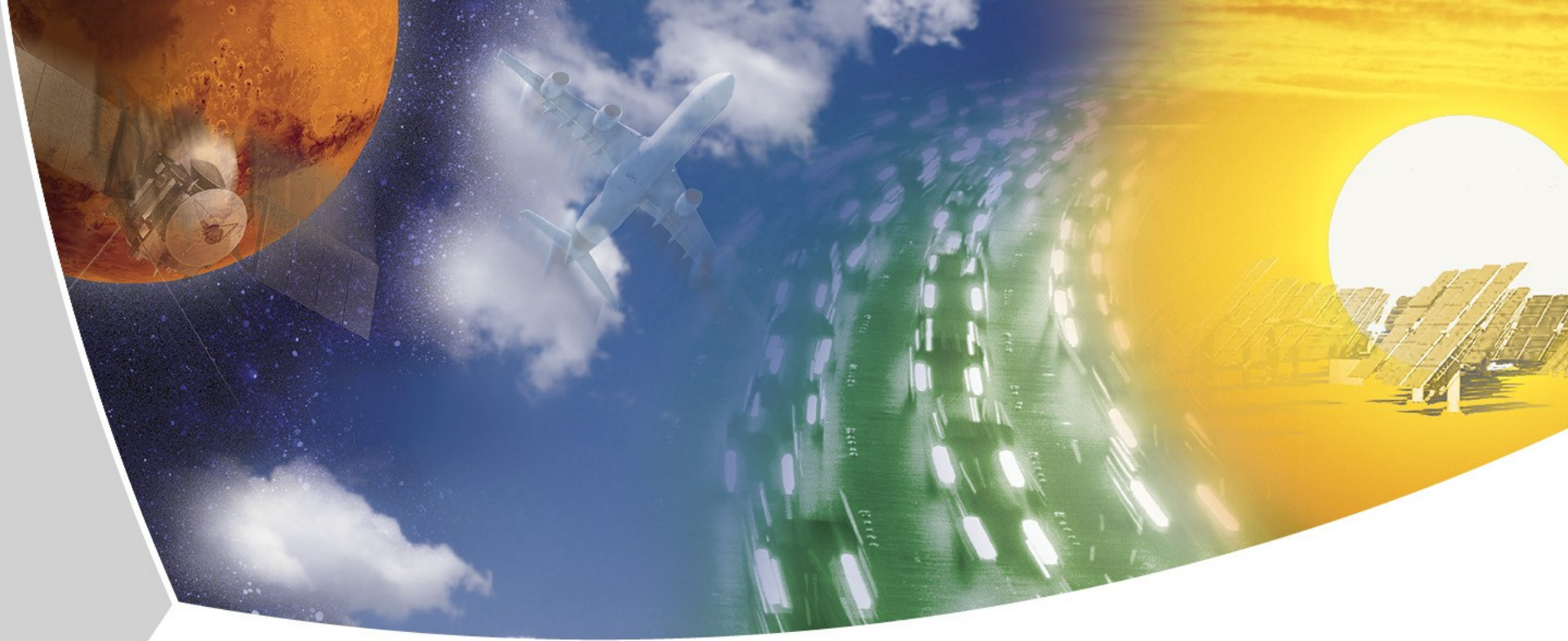




First SGM Benchmarking Results using the EuroSDR datasets

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Processing Cluster at DLR-RM

