

# mars\_moc

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ASP version: 3.7.0-alpha

asp\_plot version: 1.13.0

## DEM Summary

Property	Value
DEM File	output-DEM.tif
Dimensions (px)	1569 x 5392
GSD (m)	3.42
CRS	EPSG:None
Nodata (%)	45.6
Elevation Range (m)	-10324.4 to -9972.6

# Processing Parameters

## Runtime Summary

Step	Runtime
Bundle Adjust	N/A
Stereo	0 hours and 3 minutes
point2dem	0 hours and 0 minutes

### Bundle Adjust Command:

Bundle adjustment not run

### Stereo Command:

```
stereo --stereo-algorithm asp_mgm --subpixel-mode 9 --alignment-method affineepipolar E0201461.cub M0100115.cub out_stereo/output --corr-seed-mode 1 --sgm-collar-size 256 --compute-point-cloud-center-only --threads 8
```

### point2dem Command:

```
point2dem --auto-proj-center --errorimage out_stereo/output-PC.tif
```

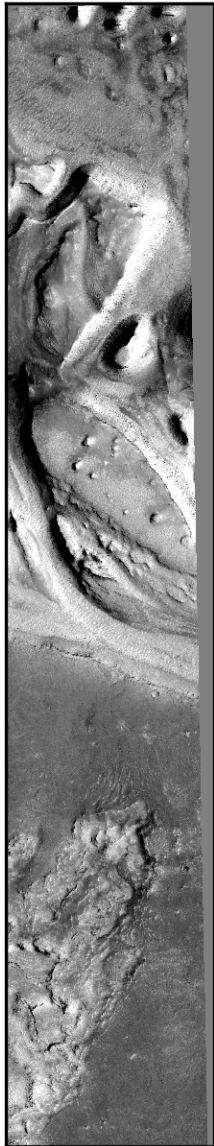
### Report Generation Command:

```
asp_plot --directory /Users/ben/Desktop/asp-plot-examples/mars_moc/ --stereo_directory out_stereo/ --add_baseemap False --altimetry_csv /Users/ben/Desktop/asp-plot-examples/mars_moc/438115_mola/MolaPEDR_34N34N_142E142E_20260319T204814563_pts_csv.csv --plot_geometry False --subset_km 0.5 --report_filename /Users/ben/Desktop/tmp/asp_plot/reports/MOC-asp-plot-report.pdf
```

## Input Scenes

### Input Scenes Raw Scenes, No Map-projection

Left  
output-L\_sub.tif



Right  
output-R\_sub.tif

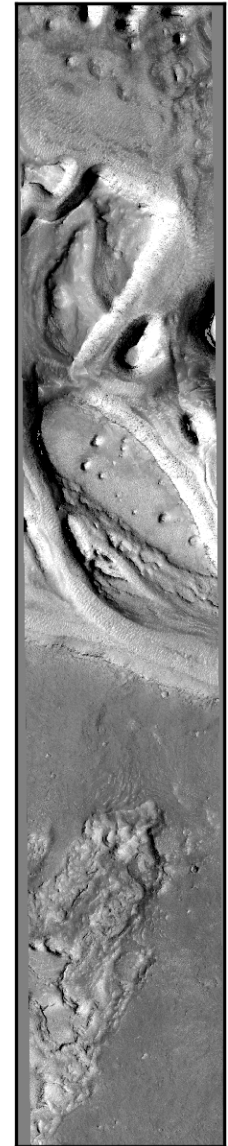
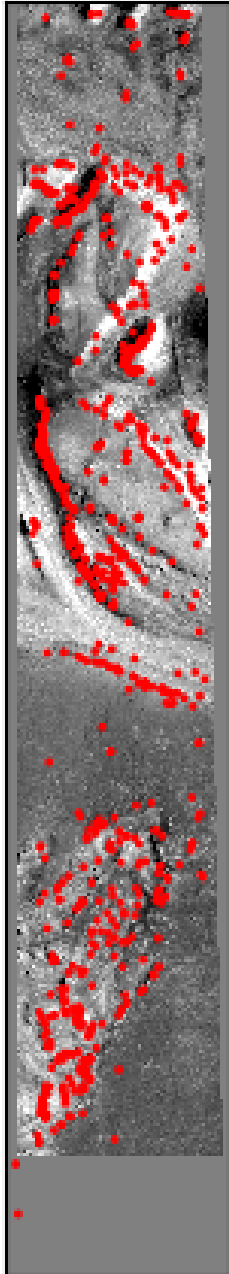


