

ucsd_stereo_21deg_12d

Processed on: 2026-04-15 14:54:41

ASP version: 3.7.0-alpha

asp_plot version: 1.12.1

DEM Summary

| Property | Value |
|---------------------|--|
| DEM File | run-DEM.tif |
| Dimensions (px) | 2499 x 2491 |
| GSD (m) | 1.20 |
| CRS | EPSG:32611 |
| Nodata (%) | 14.4 |
| Elevation Range (m) | -75.9 to 132.0 |
| Acquisition Dates | 2015-02-12 18:39:26 UTC; 2015-02-24 18:31:34 UTC |

Processing Parameters

Runtime Summary

| Step | Runtime |
|---------------|------------------------|
| Bundle Adjust | 0 hours and 16 minutes |
| Stereo | 0 hours and 28 minutes |
| point2dem | 0 hours and 0 minutes |

Reference DEM:

ref/cop30_ucsd_wgs84_utm.tif

Bundle Adjust Command:

```
bundle_adjust --threads 8 --ip-per-image 10000 --tri-weight 0.1 --tri-robust-threshold 0.1 --camera-weight 0  
1040010007A93700_P001.NTF 1040010007CA4D00_P001.NTF 1040010007A93700_P001.xml 1040010007CA4D00_P001.xml -o ba/run
```

Stereo Command:

```
stereo --stereo-algorithm asp_mgm --subpixel-mode 9 --alignment-method none --bundle-adjust-prefix ba/run  
1040010007A93700_P001_map.tif 1040010007CA4D00_P001_map.tif 1040010007A93700_P001.xml 1040010007CA4D00_P001.xml  
stereo/run ref/cop30_ucsd_wgs84_utm.tif --corr-seed-mode 1 --sgm-collar-size 256 --compute-point-cloud-center-only  
--threads 8
```

point2dem Command:

```
point2dem --tr 1.2 --t_srs EPSG:32611 --errorimage stereo/run-PC.tif
```

Report Generation Command:

```
asp_plot --directory /Users/ben/Desktop/asp-plot-examples/ucsd_stereo_21deg_12d/ --bundle_adjust_directory ba/  
--stereo_directory stereo/ --subset_km 0.25 --report_filename ../../reports/WorldView_UCSD-asp-plot-report.pdf
```

Input Scenes

Input Scenes Map-projected Scenes

Left
run-L_sub.tif



Right
run-R_sub.tif



Figure 1: Left and right input scenes used for stereo processing. Non-mapprojected scenes are shown after ASP's alignment step (e.g., *affineepipolar*), which rotates images to create horizontal epipolar lines for correlation. Mapprojected scenes have been orthorectified with RPCs against a reference DEM to roughly align the two images prior to correlation, which reduces the disparity search range; they are displayed here in their map-projected orientation.

Stereo Geometry

ucsd_stereo_21deg_12d
Center datetime: 2015-02-18 18:35:30.428675
Time offset: 11 days, 23:52:07.687800
Conv. angle: 21.21, B:H ratio: 0.37, BIE: 84.31, Assym Angle: 2.73, Int. area: 192.13 km2
ID:1040010007A93700, GSD:0.32, off:8.4, az:268.3, el:9.2, it:-1.5, ct:-8.3, scan:Forward, tdi:64
ID:1040010007CA4D00, GSD:0.32, off:12.9, az:140.4, el:14.3, it:-8.4, ct:9.8, scan:Forward, tdi:64

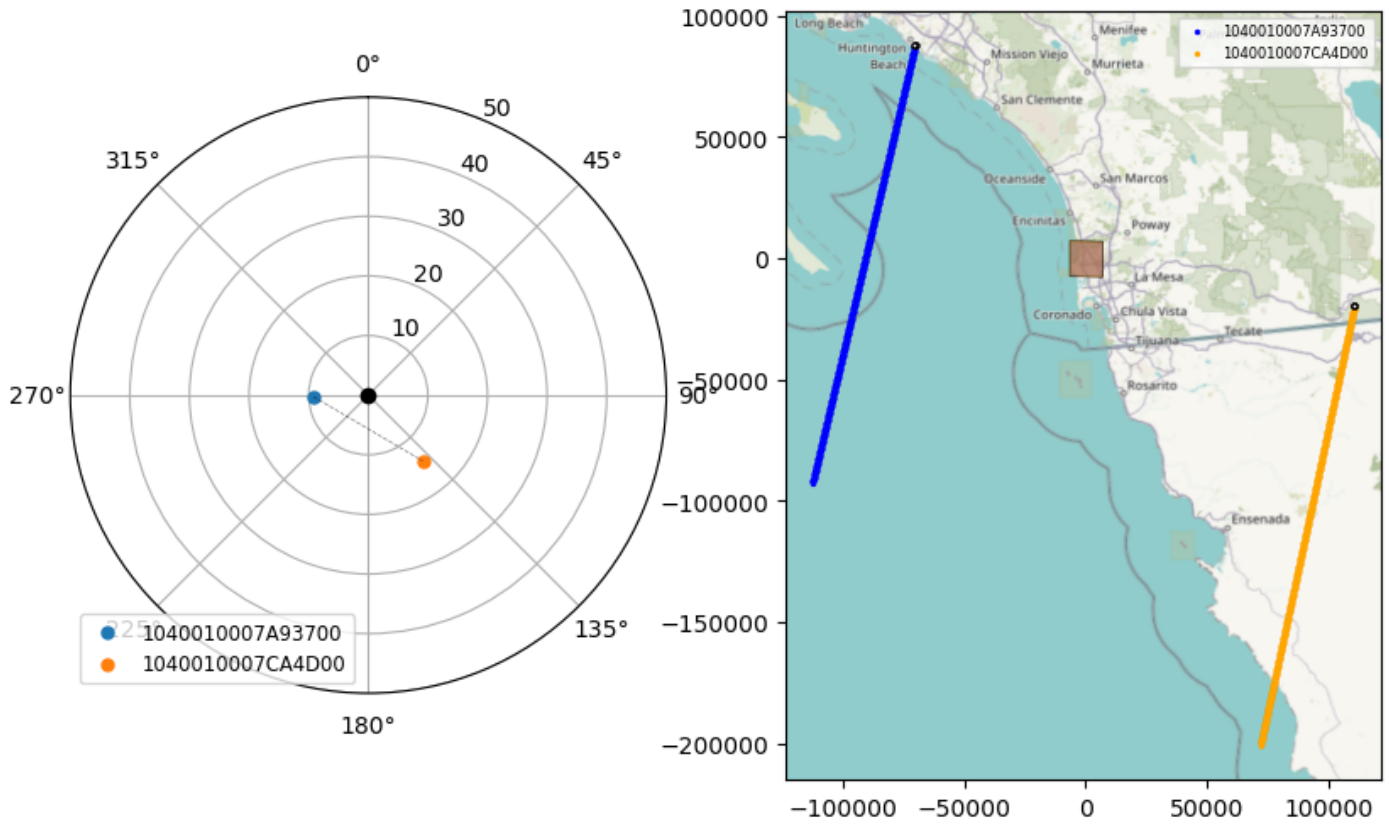


Figure 2: Stereo acquisition geometry skyplot and map view showing satellite viewing angles and scene footprints.