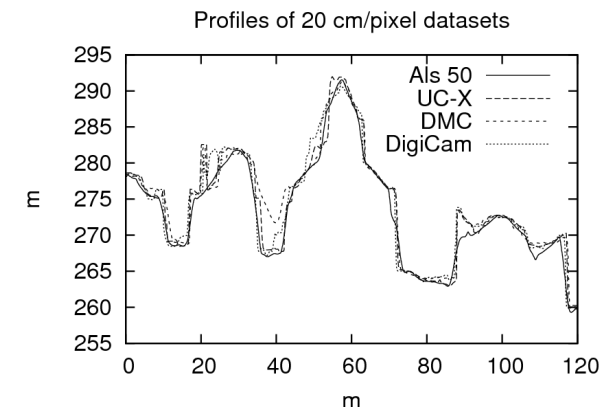
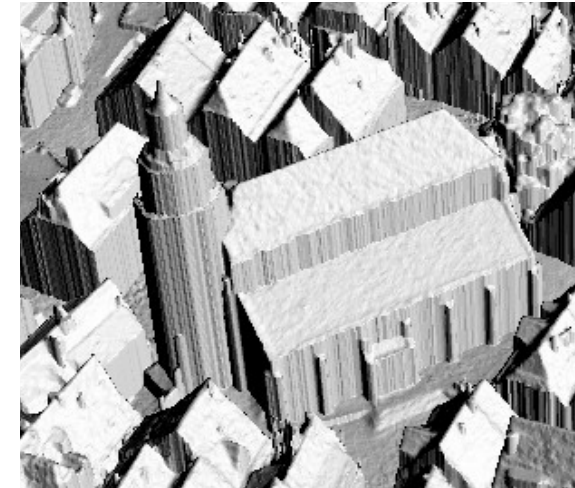
- For aerial and satellite image processing
- 3 blade systems with a total of 296 CPU cores (256 Intel X5570, 3 GHz)
- Each CPU core has 3 GB RAM
- Central files system with a capacity of 55 TB, distributed over 3 RAID systems and accessed through 4 server computer in parallel
- 200 TB archive

- More than 120 TB of images processed since 2005
- More than 16 TB DSM and ortho images created
- Possible yearly throughput is about 50 TB (aerial images)

- Productive system => no magic parameter tuning!

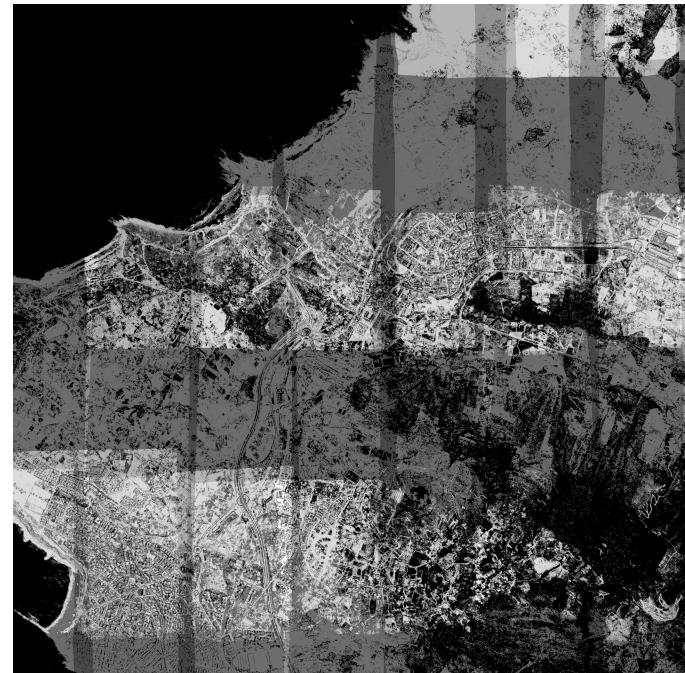
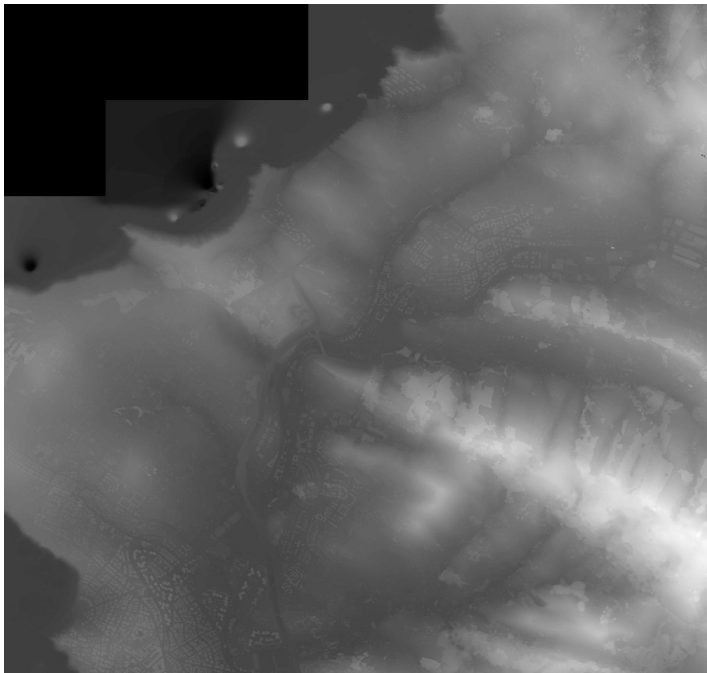
Evaluation of DSMs

