CARS & ASP Intercomparison

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Overview of the test:

Four test runs of stereo processing

- CARS (DY)
- ASP-BM (EB)
- ASP-SGM (EB)
- ASP-MGM (JB)

Each run was co-registered with the lidar acquired at the same date (+/- 2 days) using https://github.com/dshean/demcoreg

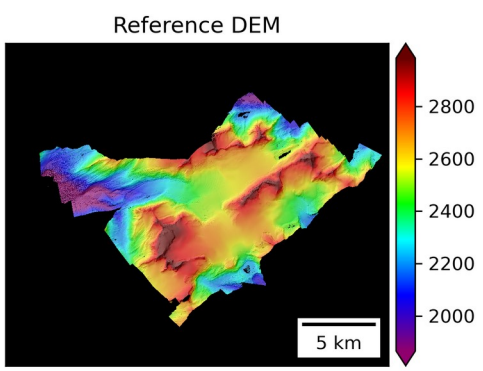
- One large lidar survey in Canada
- Three small lidar surveys in Norwey (Gra, HellM, Lan)

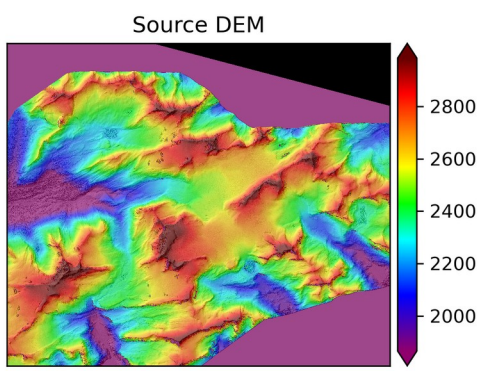
A similar statistical analysis was done for the Pléiades Glacier Observatory in this paper: https://doi.org/10.5194/tc-18-5551-2024

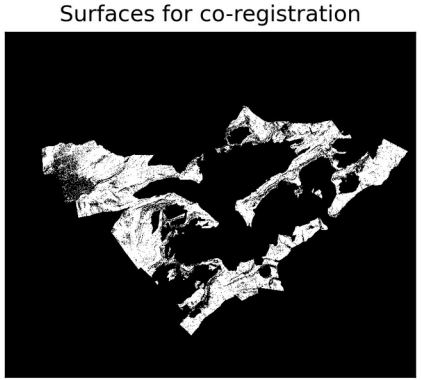
CARS vs lidar

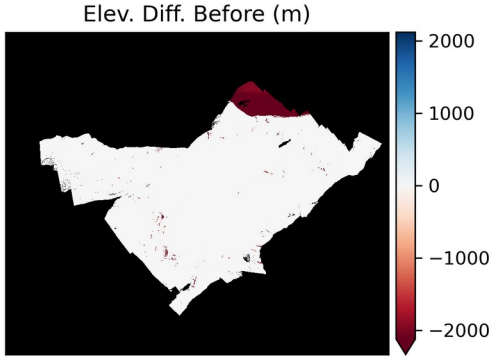
CARS vs lidar: Canada

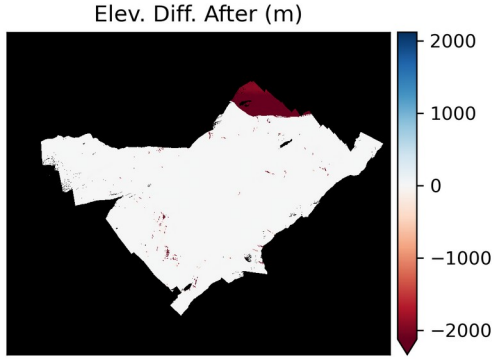
cars_peyto_peyto_20160913_1x1_medfilt-median-DEM
x: -1.75m, y: +2.19m, z: -6.65m

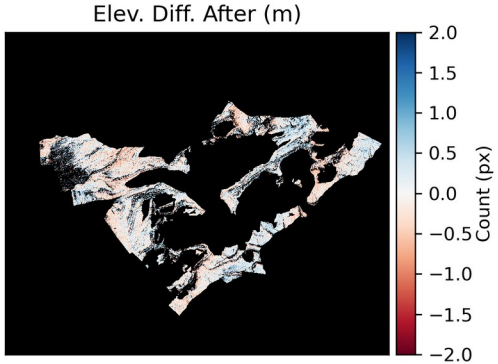


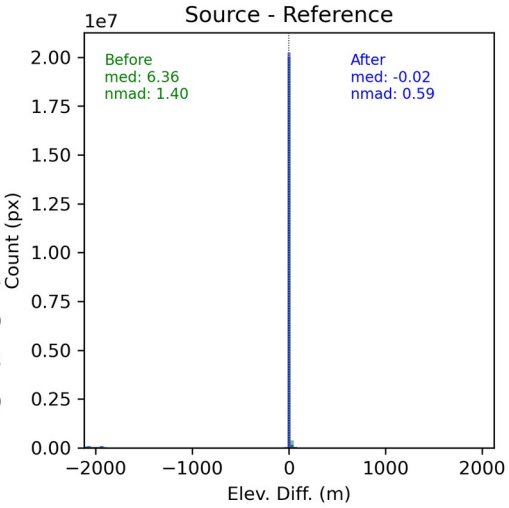






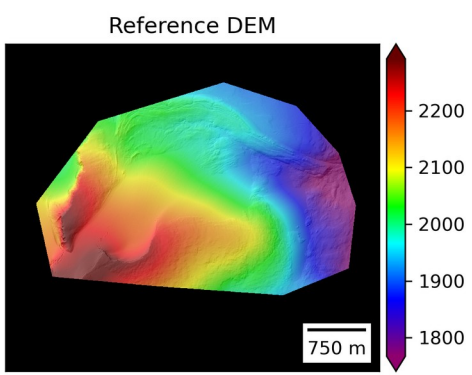


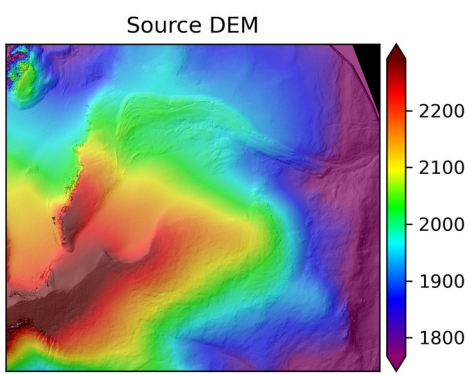


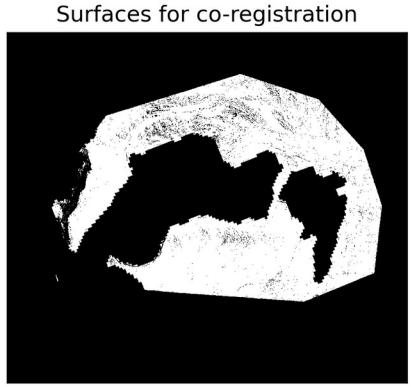


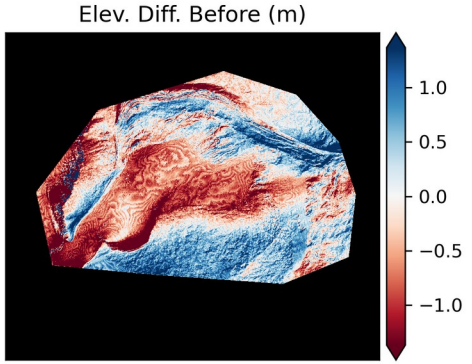
CARS vs lidar: Norway (Gra)

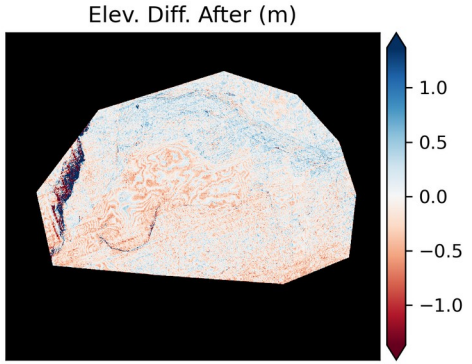
cars_hellmand_Graasubreen_20190827_1x1m_utm32n_zmae-DEM
x: -2.22m, y: +3.74m, z: +0.11m

