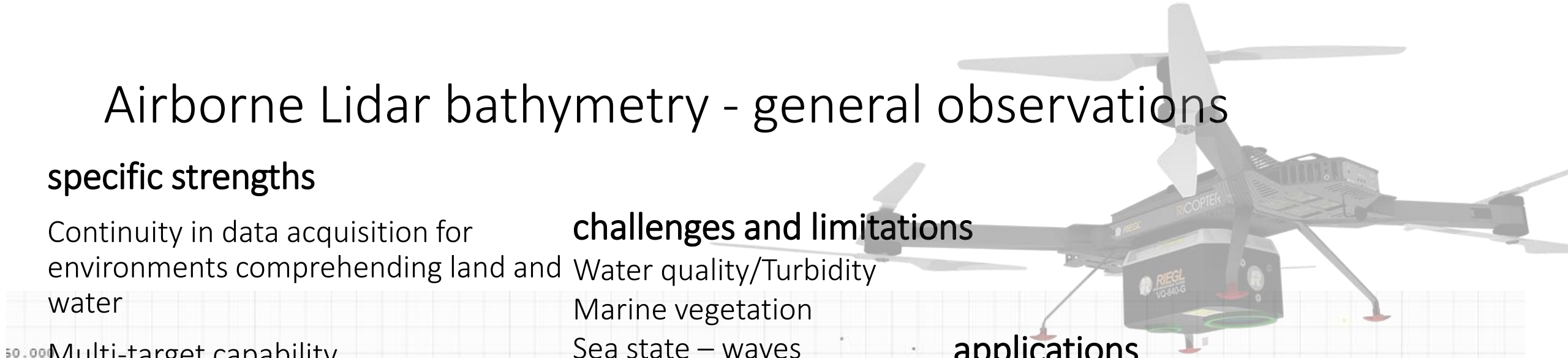
FEEDBACK ON THE USE OF LIDAR BATHY-TOPO IN RIVER ENVIRONMENTS

Ursula RIEGL – RIEGL
Paul-Henri FAURE – CNR

MONACO 2022

Airborne Lidar bathymetry - general observations



specific strengths

Continuity in data acquisition for environments comprehending land and water

Multi-target capability

As remote sensing method, ideally suited for non-navigable shallow water situations

Area coverage efficiency

challenges and limitations

Water quality/Turbidity

Marine vegetation

Sea state – waves

Difficult predictability

applications

Riverine, coastline and shallow water survey

Flood simulation maps, habitat mapping

Submarine archaeology

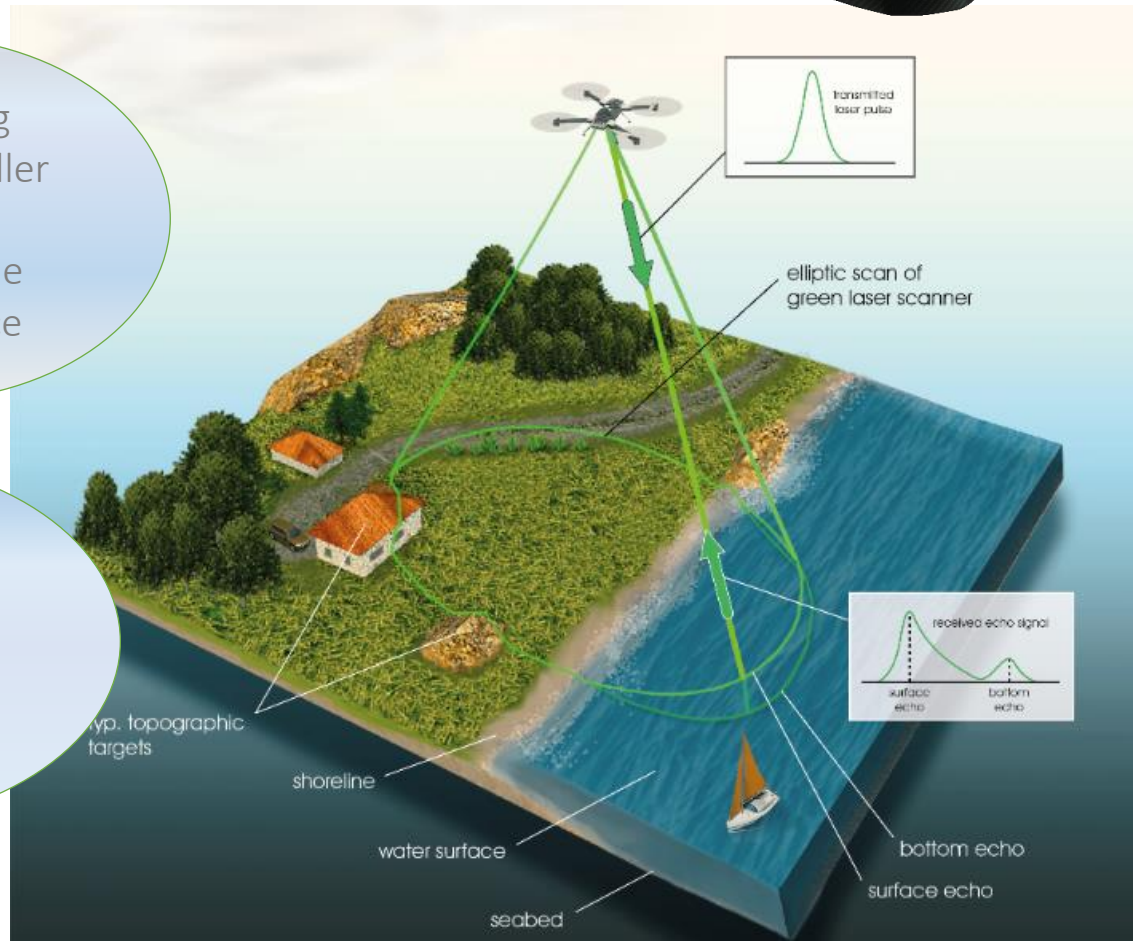
Aggradation zones survey

RIEGL compact ALB systems: VQ-840-G/VQ-840-GL

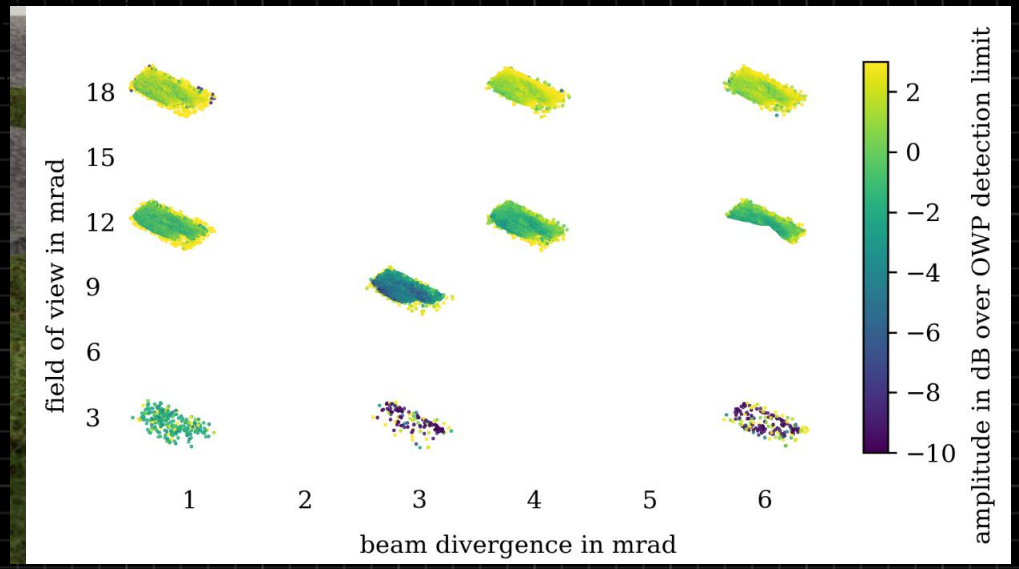
- green laser scanner
  - nearly-elliptic scan pattern, ±20° FOV (across track)
  - 2 Secchi depths water penetration
  - 50 kHz – 200 kHz laser PRR
  - online waveform processing AND full waveform recording
  - selectable laser beam divergence AND receiver FOV
- fully integrated system
  - INS (APX20)
  - 12 Mpix camera
- compact and flexible
- weight: 12 kg/9.8 kg total
  - dimensions: 360 x 285 x 200 mm³
  - interfaces for external IMU, camera, laser scanner
  - interface to *RIEGL* data recorder DR1560i OR CFAST storage card slot (up to 512 GBytes)

