates and baseline vectors, receiver serial numbers, processing settings (elevation mask, ambiguity strategy, correction parameters), antenna heights and an environment log (rain, canopy, obstruction distance), plus a crossed dry/wet and open/canopy retest at one site with at least two units per model.

## 12. Related Eview products

The receivers in these records correspond to the following Eview models, all built on Septentrio modules:

- **Eview HB56** – Septentrio mosaic-X5 inside: multi-band, multi-constellation RTK with AIM+ interference protection and SD-card logging, for drones, survey, robotics and integration projects. The mosaic-X5 records in this review use this platform.
- **Eview HB56H** – Septentrio mosaic-H inside: dual-antenna heading and attitude, for platforms where a magnetic compass is unreliable or redundant heading is needed. The mosaic-H records in this review use this platform.
- **Eview HB10** – Septentrio AsteRx-m3 inside: board-level high-precision positioning for size- and power-sensitive integration.

Selection tip: under tree canopy and multipath, evaluate AIM+ interference protection and multipath settings first; choose the HB56H when you need heading. For any side-by-side evaluation, fix the site, baseline, correction source and processing settings, and follow the retest design in Section 10.3.

Full article: [gnss-solutions.com/rtk-fix-ratio-under-tree-canopy-rain-field-review/](https://gnss-solutions.com/rtk-fix-ratio-under-tree-canopy-rain-field-review/) · Questions: [sales@gnss-solutions.com](mailto:sales@gnss-solutions.com)

## 13. Sources and credits

- **Test data, screenshots and site photos:** field test of 24 August 2023, supplied to Eview GNSS by the test team as a 22-slide deck and a two-part Chinese technical report (R1.2). Used with permission; the original files are not publicly available.
- **Plots:** RTKPLOT from RTKLIB, the open-source GNSS positioning package – [www.rtklib.com](http://www.rtklib.com).
- **GNSS modules referenced:** Septentrio [mosaic-X5](#), [mosaic-H](#) and [AsteRx-m3 family](#) (official product pages).
- **Interference protection:** Septentrio [AIM+](#).
- No third-party product images are used in this report.

Source: compiled from the test team's two-part "Mosaic under-tree test technical report" (R1.2) and the original slide-deck screenshots. In this English edition, software title bars and status-bar coordinates were cropped, a vehicle registration and badges in photo 2-1 were blurred, and the equipment-layout photo was omitted. Readings, tables and figure order are unchanged from R1.2/R1.3.