LiDAR and use of drones

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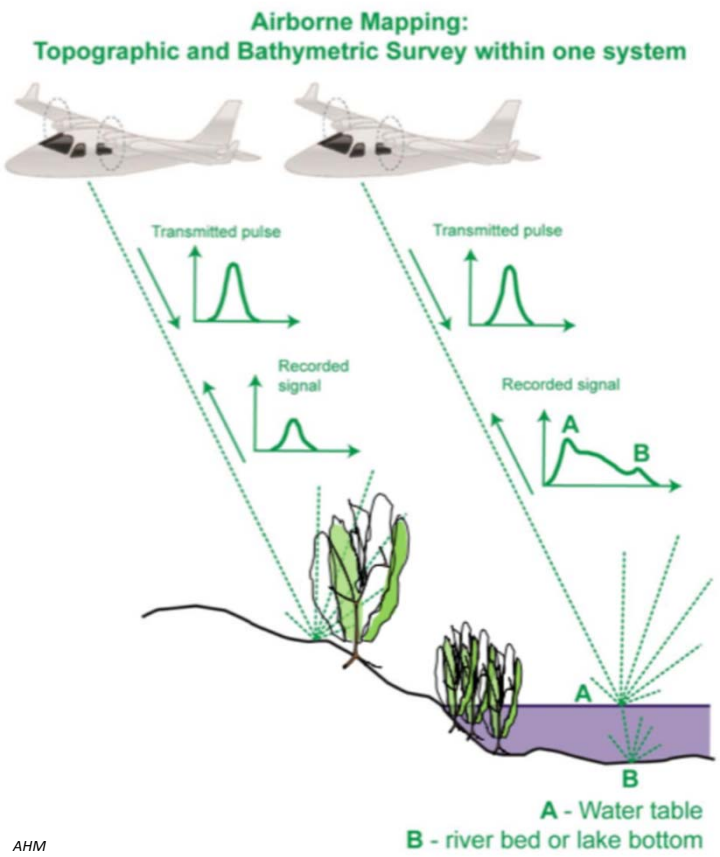
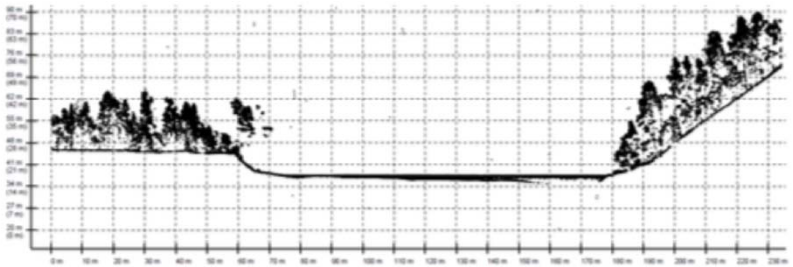
LiDAR and Drone mapping

- Green LiDAR
  - Efficient mapping of underwater geometry
  - High detail and promising accuracy
  - Must be acquired from someone with a LiDAR/Plane
- Drones and Structure from motion
  - Efficient for smaller geometries
  - Can be done by
- Using both lidar and drones:
  - Map of ground level and river bathymetry from LiDAR
  - Drone based mapping of features ”on top” of geometry
  - Combining the two data sources
- An example from mapping river ice formation

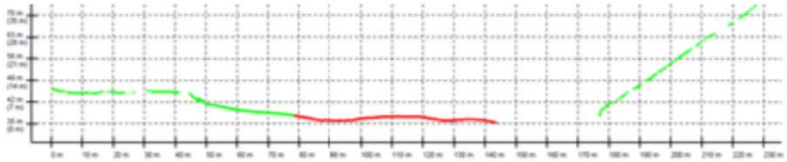
Green LiDAR



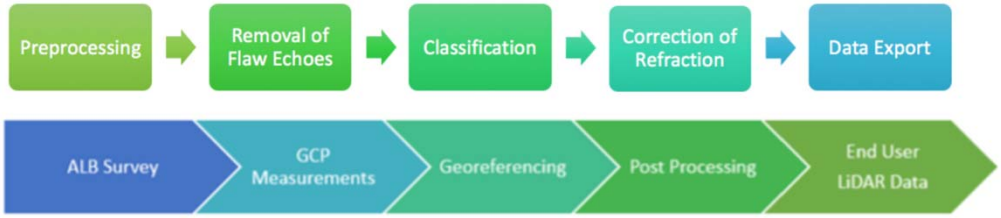
AHM



(a) Unclassified cross section



(b) Classified cross sections with river bed (red) and banks (green)