lower flying altitude, smaller aircraft, closer to the watersurface

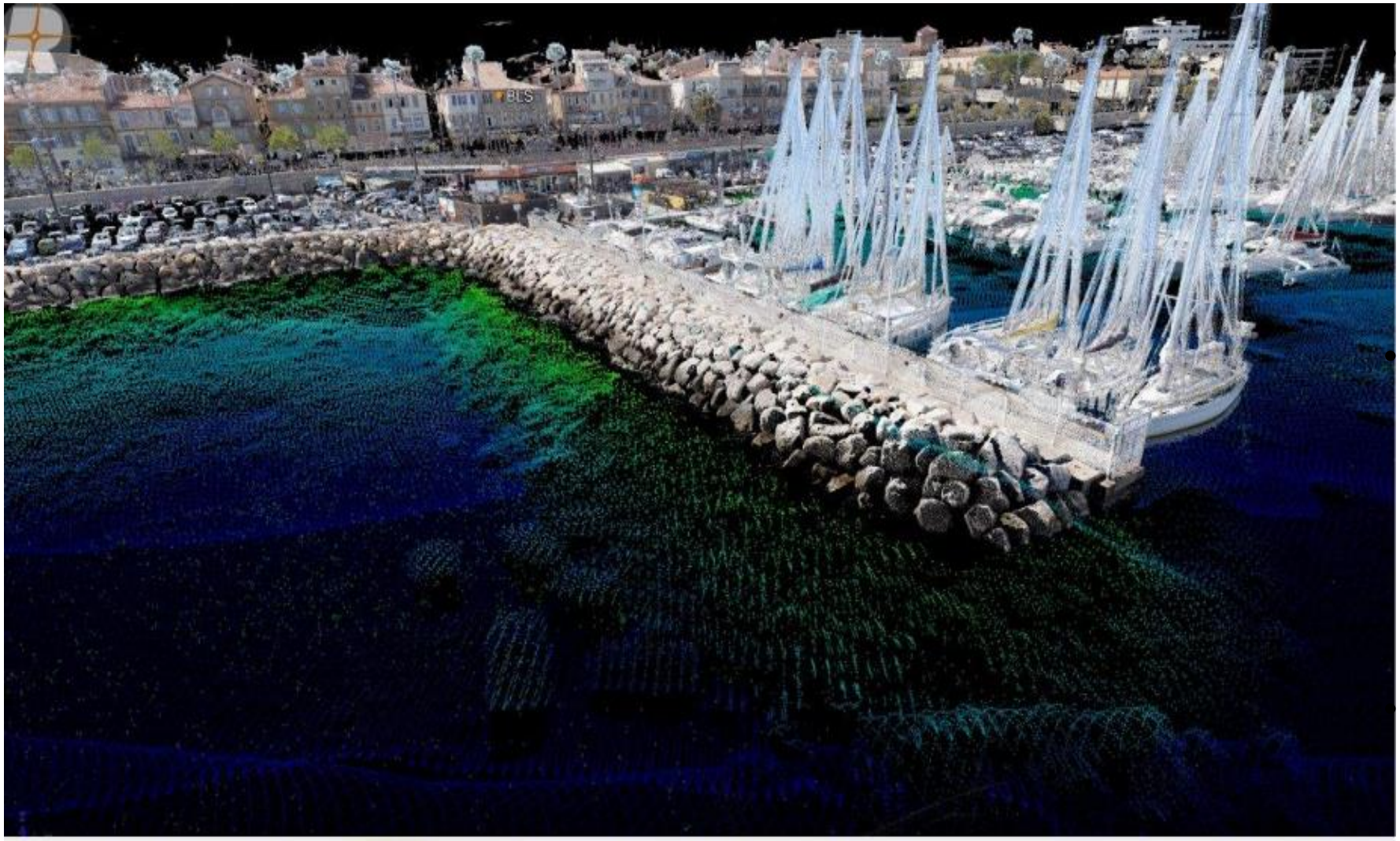
High resolution, operational versatility, excellent depth penetration



Unique features of VQ-840-G and VQ-840-GL: selectable receiver FOV and Beam Divergence



Special characteristics of low altitude - high resolution ALB



mission-tailored data acquisition
Perspective on vertical features, aquatic vegetation and deadwood, submerged objects, and infrastructure

- invites for new applications in submarine or coastal infrastructure, close-up surveys of dynamic coastal or riverine areas, hydrographic applications in waterresources management,

- potential in data fusion and complementary data acquisition

Why CNR is interested in Lidar Bathy ?

Facilitate measurements on complicated access areas : old Rhône, small streams, small branches of Rhône

CNR : concession-holder and developer of the Rhône River since 1933.

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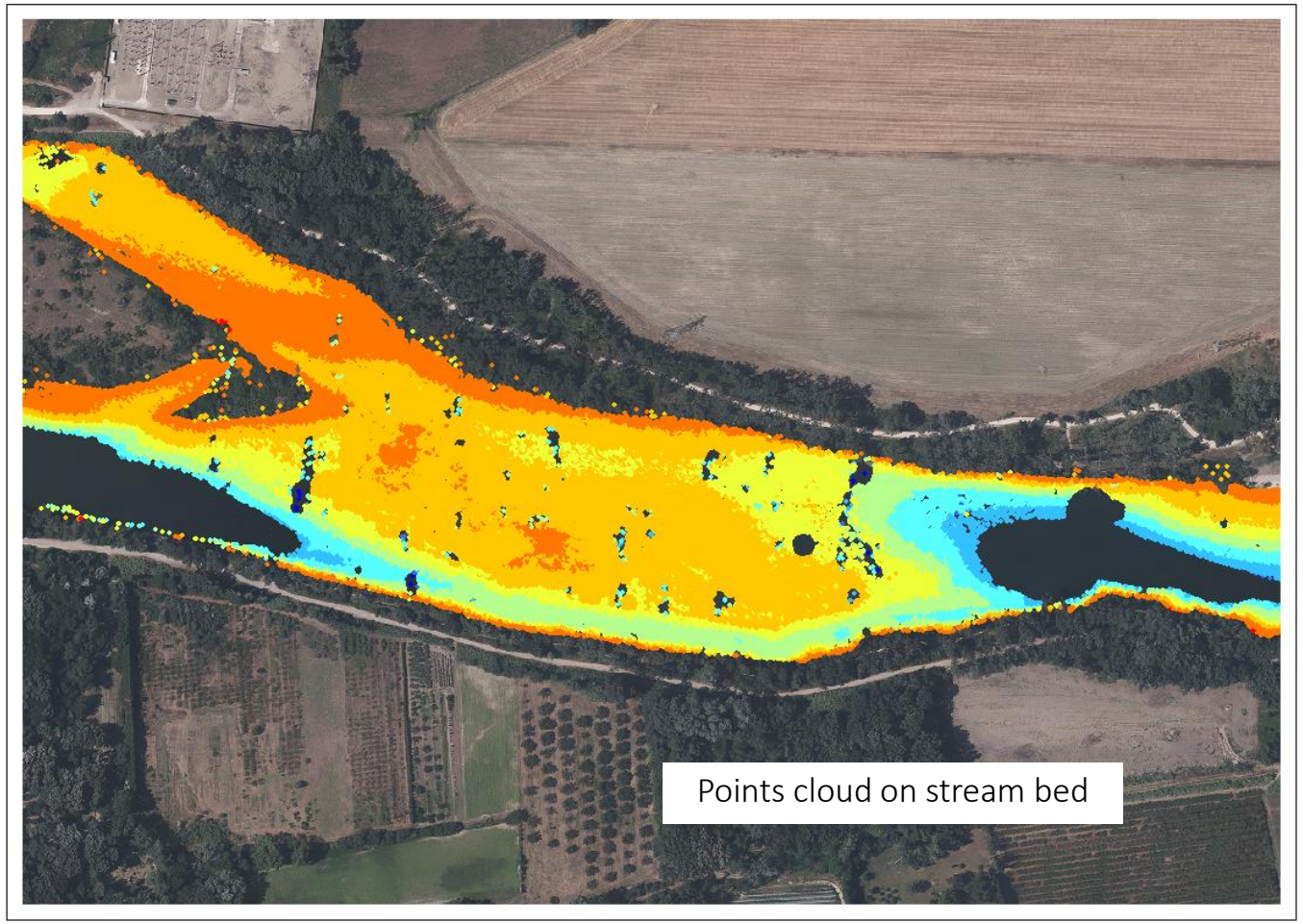
obtain a points cloud / DTM instead of cross profiles on small bottoms



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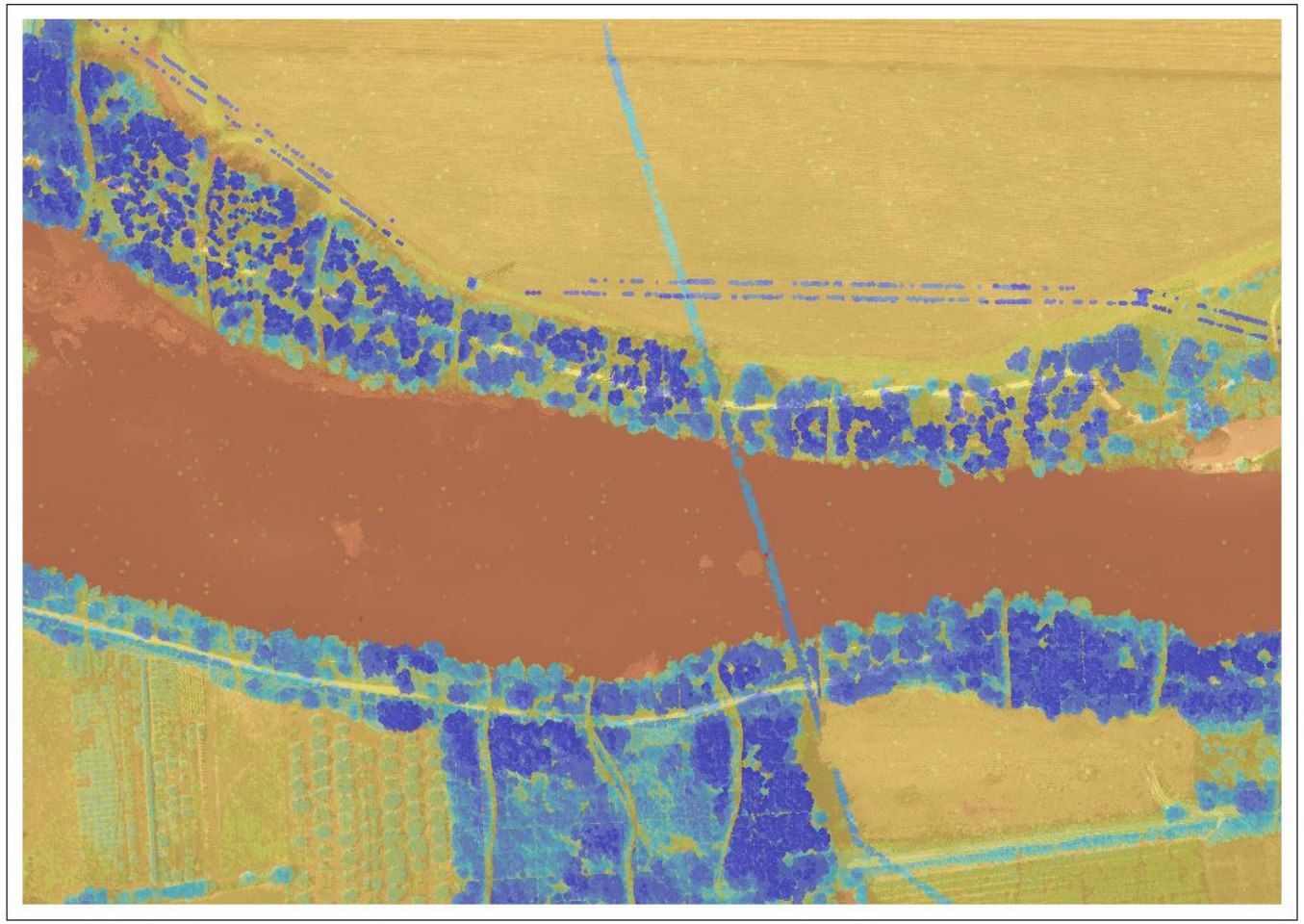
Obtain stream bottom AND terrestrial ground



