

Initial Results of the EuroSDR Test and other Experiences with Match-T

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Background

- § Usage of latest Match-T version 5.4.0 in various projects over the last month.
- § Applying Match-T on the EuroSDR test data for image matching.
- à Presentation of various findings.

Resulting DSM

DGPF(8cm, PAN 16bit), 15cmGrid

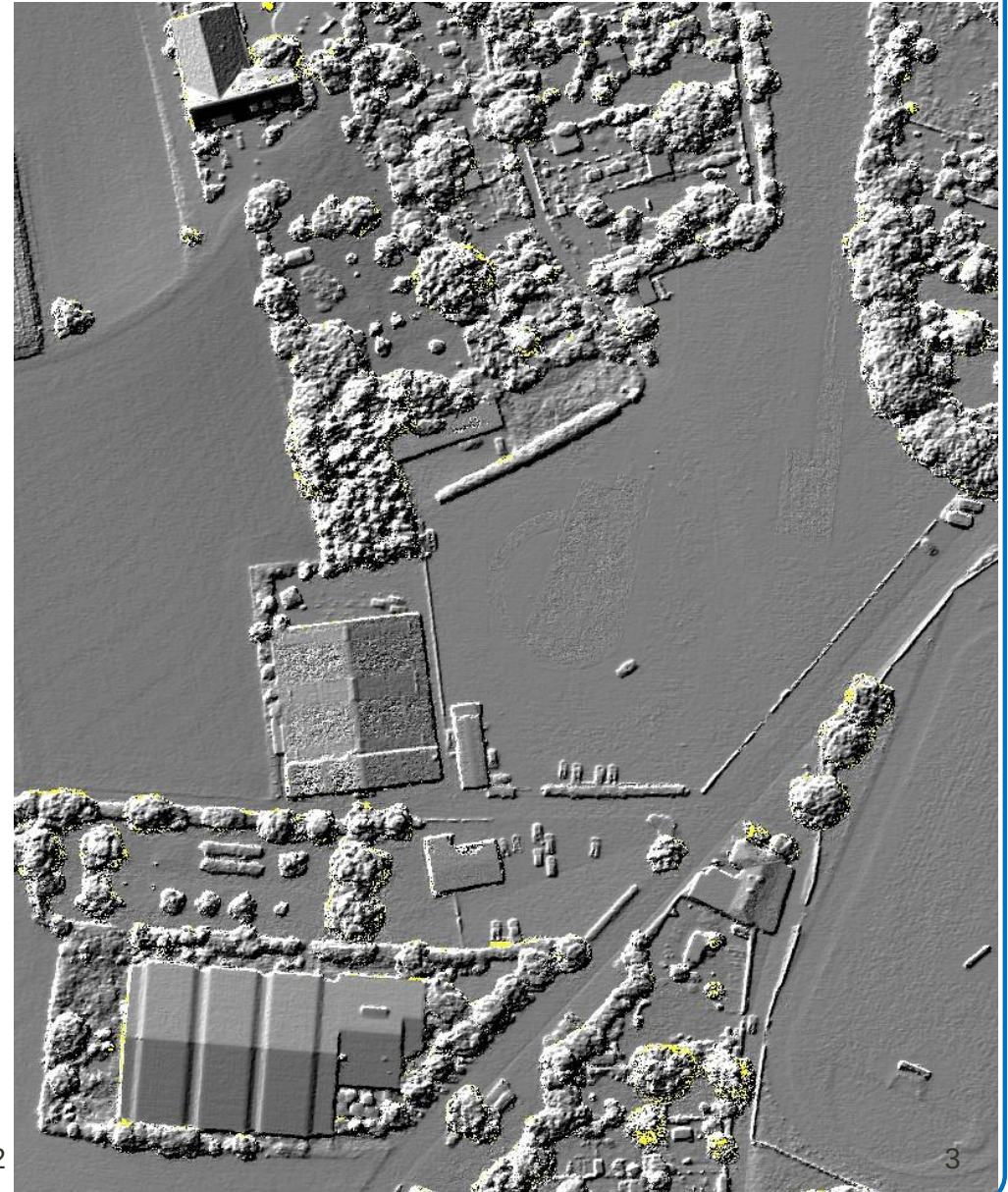
Match-T: direct result

time: 1h 30min



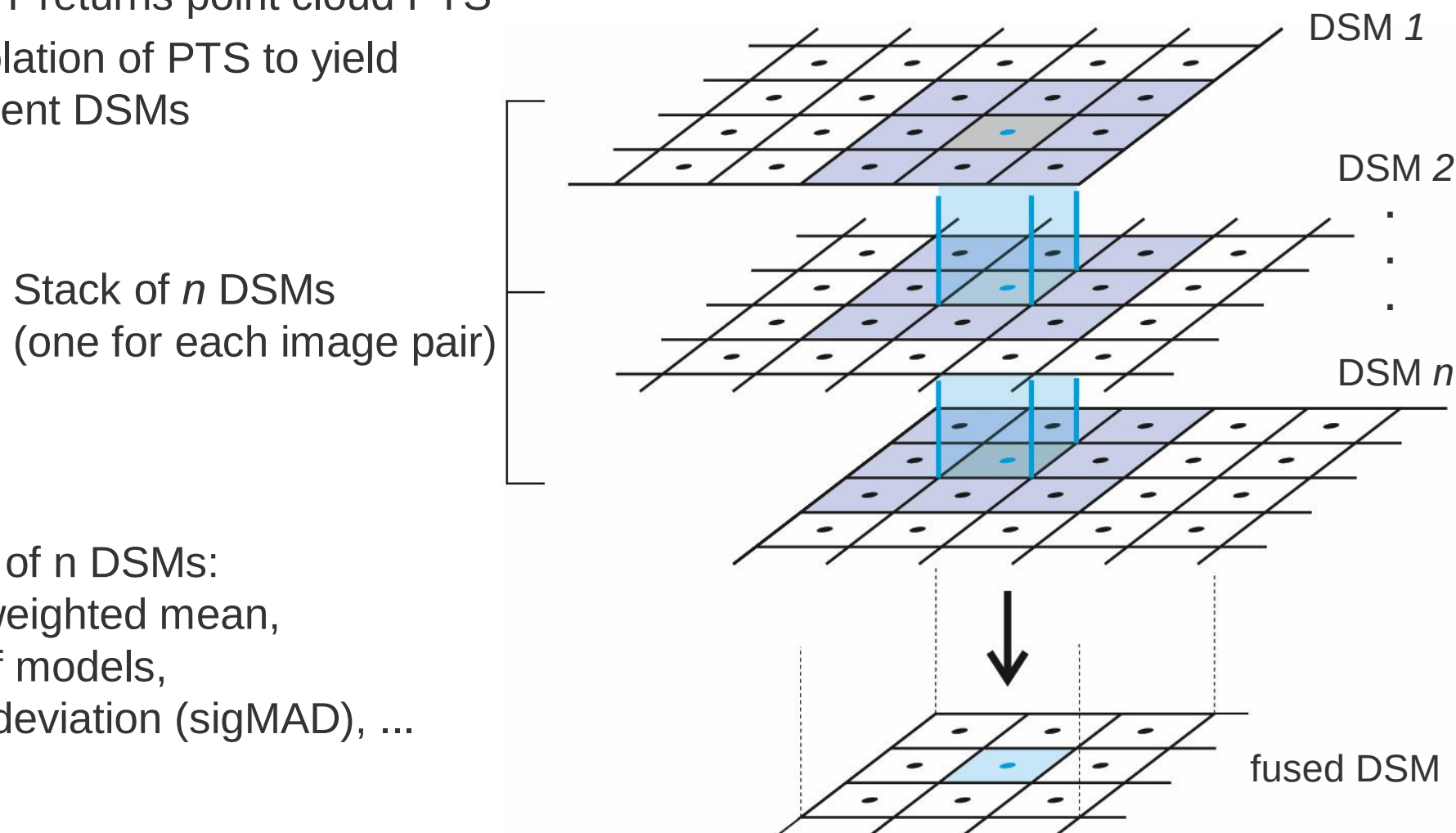
Match-T: fusion of pairs

time: 23h



Fusion of pairs

- § Run Match-T on every possible image pair (within each strip; or across strip)
- § e.g. side lap 80% à pairs with 80%, 60%, 40% and 20% overlap
- § Match-T returns point cloud PTS
- § Interpolation of PTS to yield congruent DSMs



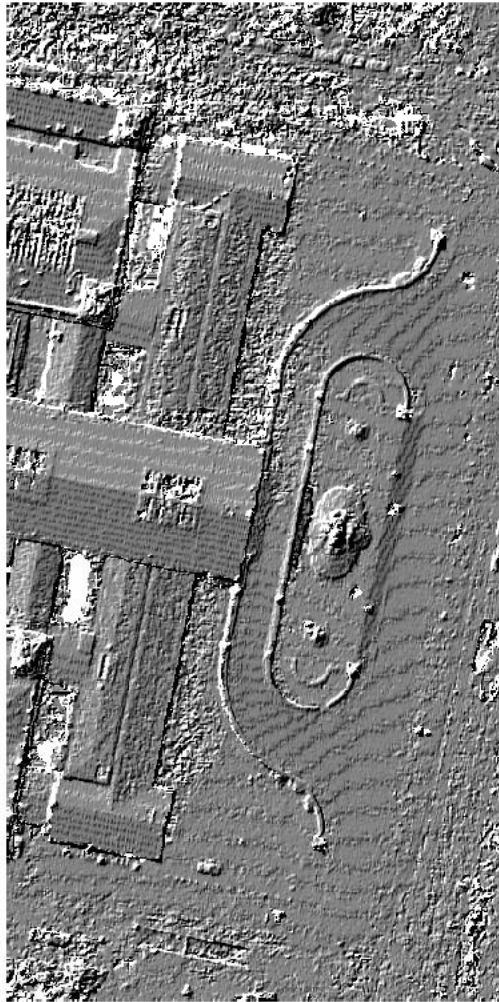
à Fusion of n DSMs:
median, weighted mean,
number of models,
standard deviation (sigMAD), ...