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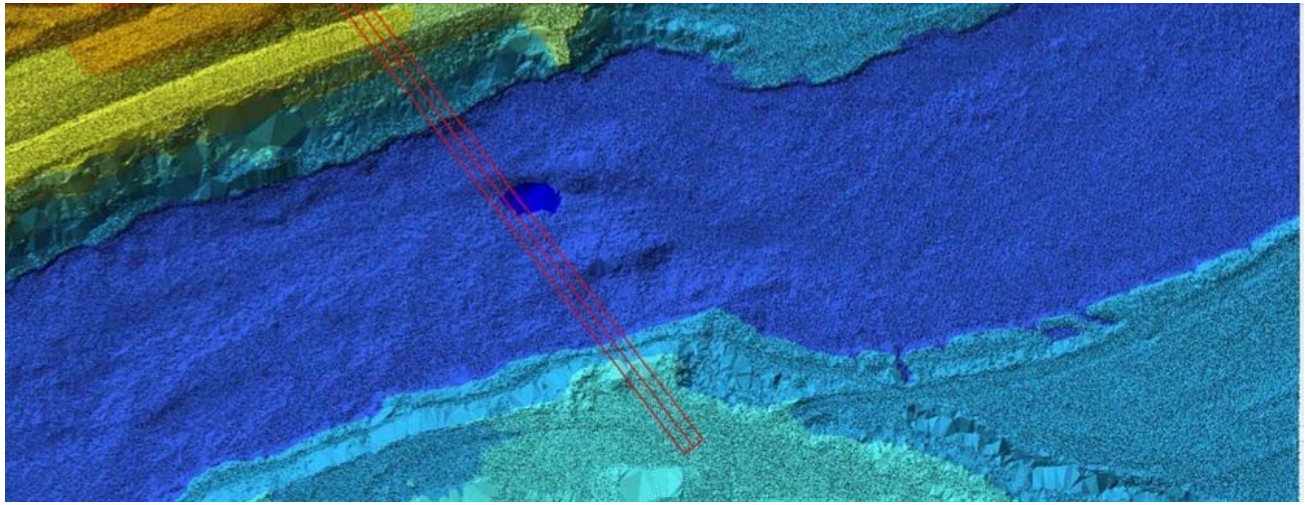

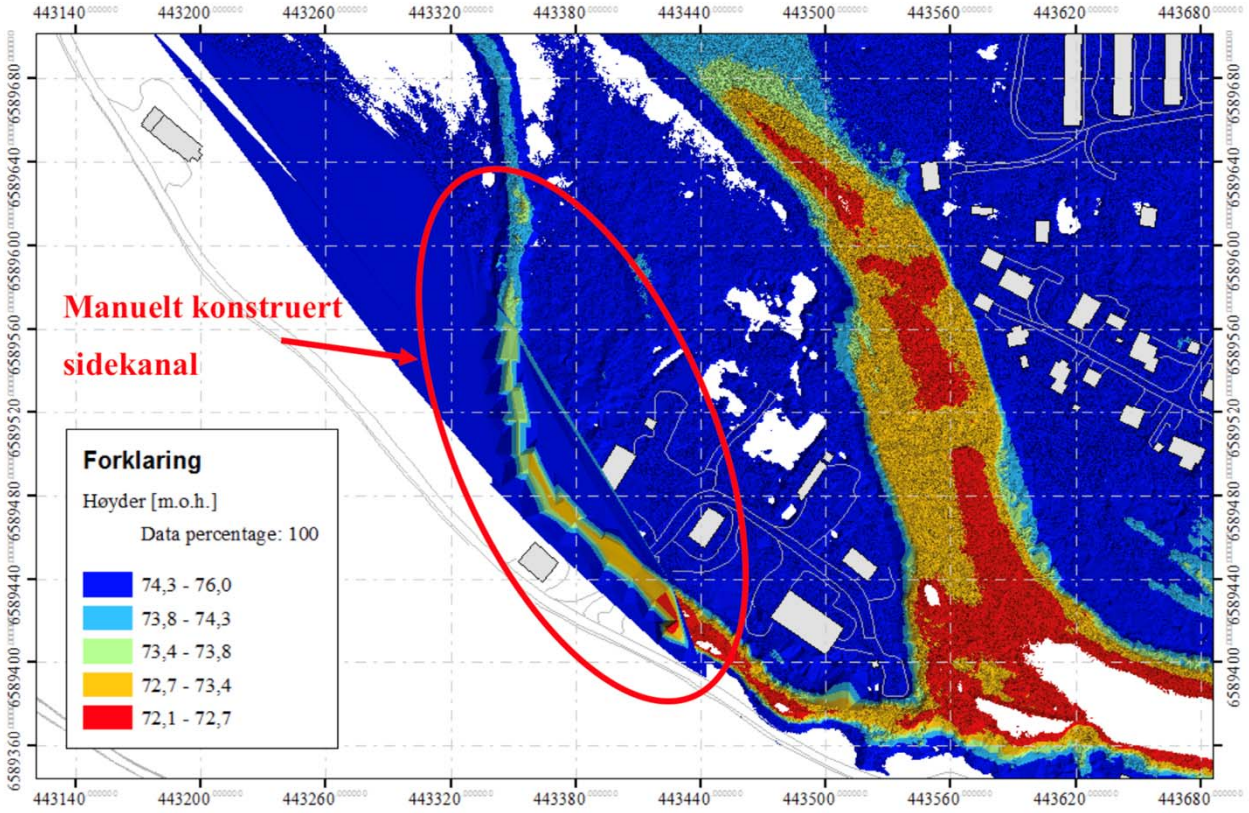
443140
443200
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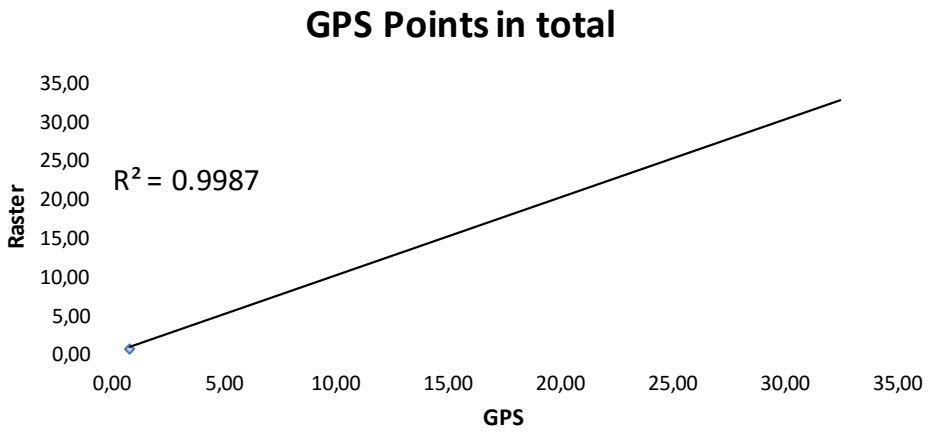
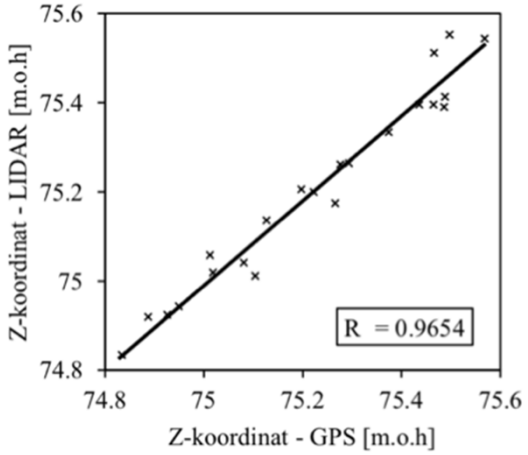
443620
443680
6589680
6589640
6589600
6589560
6589520
6589480
6589440
6589400
6589360
Manuelt konstruert
sidekanal
Forklaring
Høyder [m.o.h.]
Data percentage: 100
74,3 - 76,0
73,8 - 74,3
73,4 - 73,8
72,7 - 73,4
72,1 - 72,7