Stream bottom and terrestrial ground
Avignon 2021

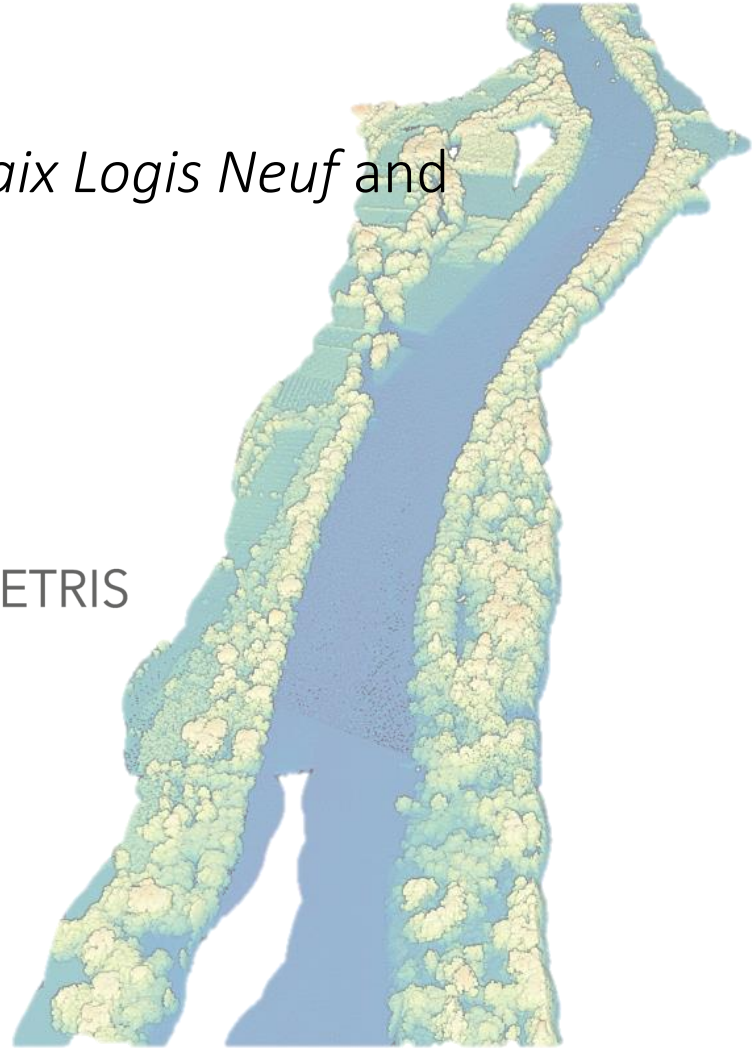
2022 test acquisitions

2022 : helicopter on 2 zones *Baix Logis Neuf* and *Chautagne*

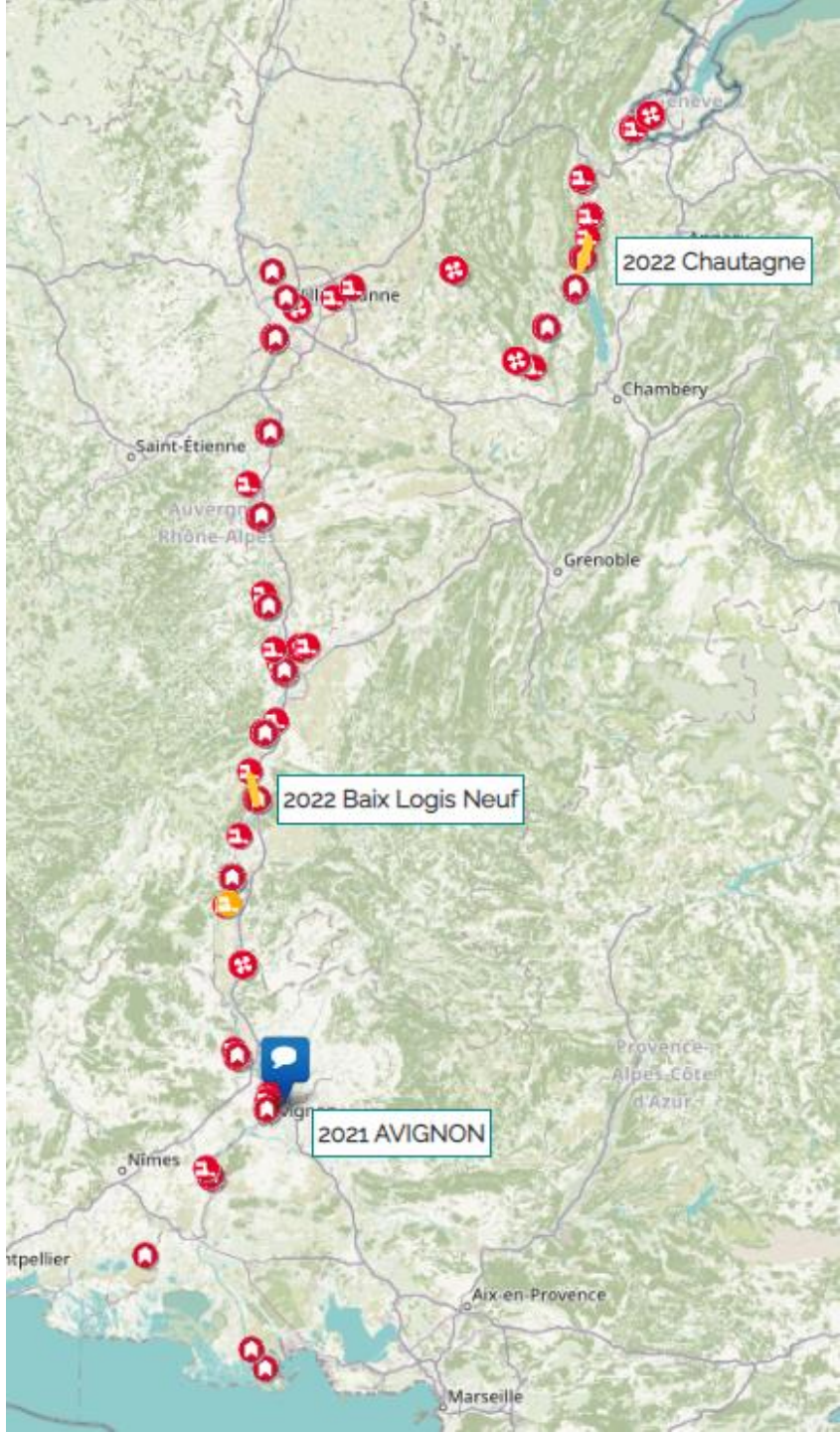
height of flight : 150 m

Needs : monitoring of gravel banks

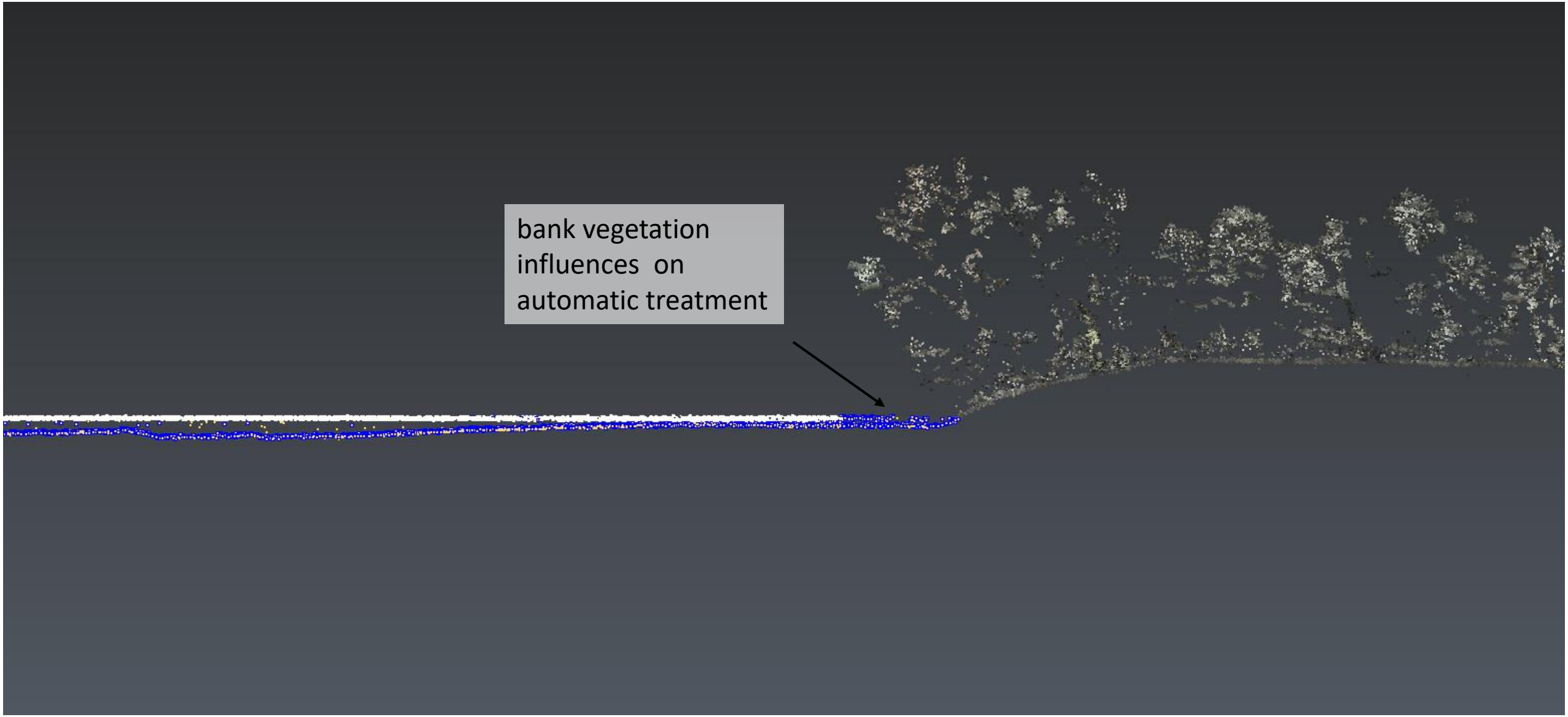
acquisition and processing : ALTAMETRIS



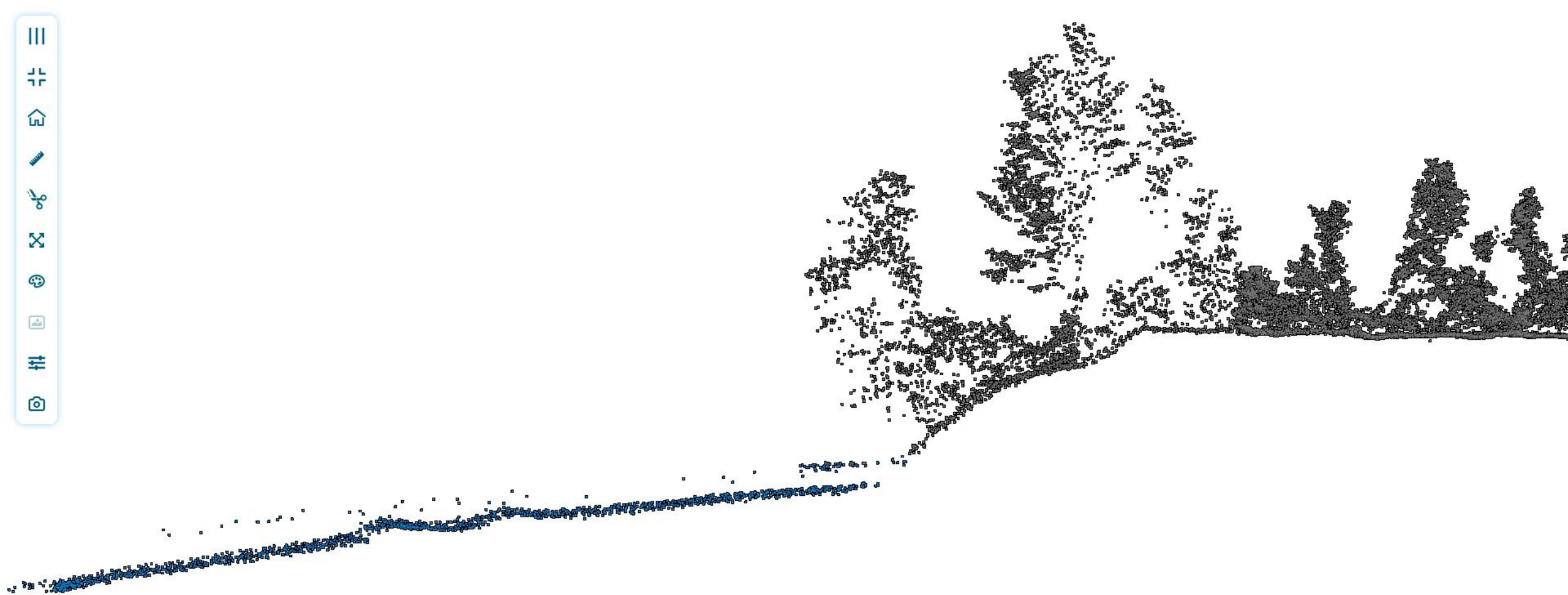