Single image pair: impact of overlap

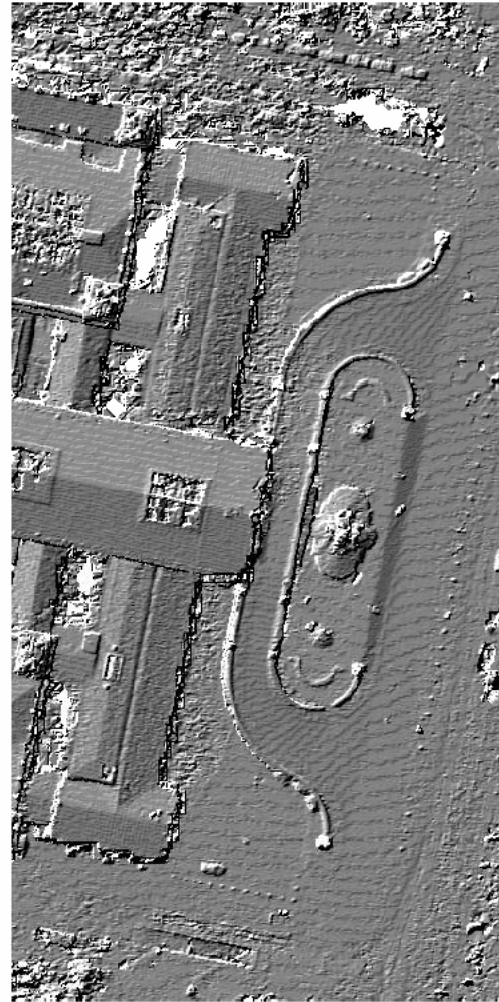
Vienna (6cm, RGB 8bit), 25cmGrid



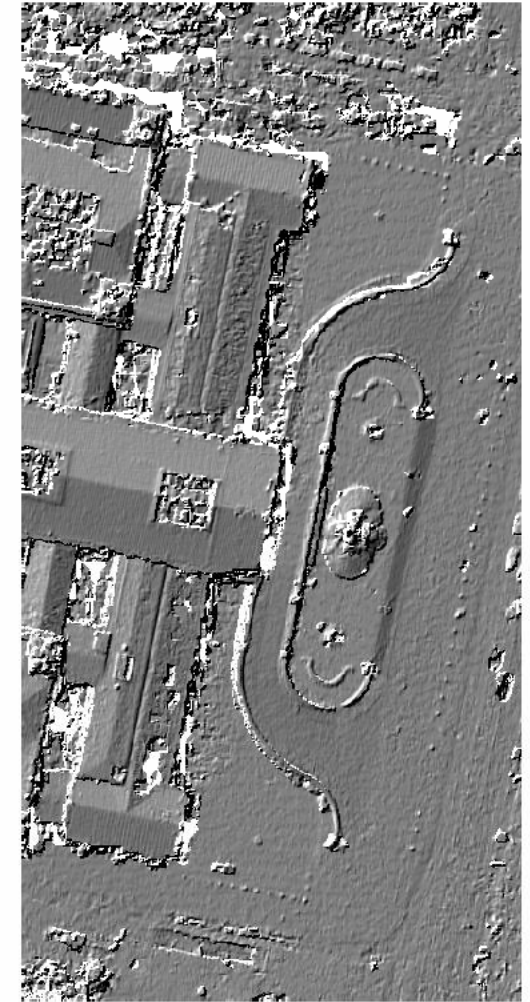
(a) Luftbild



(a) 80%-Bildpaar 3357/3358



(b) 60%-Bildpaar 3356/3358

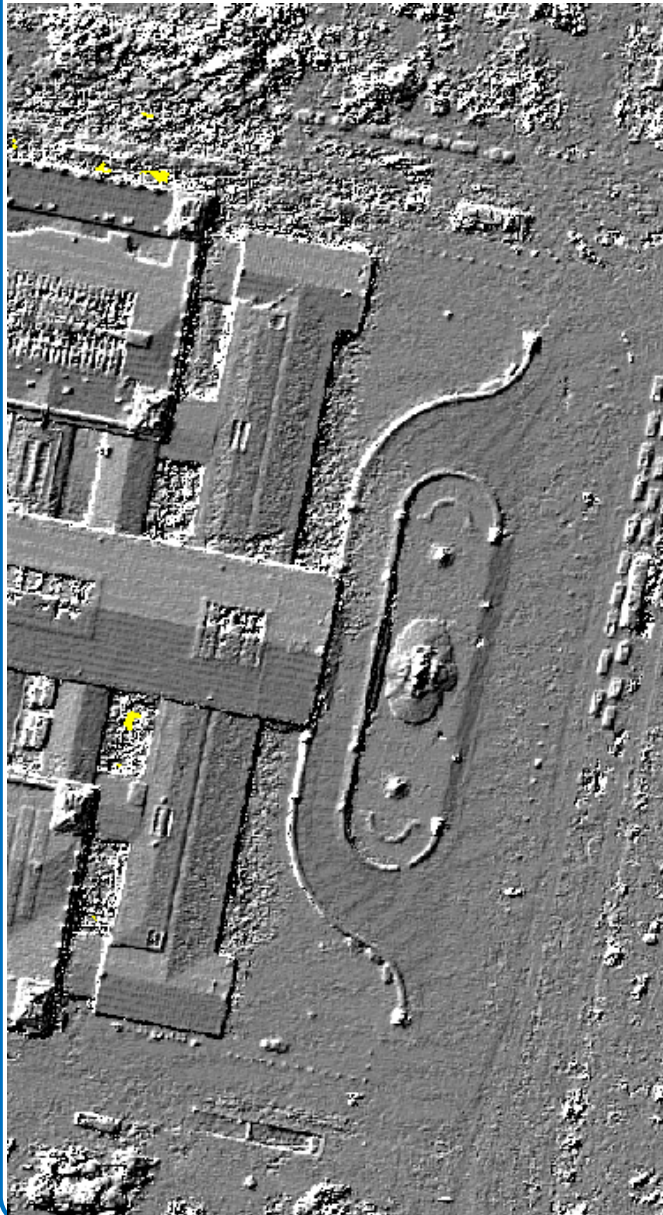


(c) 40%-Bildpaar 3355/3358

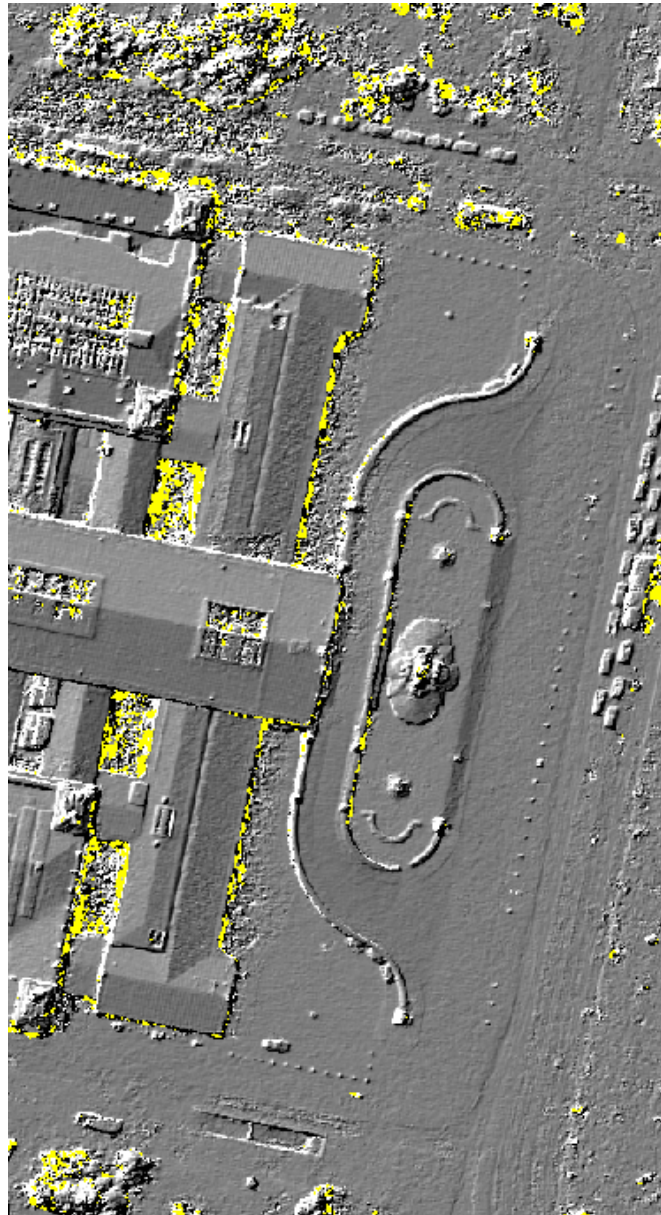
- * Poor texture on inclined planes à steps (increasing with overlap)
- * Edges slightly better with increasing with overlap