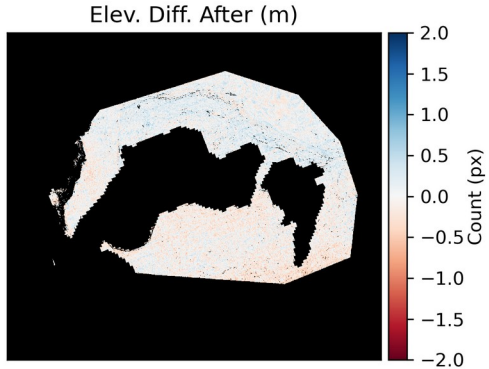


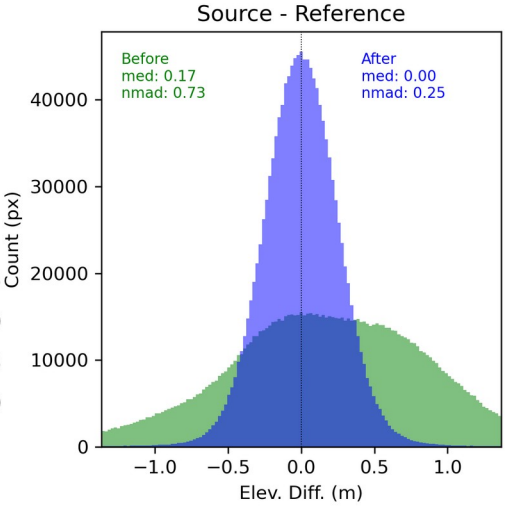






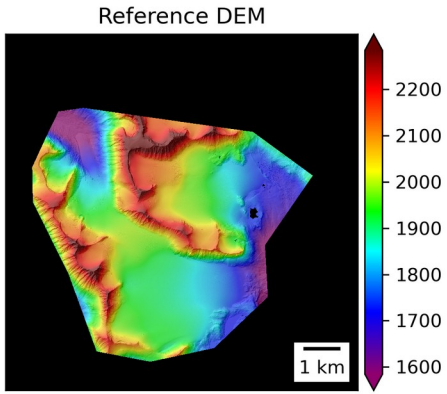


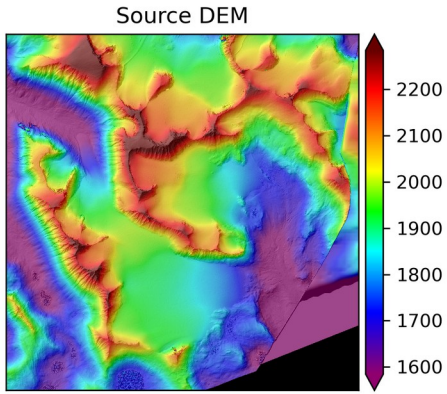


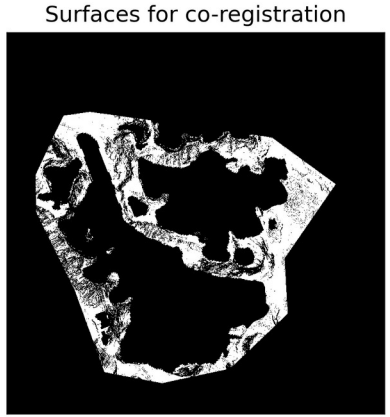


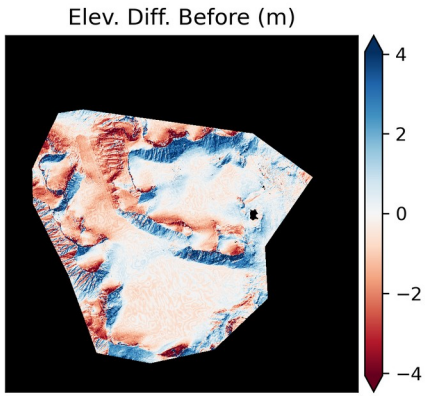
CARS vs lidar: Norway (HellM)

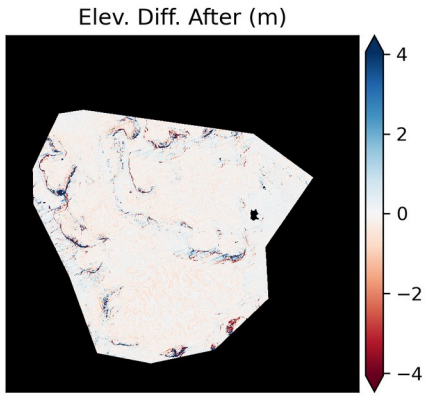
cars_hellmand_hellMem_20190827_1x1m_utm32n_zmae-DEM
x: -2.51m, y: +4.18m, z: +0.21m

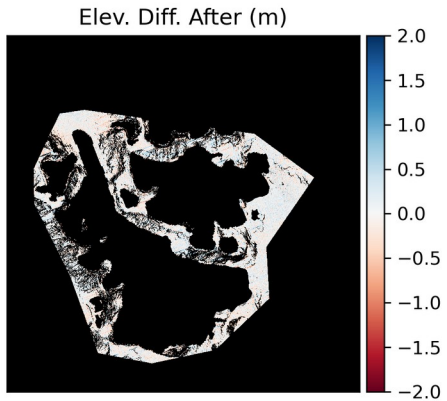


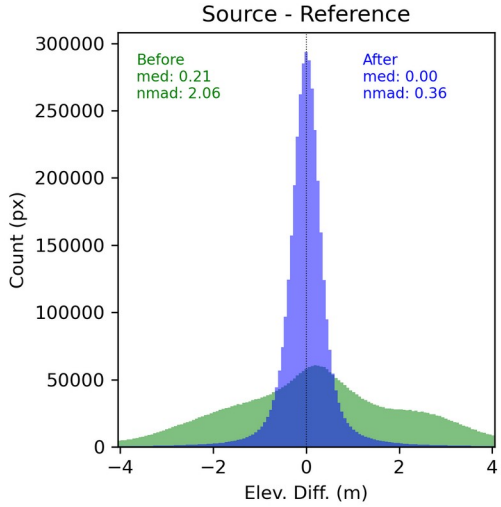






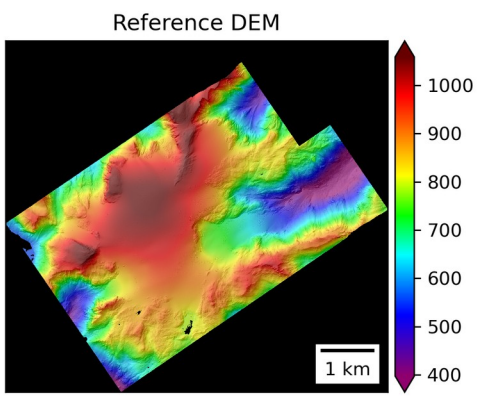


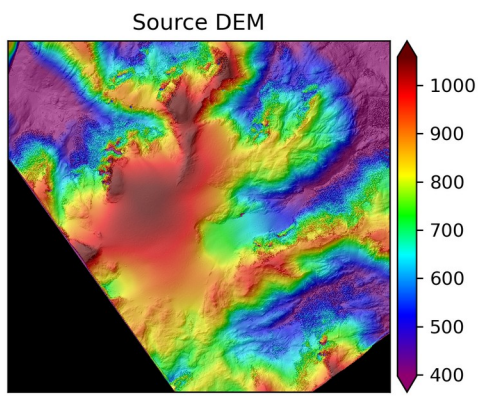


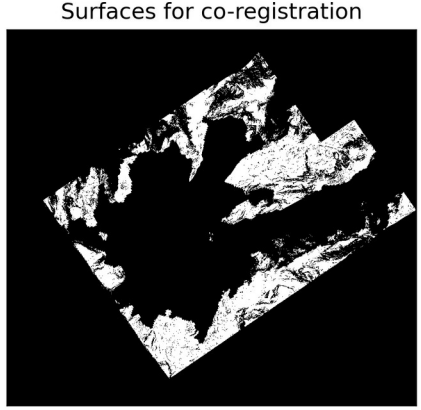


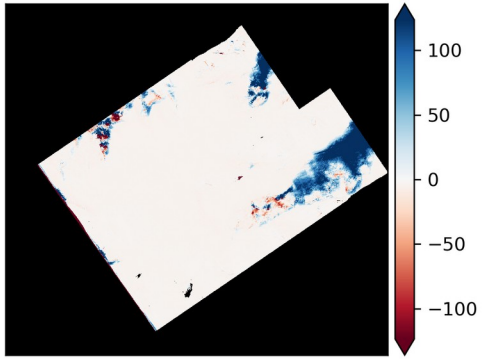
CARS vs lidar: Norway (Lan)

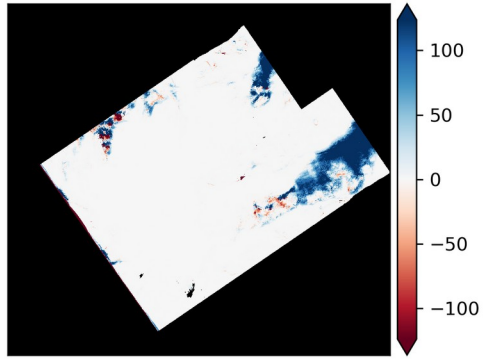
cars_Langfjordjokelen_Langfjordjokelen_20180901_1x1m_utm34n_zmae-DEM
x: +0.87m, y: +1.85m, z: +3.80m