Match Points

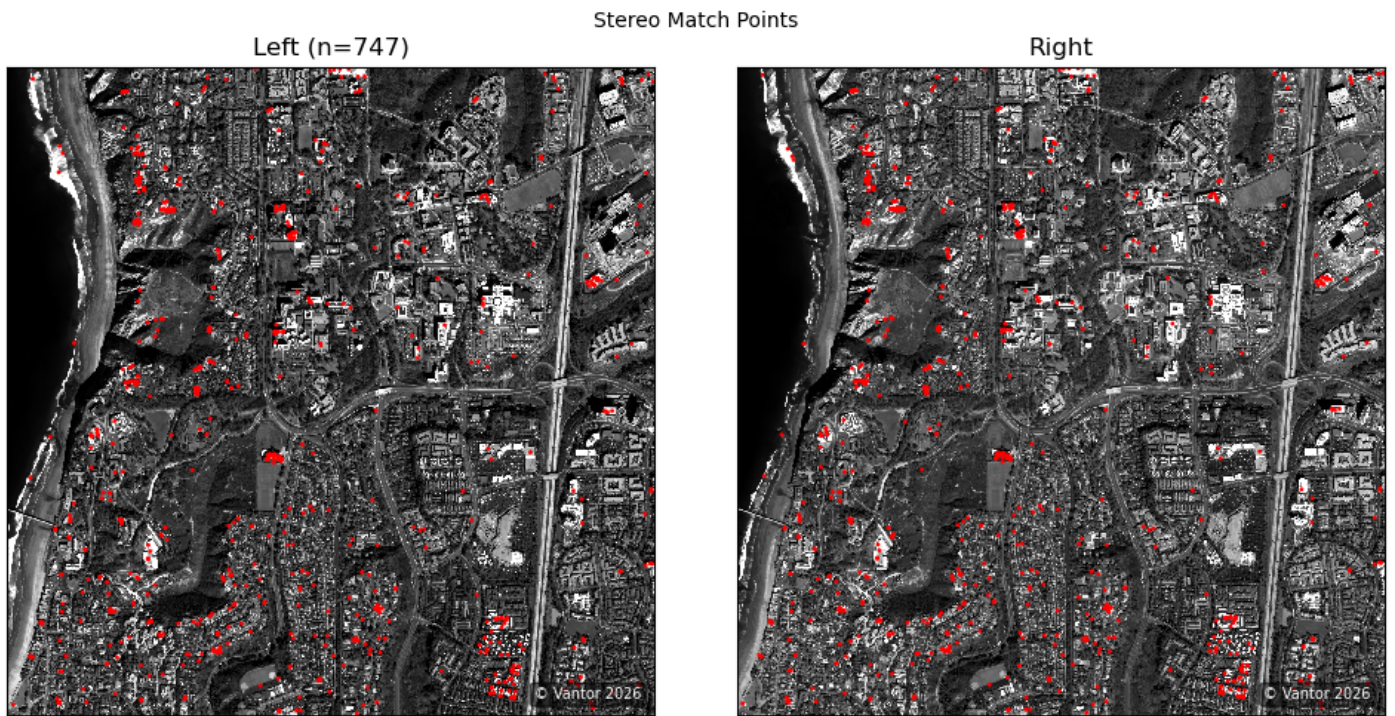


Figure 3: Interest point matches between left and right images. These are produced by `stereo_corr` during its initial interest point matching step, which is used to set the search windows for subsequent dense correlation (not the dense correlation matches themselves).

Bundle Adjust Residuals (Log Scale)

Bundle Adjust Initial and Final Residuals (Log Scale)

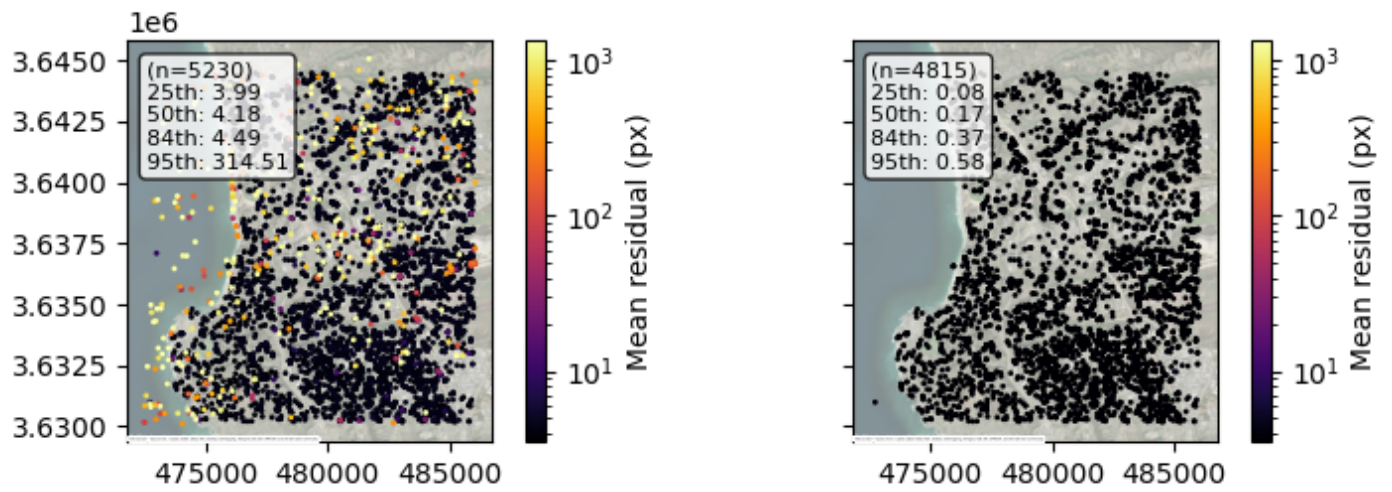


Figure 4: Initial and final bundle adjustment residuals on a logarithmic scale.