Fusion results

Median (of all 80%)



weight. mean (all 20%-80%)



sigMAD (all 20%-80%)

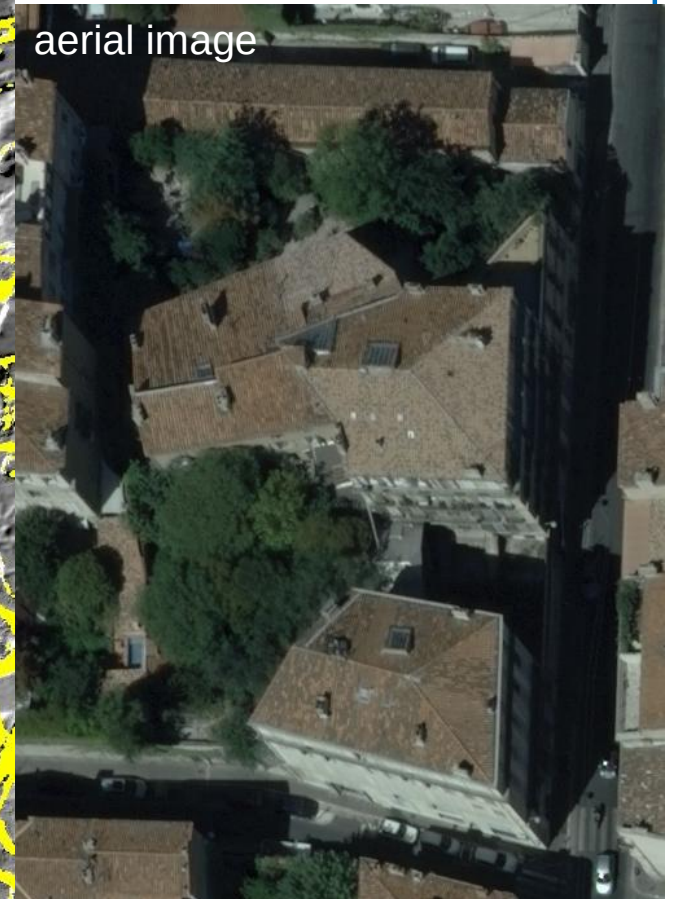
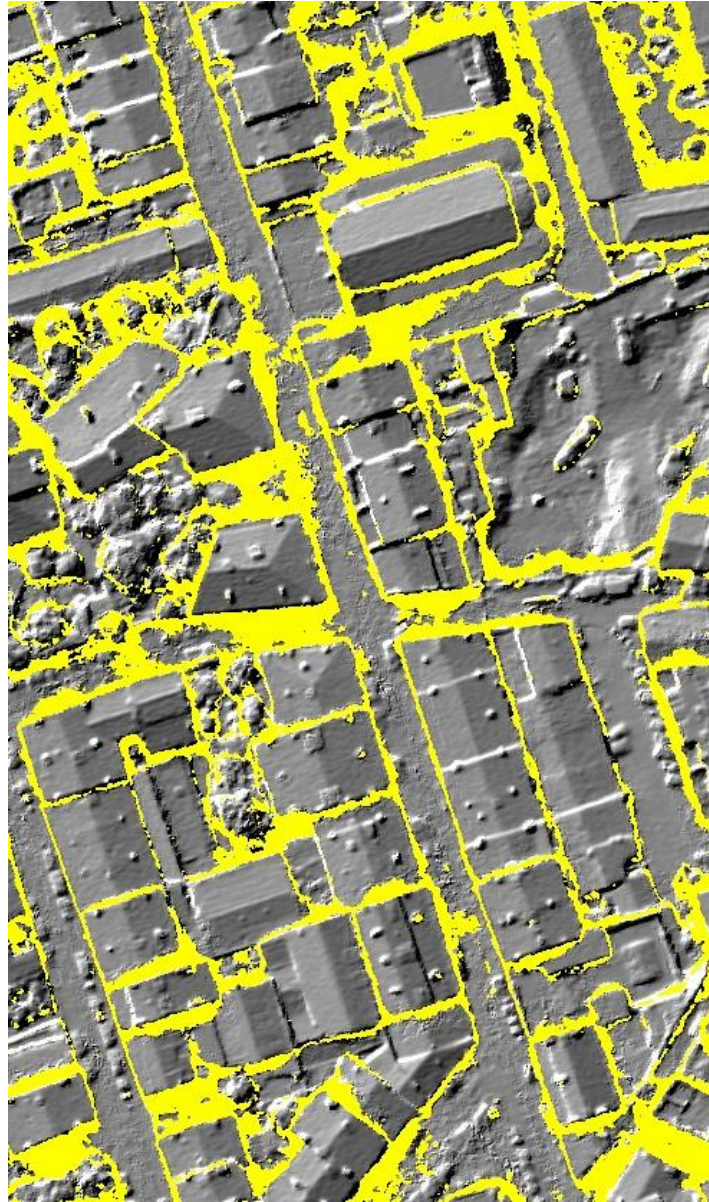
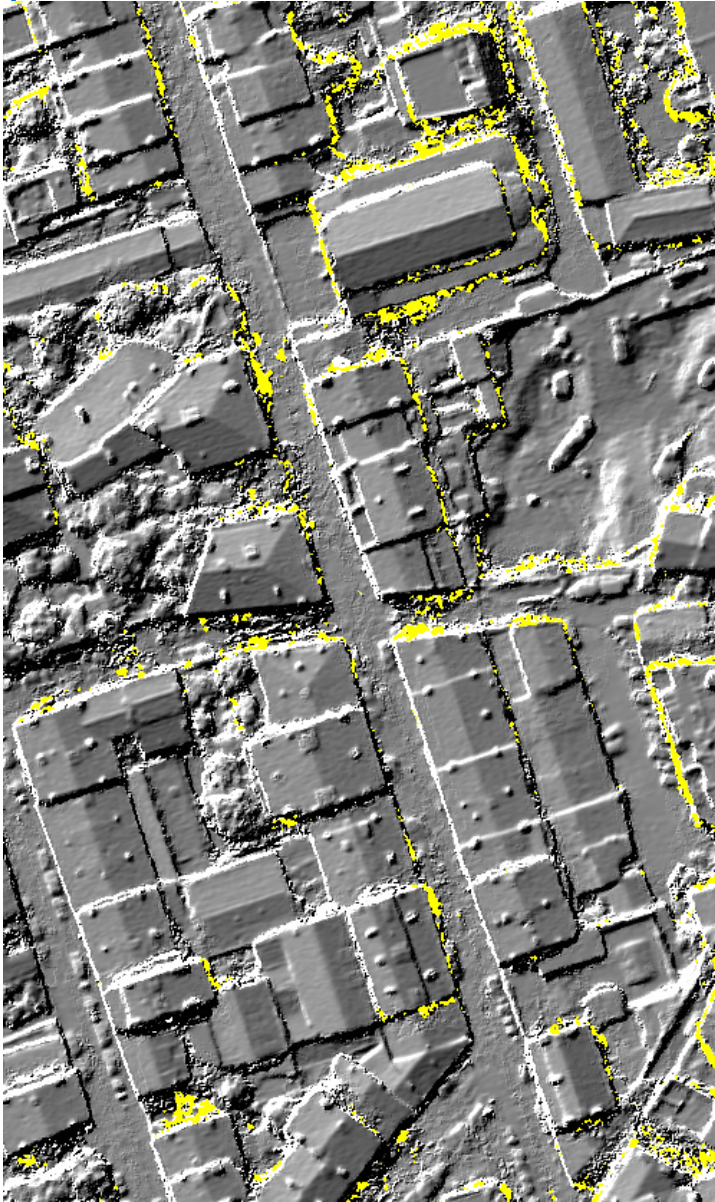


Possible use of sigMAD from fusion: Masking

Marseille (12cm, RGB 8bit), 25cmGrid

orig.fusion result

fusion masked with sigMAD > 1m



Benefit of across strip models?

