

# Towards large-scale city reconstruction from satellites

## Supplementary Material

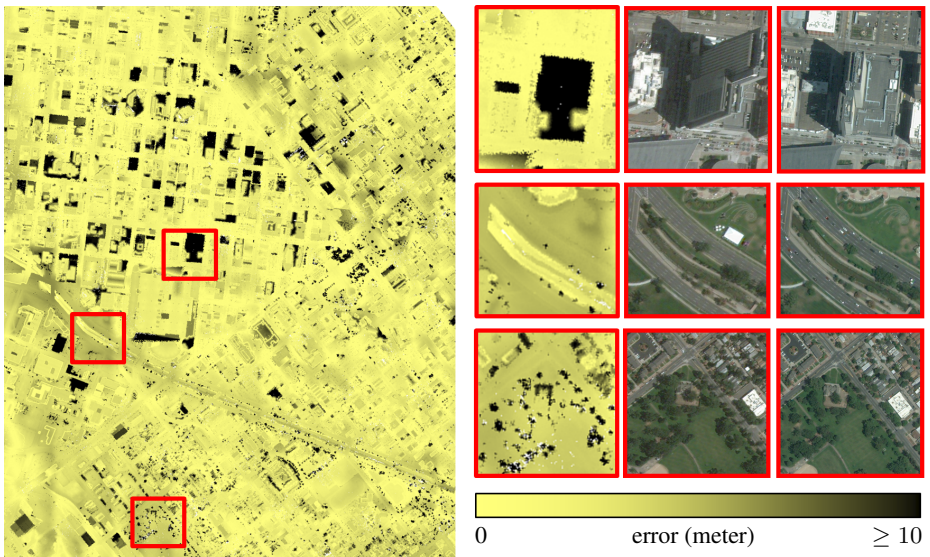
Liuyun Duan and Florent Lafarge

Inria

firstname.lastname@inria.fr

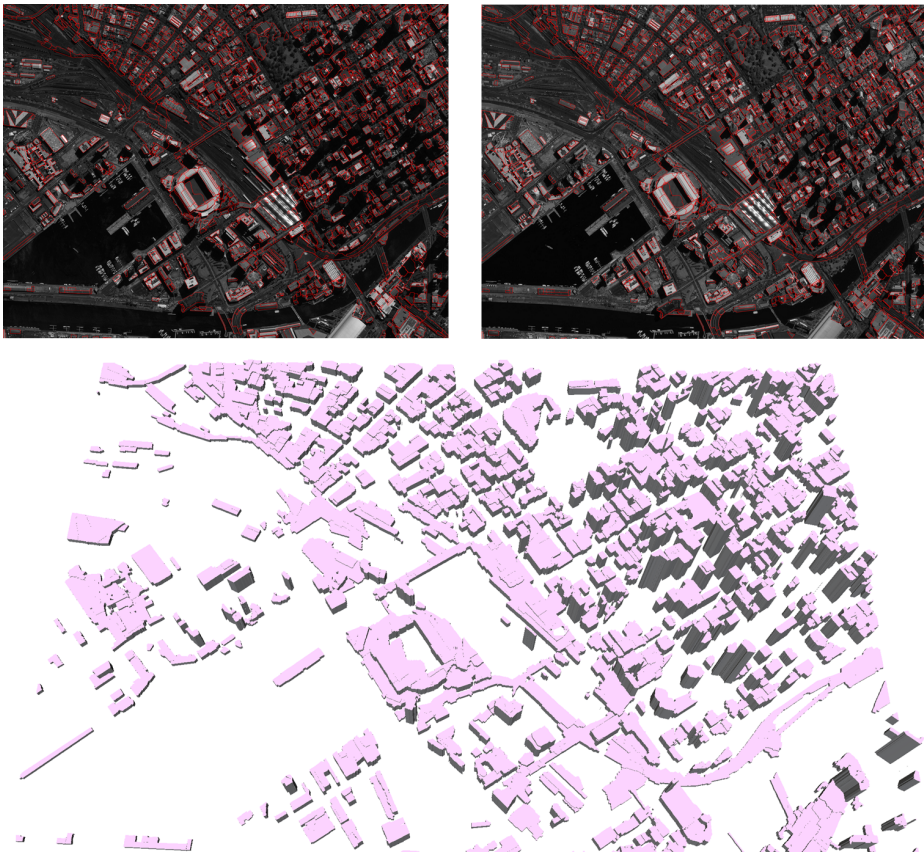
This document presents several additional experiments with an altimetric evaluation at large scale on the city of Denver (Section 1), and several city reconstruction results (Section 2).