Bundle Adjust Residuals (Linear Scale)

Bundle Adjust Initial and Final Residuals (Linear Scale)

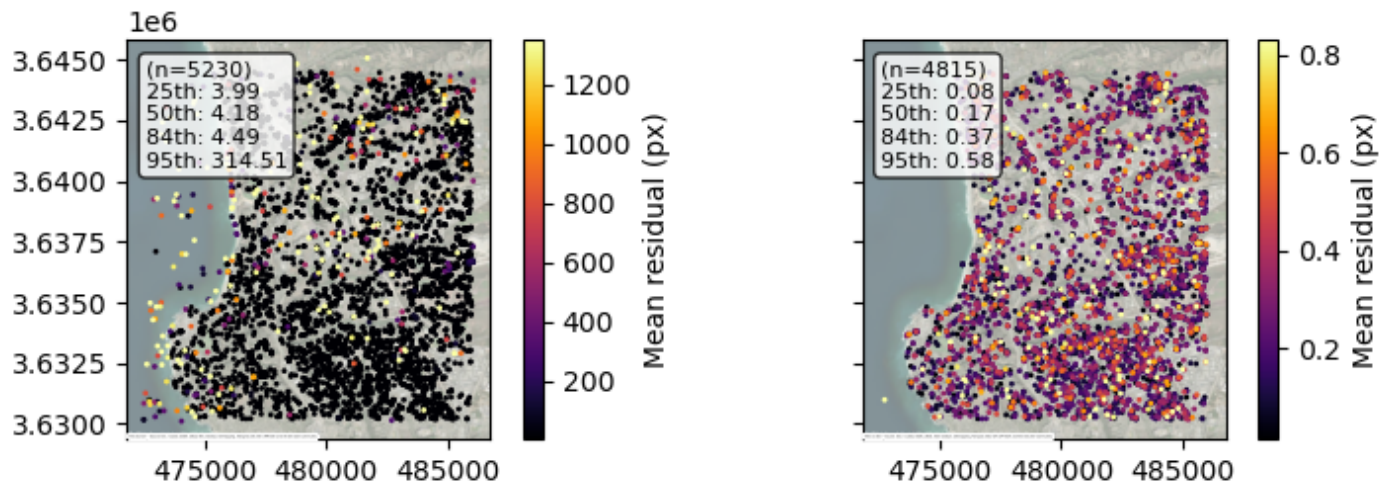


Figure 5: Initial and final bundle adjustment residuals on a linear scale.

Disparity

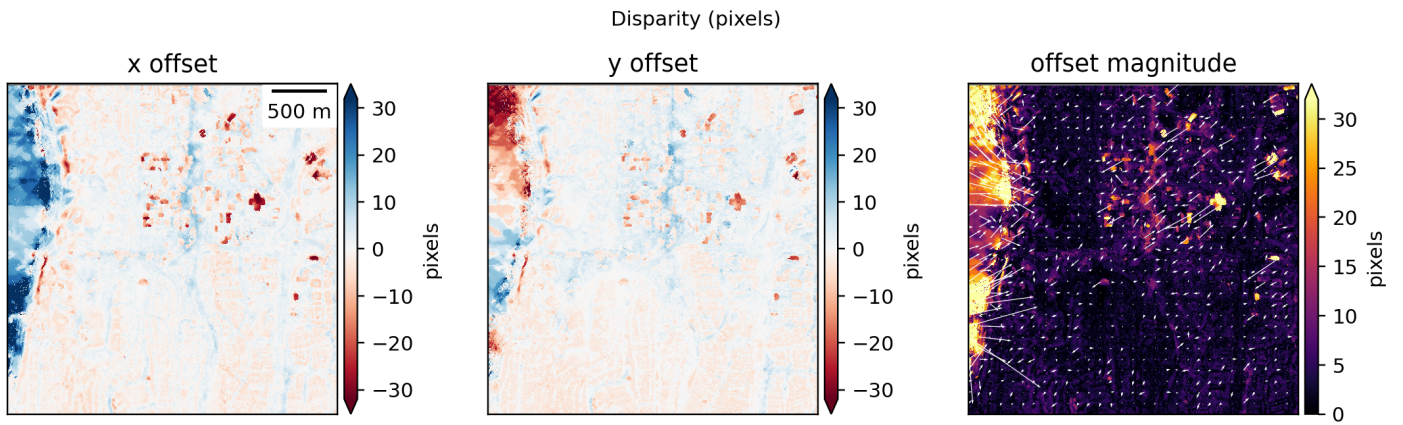


Figure 6: Horizontal and vertical disparity maps in pixels with quiver overlay.

DEM Results

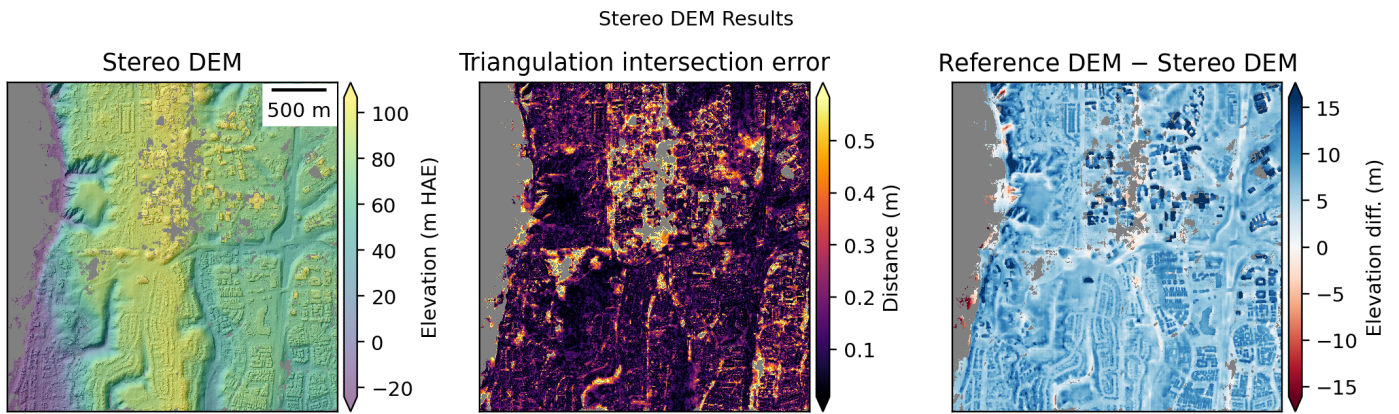


Figure 7: Output DEM with intersection error map and difference relative to the reference DEM used in processing.

