A grain size measurement protocol using underwater imagery as a preliminary step for evaluating the effects of ecological restoration of the Rhône

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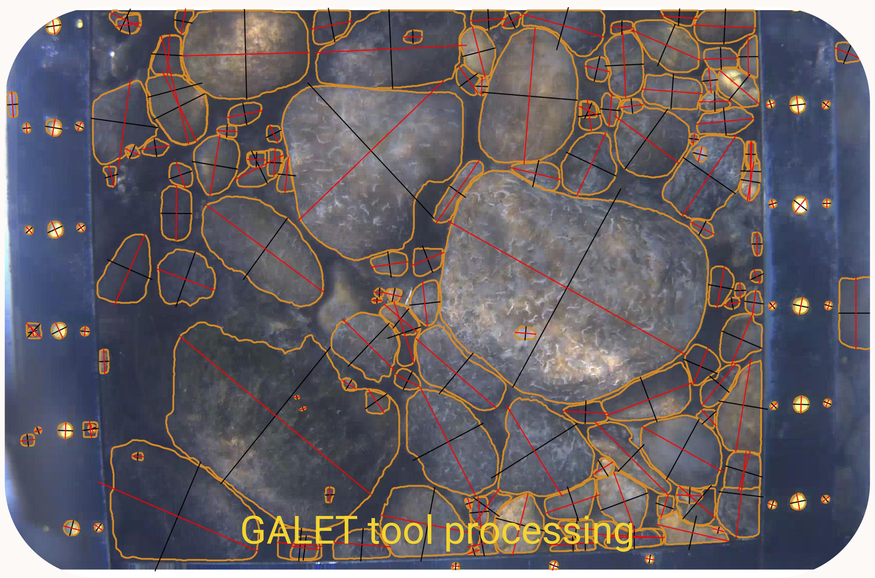
1. Context

50 m cross-sections (CS)
+ 5 points on each CS
+ 3 photos on each point
+ 1,5 km acquisition
+ 2 days on site

465 photos acquired
46 341 elements detected



Automatic detection of particles and estimation of their axis length using the GALET tool (Styx4D)

Axe A
Axe B

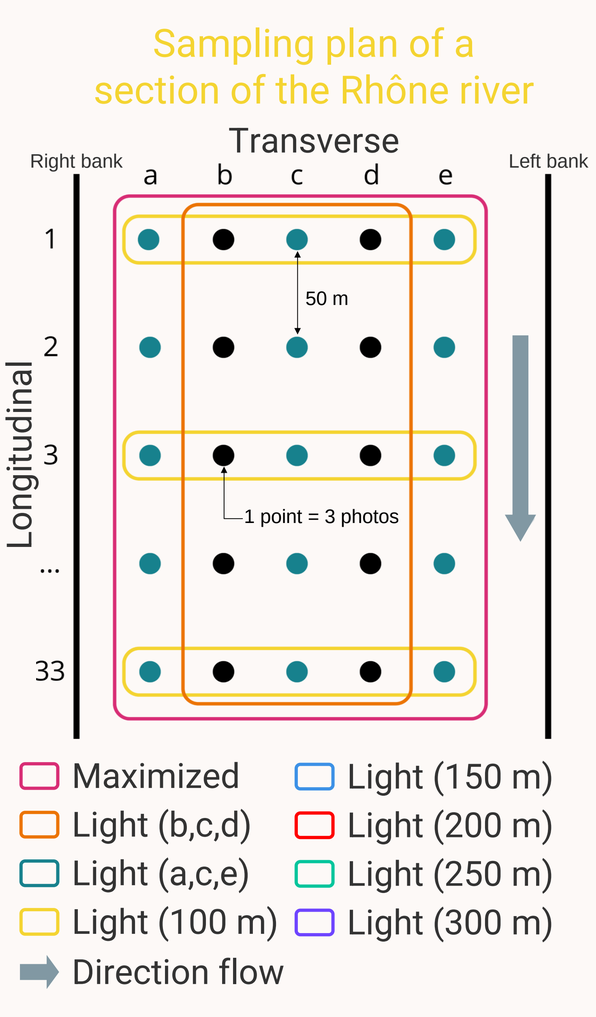
2. Evaluating grain size from underwater images