DGPF(8cm, PAN 16bit), 15cmGrid

S2_#171



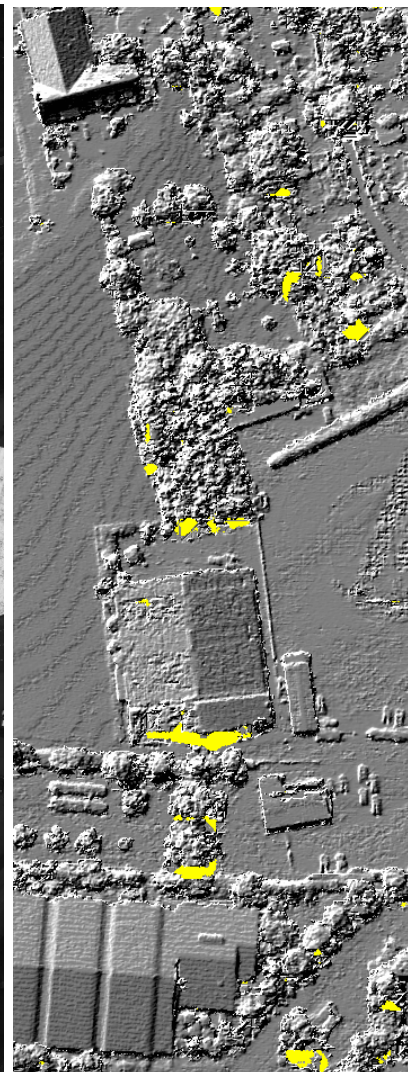
S2_#173



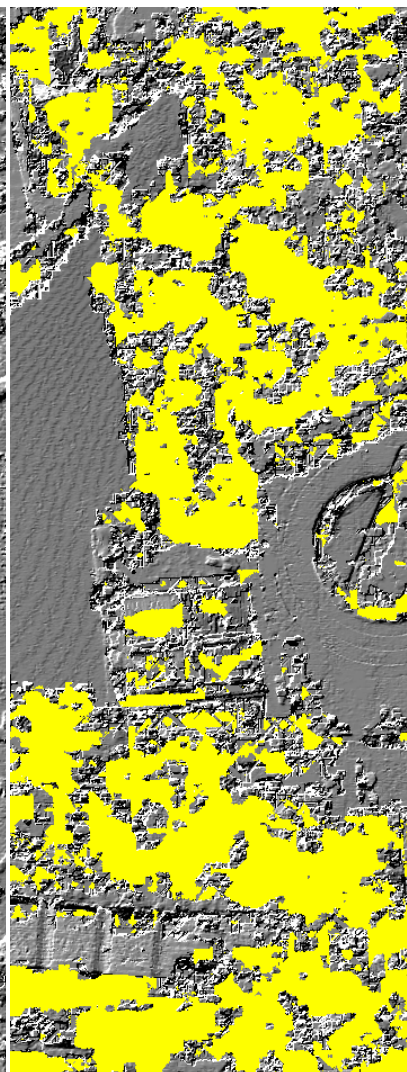
S1_#148



#171_#173



#173_#148



Benefit of across strip models?

Marseille (12cm, RGB 8bit), 25cmGrid

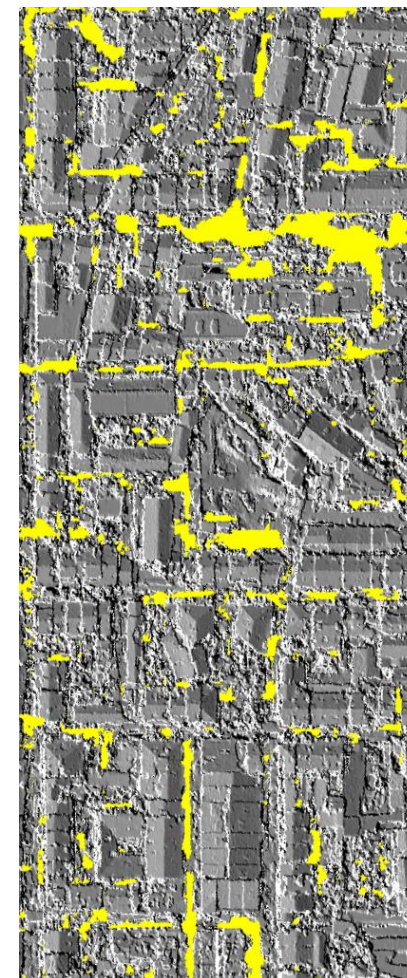
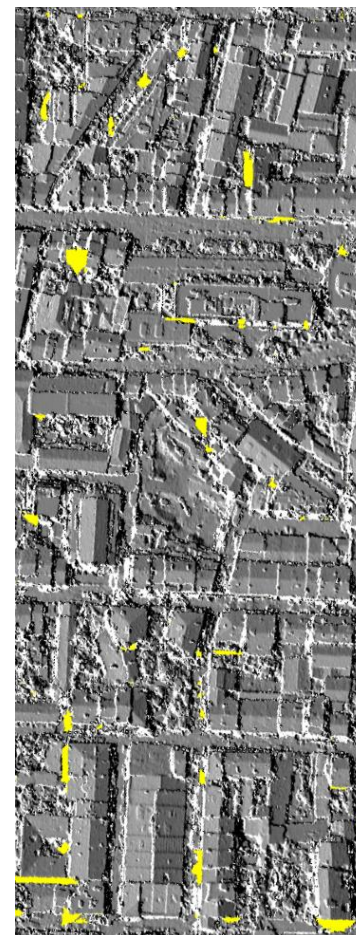
S2_#1050

S1_#1052

S2_#773

#1050_#1052

#173_#148



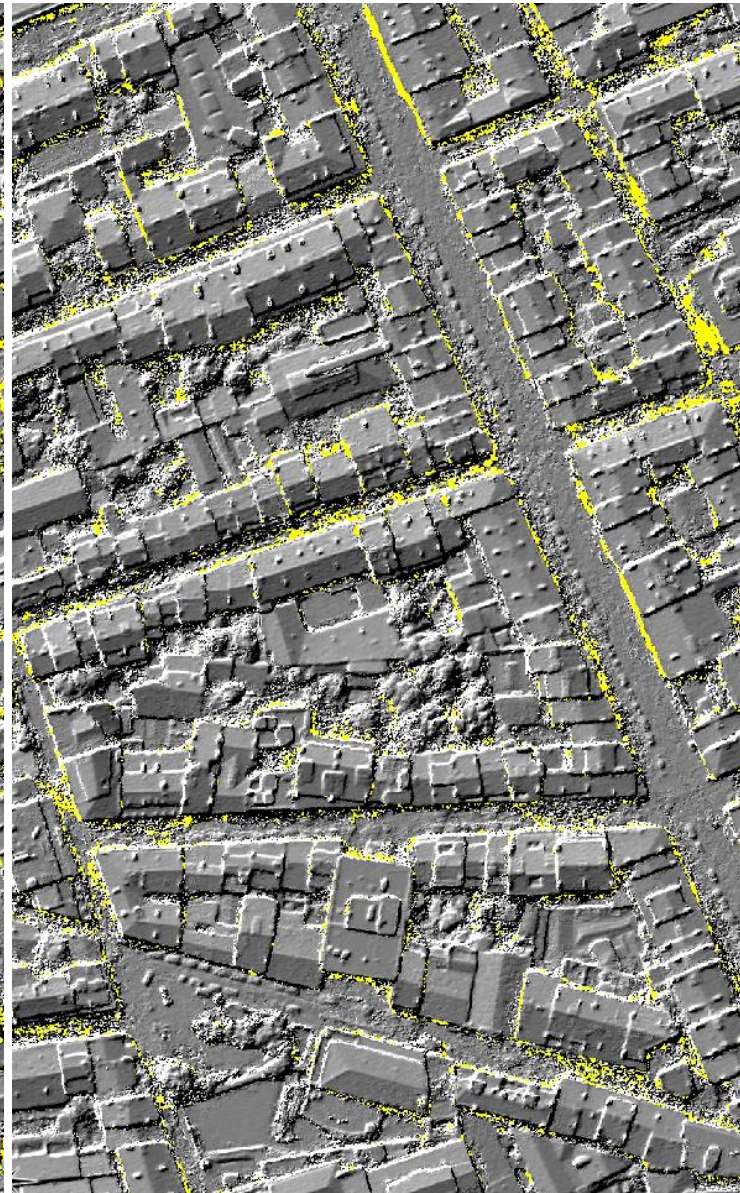
8bit OPs unscaled

homogeneous gray values across strip à ok

Benefit of across strip models?