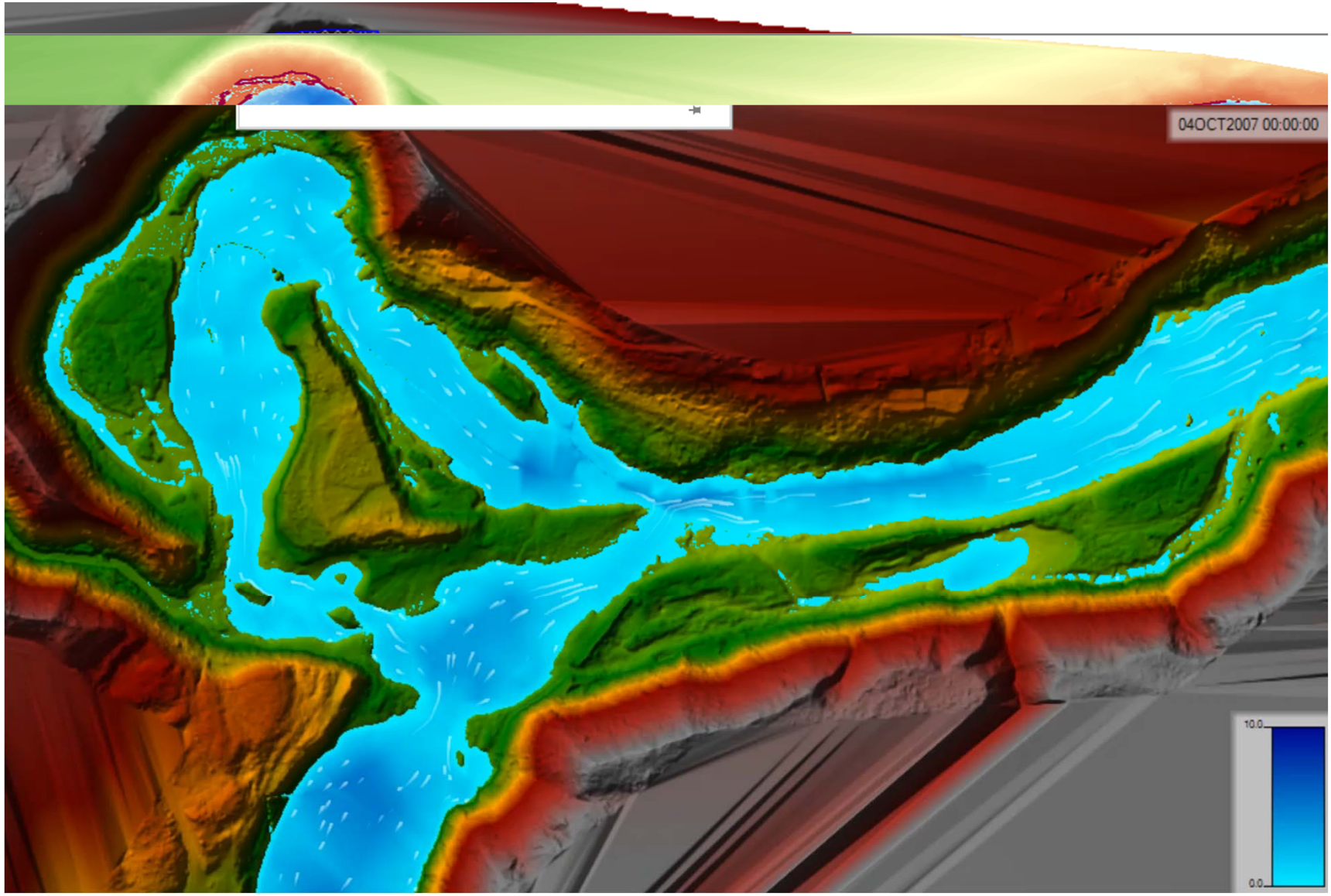
Skeie, 2017

Filling in and checking accuracy





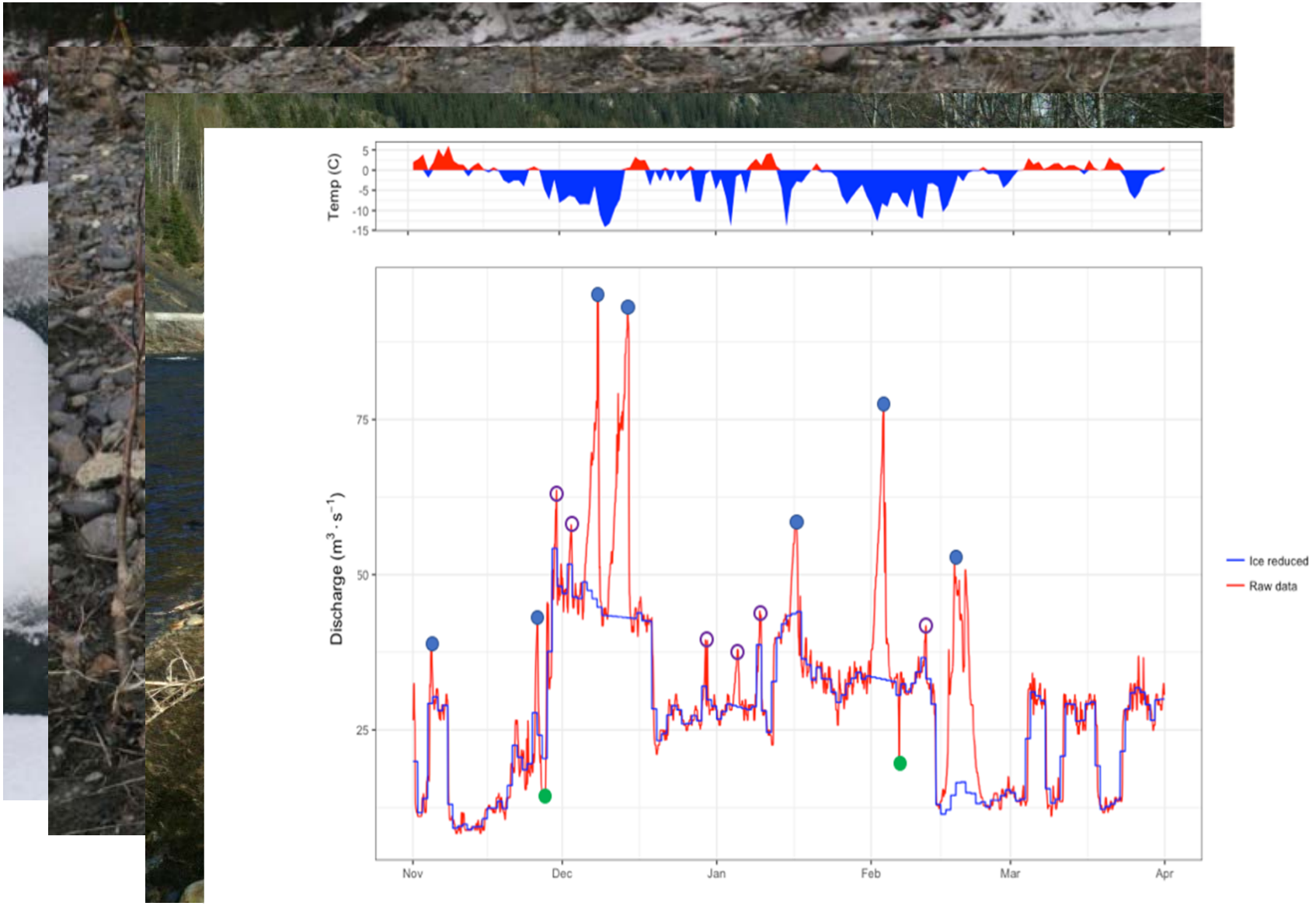
Modelling



Rozier, 2017

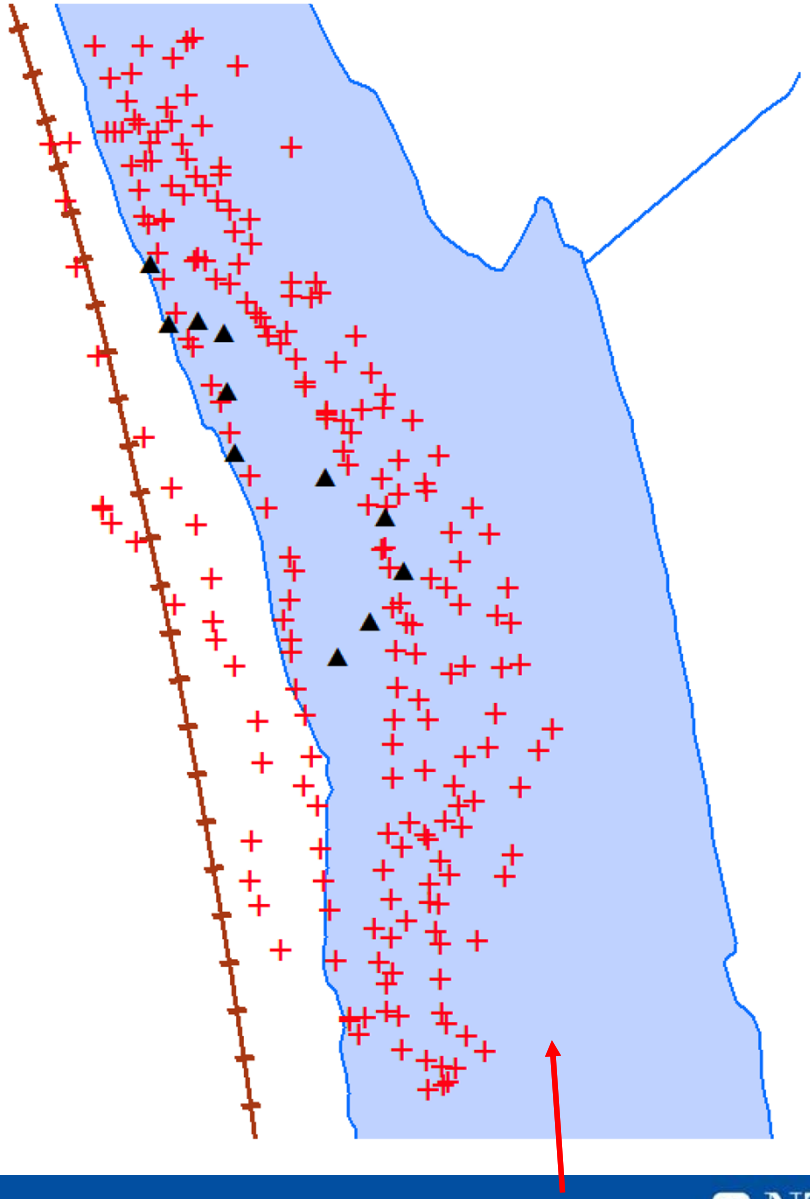
Skeie, 2017

Ice as a driver for Hy-Mo processes



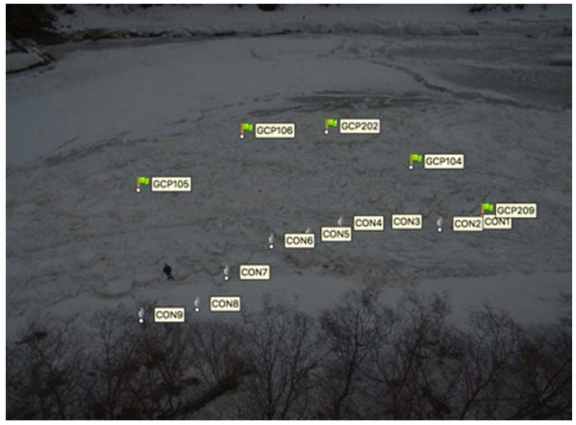
Measuring ice can be a challenge