Figure 1: Left and right input scenes used for stereo processing. Non-mapprojected scenes are shown after ASP's alignment step (e.g., *affineepipolar*), which rotates images to create horizontal epipolar lines for correlation. Mapprojected scenes have been orthorectified with RPCs against a reference 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.

## Match Points

### Stereo Match Points

Left (n=854)



Right

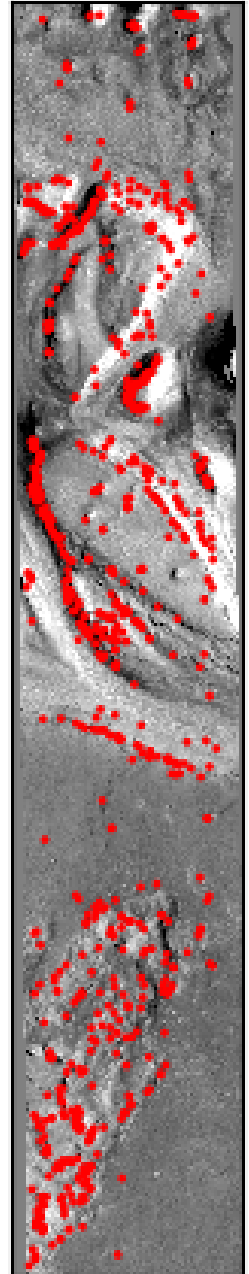


Figure 2: Interest point matches between left and right images. These are produced by `stereo_corr` during its initial interest point matching step, which is used to set the search windows for subsequent dense correlation (not the dense correlation matches themselves).

# Disparity

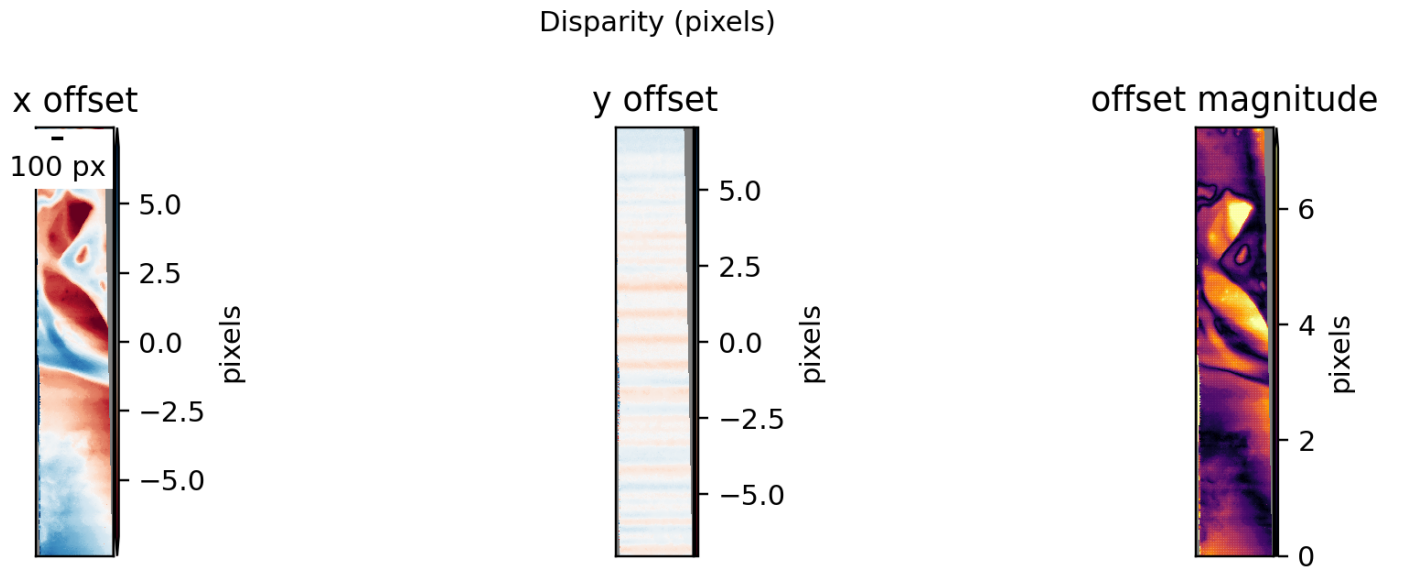
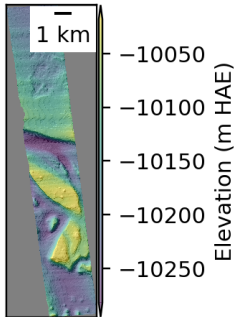