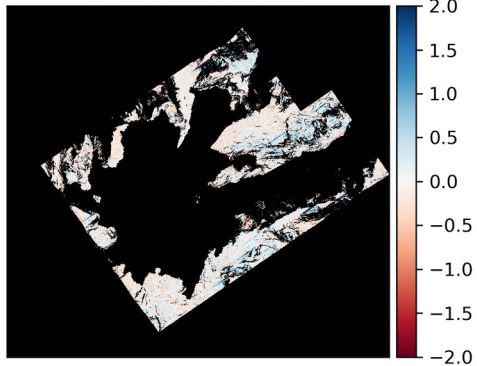


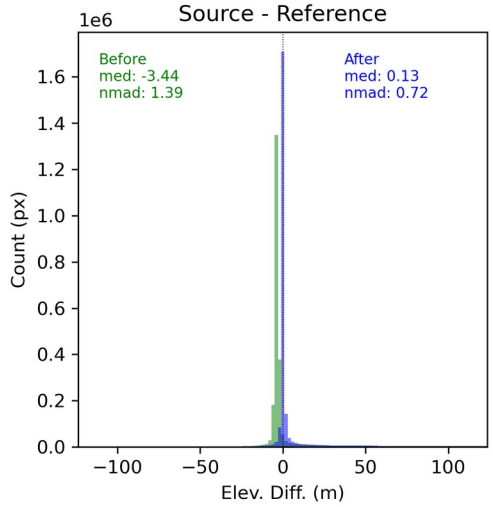








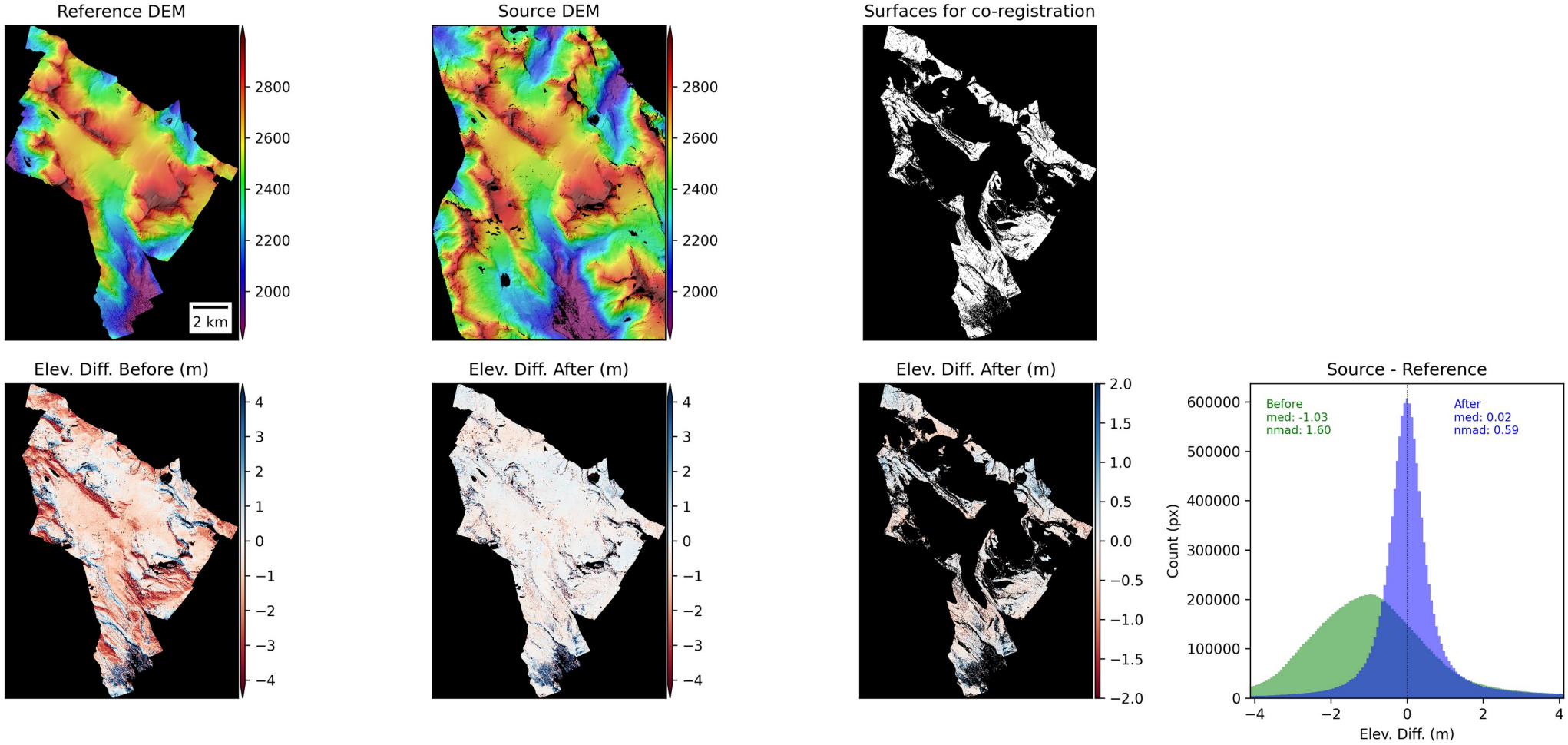




ASP-BM vs lidar

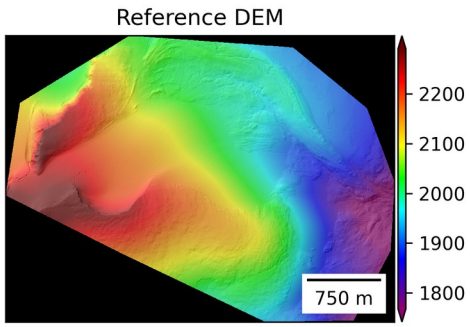
ASP-BM vs lidar: Canada

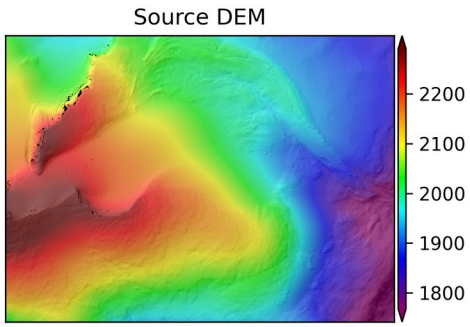
2016-09-13_1912075_Wapta_WNA_DEM_BM_2m_peyto_20160913_1x1_medfilt-median-DEM
x: -0.92m, y: -3.03m, z: +0.75m

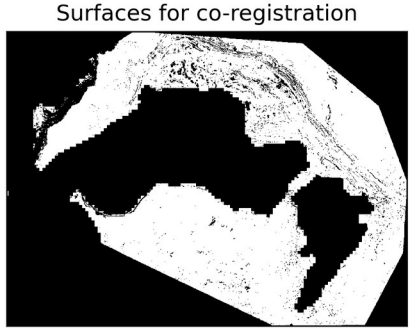


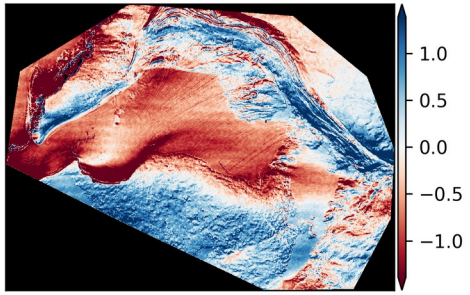
ASP-BM vs lidar: Norway (Gra)

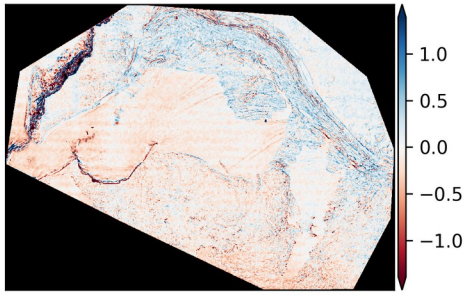
2019-08-27_Jotun_DEM_BM_2m_Graasubreen_20190827_1x1m_utm32n_zmae-DEM
x: -0.58m, y: +4.39m, z: +0.11m

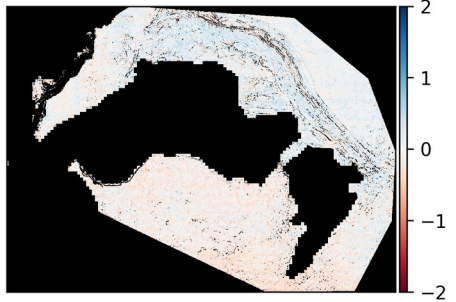


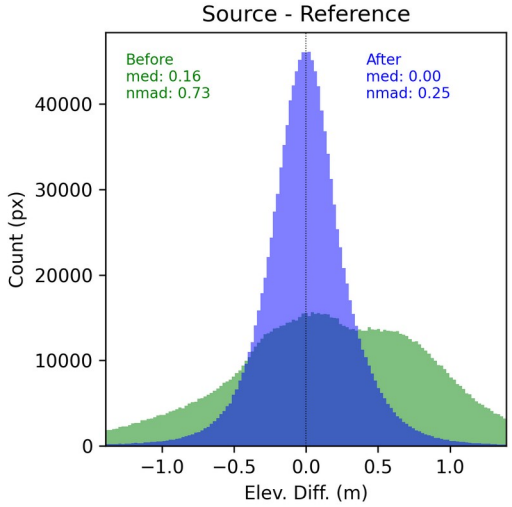






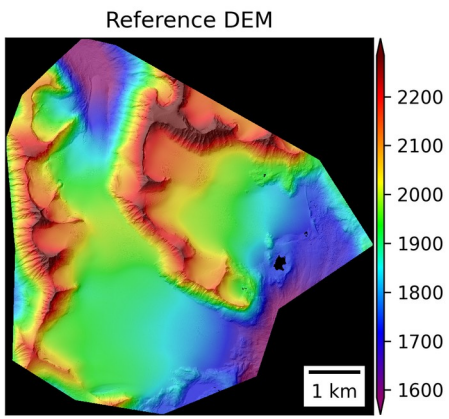


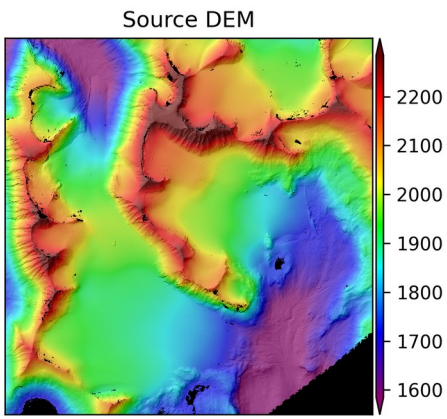


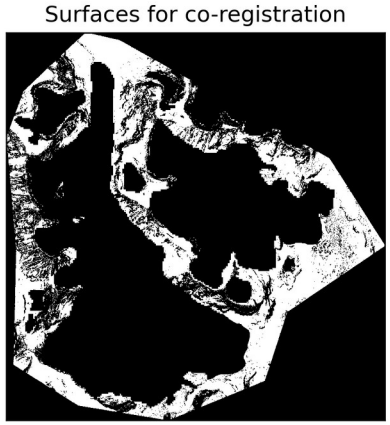


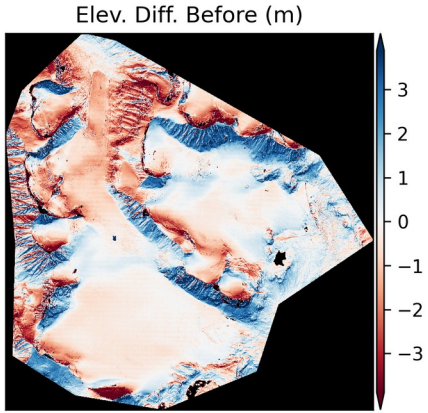
ASP-BM vs lidar: Norway (HellM)