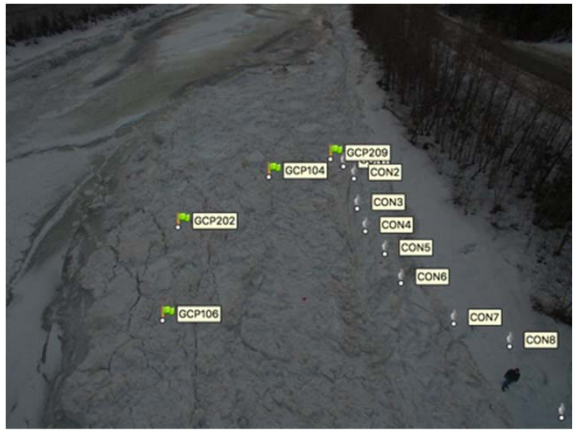
Mapping ice using a drone and SfM



Structure from motion

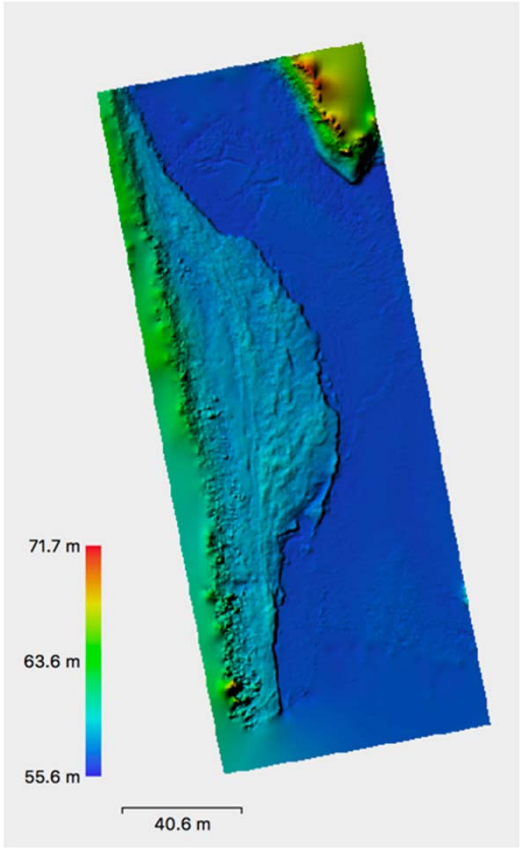
Images with ground control



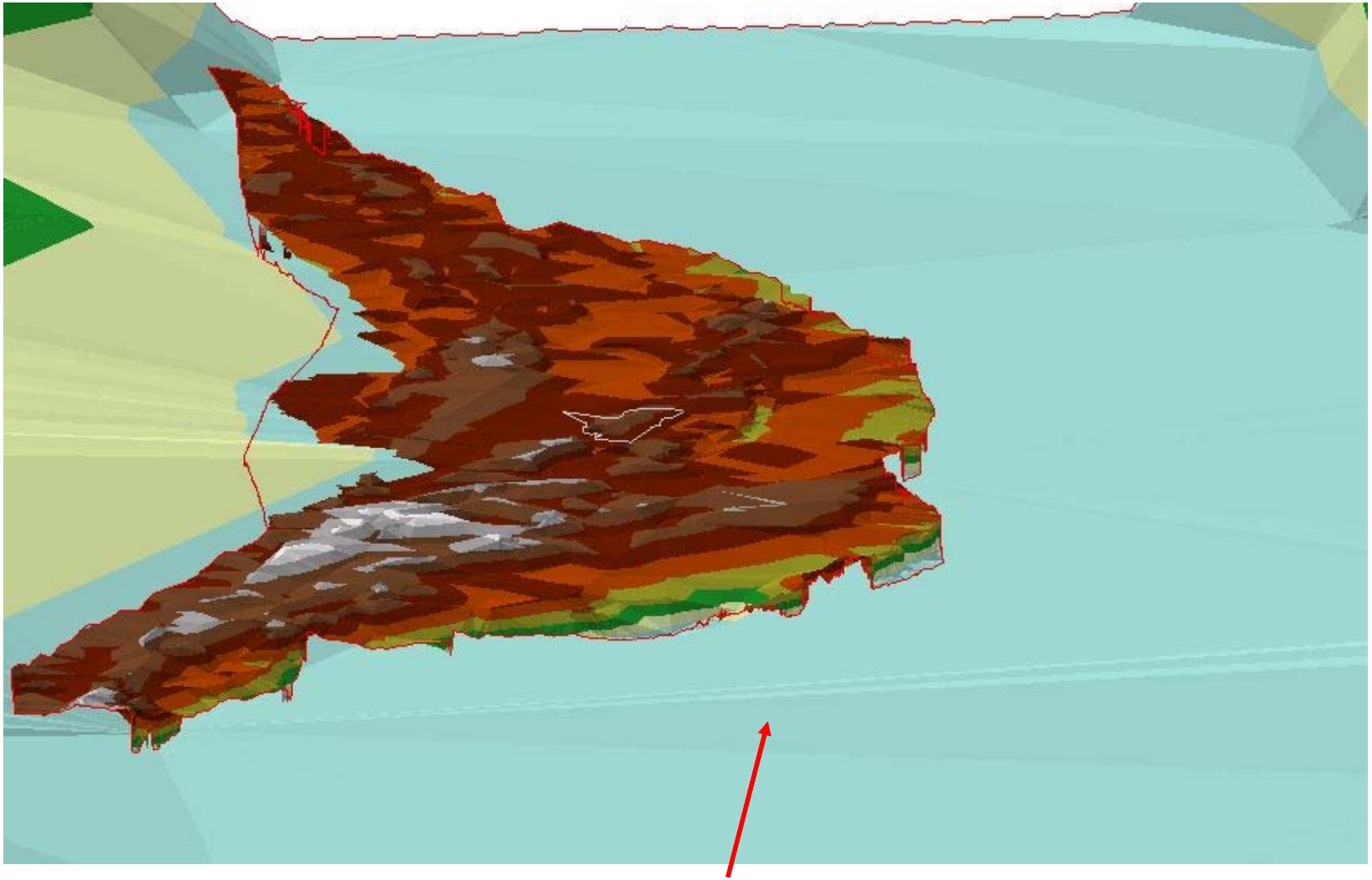


Dense point cloud

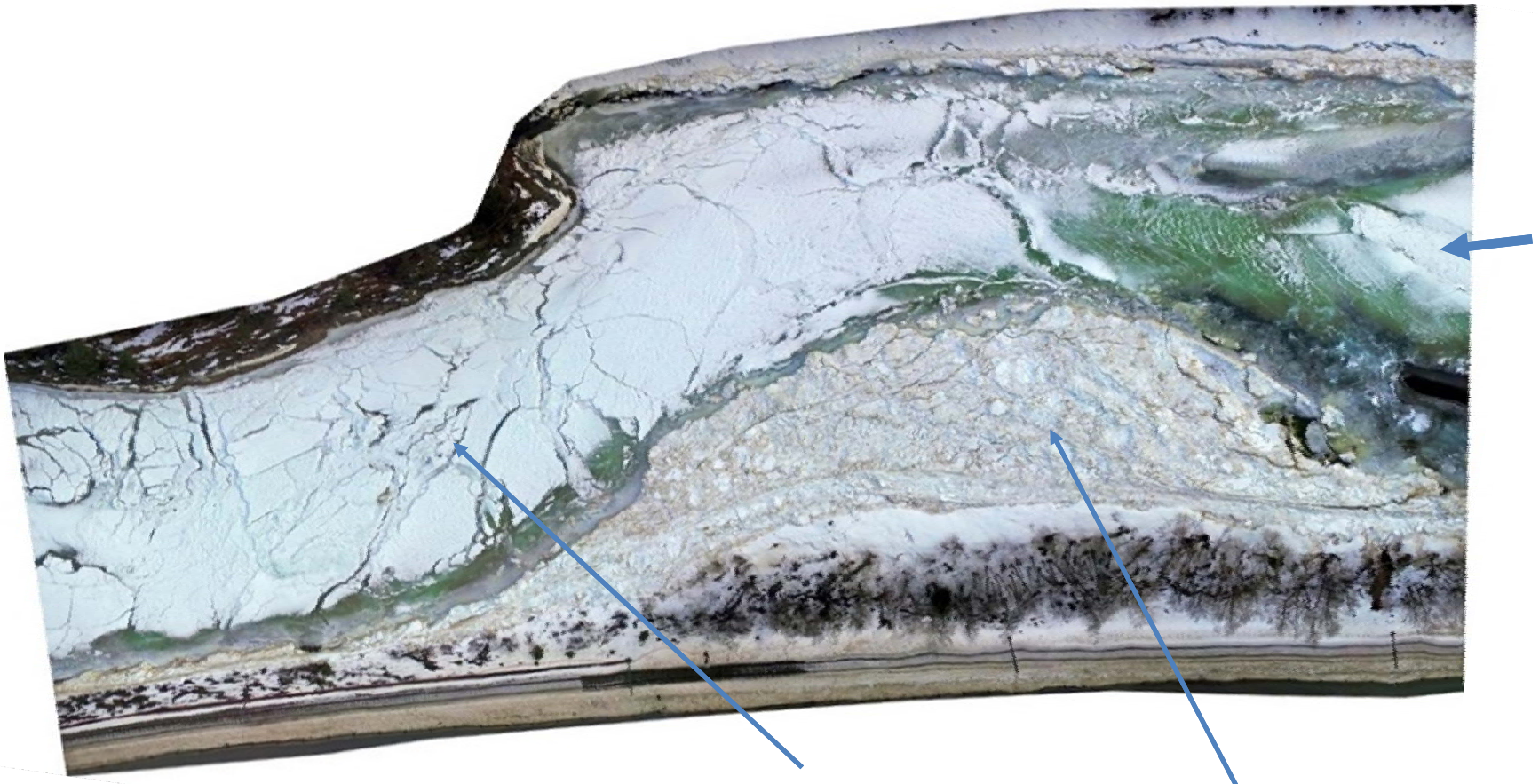
Digital Elevation Model