### 1 Altimetric evaluation at large-scale

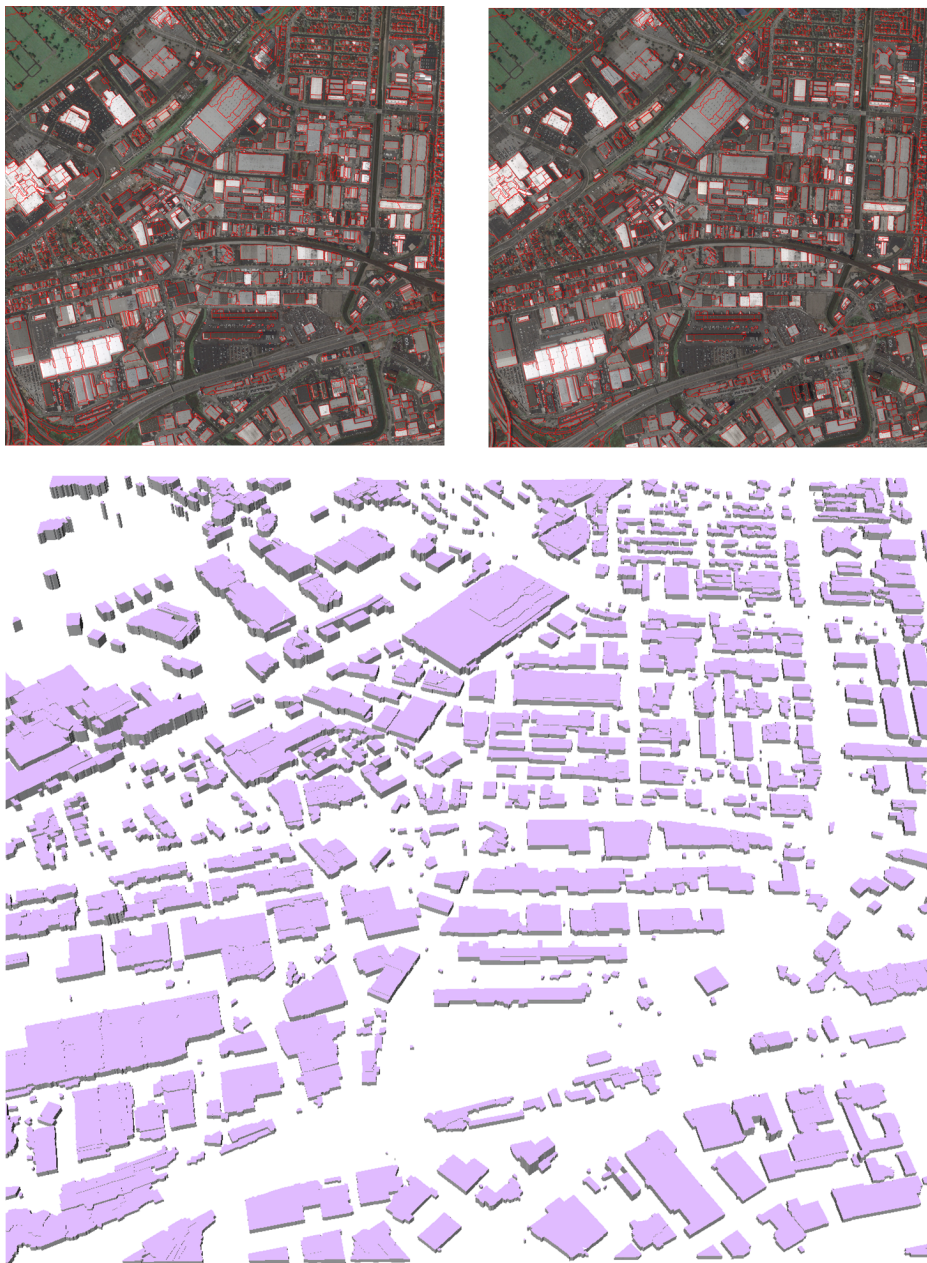


**Fig. 1.** Altimetric accuracy on Denver. Considering Airborne Lidar measurements as ground truth, we compute an altimetric error map (left) of our output 3D model on Denver (see Figure 1) by, first, measuring the Hausdorff distance from each Lidar points to the output 3D model, and, second, projecting the