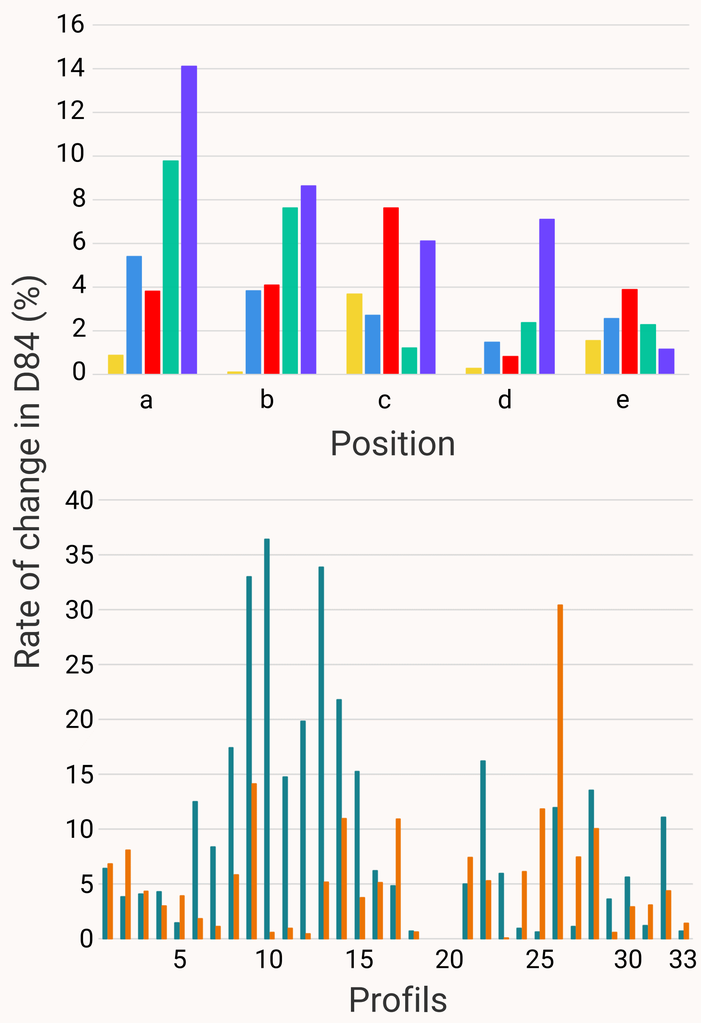
Analysis of 10 images before/after manual correction to check the quality of AI processing : correction of particle shapes, their B axes and IA detections (AI can detect elements that are not particles or, on the contrary, lack them)

Rate of change between manually corrected image and raw image (%)	Shapes	Axes	Detections
D16	19	6	38
D50	5	5	16
D84	3	4	8

- Overestimation of B axes by the GALET tool (73 % of cases) Not meaningful, as the differences are still minor (< 1 cm)
- Detection errors are the most frequent. This mainly concerns small particles less than 8 mm (61 % of cases)

3. Optimising the sampling design





- Homogeneity of the grain size at the sampling reach scale
- Longitudinally, CS can be spaced every 300 m for a study of bedload transport, and every 100 m for a study of habitats
- Transversally, the study of the centre of the channel provides results closer to those maximised

4. Conclusion

- Study based on a first version of the tool with the aim of remedying the weaknesses identified
- Sampling plan depending on the objectives of the study (habitats/ bedload transport)
- The centre of the channel presents more complete results
- Preliminary research effort expanded in a PhD thesis

5. Aims of the thesis

CIFRE PhD thesis in partnership with CNR and ENS (thesis directors : Hervé Piégay, Christophe Moiroud)

AXE 1
Grain size changes of the river bottom

AXE 2
Morphological changes due to restoration (sediment reinjection)

AXE 3
Effects on the thermal pattern of the water column

AXE 4
Effects on benthic fauna and riparian vegetation