2022 Baix Logis Neuf



Case of banks vegetation



Données Baix Logis Neuf 2022



Data analysis

(Baix Logis Neuf 2022)

Data analysis

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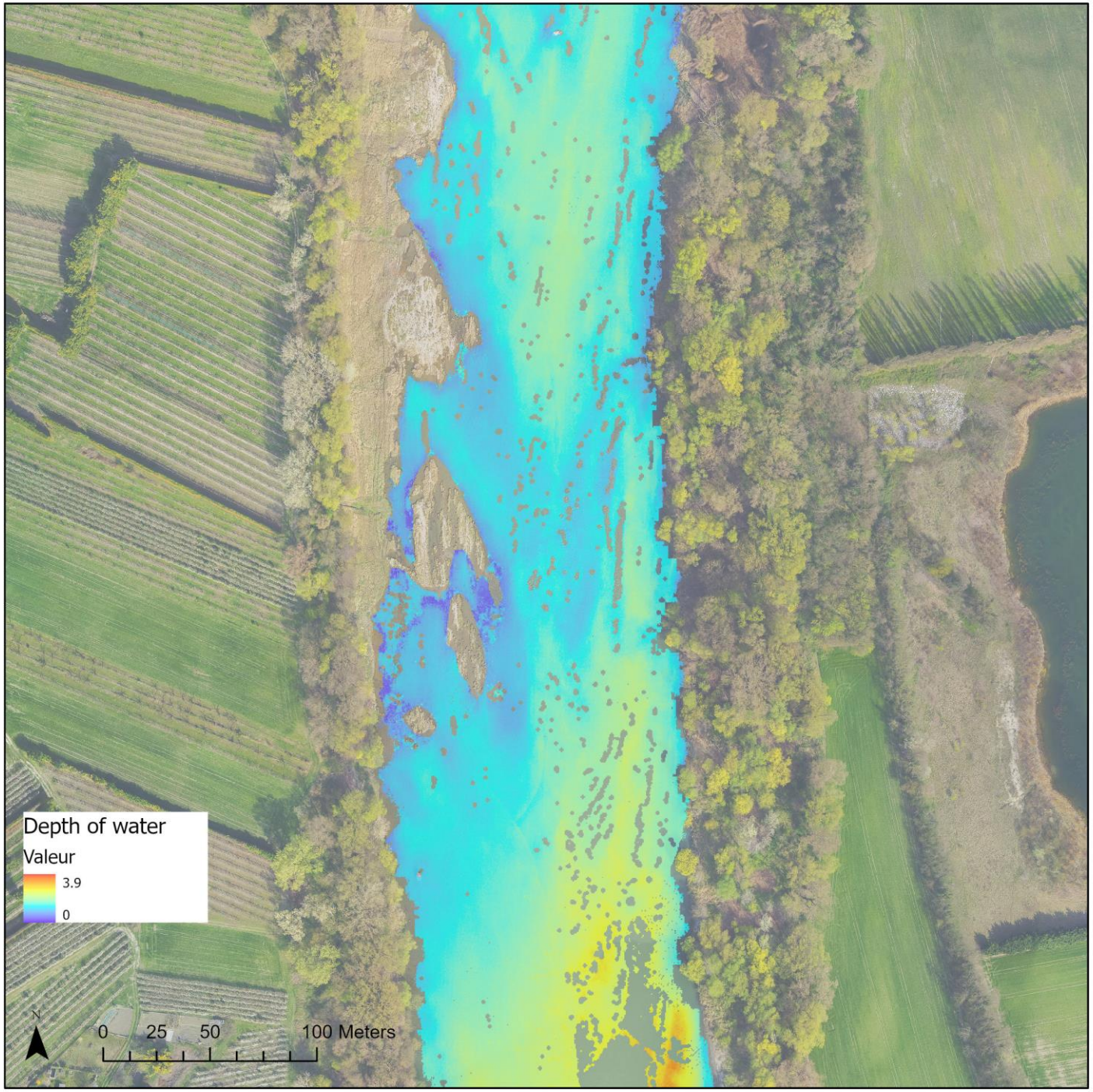
Depths

Maximum 3.5 m

complies with the specifications



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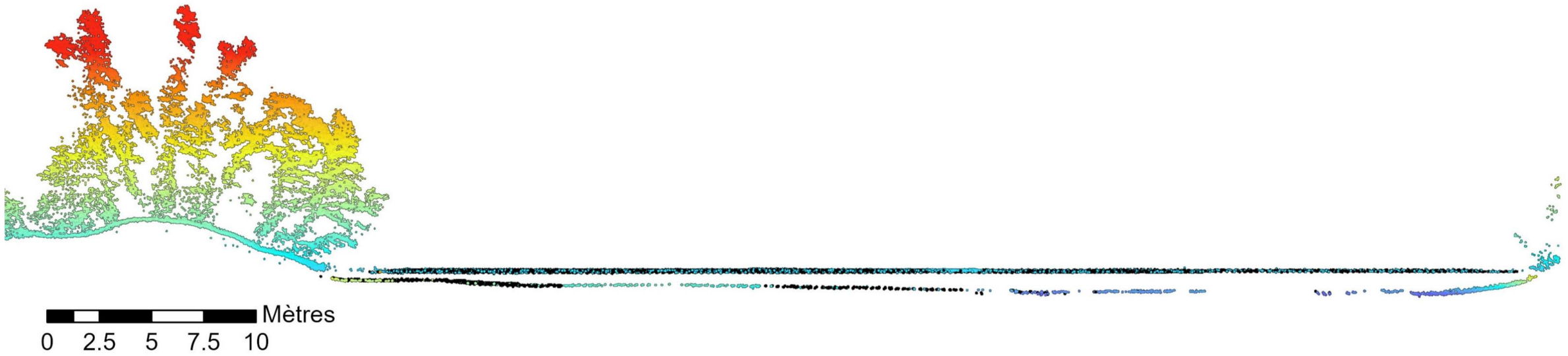