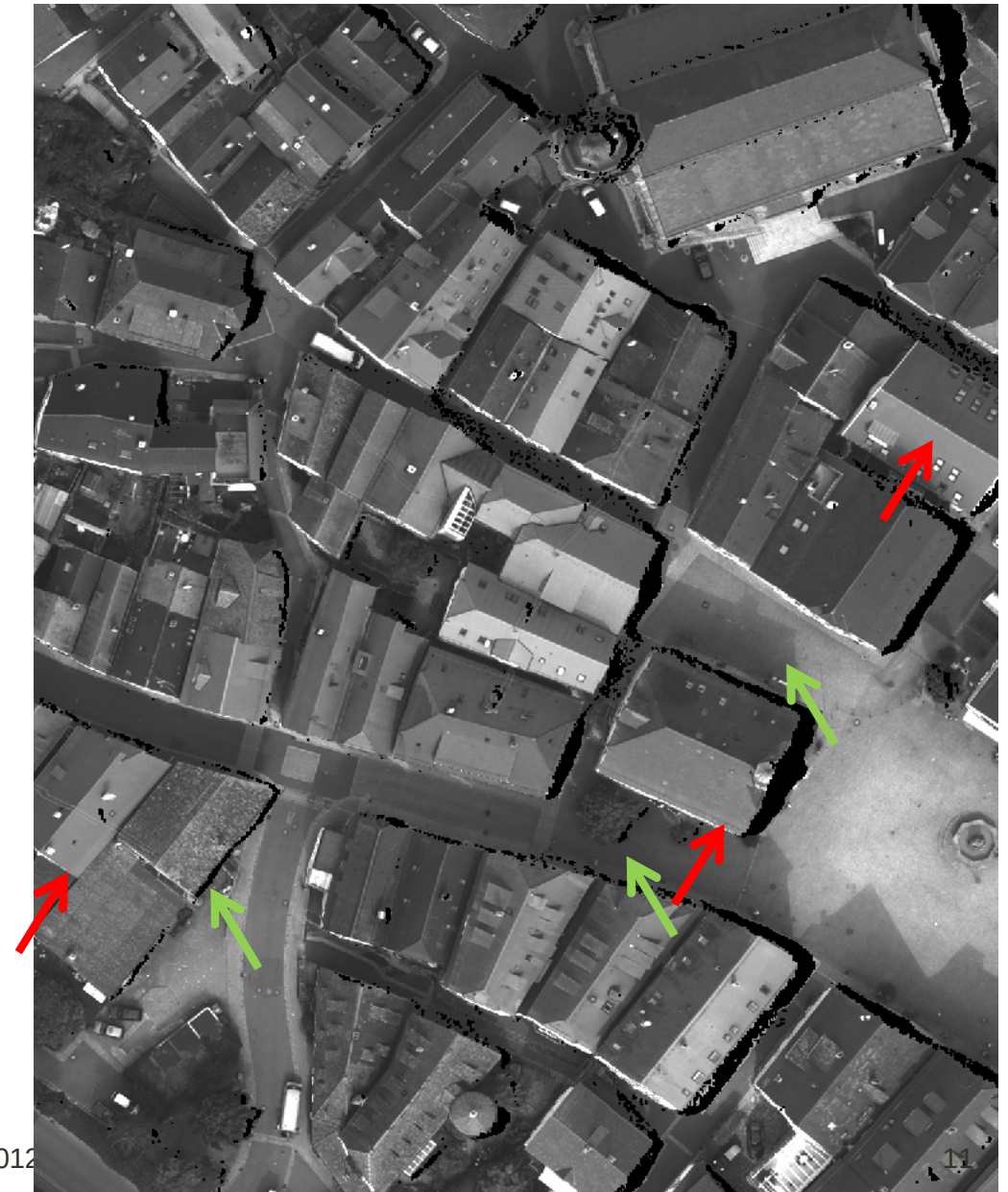
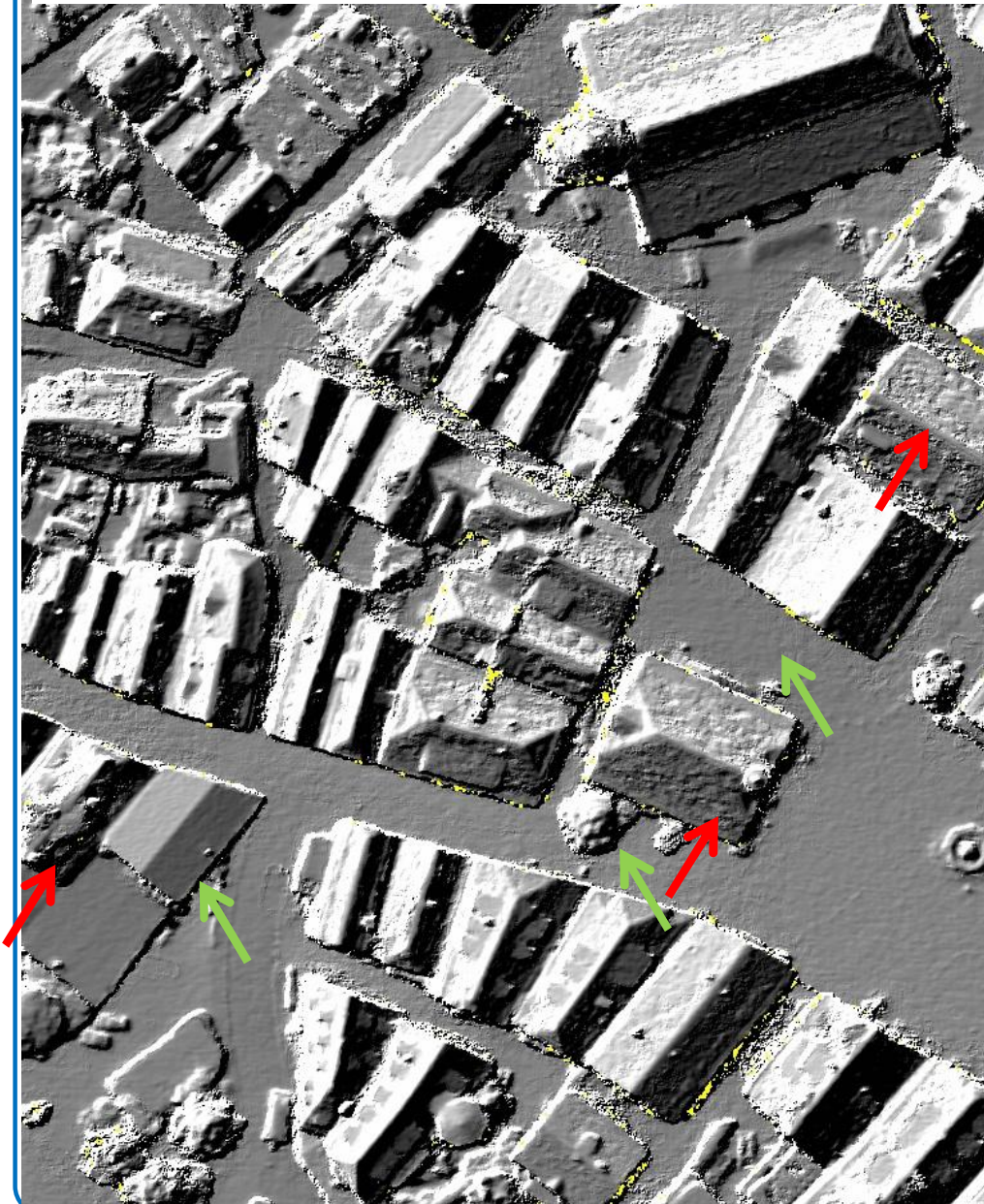
Marseille (12cm, RGB 8bit), 25cmGrid

without across strip models, with them à less holes (but here mainly shadow areas)