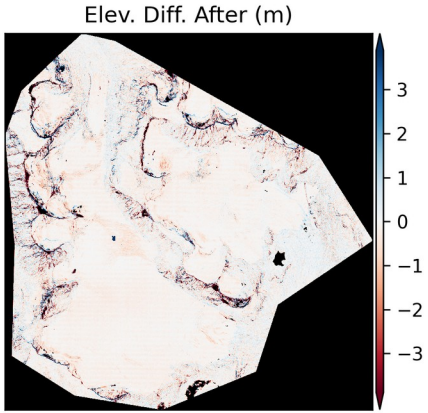
2019-08-27_Jotun_DEM_BM_2m_hellMem_20190827_1x1m_utm32n_zmae-DEM
x: -0.81m, y: +4.90m, z: +0.22m

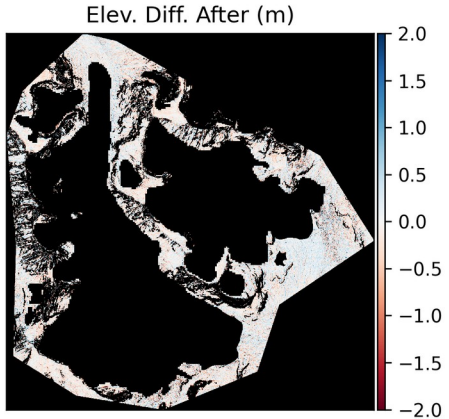


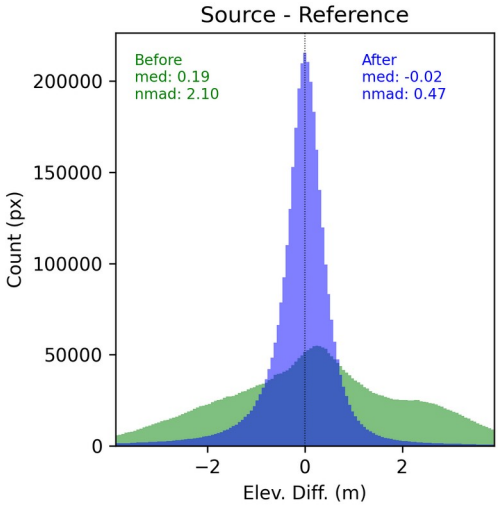








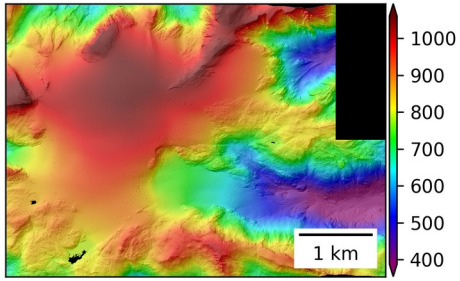




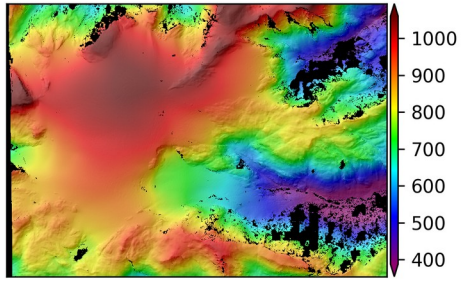
ASP-BM vs lidar: Norway (Lan)

2018-09-01a_Langfjord_DEM_BM_2m_Langfjordjokelen_20180901_1x1m_utm34n_zmae-DEM
x: +1.79m, y: +1.19m, z: +3.84m

Reference DEM

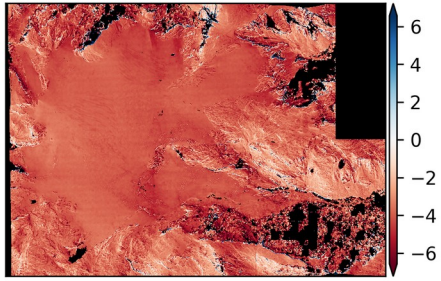


Source DEM

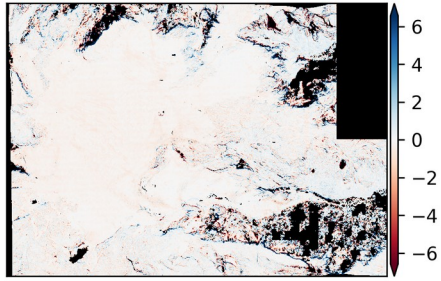


Surfaces for co-registration

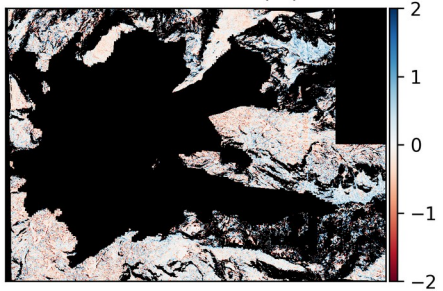
Elev. Diff. Before (m)



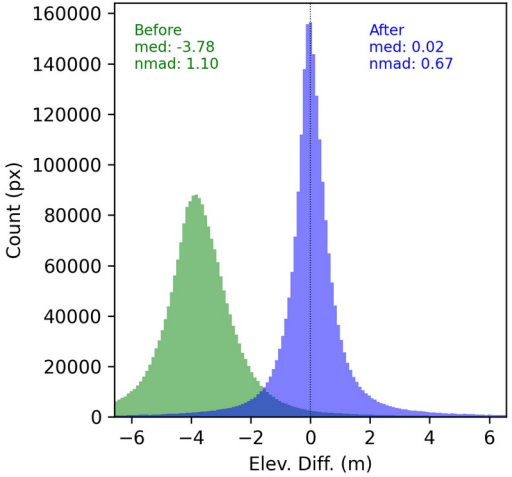
Elev. Diff. After (m)



Elev. Diff. After (m)



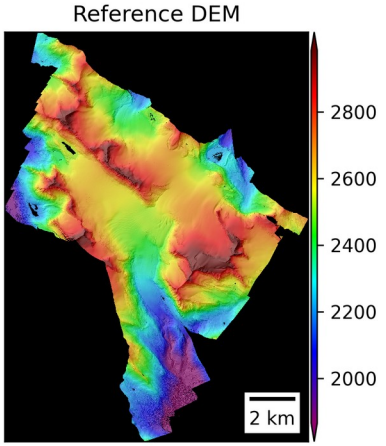
Source - Reference

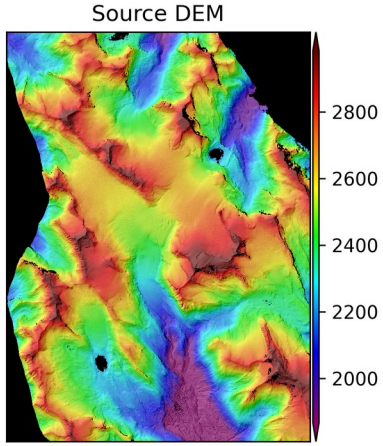


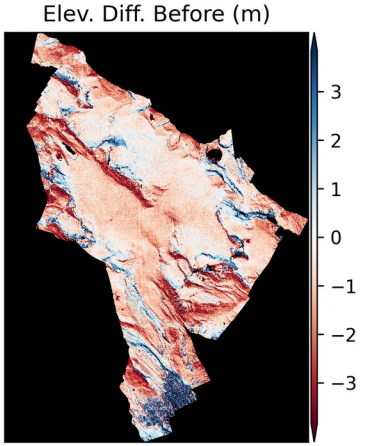
ASP-SGM vs lidar

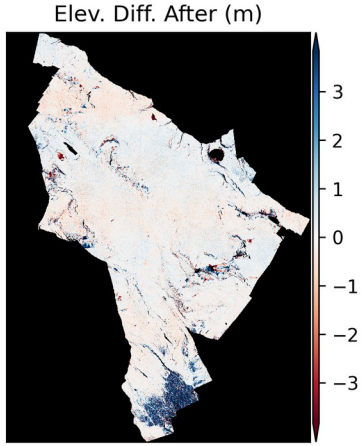
ASP-SGM vs lidar: Canada

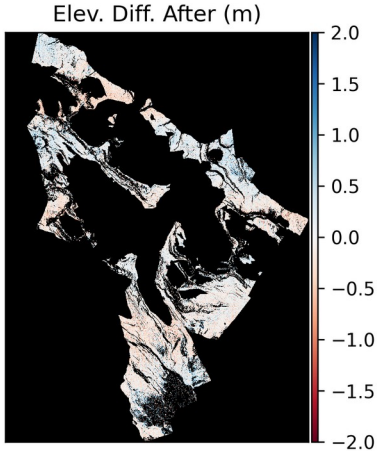
2016-09-13_1912075_Wapta_WNA_DEM_SGM_2m_peyto_20160913_1x1_medfilt-median-DEM
x: -0.94m, y: -3.08m, z: +0.77m