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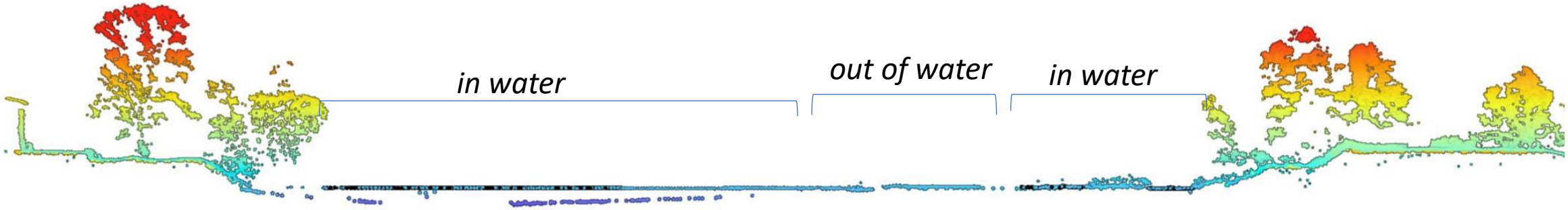
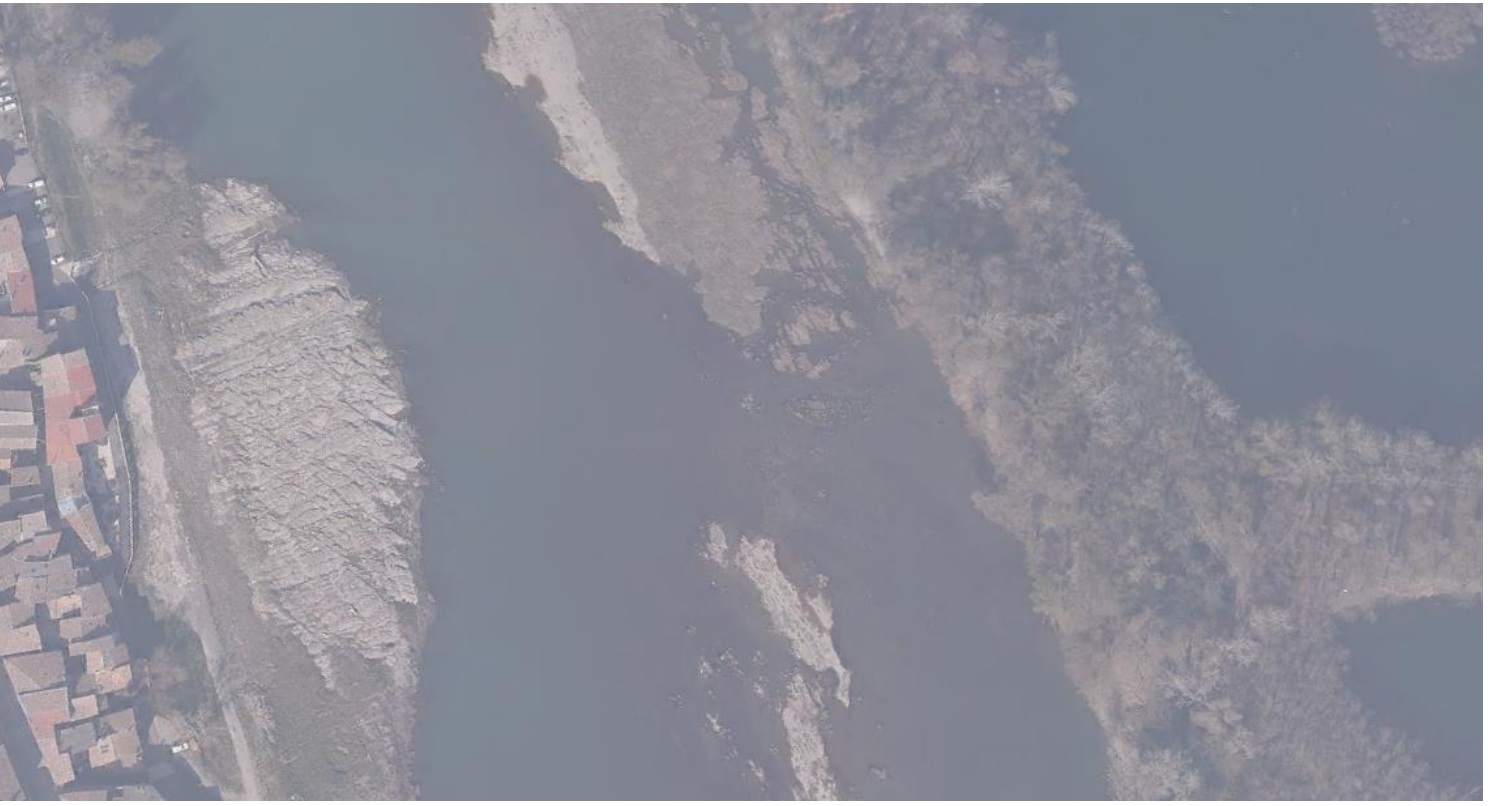




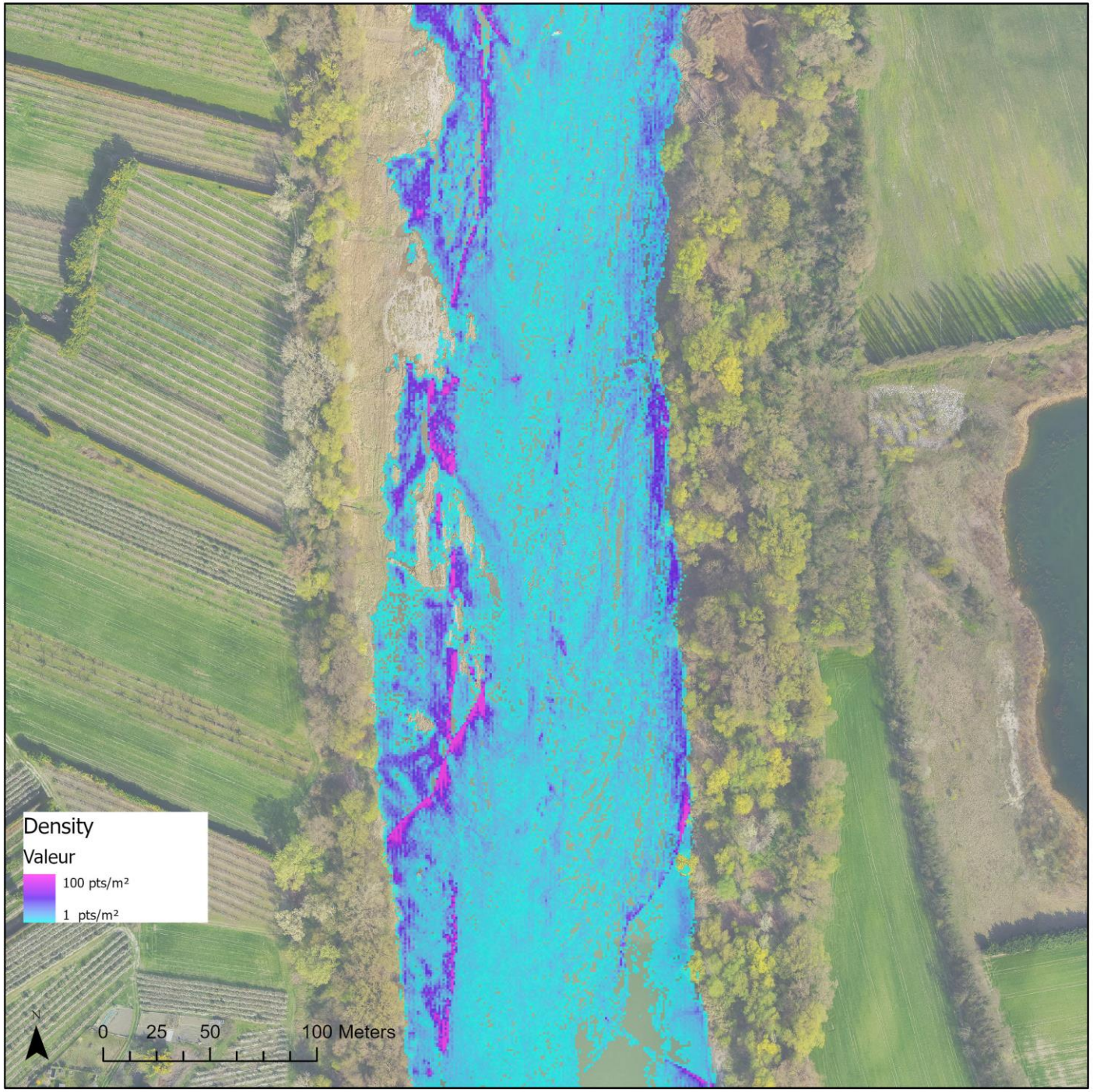
continuity of the data of the zones in water to the zones out of water

Data analysis

(Baix Logis Neuf 2022)

Cloud density « bottom »

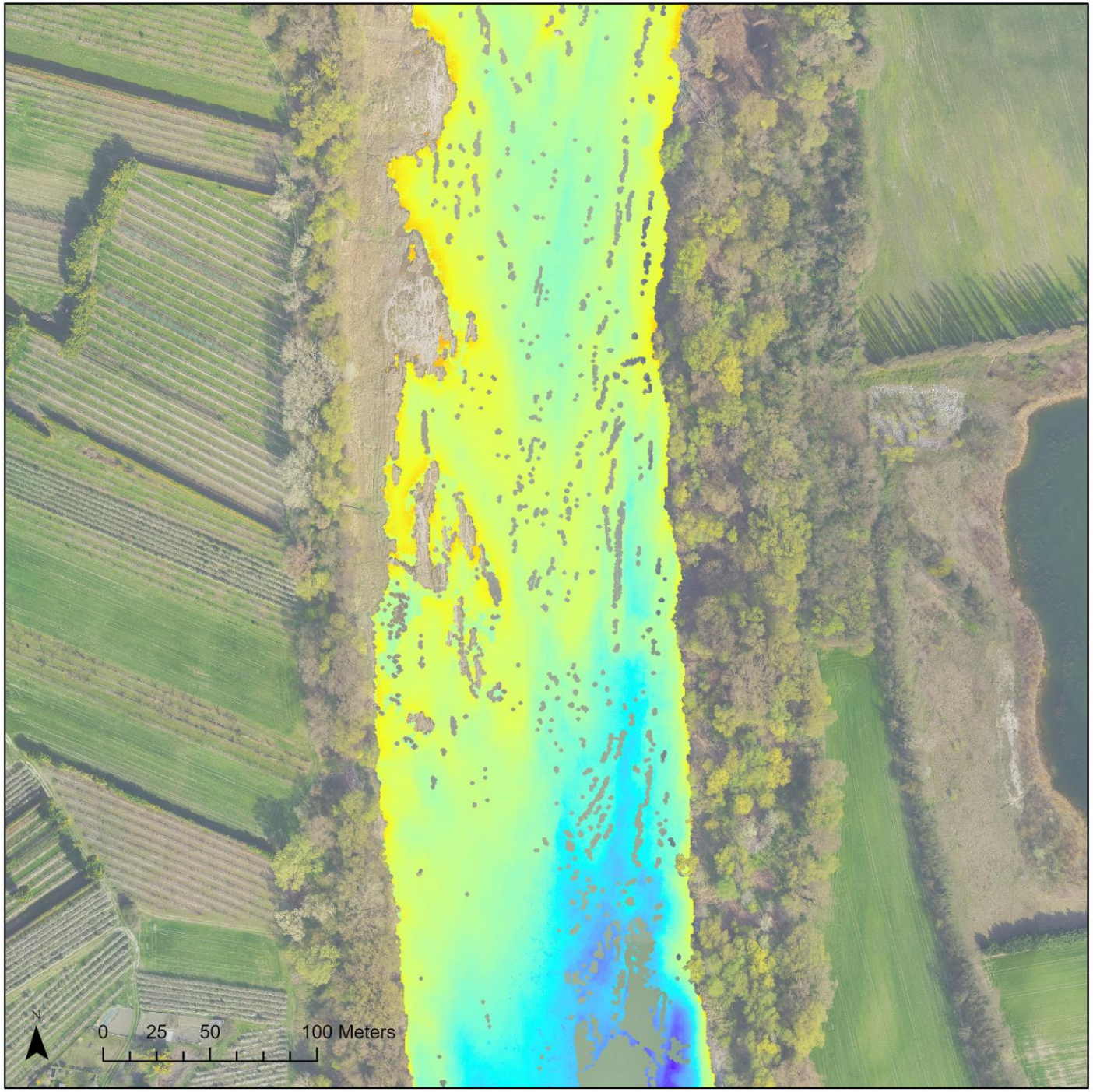
Good density (more than enough for the needs)
Density decreasing with depth