Georeferenced ice DEM

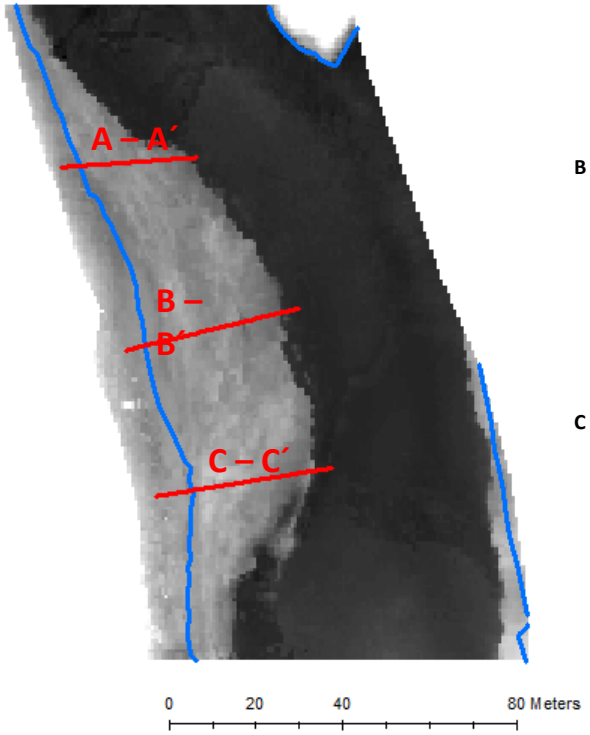


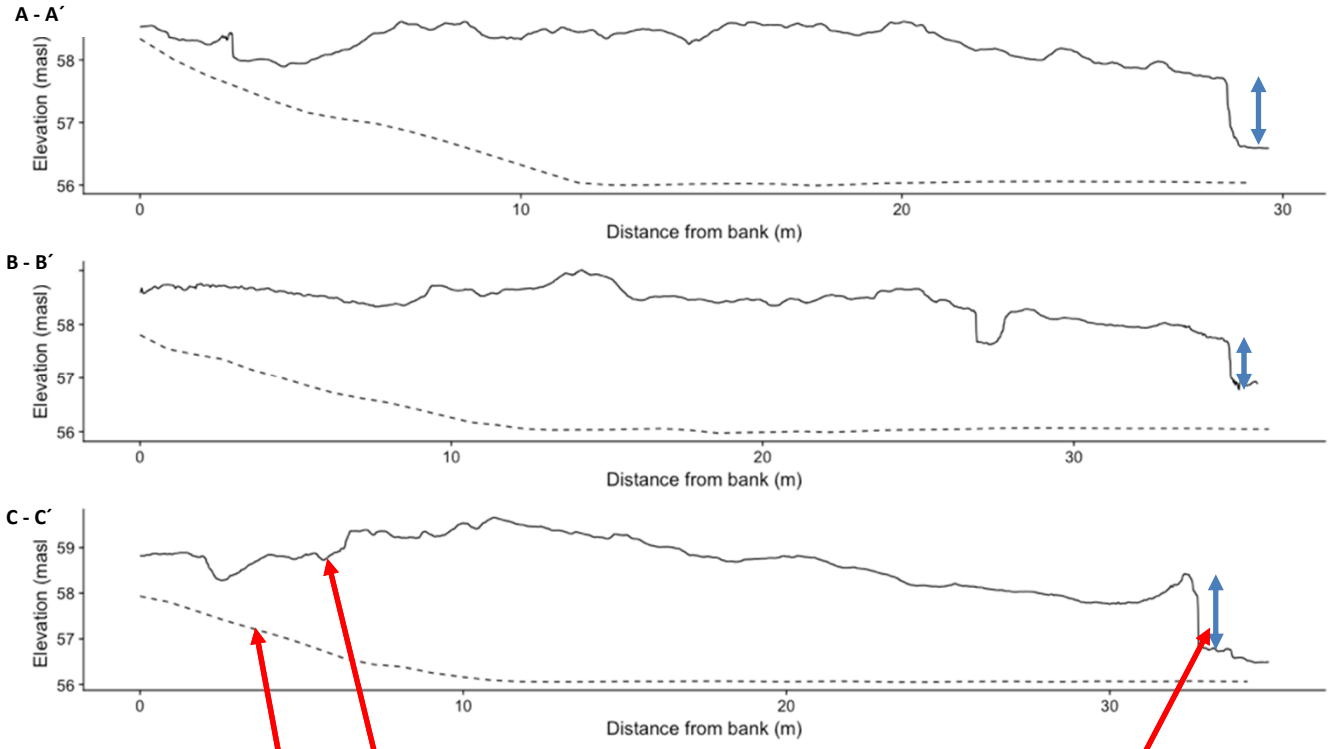
Orthomosaic of Gaula ice jam



Mean error from processing: 7.1 cm, mean error from control: 10.2 cm

Estimating ice jam size





Ice jam (from ice DEM)

Bathymetry (1m DEM)

Shear wall height

Jam volume: 6786 m^3, mean thickness: 2.19 m, max thickness: 3.56 m

Summary

- Green LiDAR provides a efficient way of capturing large and detailed data sets for river bathymetry:
  - Dependent on water clarity, discharge, turbulence
  - Filling in data must be expected
  - Control of data is promising, and so is the model applications done using LiDAR bathymetries.
- Drones and SfM is also highly relevant for HyMo collection:
  - E.g. the data for ice would be close to impossible to collect manually, and more cumbersome and expensive with terrestrial scanning
  - Low cost approach
  - Dependent on light, wind and regulations of drone operation