distance values into a XY grid. The closeups illustrate the main types of errors that occur, in particular buildings missed because of insufficient number of elevation estimates, rough ground approximation due to elevated roads, and presence of trees that are not handled by our algorithm (right, from top to bottom).

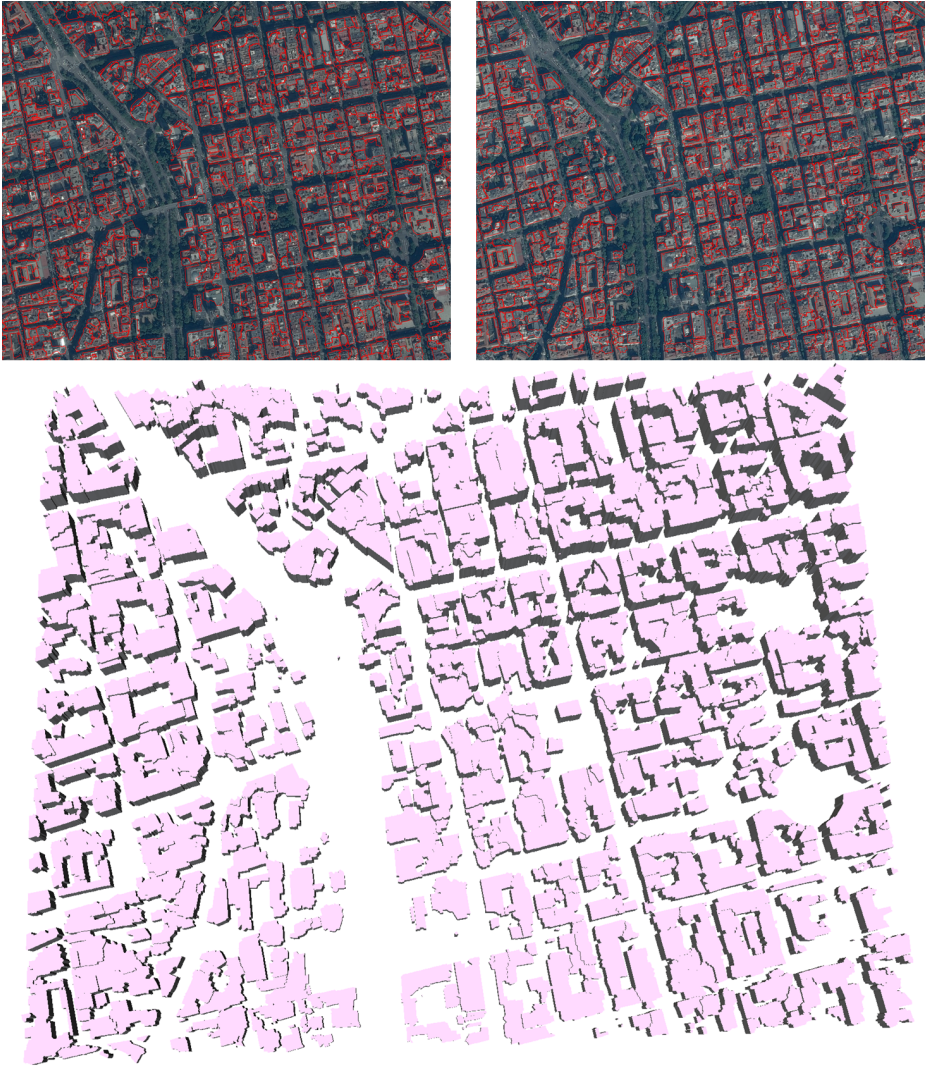
## 2 Additional large-scale city results