Data analysis

(Baix Logis Neuf 2022)

Lidar (only bottom of the stream)



Data analysis

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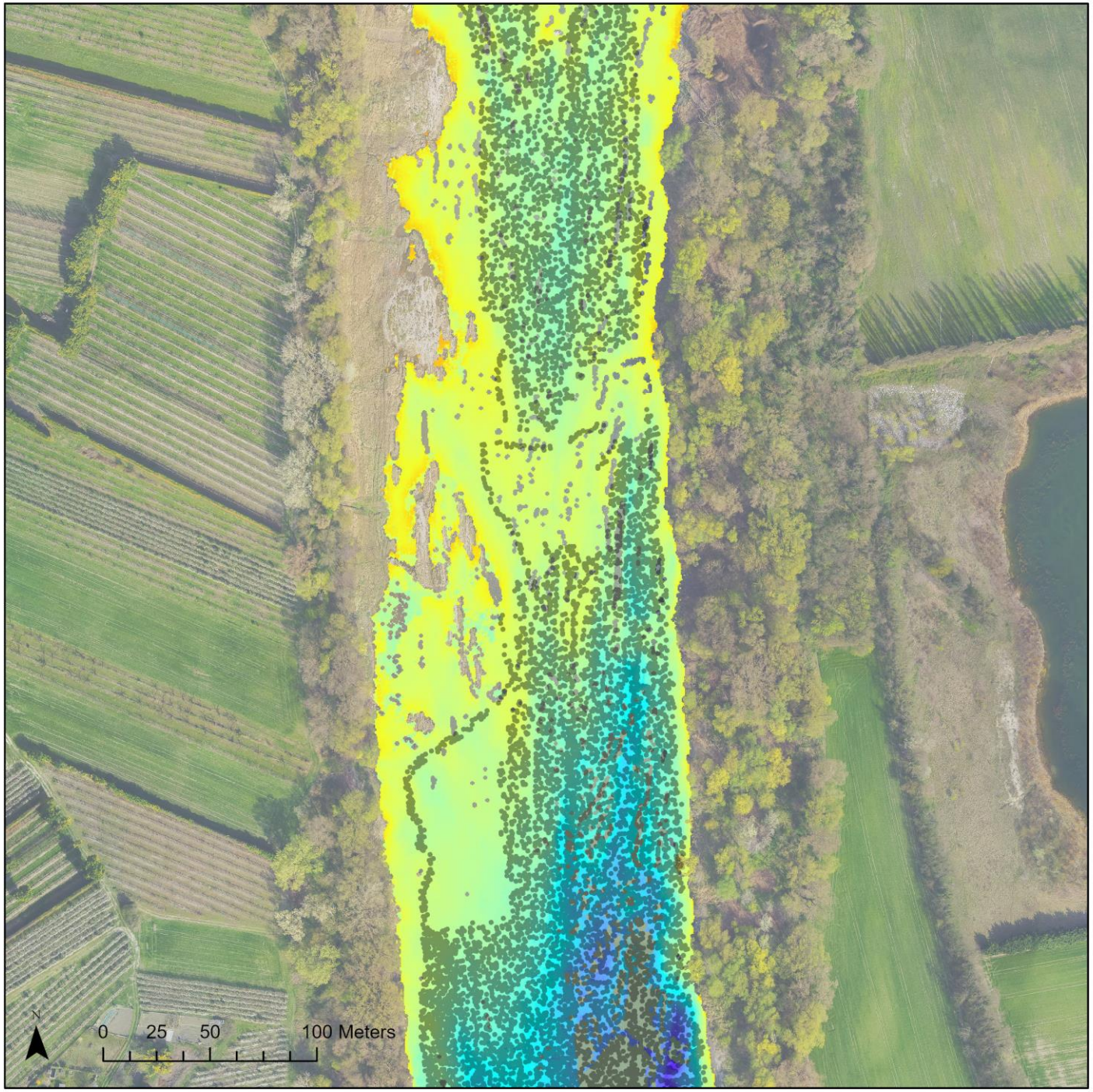
Lidar & Multibeam

in very small depths, the LiDAR allows a better cover



Data analysis

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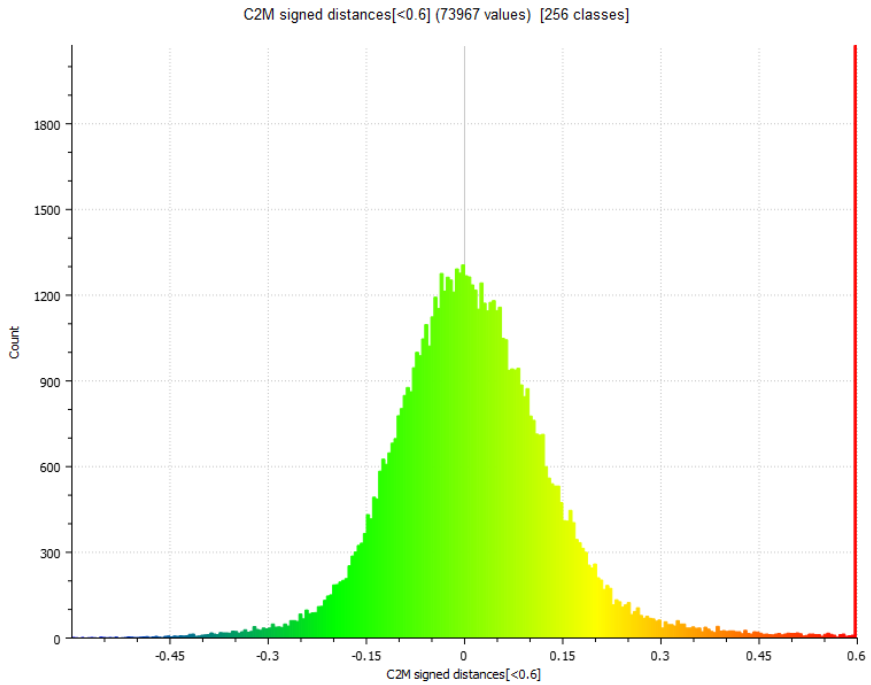
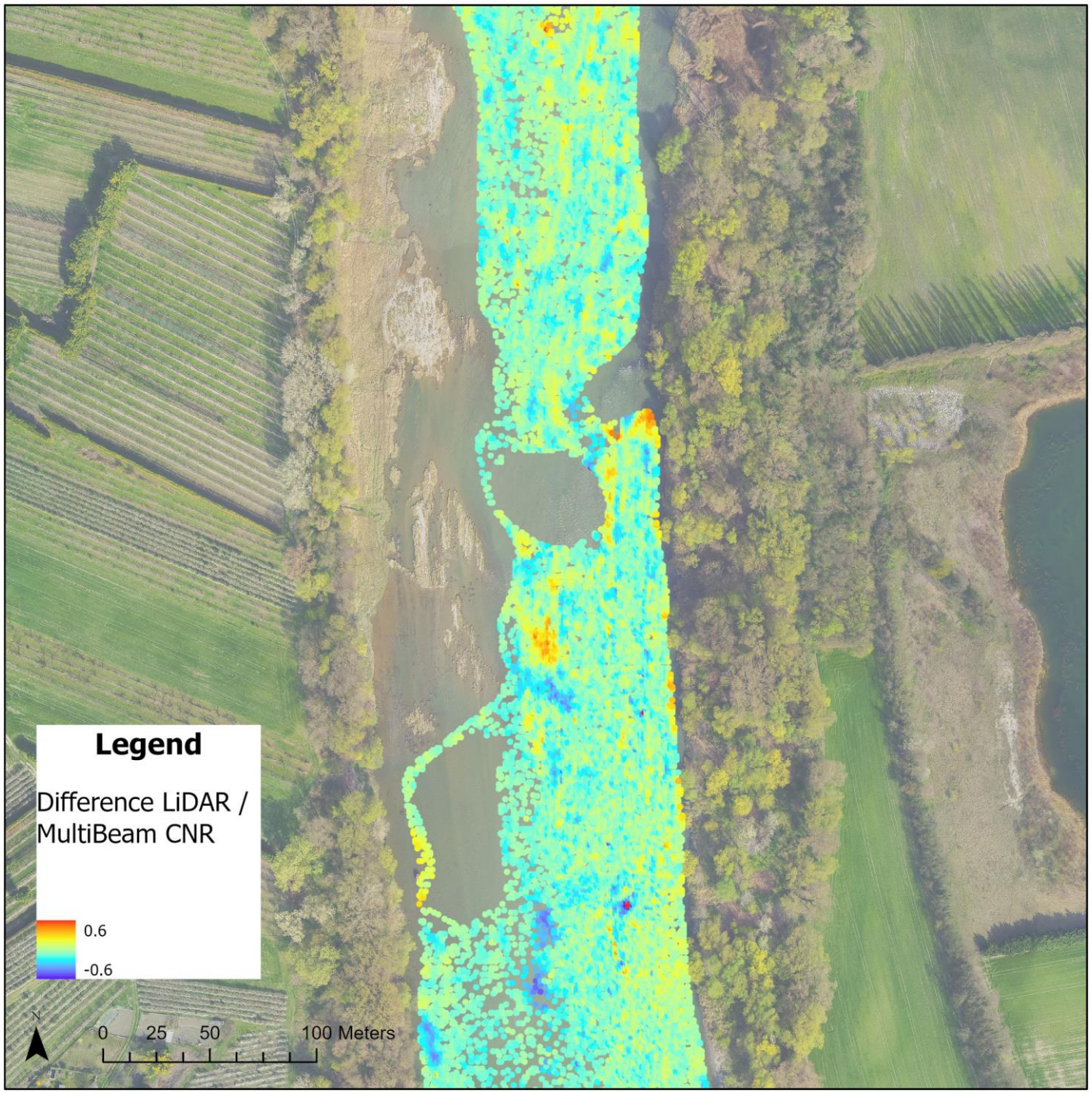
± 10 cm with CNR reference data (multibeam)