Detailed Hillshade

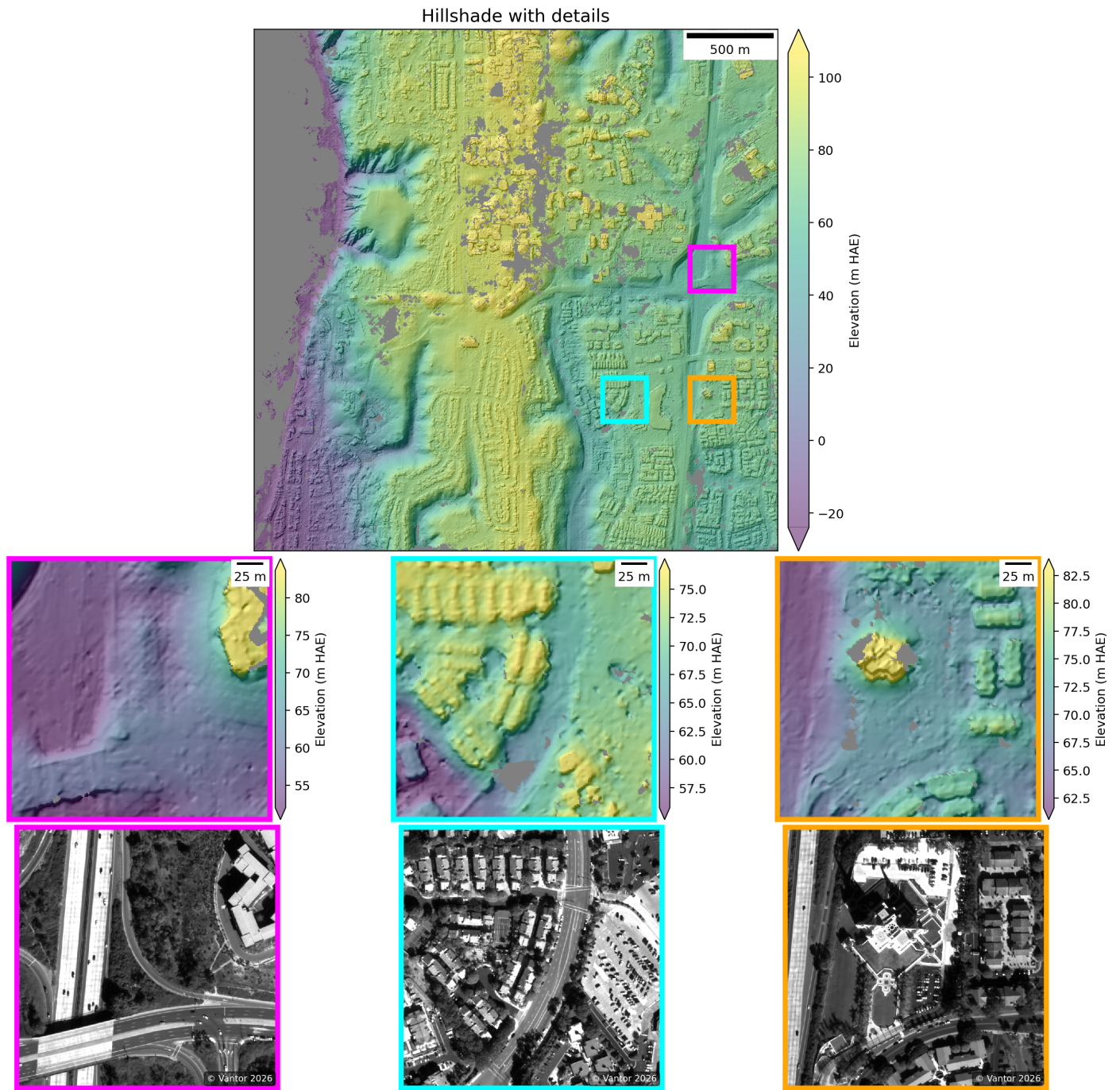


Figure 8: DEM hillshade. If the intersection error is available, zoomed subsets selected from low, medium, and high (left to right) uncertainty areas are displayed in the second row. If the mapprojected image is available, corresponding ortho image subsets are displayed in the bottom row.