Figure 3: Horizontal and vertical disparity maps in pixels with quiver overlay.

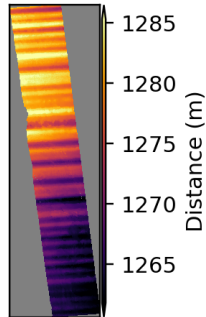
## DEM Results

### Stereo DEM Results

Stereo DEM



Triangulation intersection error



Reference DEM – Stereo DEM

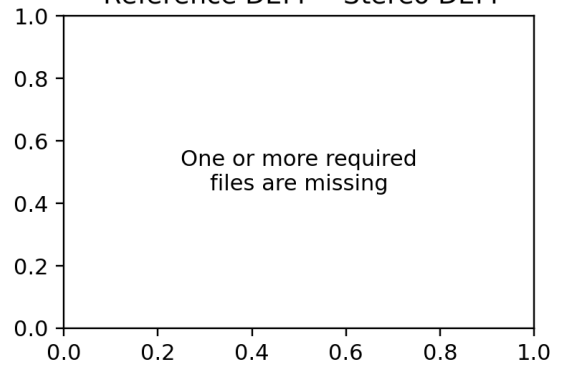


Figure 4: Output DEM with intersection error map and difference relative to the reference DEM used in processing.