Histogram Without extreme values

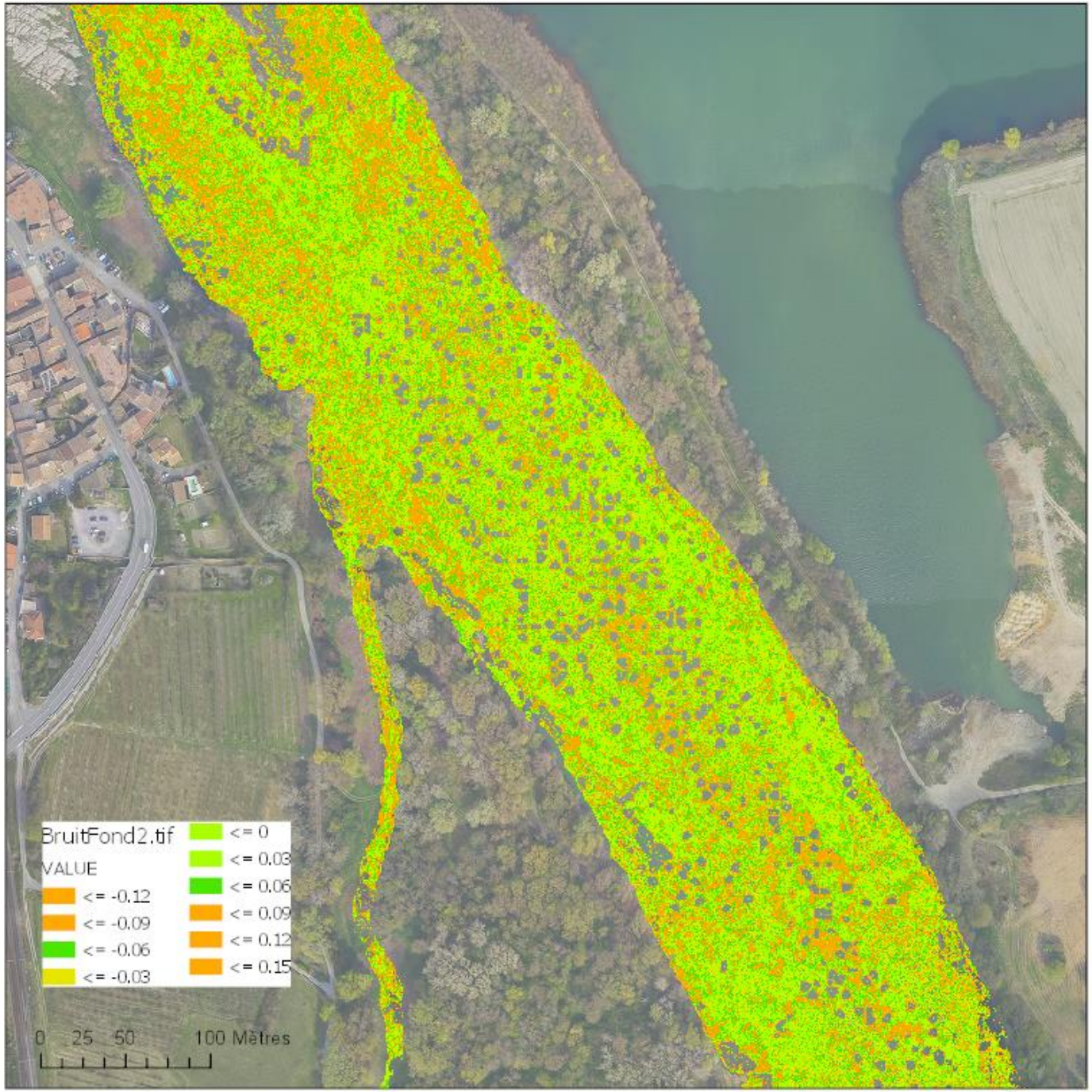


Data analysis

(Baix Logis Neuf 2022)

measurement noise

On water surface or on the bottom about ± 5 cm (10 cm thick points cloud)



Profil de 20 cm de profondeur

Data analysis

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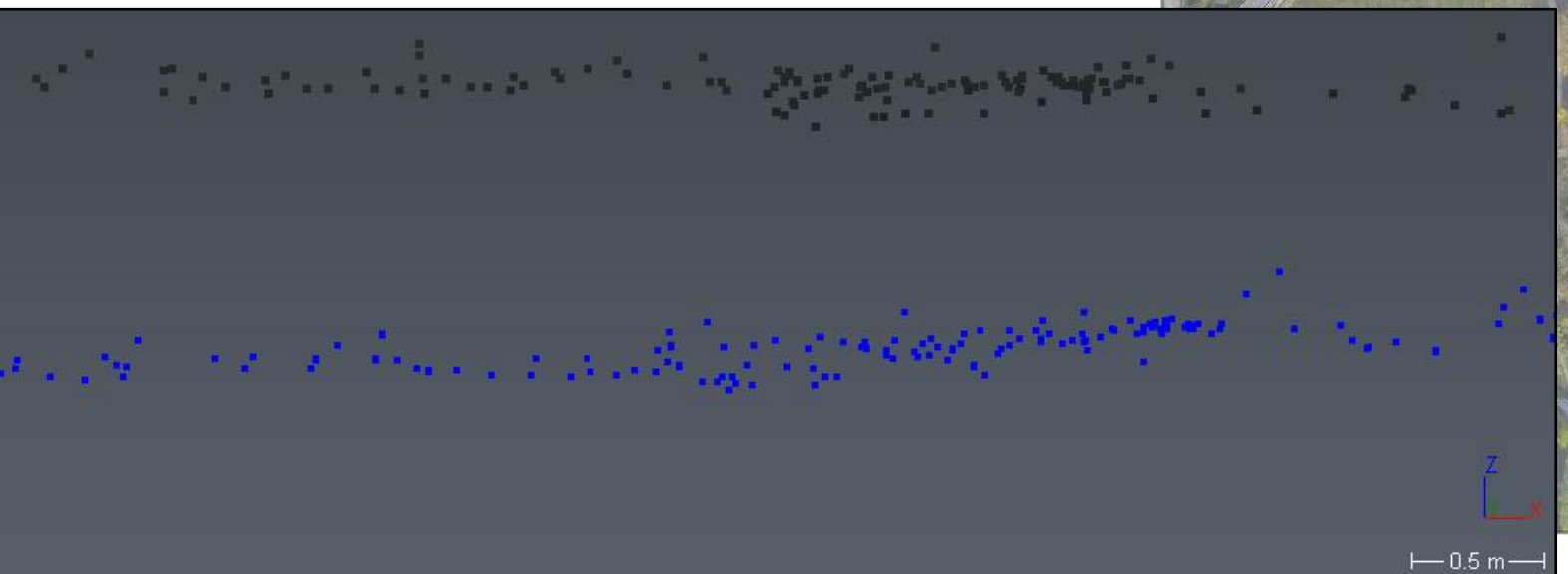
measurement noise

On water surface or on the bottom about ± 5 cm (10 cm thick points cloud)



Limits

(identified en 2022)

Factors affecting the quality of the measurement

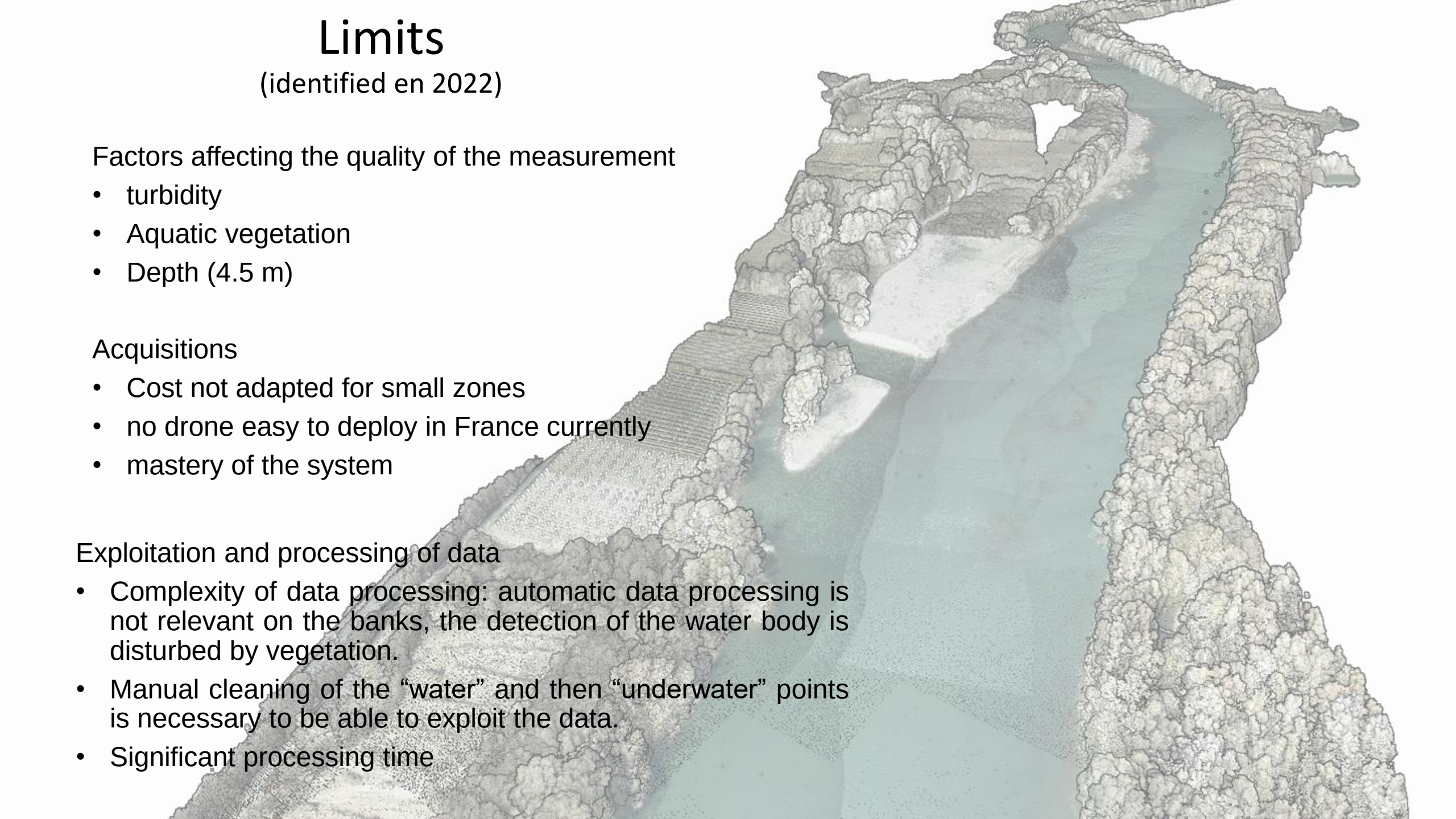
- turbidity
- Aquatic vegetation
- Depth (4.5 m)