- Density and number of measurements as confidence
- Comparison to ground control points (GCP)
 - => But flat, well textured areas are well matched by any stereo method
- Dense statistical comparison against ground truth
 - => Ground truth must be recorded with much higher resolution and accuracy to be meaningful!
- Qualitative evaluation in structured environments (humans see if a building looks correct)
 - 3D renderings of structured environments
 - Visual comparison of height profiles
- Runtime and ability to parallelize method
- Hirschmüller and Bucher (DGPF 2010)



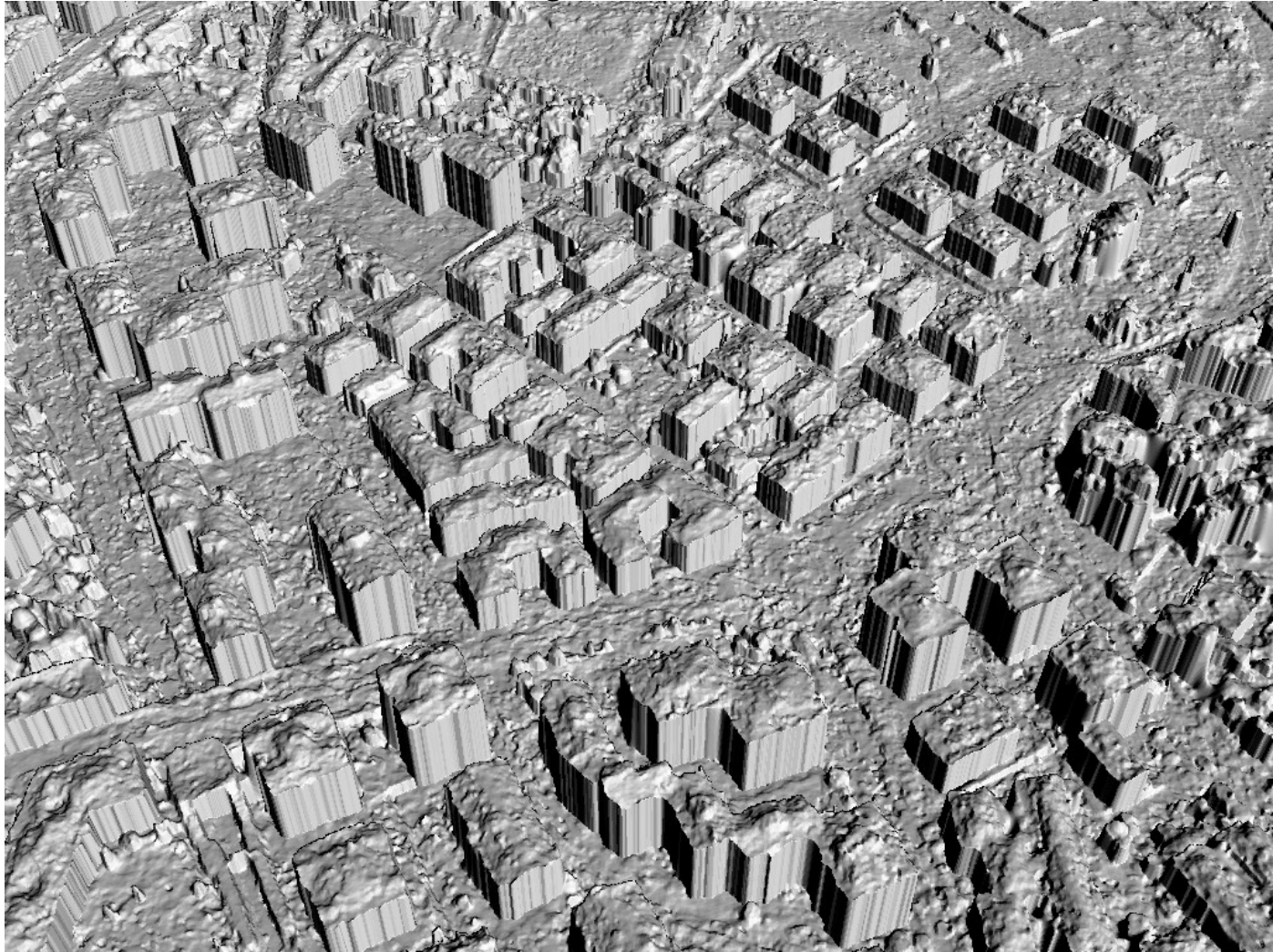
Algorta

- UltraCam-X, 39 images, 8 bit, GSD 25 cm/pixel, overlap 65% / 35%
- Matching: Previous and next image in strip only
- Mean number of measurements is 2.2, maximum is 7
- Processing (single threaded, one core): 125.8 h (3.2 h/image)



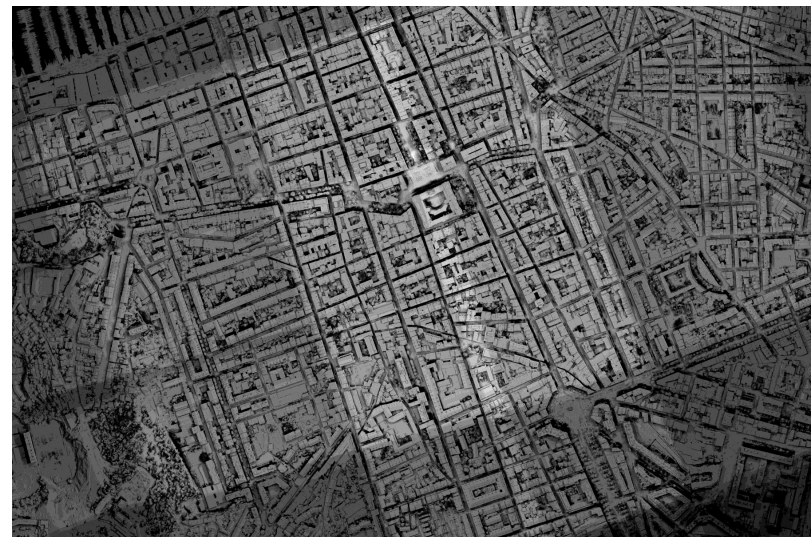
3D Reconstruction of Algorta

- Comment: Noisy, higher image overlap required (currently 65% / 35%)