ICESat-2 ATL06-SR Map

ICESat-2 ATL06-SR
all (n=1086)
2018-10-14 to 2026-04-21

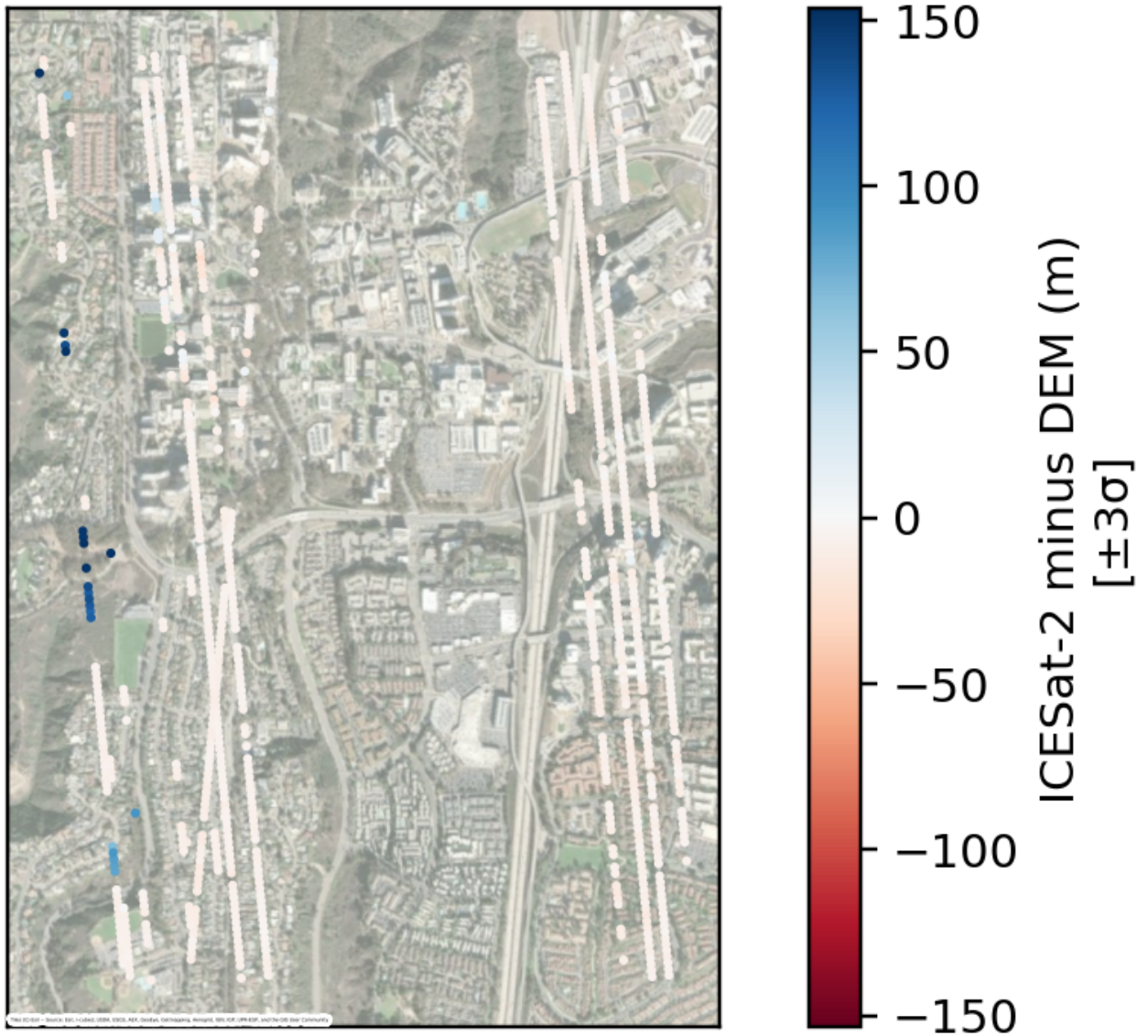


Figure 9: ICESat-2 ATL06-SR elevation differences vs. ASP DEM.

ICESat-2 ATL06-SR Histogram

ICESat-2 ATL06-SR vs DEM
all (n=977)
2018-10-14 to 2026-04-21

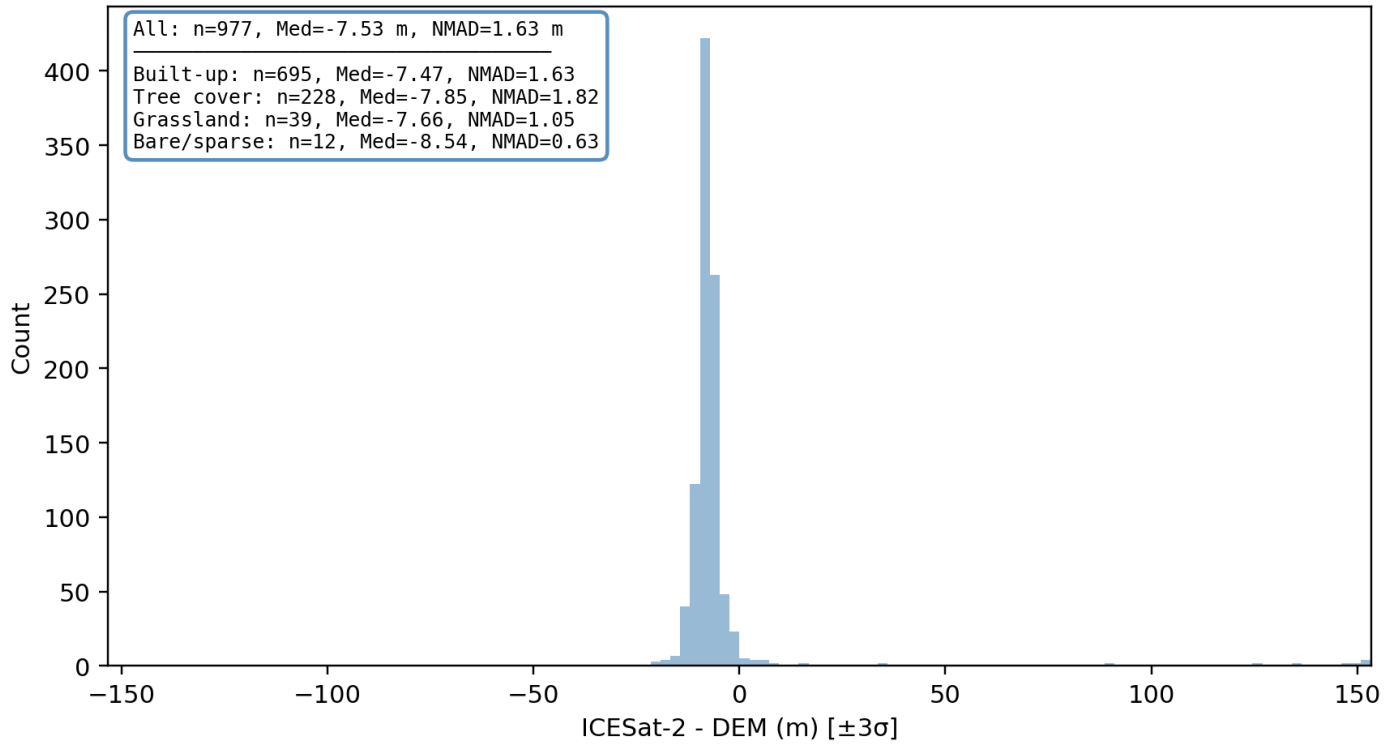


Figure 10: Distribution of elevation differences between ICESat-2 ATL06-SR and ASP DEM with per-landcover statistics.