Acquisitions

- Cost not adapted for small zones
- no drone easy to deploy in France currently
- mastery of the system

Exploitation and processing of data

- Complexity of data processing: automatic data processing is not relevant on the banks, the detection of the water body is disturbed by vegetation.
- Manual cleaning of the “water” and then “underwater” points is necessary to be able to exploit the data.
- Significant processing time

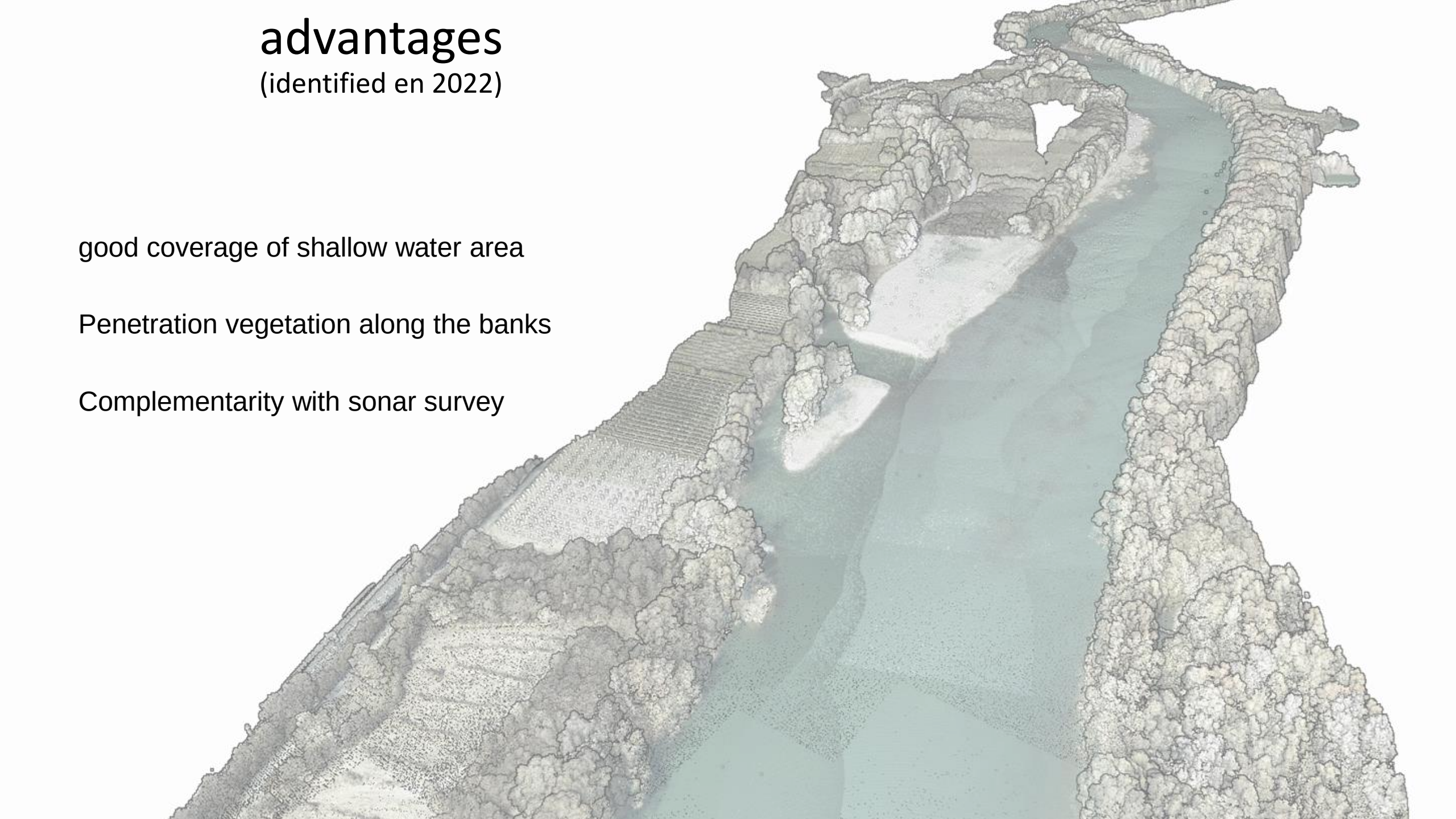


advantages
(identified en 2022)

good coverage of shallow water area

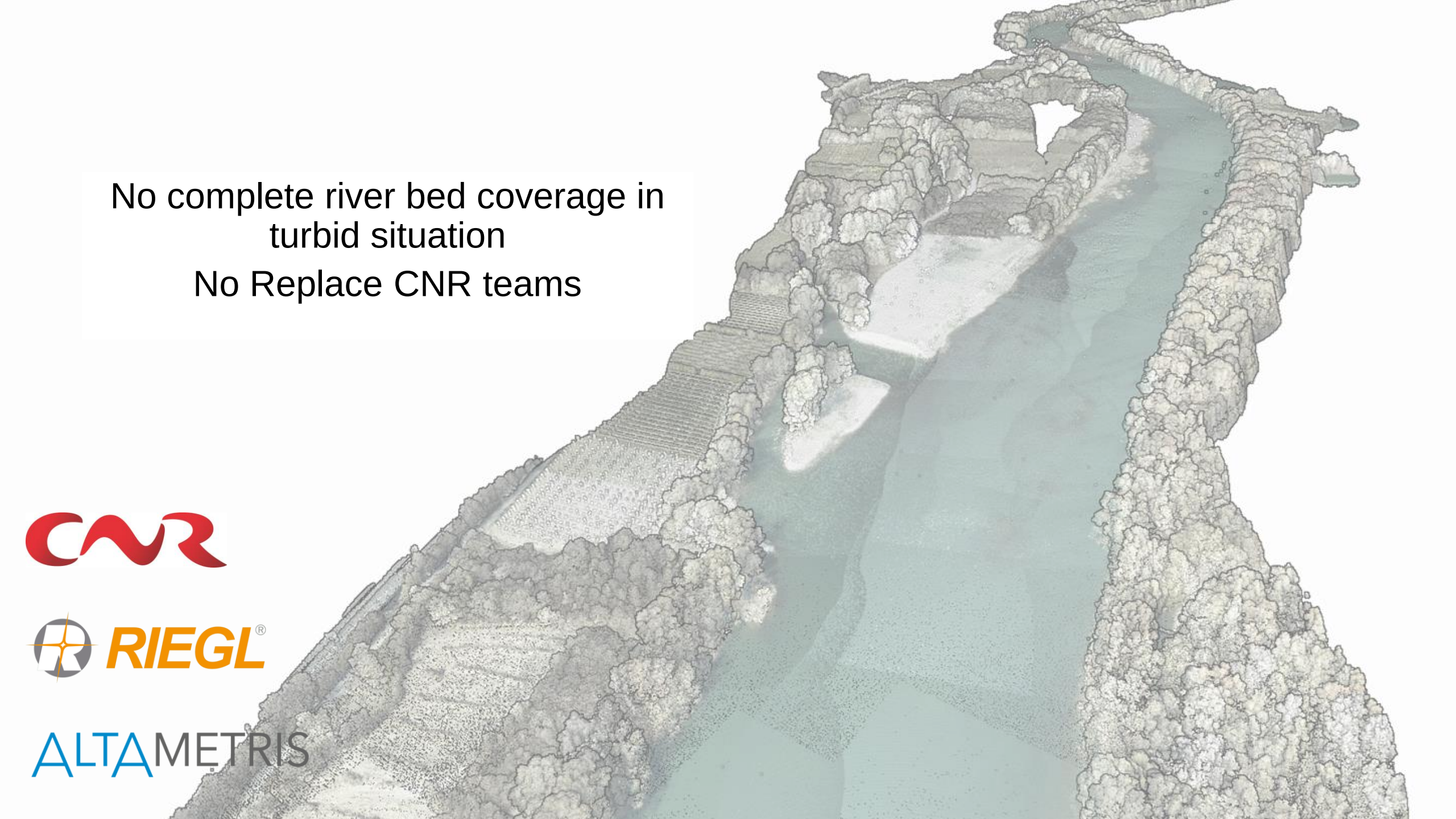
Penetration vegetation along the banks

Complementarity with sonar survey



No complete river bed coverage in turbid situation

No Replace CNR teams



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Ursula RIEGL – RIEGL uriegl@riegl.com

Paul-Henri FAURE – CNR p.faure@cnr.tm.fr

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