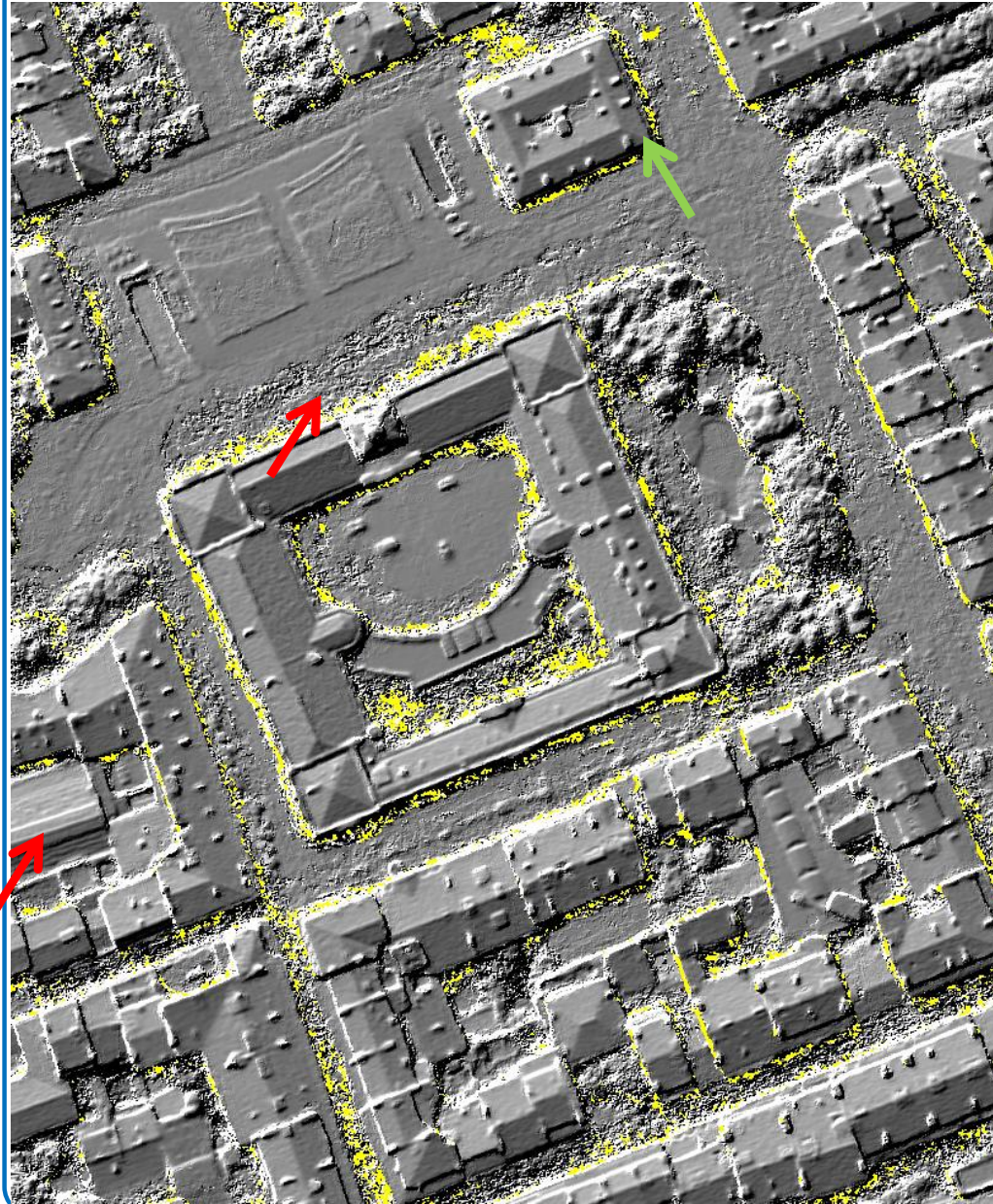
Fusion result: DGPF(8cm, PAN 16bit), 15cmGrid

Roofs generally “destroyed” due to bad texture, shadows ok (sun not bright or 16bit)



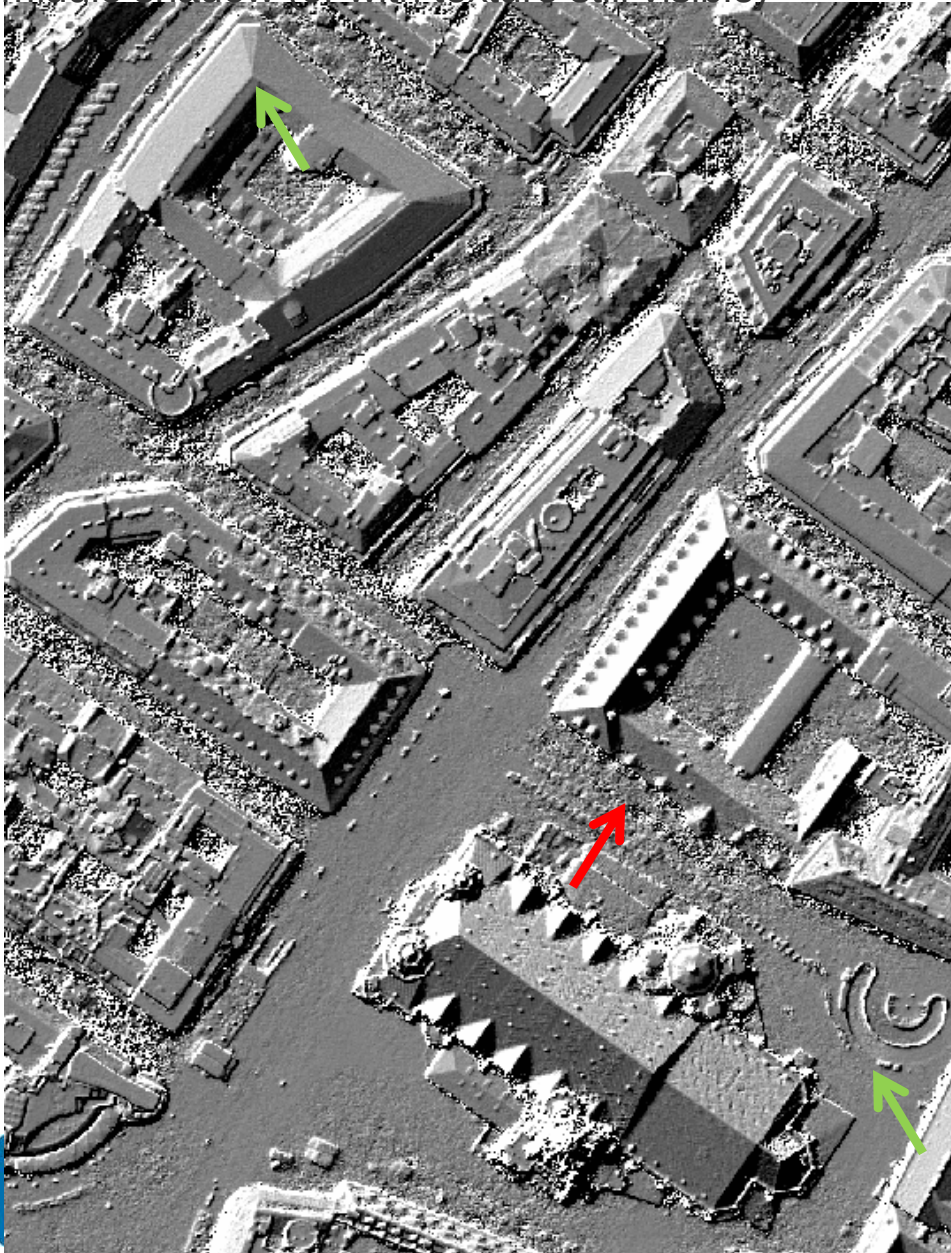
Fusion result: Marseille (12cm, RGB 8bit), 25cmGrid

Roofs generally ok due to good texture, problems in shadow

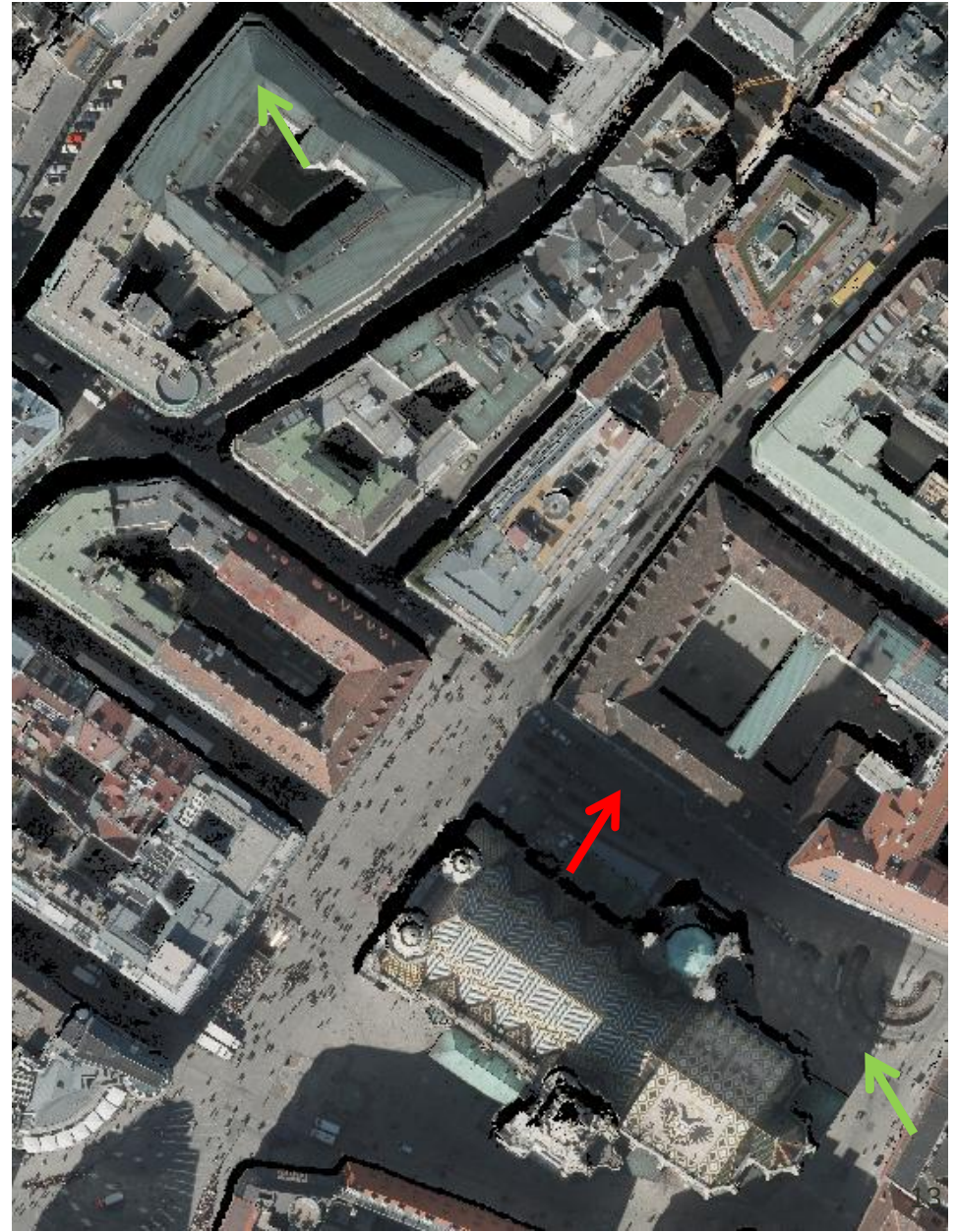


Fusion result: Vienna (6cm, RGB 8bit), 25cmGrid

($L=Q=80\%$, only in-strip pairs) roofs generally ok due to good texture, problems in dark shadow, ok in middle shadow (or with texture still visible)