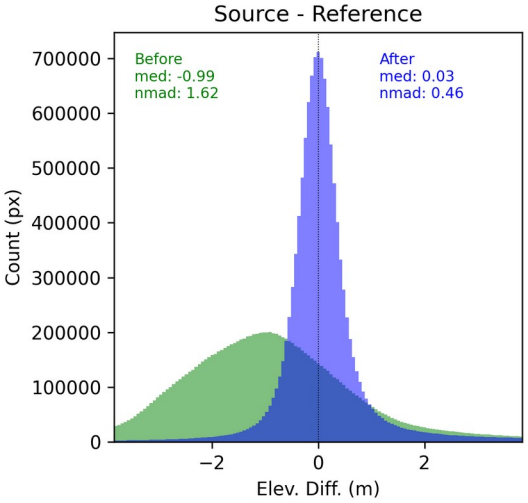






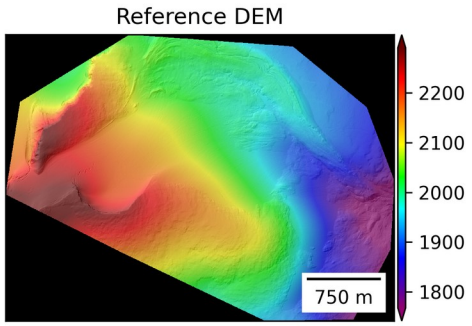


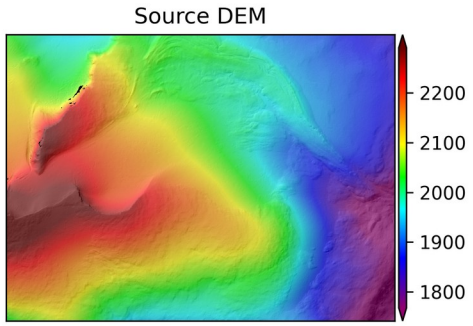


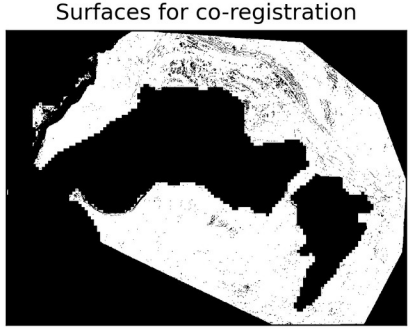


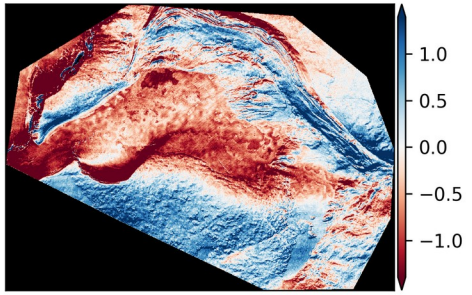
ASP-SGM vs lidar: Norway (Gra)

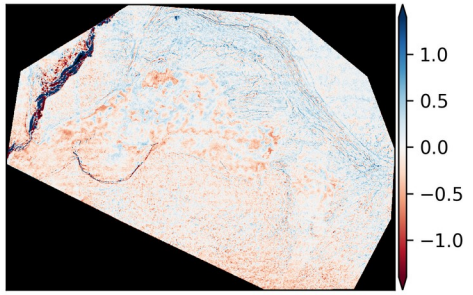
2019-08-27_Jotun_DEM_SGM_2m_Graasubreen_20190827_1x1m_utm32n_zmae-DEM
x: -0.69m, y: +4.42m, z: +0.13m

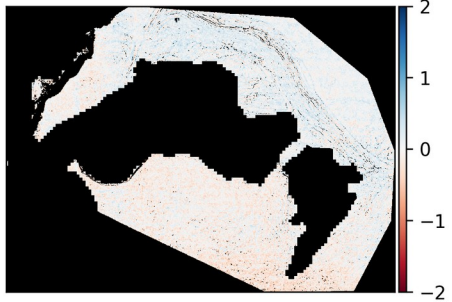


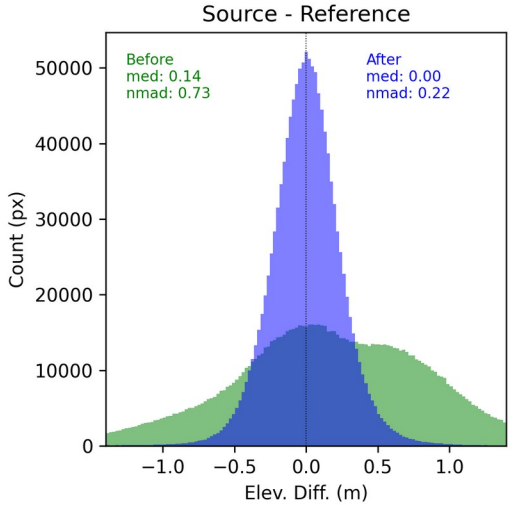








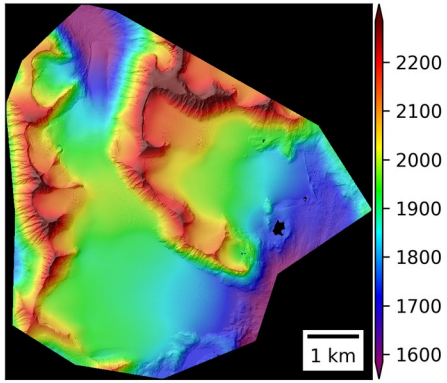




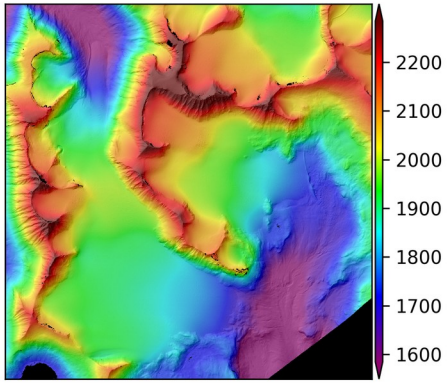
ASP-SGM vs lidar: Norway (HellM)

2019-08-27_Jotun_DEM_SGM_2m_hellMem_20190827_1x1m_utm32n_zmae-DEM
x: -0.80m, y: +4.91m, z: +0.25m

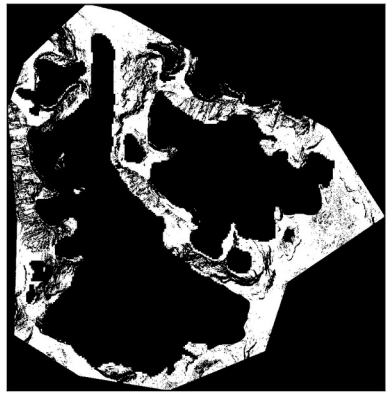
Reference DEM



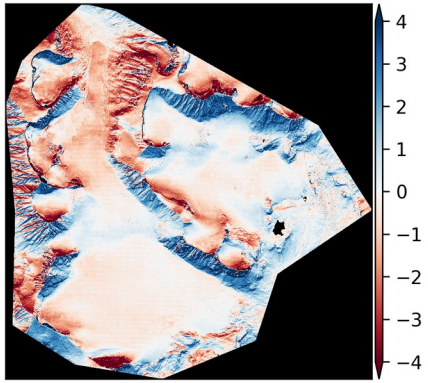
Source DEM



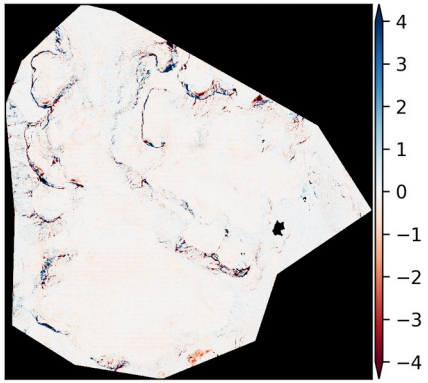
Surfaces for co-registration



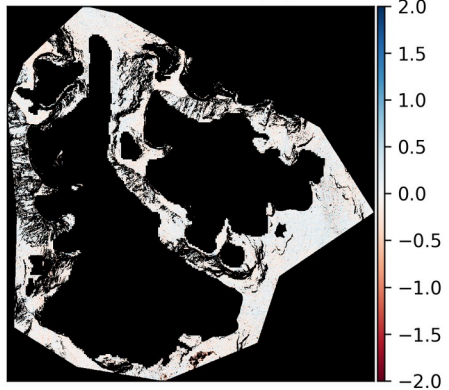
Elev. Diff. Before (m)