## Detailed Hillshade

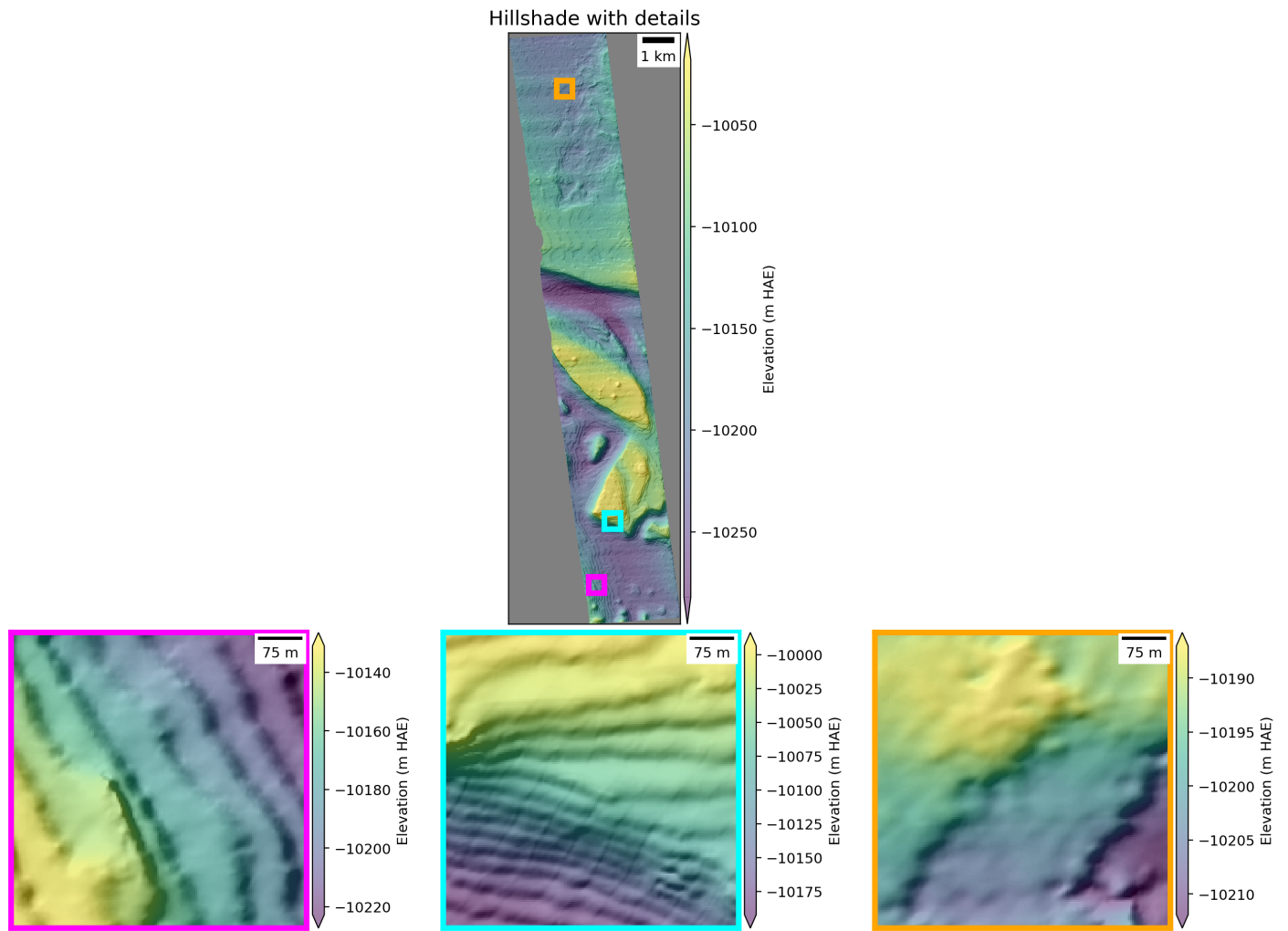


Figure 5: DEM hillshade. If the intersection error is available, zoomed subsets selected from low, medium, and high (left to right) uncertainty areas are displayed in the second row. If the mapped image is available, corresponding ortho image subsets are displayed in the bottom row.