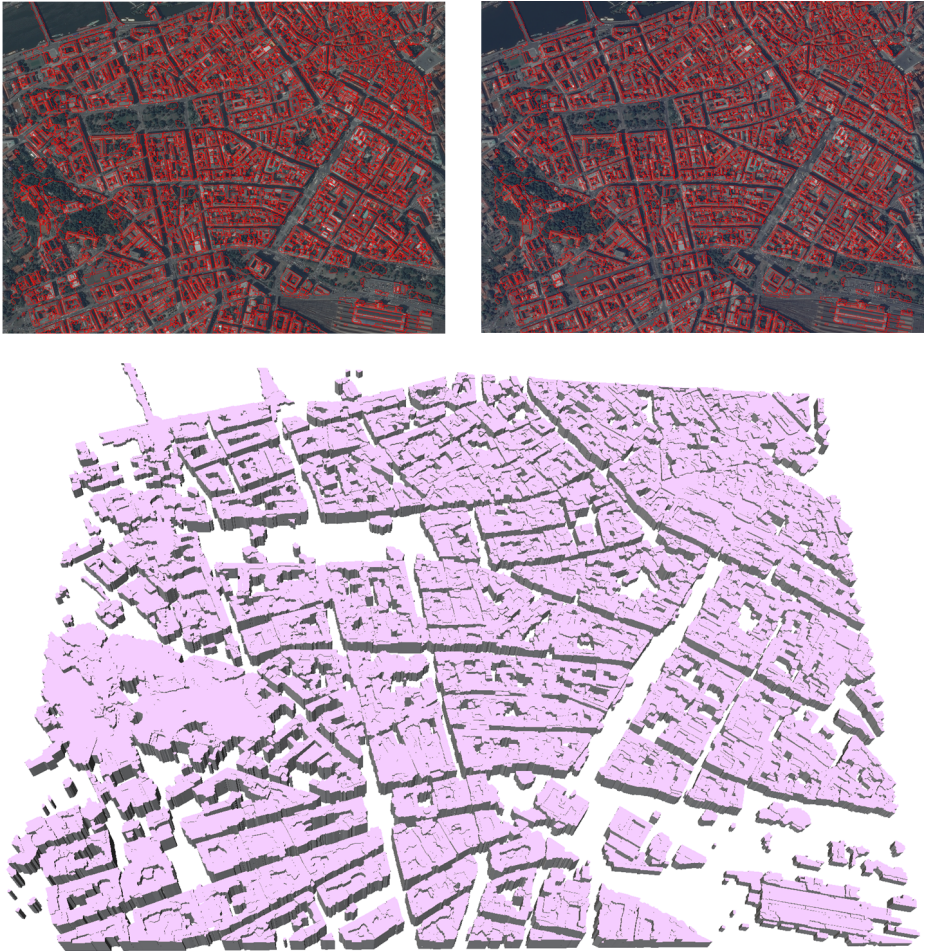
**Fig. 2.** Reconstruction of Melbourne harbor. Our algorithm interprets elevated roads and bridges as buildings. A richer urban semantics is necessary to solve this problem. For evaluating the reconstruction accuracy with visual considerations, roof edges of the output 3D model have been back-projected into the input stereo satellite images (top, see red lines). This display scheme is also used for Figures 3 ,4 and 5.



**Fig. 3.** Reconstruction of an industrial district in San Francisco. Our LOD1 representation is well suited to industrial areas which are mainly composed of flat planar structures. Note that our algorithm is robust to building size variation, as we can see with both small houses and large industrial sites within the same scene.



**Fig. 4.** Reconstruction of Madrid downtown. Buildings of European cities as Madrid typically have sloping roofs that are better described by a LOD2 representation. Although our algorithm correctly extracts building blocks, high resolution airborne acquisition is recommended for capturing such roofs with better accuracy.



**Fig. 5.** Reconstruction of Prague downtown. Although Prague exhibits urban characteristics similar to Madrid (Figure 4), its reconstruction is more challenging as (i) the road network (and by extension the building block layout) is more complex, and (ii) dense vegetation is more frequent and can easily be interpreted as buildings (see the middle left area on the output 3D model).