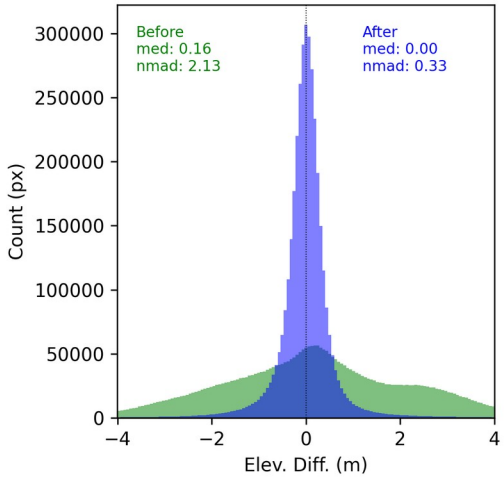
Elev. Diff. After (m)



Elev. Diff. After (m)



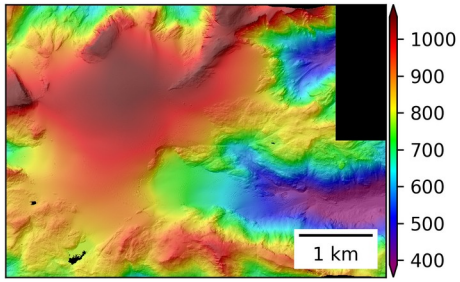
Source - Reference



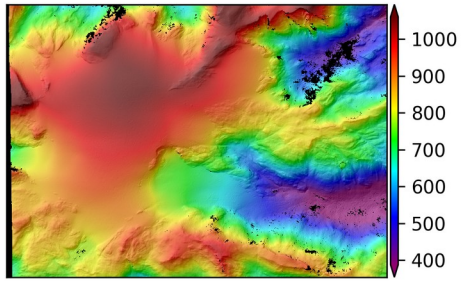
ASP-SGM vs lidar: Norway (Lan)

2018-09-01a_Langfjord_DEM_SGM_2m_Langfjordjokelen_20180901_1x1m_utm34n_zmae-DEM
x: +1.76m, y: +1.23m, z: +3.85m

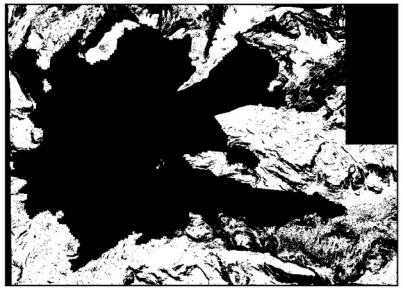
Reference DEM



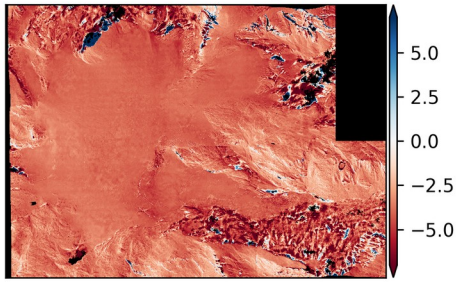
Source DEM



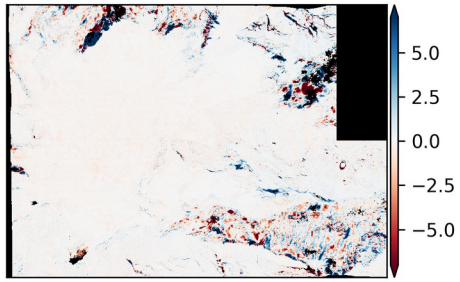
Surfaces for co-registration



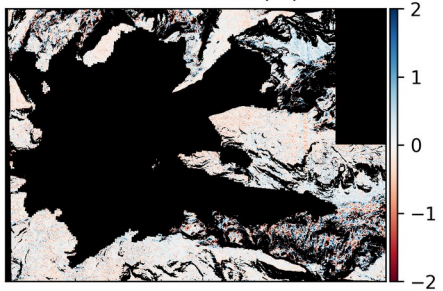
Elev. Diff. Before (m)



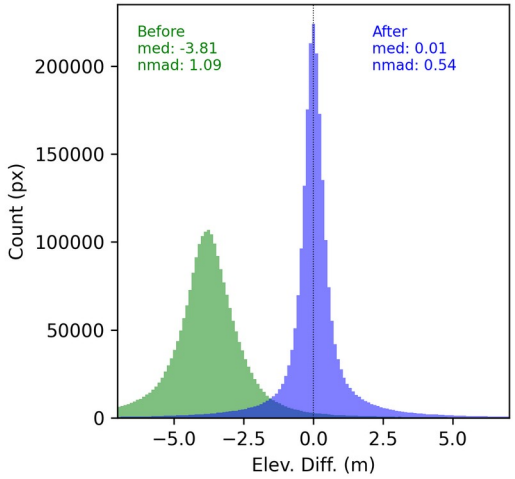
Elev. Diff. After (m)



Elev. Diff. After (m)



Source - Reference

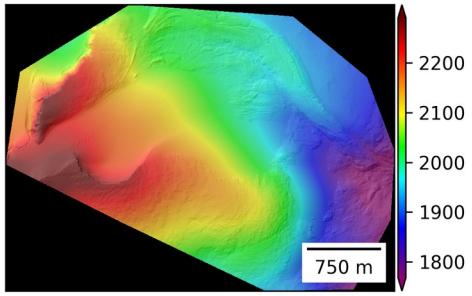


ASP-MGM vs lidar

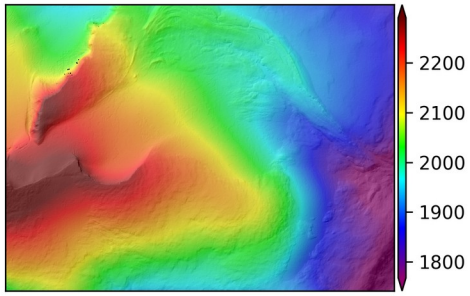
ASP-MGM vs lidar: Norway (Gra)

nor_20190827_110254_110331_mgm_2x2m-DEM_Graasubreen_20190827_1x1m_utm32n_zmae-DEM
x: -0.68m, y: +4.38m, z: +0.12m

Reference DEM

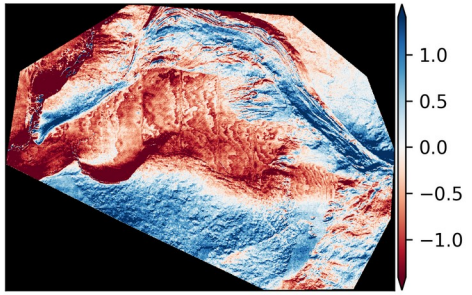


Source DEM

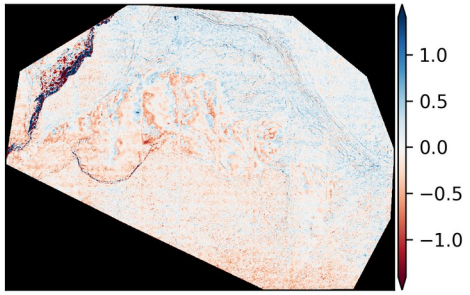


Surfaces for co-registration

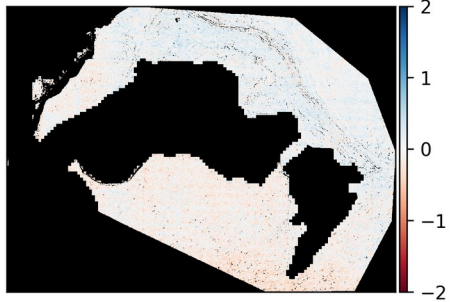
Elev. Diff. Before (m)



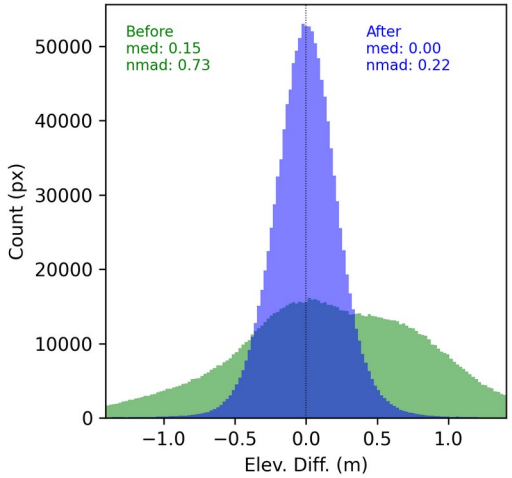
Elev. Diff. After (m)



Elev. Diff. After (m)

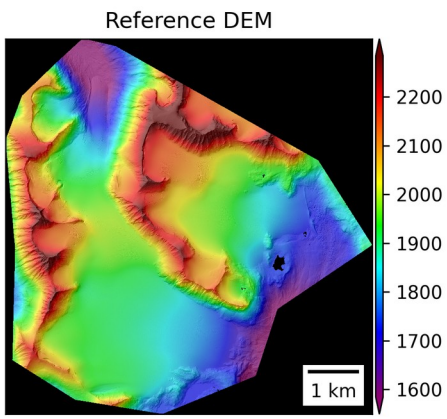


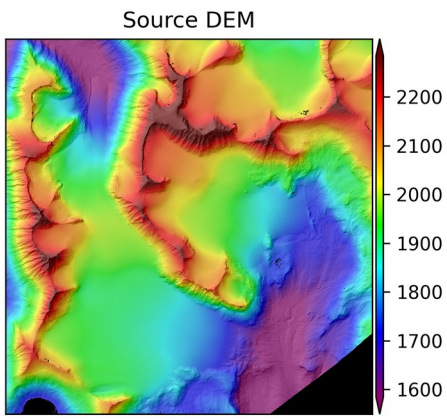
Source - Reference

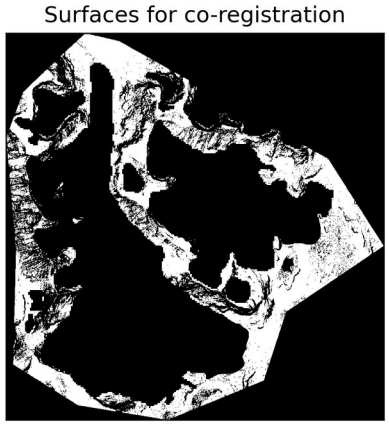


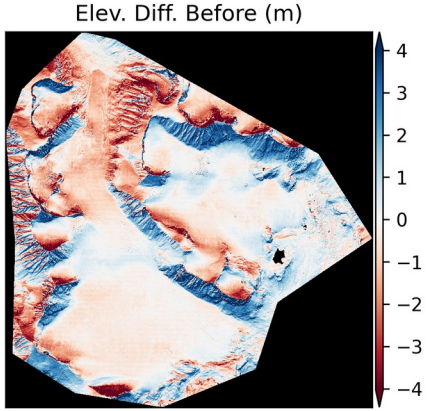
ASP-MGM vs lidar: Norway (HellM)