# MOLA Altimetry Map

## MOLA vs DEM

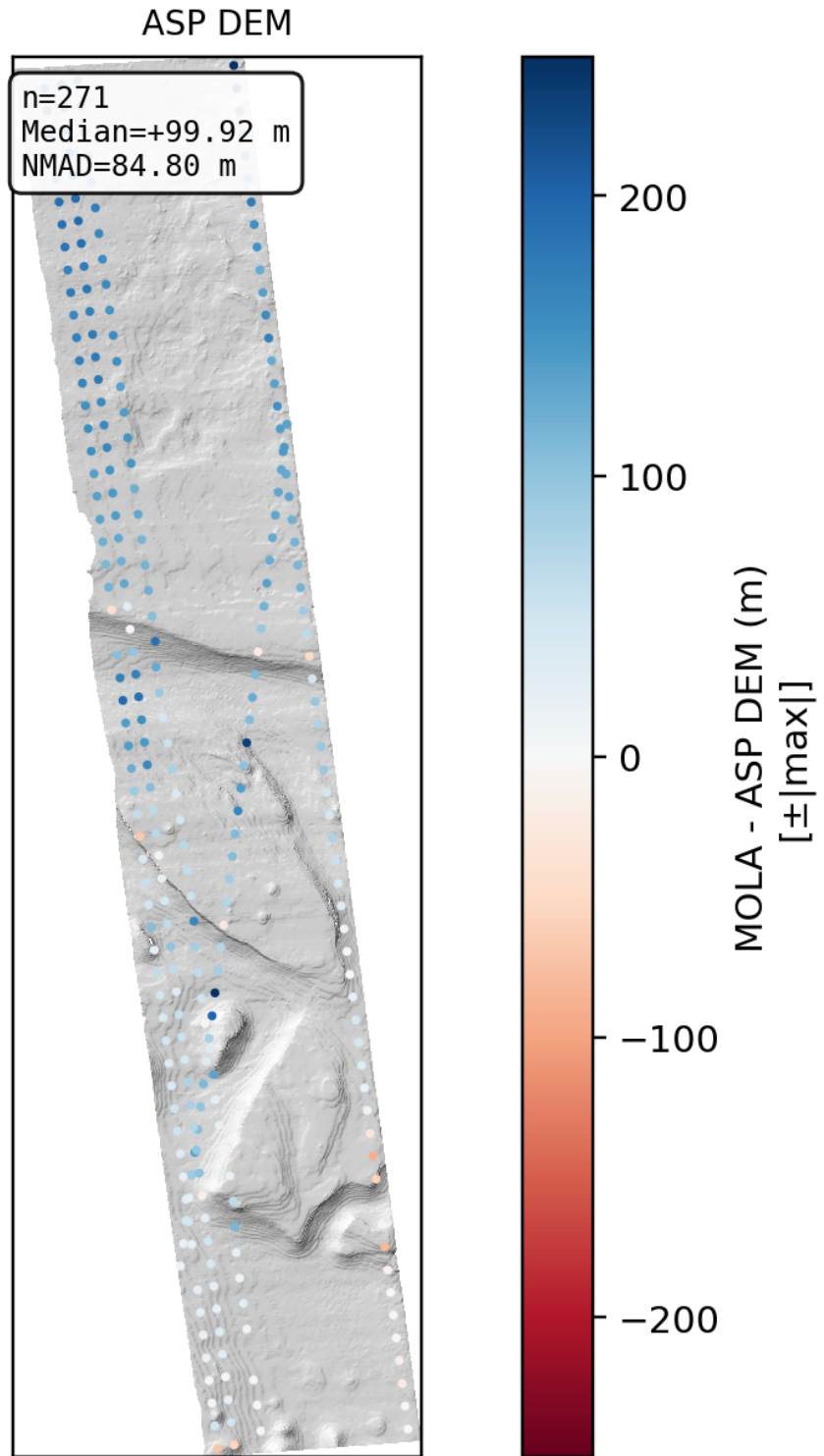


Figure 6: MOLA elevation differences vs. ASP DEM.