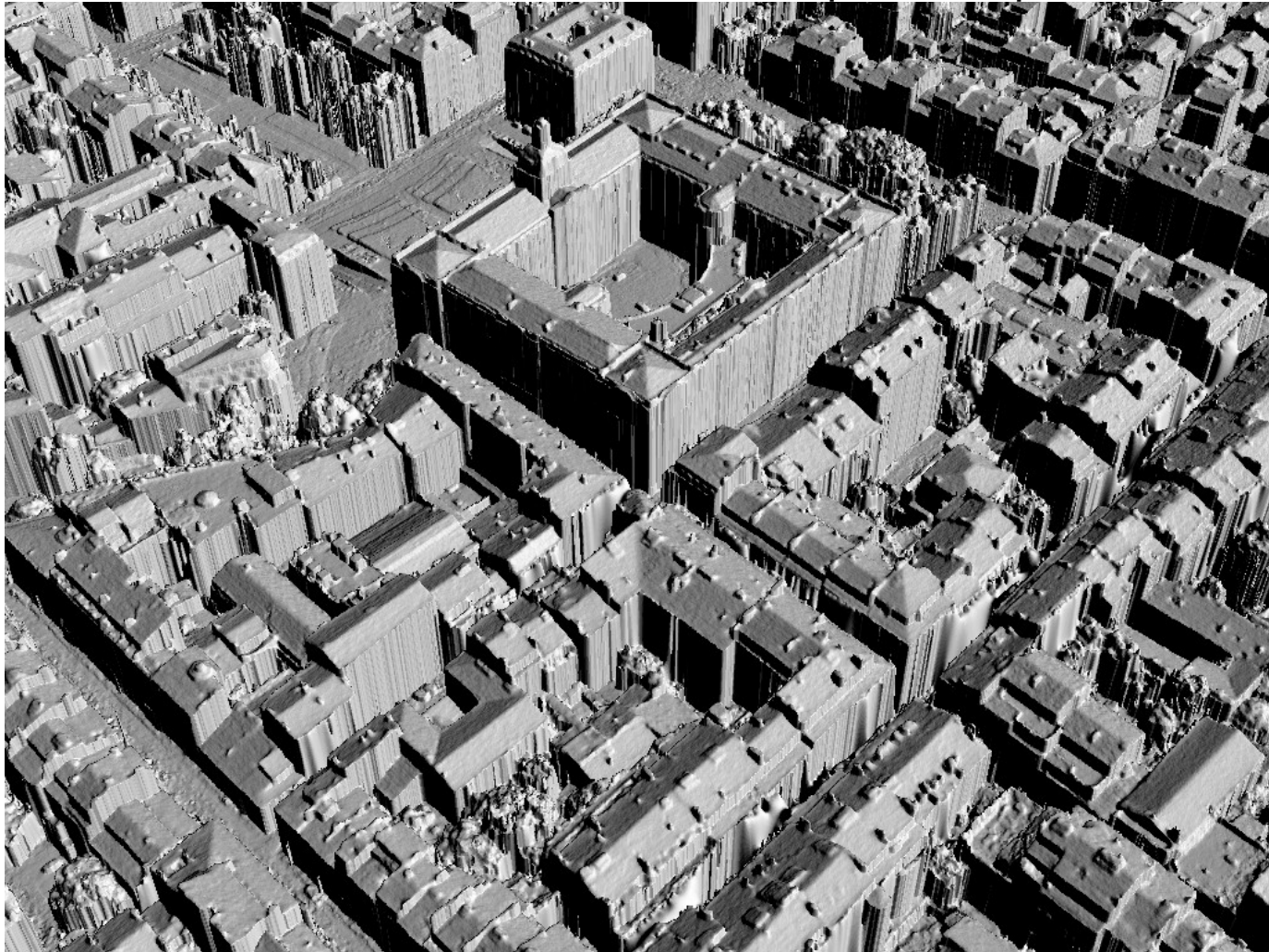
Marseille

- DMC, 25 images, 8 bit, GSD 10 cm/pixel, overlap 76% / 65%
- Matching: Each image against 8 direct neighbors (in and across strip)
- Mean number of measurements is 4.5, maximum is 20
- Processing (single threaded, one core): 385.7 h (15.4 h/image)