ICESat-2 ATL06-SR Profile

RGT 585, Cycle 17, Spot 5 (2022-10-29) — n=141
2018-10-14 to 2026-04-21

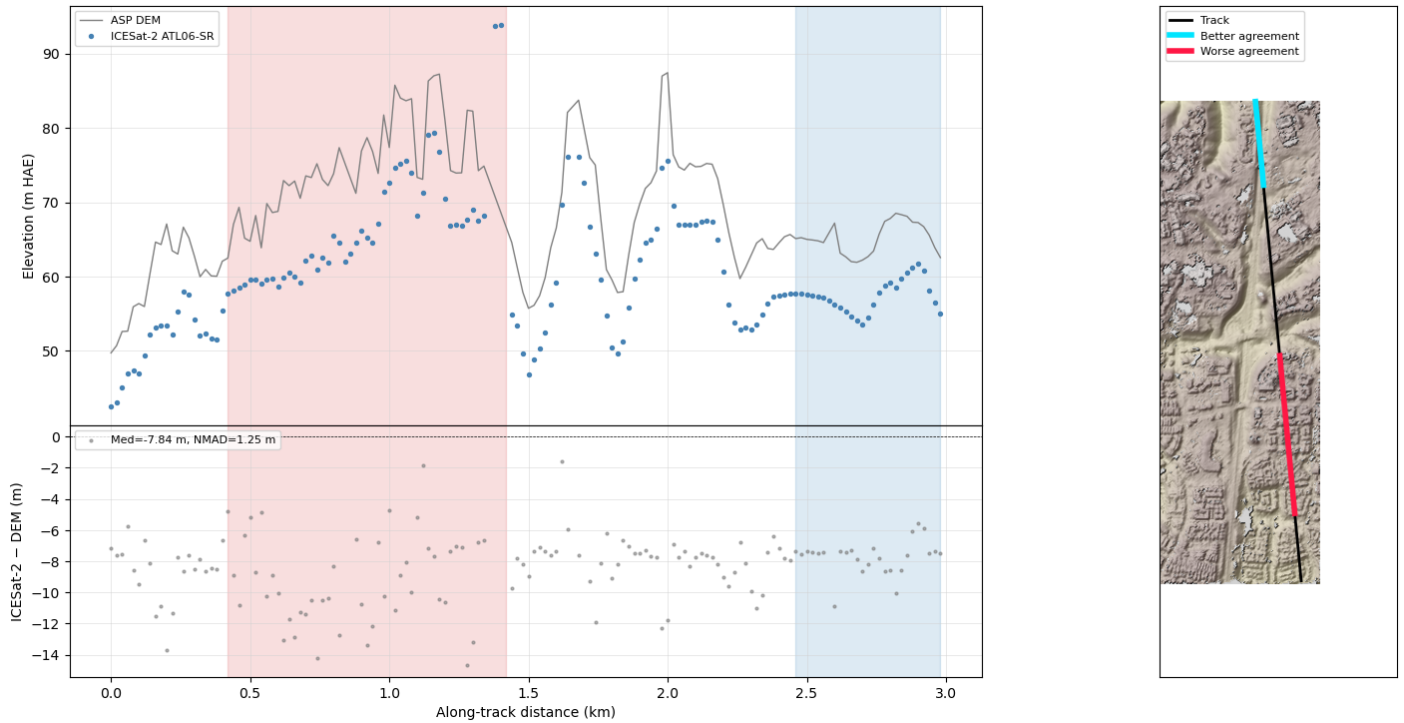


Figure 11: Elevation profile along the ICESat-2 track with the most valid points, comparing ATL06-SR and DEM heights (top) and height differences (bottom), with a context hillshade map on the right. Blue/red highlights mark the 1 km segments with better and worse agreement between ICESat-2 and the DEM.

ICESat-2 ATL06-SR Agreement Segments

RGT 585, Cycle 17, Spot 5 (2022-10-29) — n=141
2018-10-14 to 2026-04-21

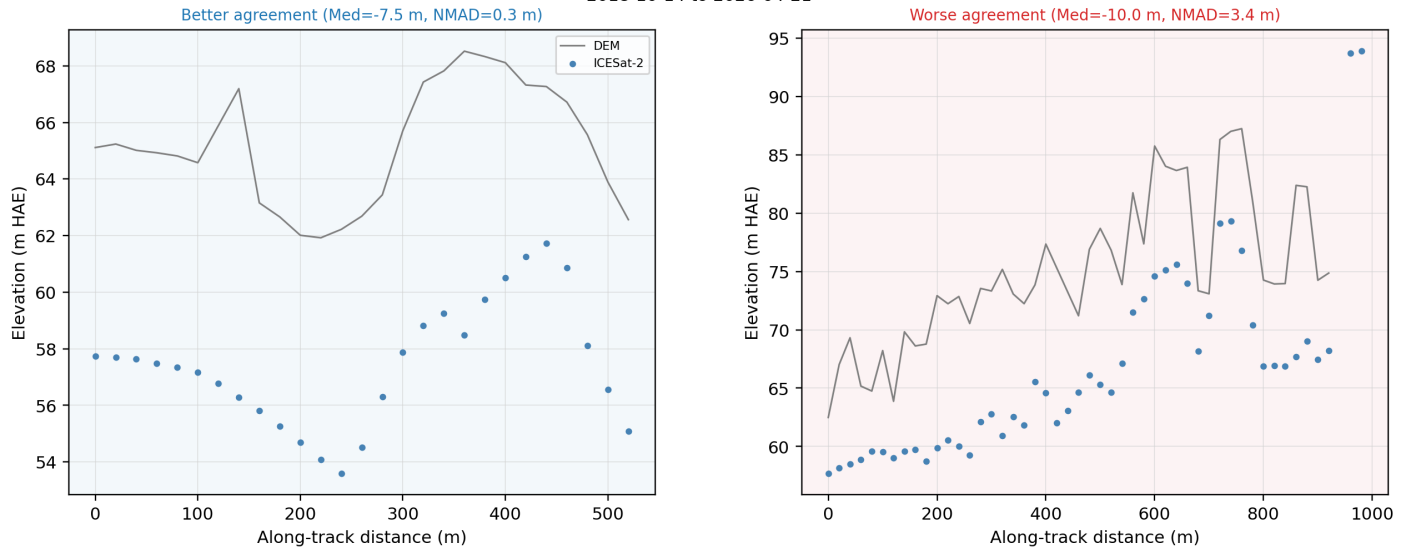


Figure 12: 1 km segments along the ICESat-2 track with better (left) and worse (right) agreement with the DEM. Segments are scored by $3 \cdot |\text{median}(dh)| + \text{NMAD}(dh)$, which weights the median bias three times more than the dispersion so that a segment with a large bias is not selected as 'better agreement' just because its NMAD is small.