# MOLA Altimetry Histogram

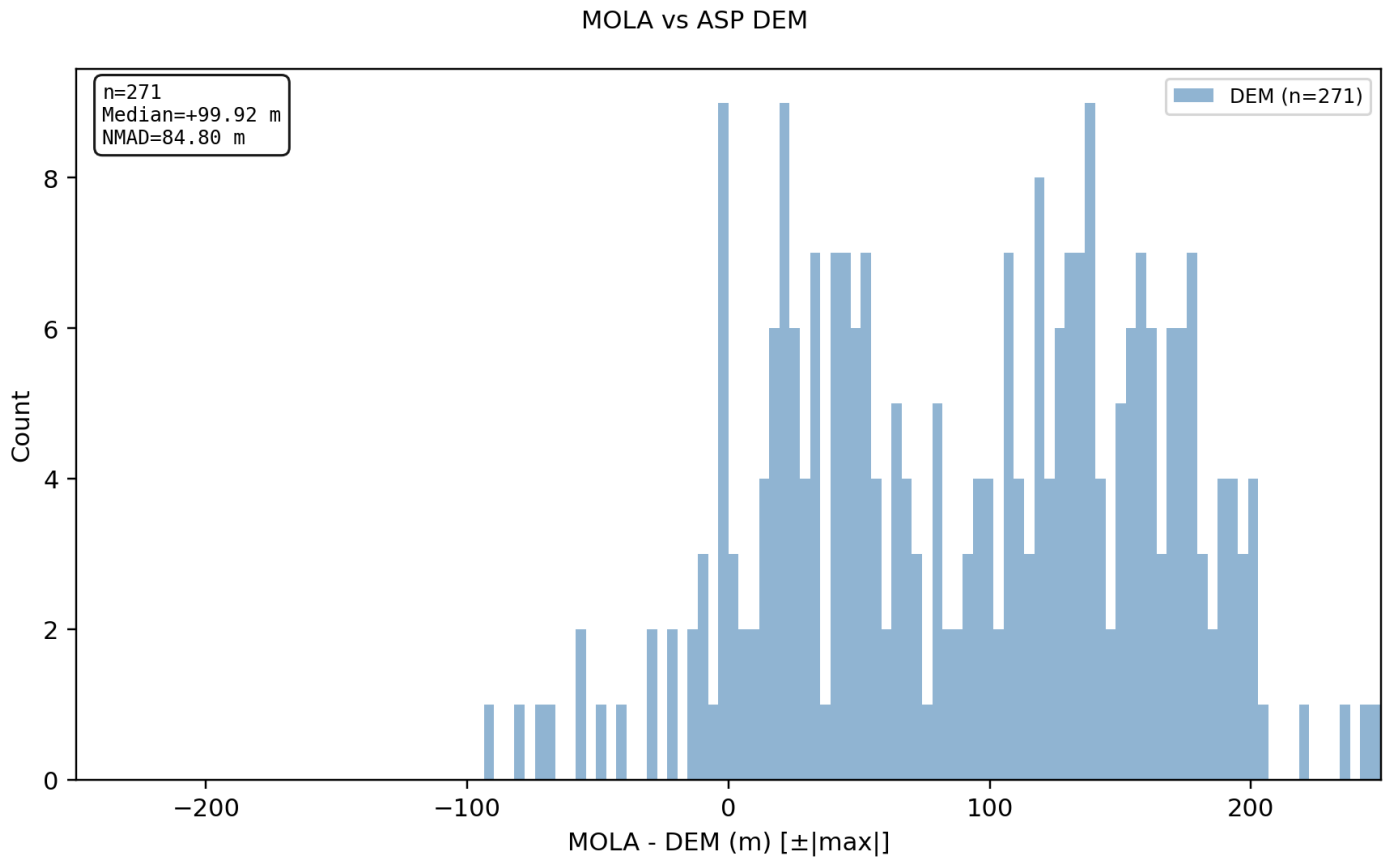


Figure 7: Distribution of elevation differences between MOLA and ASP DEM.

## DEM Alignment with MOLA

### Alignment Parameters

Parameter	Value
max_displacement	500
minimum_points	20
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
25.8	103	173	23.4	60.4	98.1	34.1	29.1	94.4	104

ASP's `pc_align` estimates a rigid 3D translation that minimizes the height residuals between the ASP DEM and the MOLA planetary radii. The CSV is passed as the reference cloud with `--csv-format '1:lon 2:lat 3:radius_m'`, and `--datum` is set to `D_MARS` or `D_MOON` to match the ASP DEM. The resulting translation is applied to the DEM directly (geotransform + pixel-value shift, no resampling) to produce the aligned DEM.