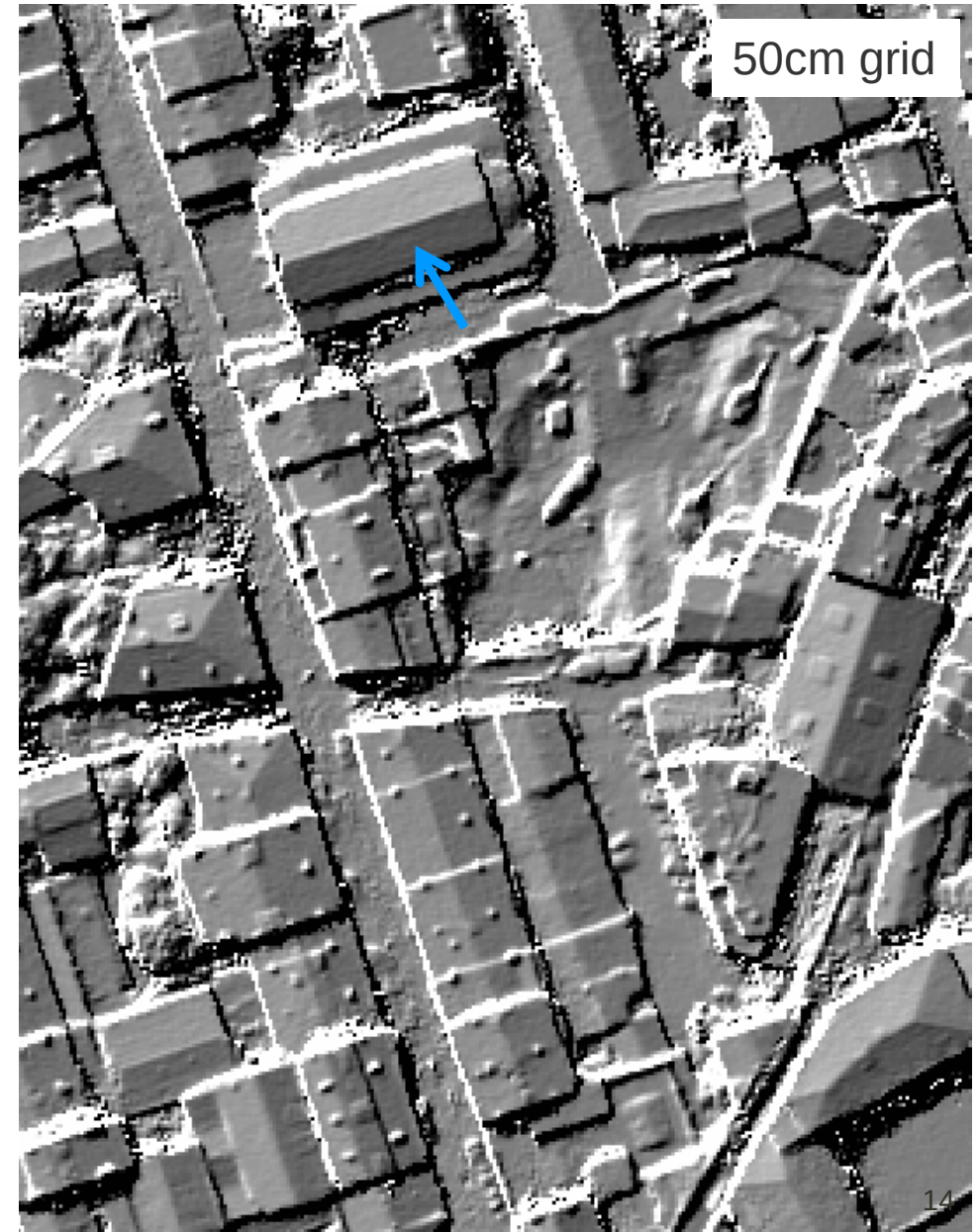
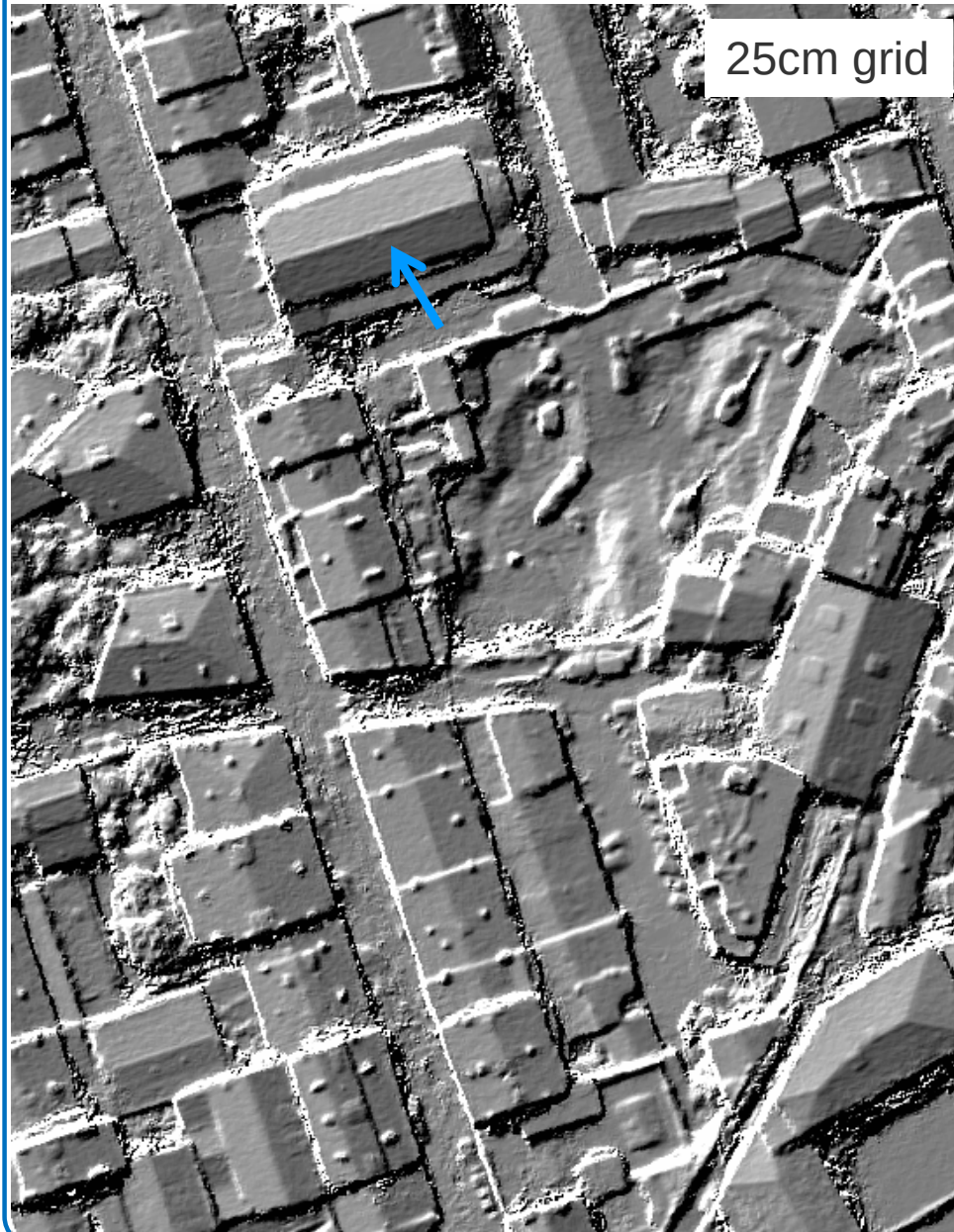


R 2012



Choice of grid width?