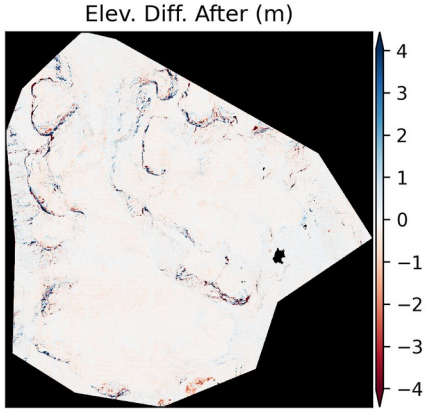
nor_20190827_110254_110331_mgm_2x2m-DEM_hellMem_20190827_1x1m_utm32n_zmae-DEM
x: -0.81m, y: +4.90m, z: +0.25m

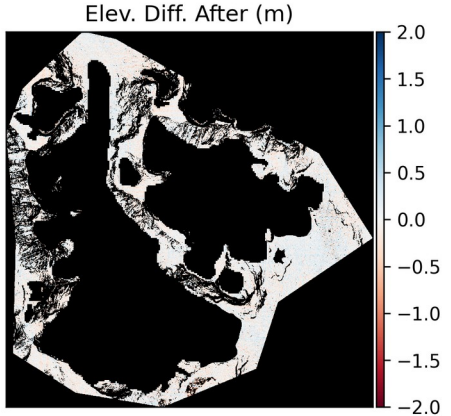


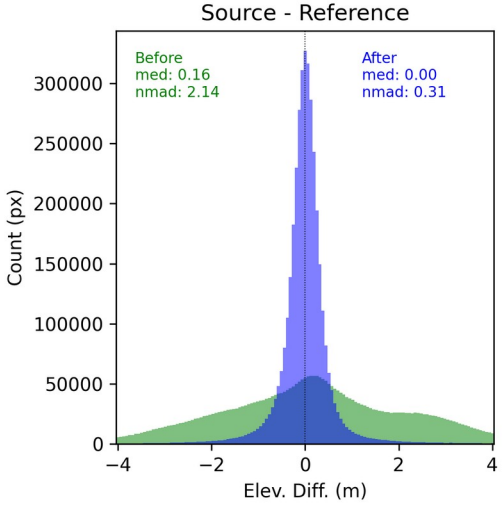








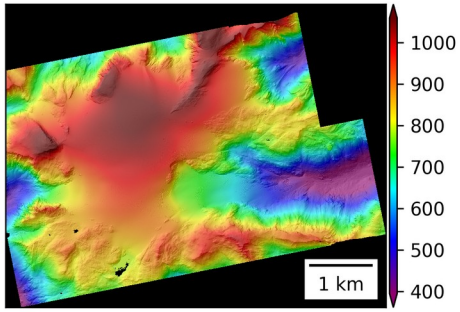




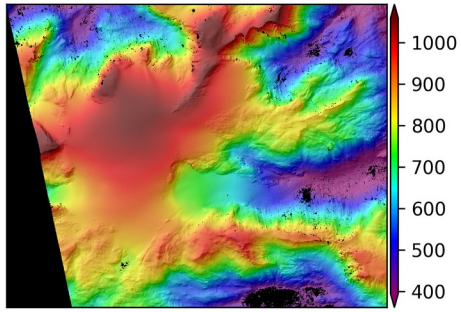
ASP-MGM vs lidar: Norway (Lan)

nor_20180901_103027_103103_mgm_2x2m-DEM_Langfjordjokelen_20180901_1x1m_utm34n_zmae-DEM
x: +1.50m, y: +1.55m, z: +3.85m

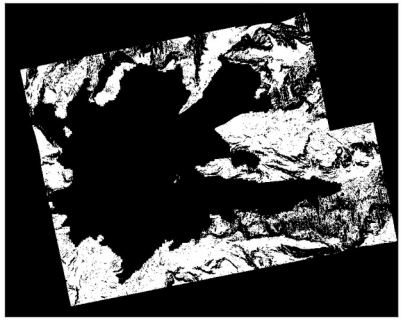
Reference DEM



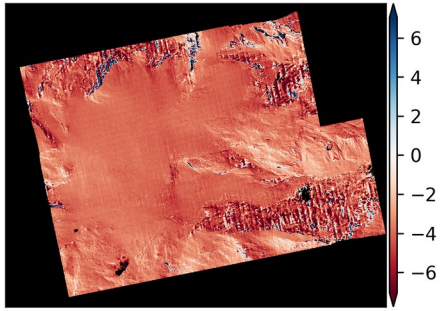
Source DEM



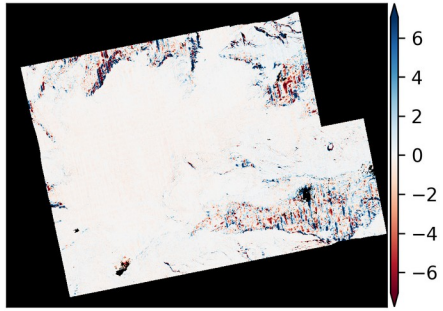
Surfaces for co-registration



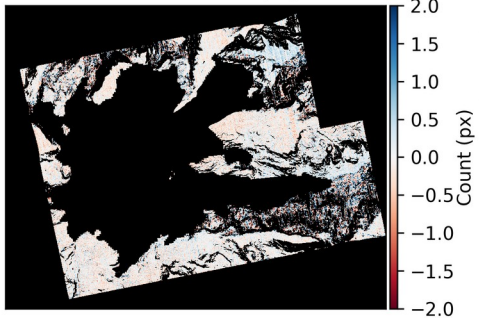
Elev. Diff. Before (m)



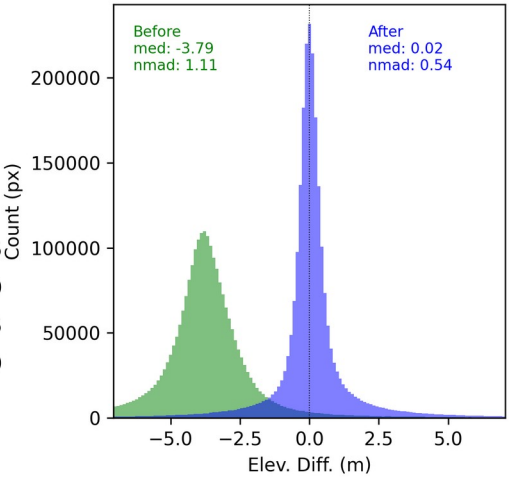
Elev. Diff. After (m)



Elev. Diff. After (m)