Alignment Parameters (above):

- `max_displacement`: `pc_align` upper bound on the translation magnitude (m).
- `minimum_points`: minimum MOLA points that overlap the DEM; below this the alignment is skipped.
- `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-MOLA 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 103.22 m -> 60.42 m (41.5% reduction). Aligned DEM written to `/Users/ben/Desktop/asp-plot-examples/mars_moc/out_stereo/output-DEM_pc_align_translated.tif`.**

# MOLA Altimetry Map (Aligned DEM)

MOLA vs DEM

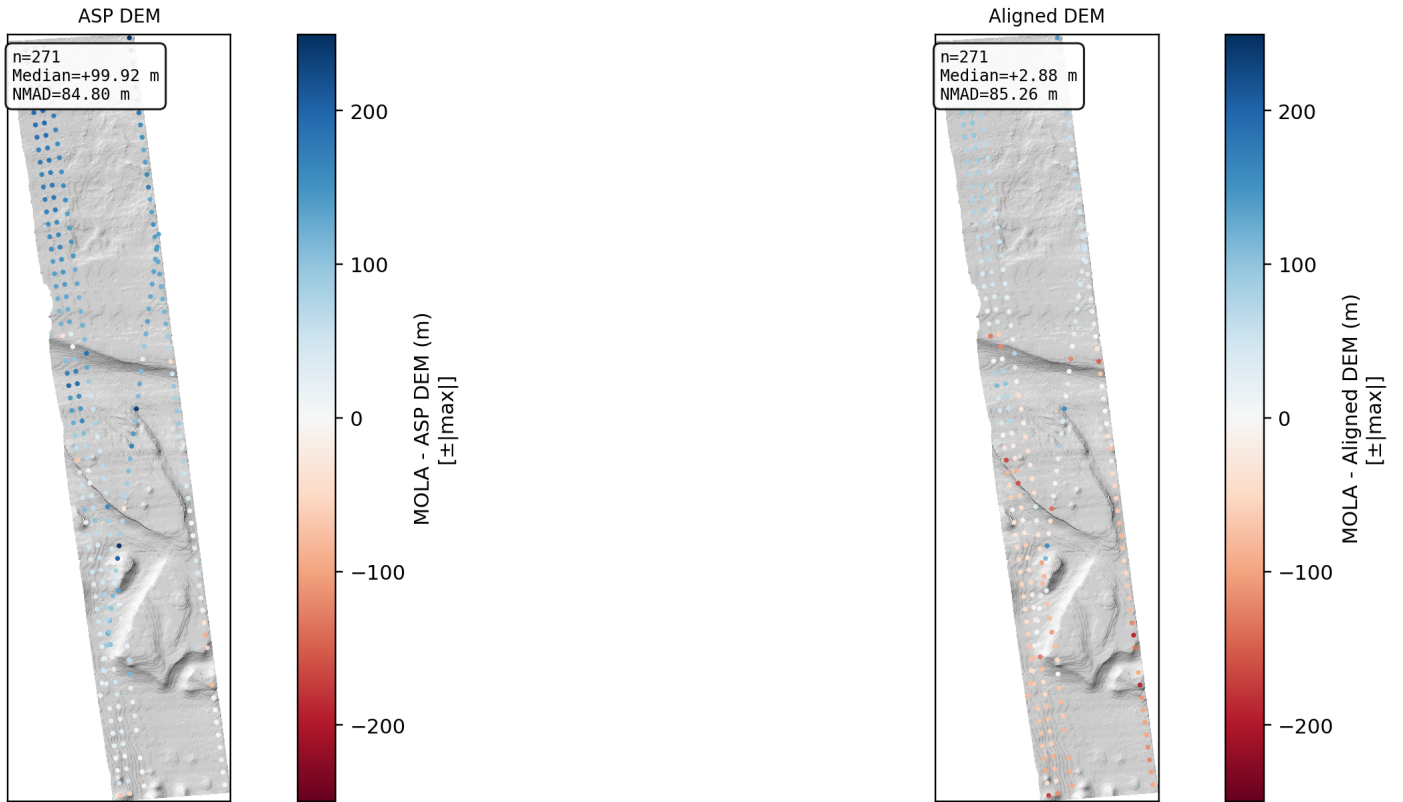


Figure 9: Pre- (left) and post-alignment (right) map views of MOLA elevation differences. The aligned-DEM hillshade is used as the backdrop for both panels.