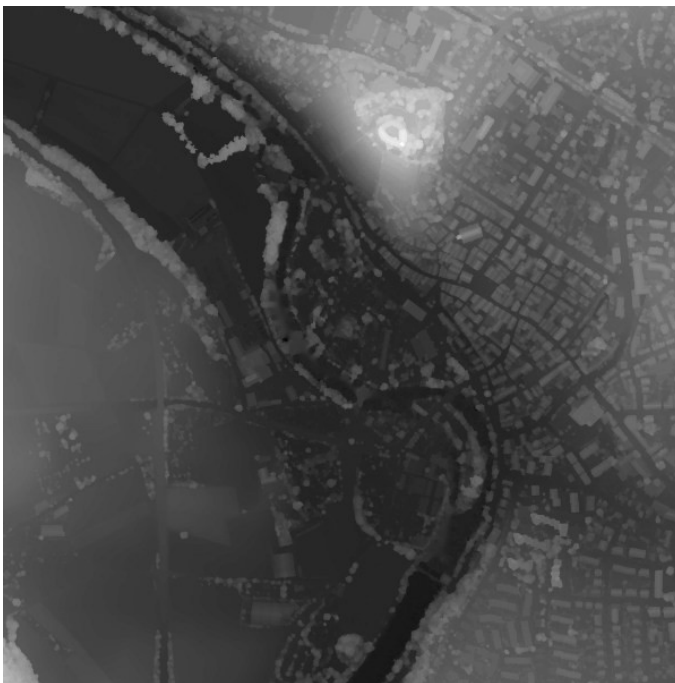
3D Reconstruction of Marseille

- Comment: Wide FoV and rather low overlap => interpolating narrow streets



DGPF Low Resolution

- UltraCam-X, 6 images, 16 bit, GSD 20 cm/pixel, overlap 63% / 62%
- Matching: Each image against all direct neighbors (in and across strip)
- Mean number of measurements is 3.8, maximum is 6
- Processing (single threaded, one core): 37.2 h (6.2 h/image)



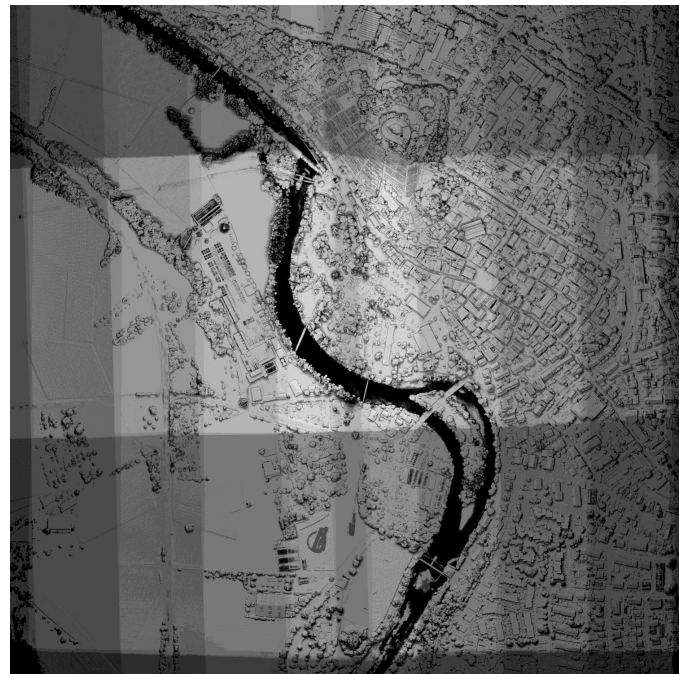
3D Reconstruction of DGPF Low Resolution

- Comment: Noisy, higher image overlap required (currently 63% / 62%)



DGPF High Resolution

- UltraCam-X, 21 images, 16 bit, GSD 8 cm/pixel, overlap 84% / 63%
- Matching: Previous and next two within strip and across
- Mean number of measurements is 7, maximum is 18
- Processing (single threaded, one core): 138.6 h (6.6 h/image)