DEM Alignment with ICESat-2

Alignment Parameters

| Parameter | Value |
|---------------------------|-------|
| processing_level | all |
| minimum_points | 500 |
| agreement_threshold | 0.25 |
| min_translation_threshold | 0.1 |
| improvement_threshold_pct | 5.0 |

Alignment Statistics (m)

| p16_beg | p50_beg | p84_beg | p16_end | p50_end | p84_end | N_shift | E_shift | D_shift | T |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|------|
| 5.58 | 7.44 | 9.38 | 0.27 | 1.11 | 3.68 | 0.87 | -2.23 | -7.63 | 8.00 |

ASP's pc_align estimates a rigid 3D translation that minimizes the height residuals between the ASP DEM and ICESat-2 ATL06-SR ground-track points used as the reference point cloud. The translation is applied to the DEM directly (geotransform + pixel-value shift, no resampling) to produce the aligned DEM.

Alignment Parameters (above):

- processing_level: ATL06-SR filter key used as the reference; 'all' uses every filtered point.
- minimum_points: minimum ATL06-SR point count required; fewer points skips the alignment.
- agreement_threshold: maximum relative disagreement across temporal sub-filters before the aligned DEM is flagged as inconsistent.
- min_translation_threshold: minimum translation magnitude (as a fraction of the DEM GSD) required to write out an aligned DEM.
- improvement_threshold_pct: minimum percentage reduction in p50 required to keep the aligned DEM on disk; below this, the aligned DEM is removed.

Alignment Statistics (above, in meters):

- p16_beg / p50_beg / p84_beg: 16th / 50th / 84th percentile of the DEM-vs-ICESat absolute height residuals before alignment.
- p16_end / p50_end / p84_end: same percentiles after alignment.
- N_shift / E_shift / D_shift: north / east / down components of the applied translation vector.
- |T|: magnitude of the translation vector.

p50 improved from 7.44 m -> 1.11 m (85.0% reduction). Aligned DEM written to /Users/ben/Desktop/asp-plot-examples/ucsd_stereo_21deg_12d/stereo/run-DEM_pc_align_translated.tif.

ICESat-2 ATL06-SR Histogram (Aligned DEM)

ICESat-2 ATL06-SR vs DEM
all (n=977)
2018-10-14 to 2026-04-21

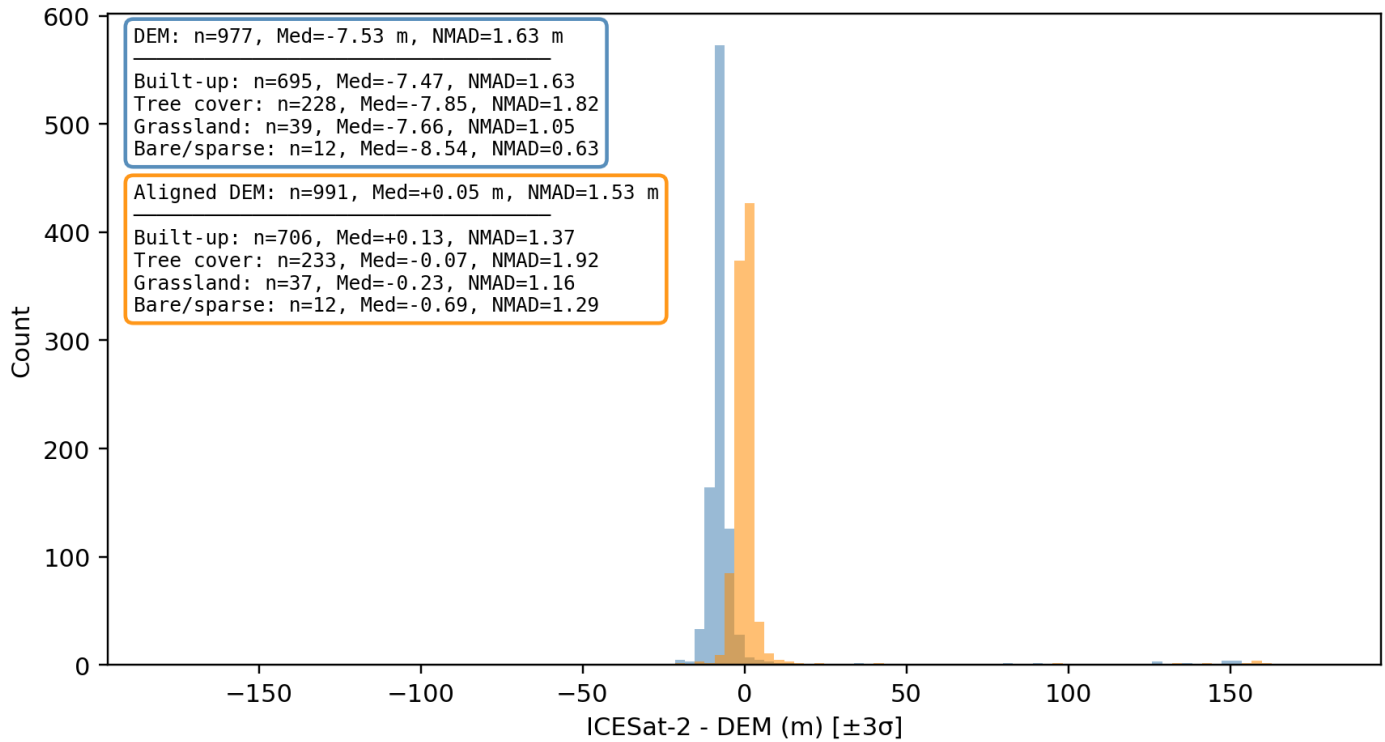


Figure 14: Pre- (steelblue) and post-alignment (orange) distributions of ICESat-2 minus DEM height differences, with per-landcover statistics in the two stacked text boxes. Box outline color matches the bar color.