# MOLA Altimetry Histogram (Aligned DEM)

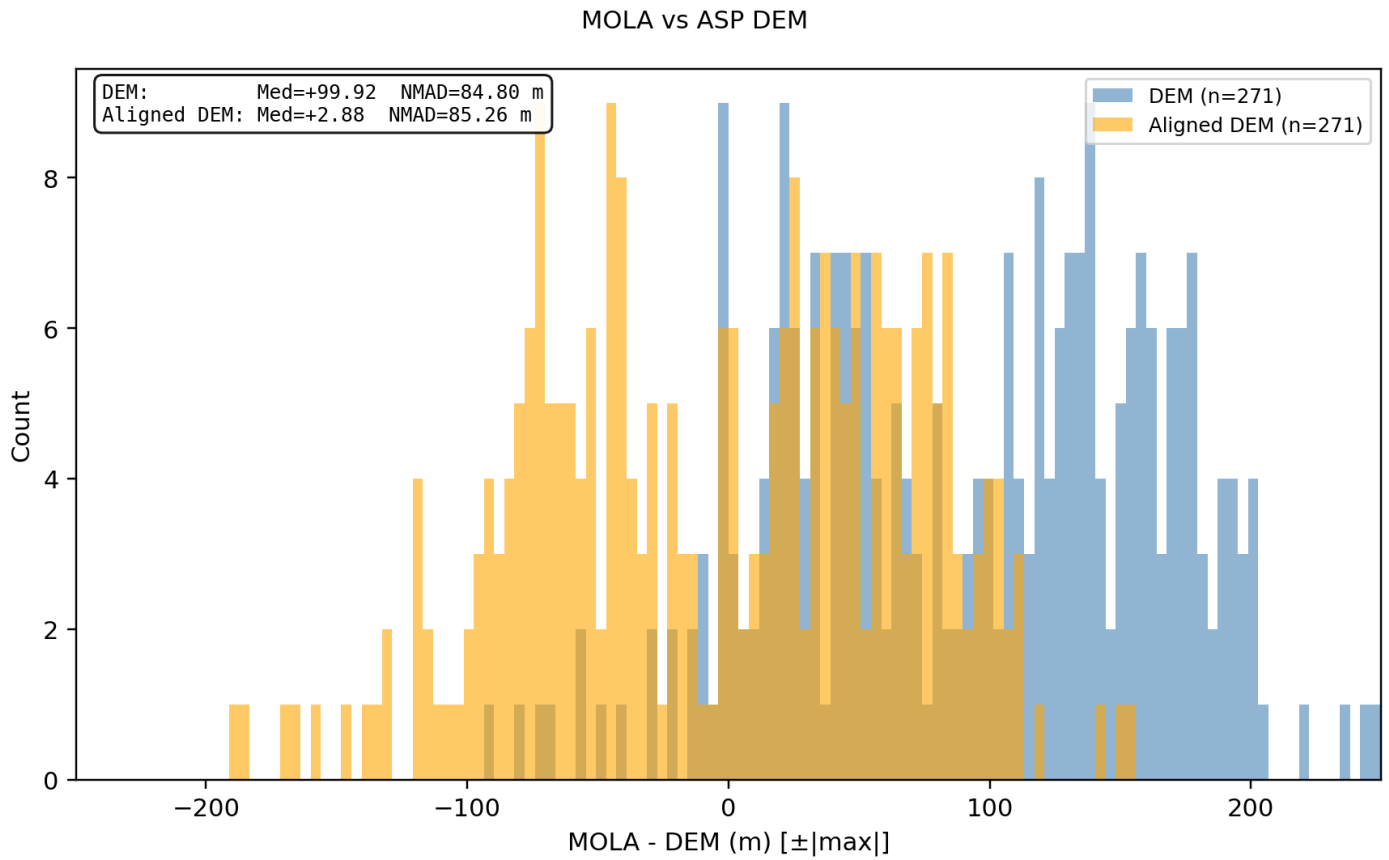


Figure 10: Pre- (steelblue) and post-alignment (orange) distributions of MOLA minus DEM height differences with shared bin edges.