Source - Reference



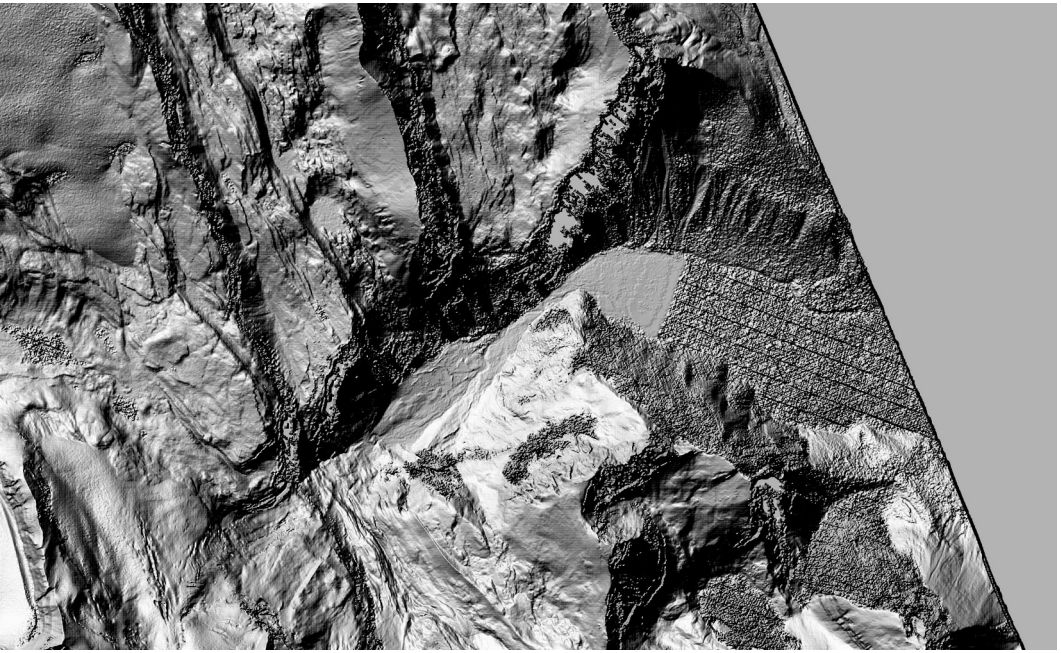
Overview of results

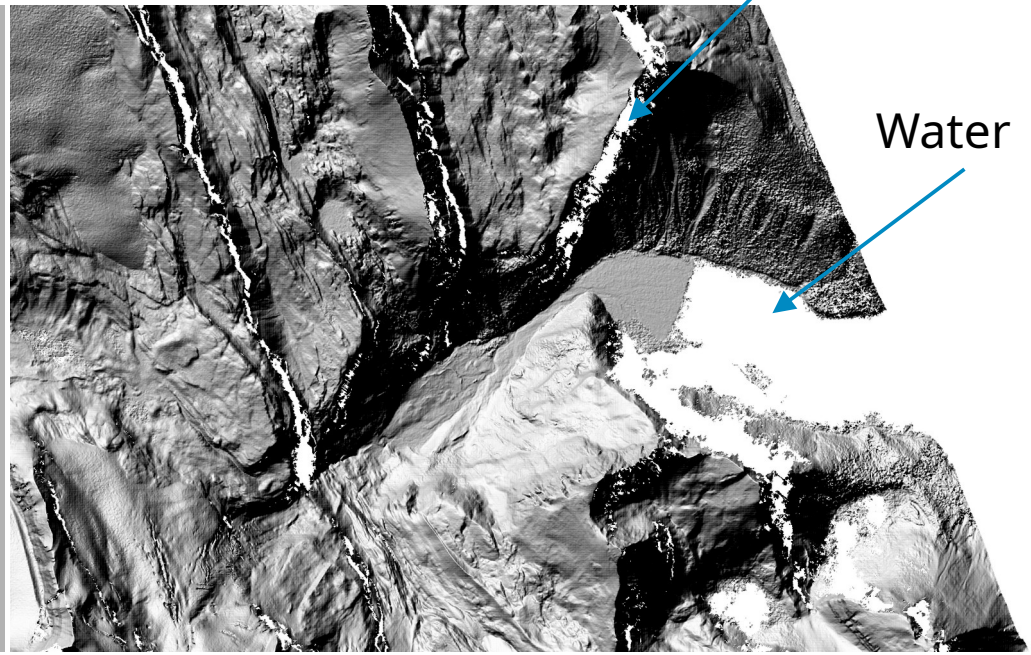
	CARS NMAD (m)	ASP-BM NMAD (m)	ASP-SGM NMAD (m)	ASP-MGM NMAD (m)
Canada	0.59	0.59	0.46	N/A
Norway (Gra)	0.25	0.25	0.22	0.22
Norway (HellM)	0.36	0.47	0.33	0.31
Norway (Lan)	0.72	0.67	0.54	0.54

Other remarks: Hillshades

CARS

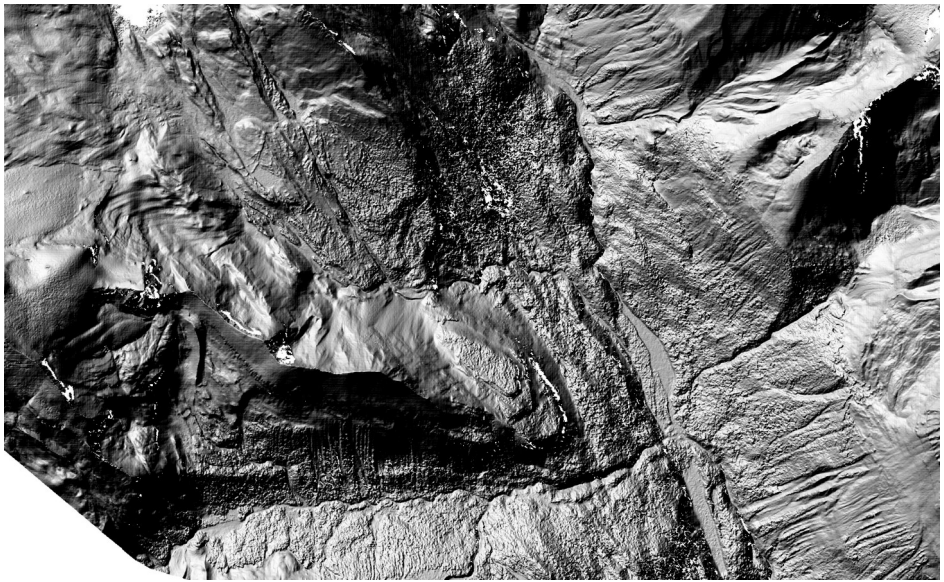
ASP-SGM



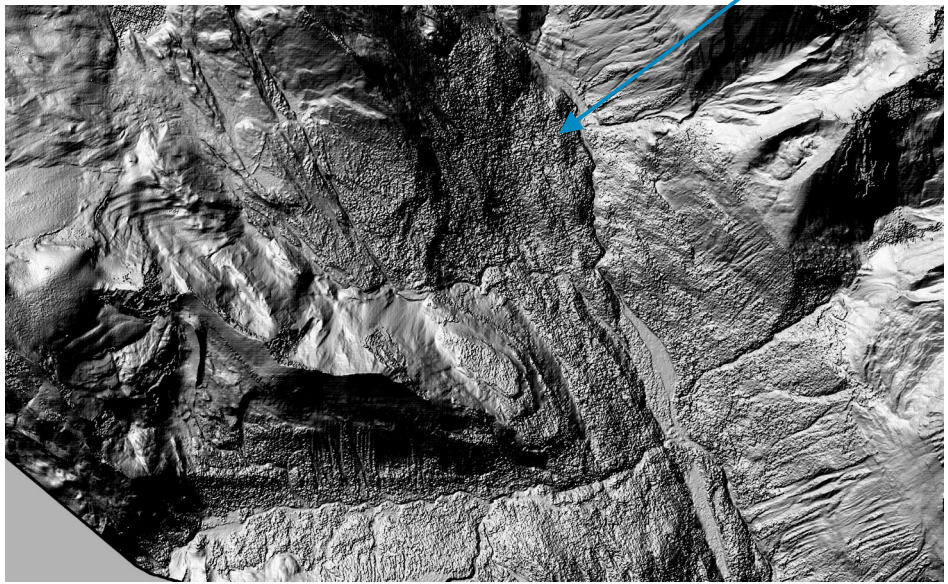


Challenging areas: Steep areas, shadows, water, trees
ASP leaves them as gaps or with smooth interpolation
CARS produces noisy results in the DEM

CARS



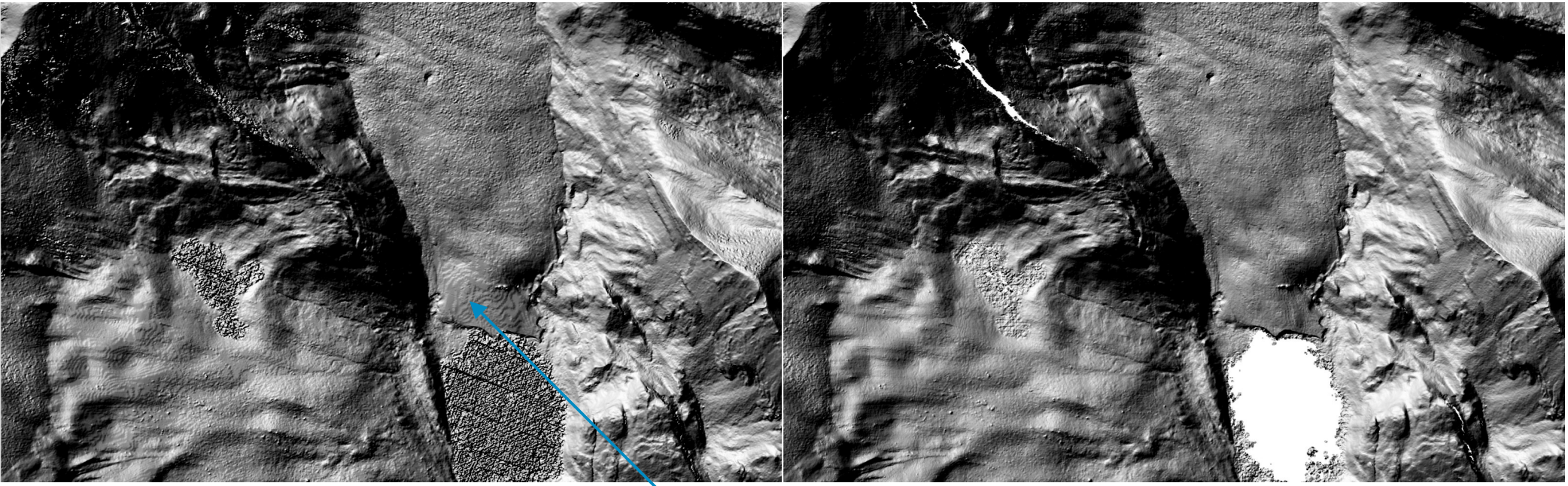
ASP-SGM



Similar visual results in forest

CARS

ASP-SGM



Contour-style elevations

Slight differences in glaciers

“Contour-style” elevations in CARS

Interpolation in water and shadows