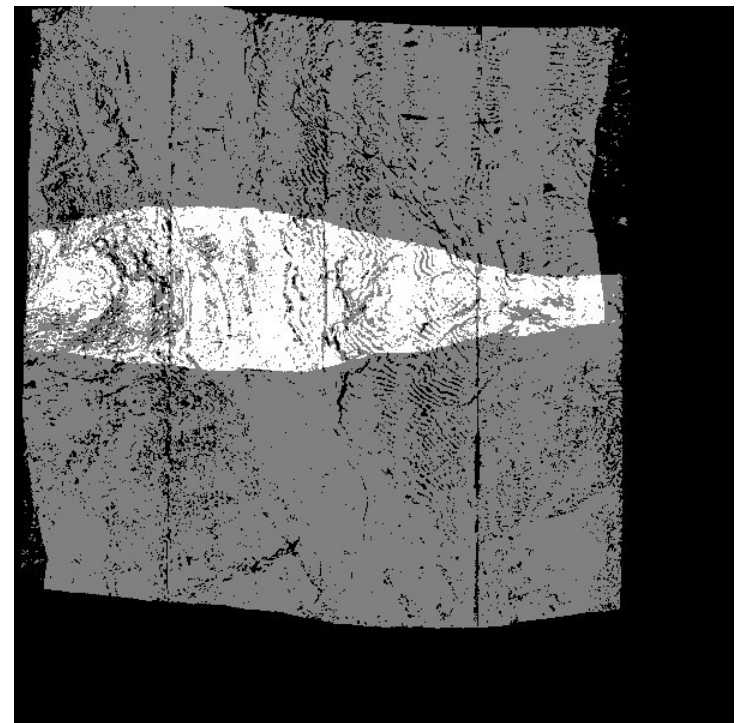
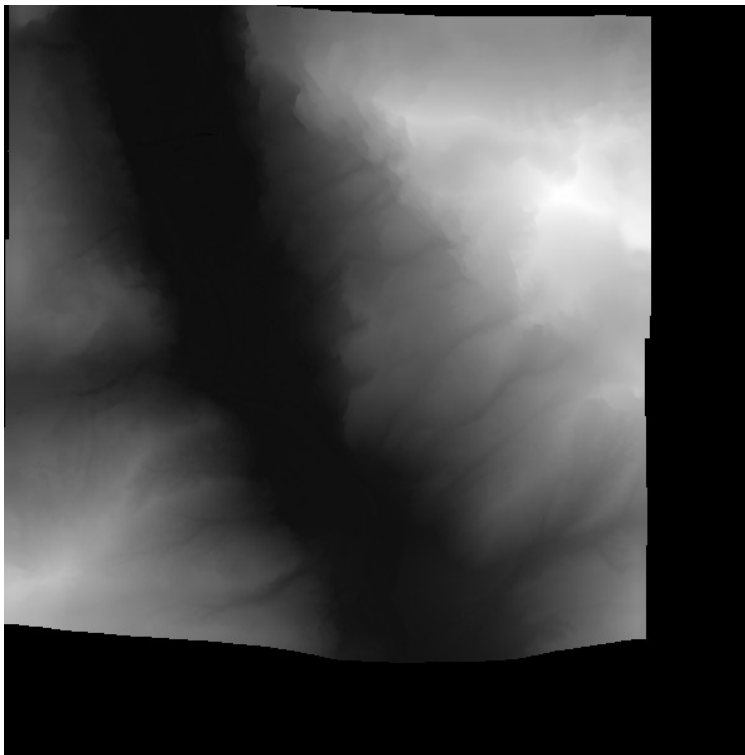
3D Reconstruction of DGPF Low Resolution