ICESat-2 ATL06-SR Profile (Aligned DEM)

RGT 585, Cycle 17, Spot 5 (2022-10-29) — n=141
2018-10-14 to 2026-04-21

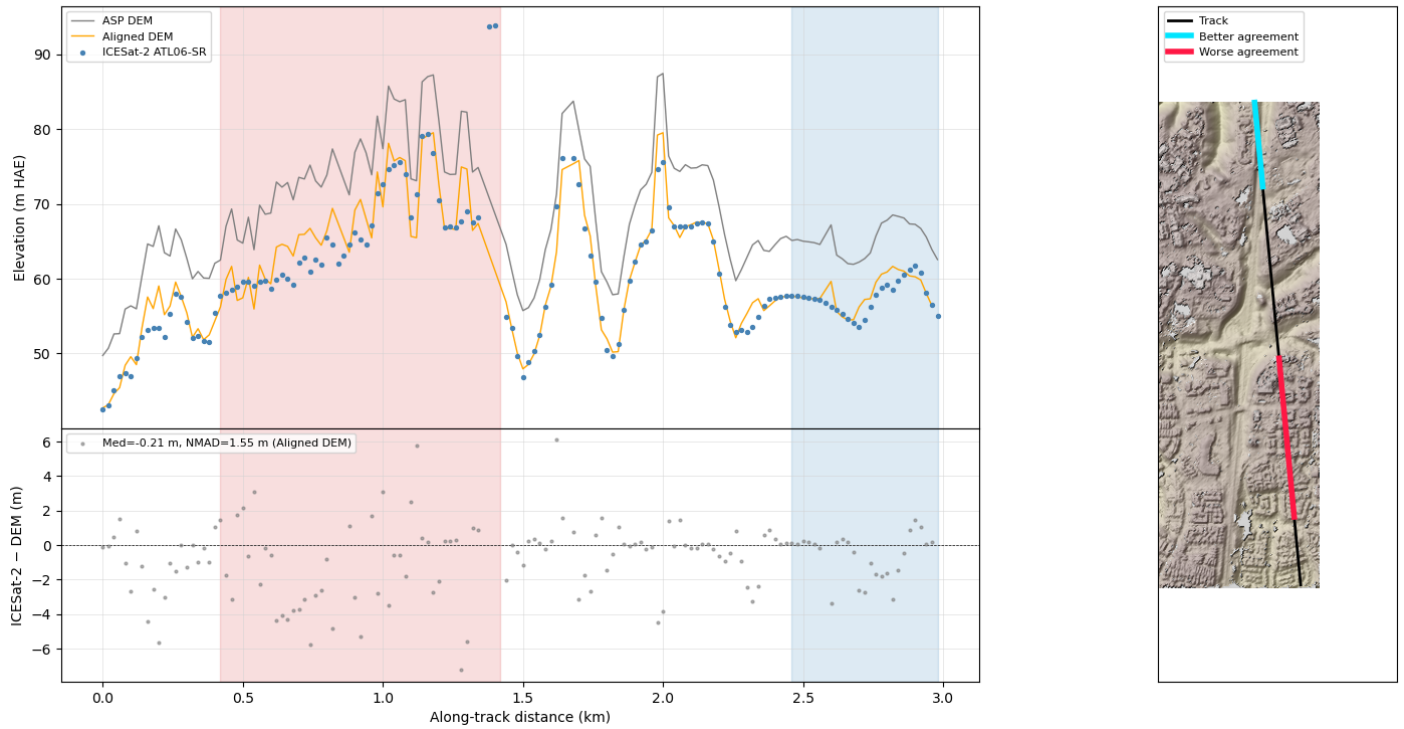


Figure 15: Elevation profile along the ICESat-2 track after *pc_align*. The aligned DEM is overlaid on the profile and used to recompute the height differences shown in the lower panel.

ICESat-2 ATL06-SR Agreement Segments (Aligned DEM)

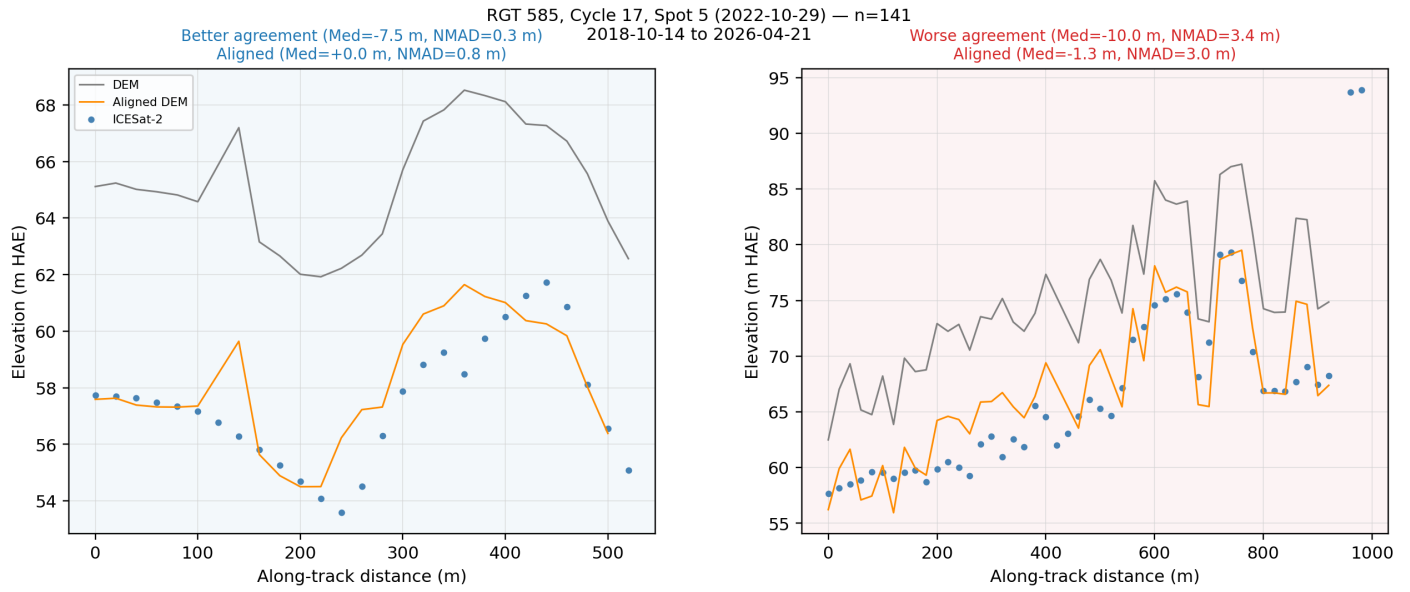


Figure 16: The same better- and worse-agreement segments as above, now with the aligned DEM overlaid. Segment selection is held fixed so Median/NMAD can be compared directly.