Marseille (12cm GSD, MatchT points every 2xGSD) à improved edge representation

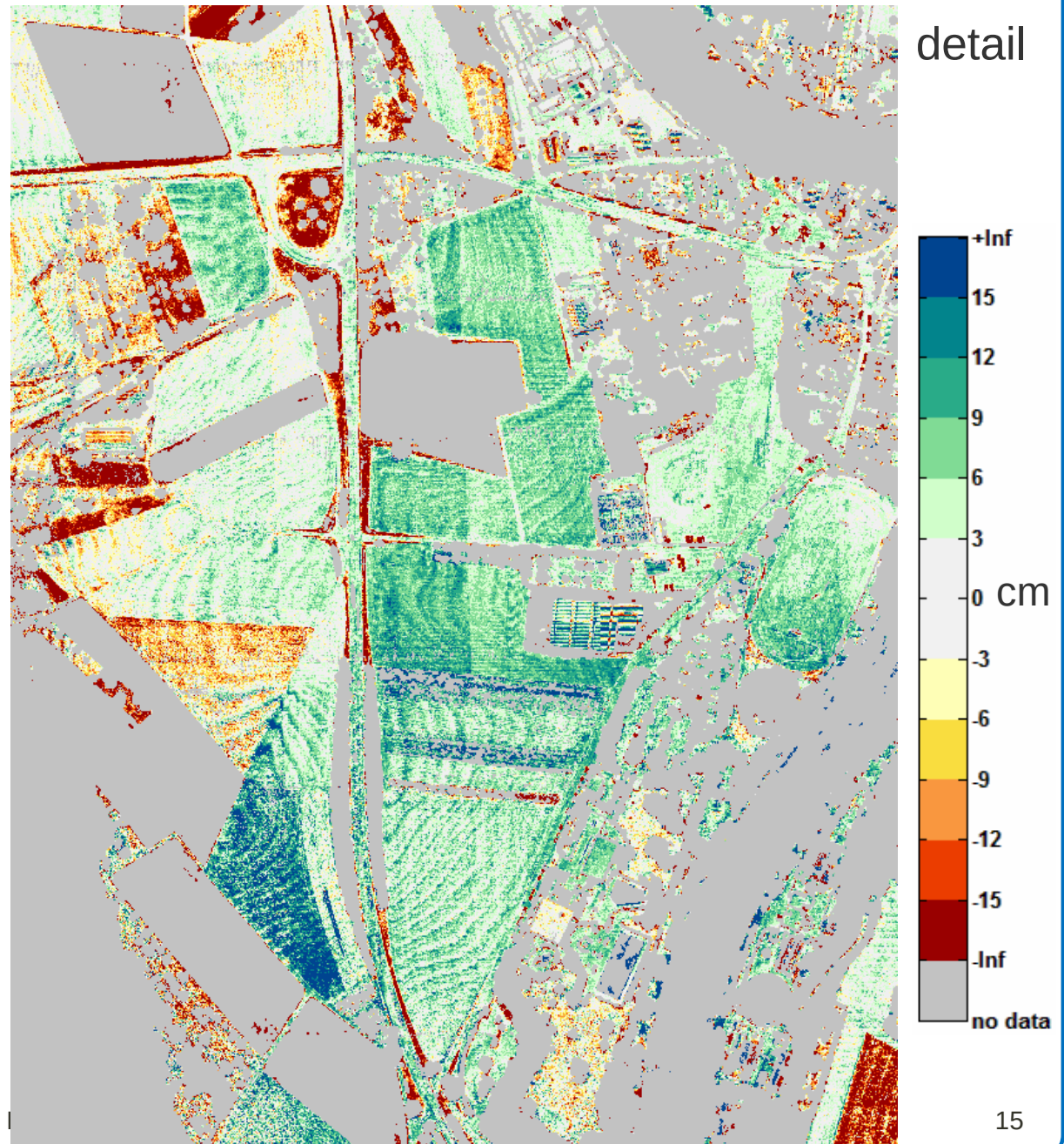


Comparison with ALS

- § DGPF(**8cm**, PAN 16bit)
- § AT of images:
 - flight: 11.9.2008
 - sigZ ~ **4cm**
- § ALS (density >3pts/m²):
 - flight: 21.8.2008
 - difference of ALS-DOM and PHO-DOM: à sigMAD in smooth surfaces: **8cm**

à overall std. of diff. ~ GSD

Do laser and images see the same thing?

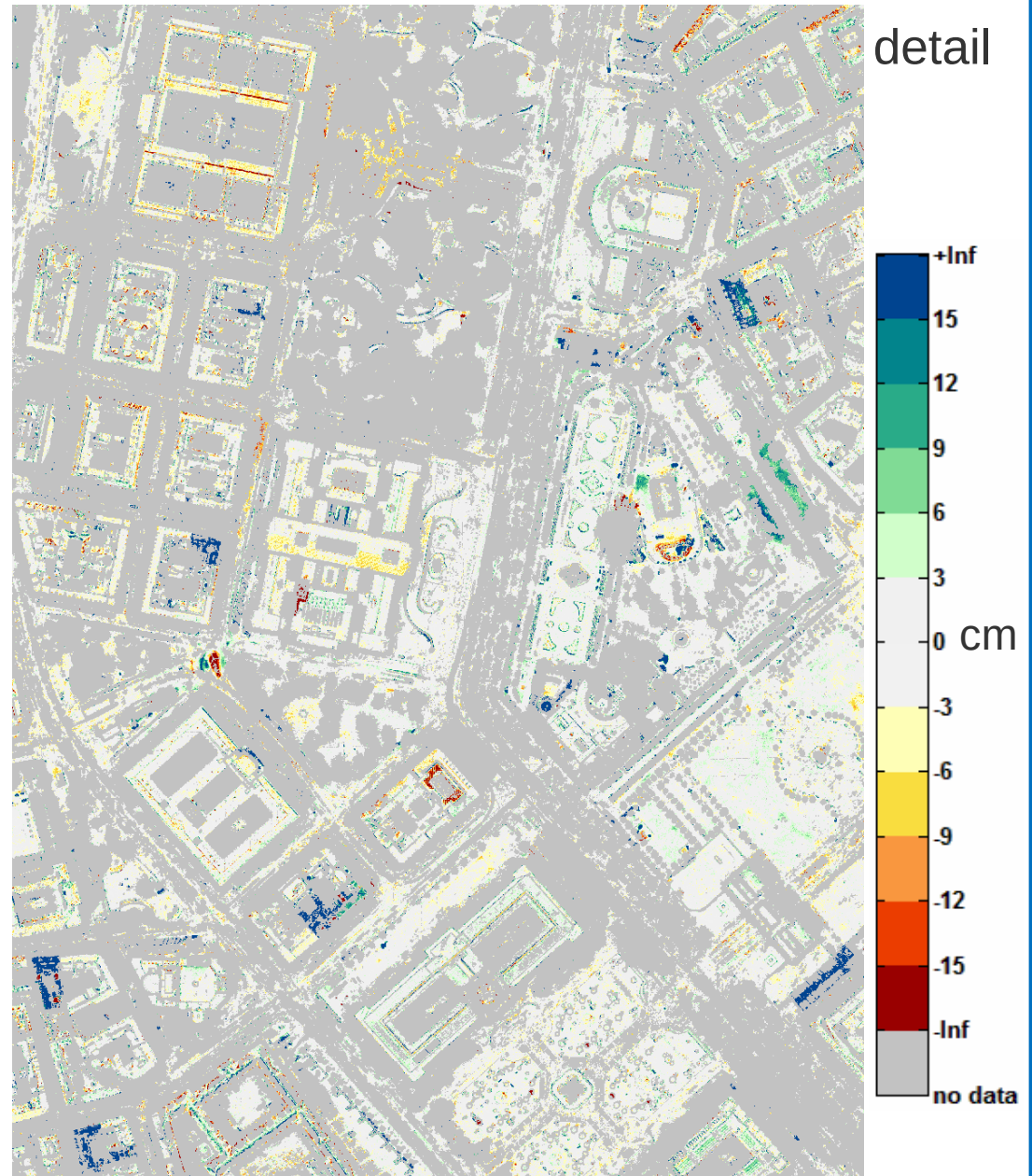


Comparison with ALS

- § Vienna(**6cm**, RGB 8bit)
- § AT of images:
 - flight: March 2011
 - sigZ ~ **4cm**
- § ALS (density >20pts/m²):
 - flight: 2007/2008
 - difference of ALS-DOM and PHO-DOM: **à** sigMAD in smooth surfaces: **6cm**

à overall std. of diff. ~ GSD

In the city laser and images see the same thing.



Summary

- § Recent version 5.4.0 of Match-T comes with a variant of SGM
- § Improved fusion result of all image pairs over standard output (however, much longer processing time)
- § Currently: DOM grid width $\sim 2 \cdot \text{GSD}$ to $5 \cdot \text{GSD}$ seems reasonable

- § “Wish list” Match-T should offer:
 - Button for high quality result (which it is already capable of doing)
 - GPU processing $\rightarrow$ speed
 - Better matching costs to cope for illumination changes ($\rightarrow$ across strip pairs)