➤ Comment: Very good results due to nearly optimal flight configuration



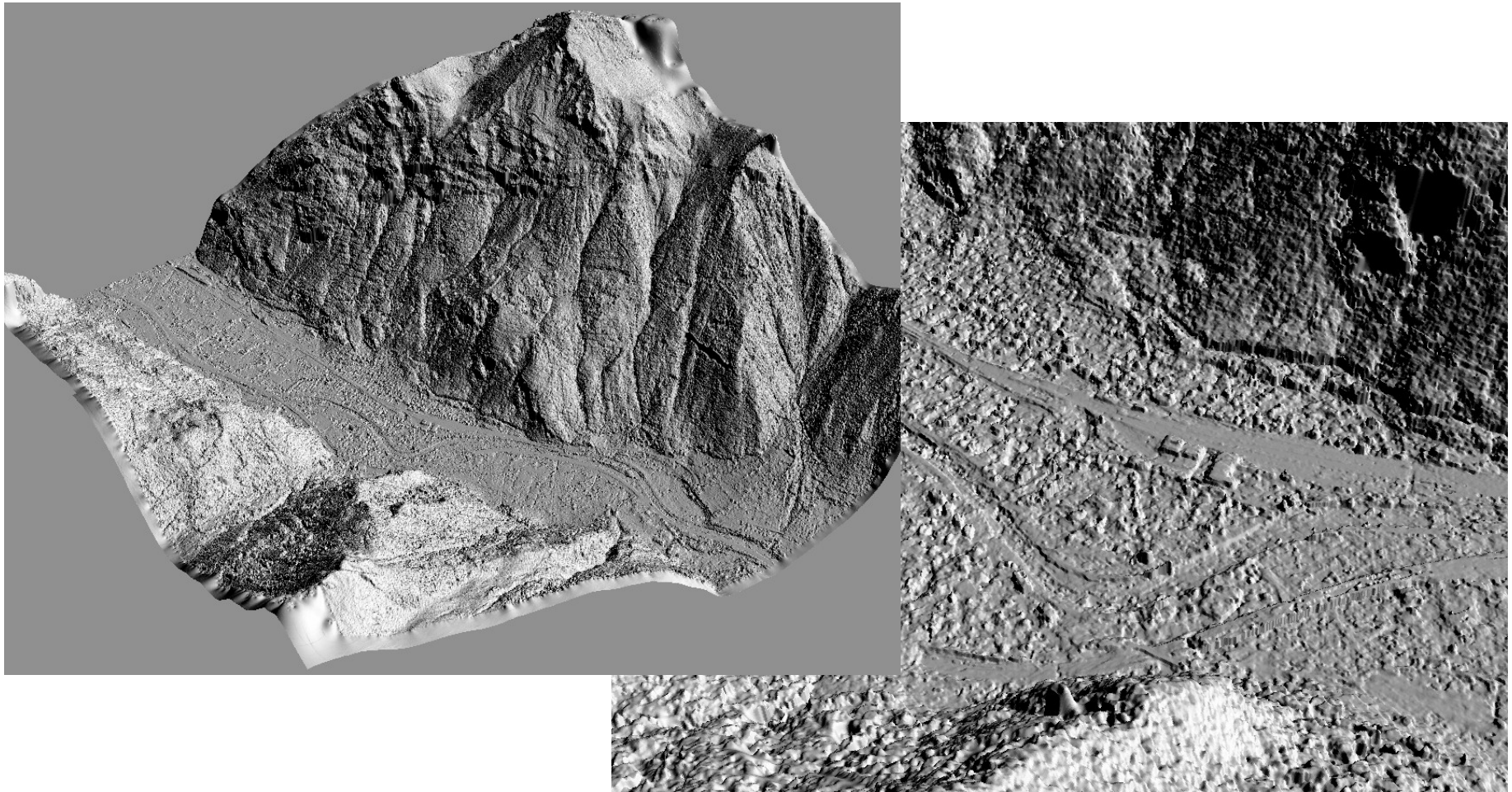
Swiss Topo

- ADS 40, 2 strips, 16 bit, GSD 50 cm/pixel
- Matching: Nadir pan against forward, backward and green, within strip
- Processing (single threaded, one core): 1.6 h (half resolution!)



3D Reconstruction of DGPF Low Resolution

➤ Comment: Matching at half resolution due to epipolar error of 2-3 pixel





Conclusion and Recommendations

- Very high quality can be reached
- Quality depends on camera configuration, i.e. FoV and overlap in and across strips
- 80/70 or higher overlap required in for urban scenes, especially for narrow streets
- Quantitative comparison of different methods missing