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Geostatistical analyses of fluvial deposits in valleys: a lever for the restoration large river systems

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RCEM 2019
16-21 NOVEMBER - AUCKLAND
11th RIVER, COASTAL AND ESTUARINE MORPHODYNAMICS SYMPOSIUM

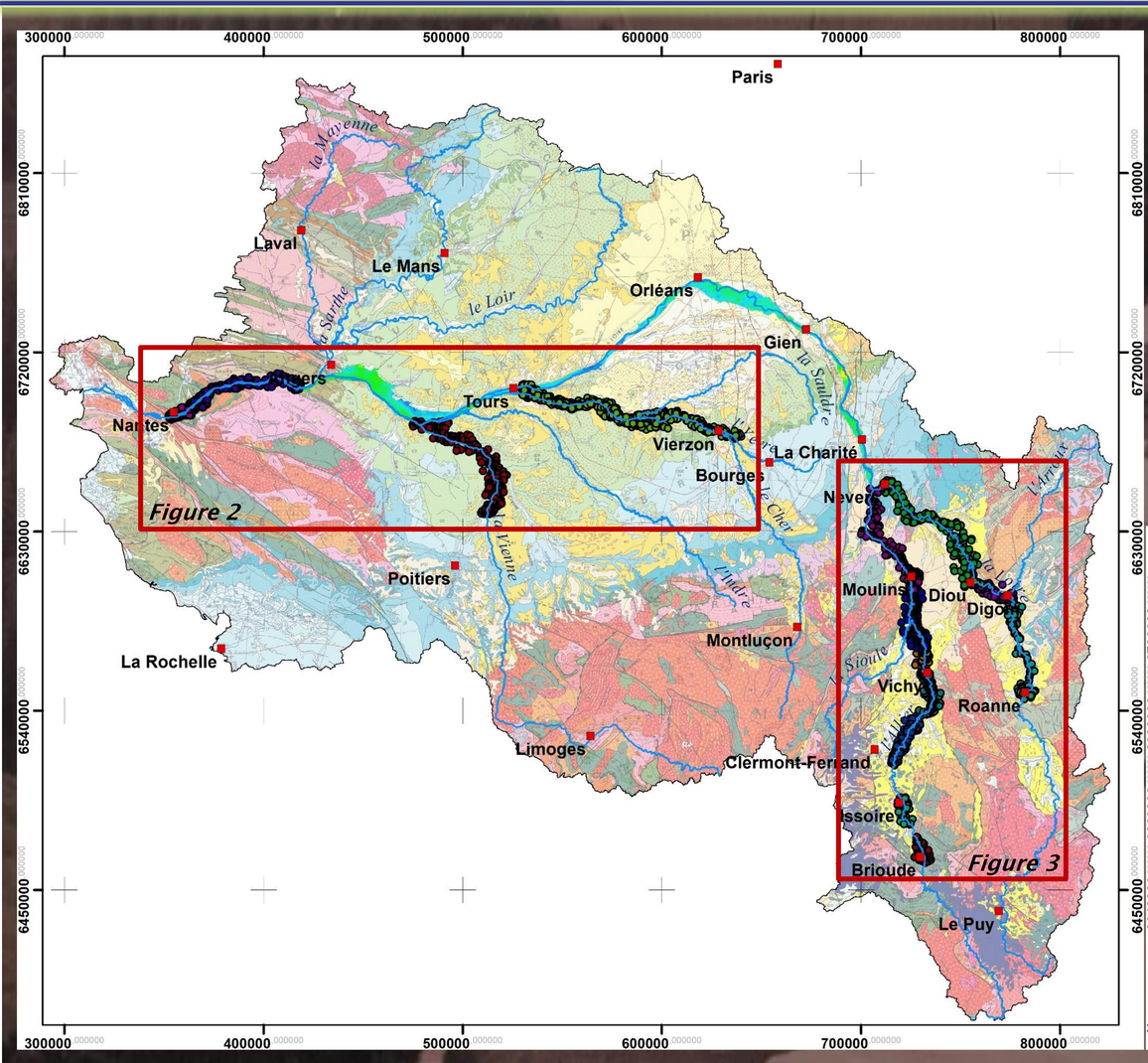

Figure 1: Map of the Loire catchment

1. Introduction

In modern alluvial systems, sedimentary continuity is a prerequisite to ecological restoration. The mobilizable sediment load is predominantly supplied by upstream inputs and available stocks in the main and tributary valleys.

The aim of this study (COSAL project) is to quantify the sediments stored in the valley of the largest river in France (the Loire) and its main tributaries (fig.1) to define potential river reaches where restoration works could be done in the future to restore sediment continuity

2. Methodology

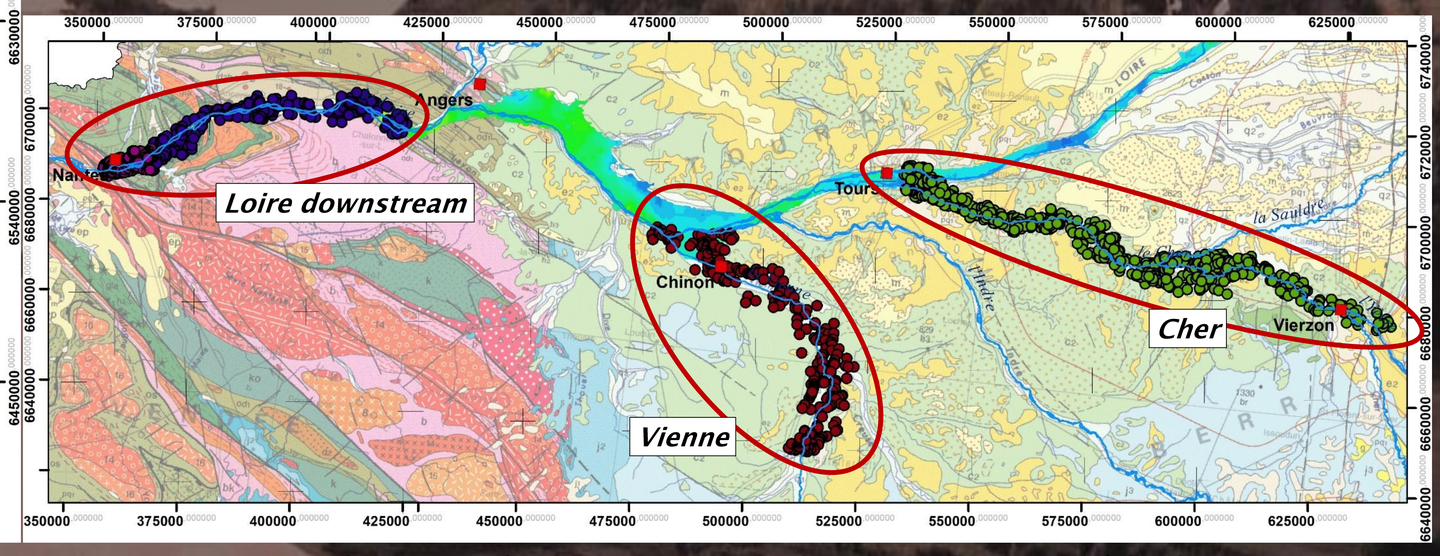

Figure 2 : Boreholes geographic coverage on the Loire downstream, the Vienne and the Cher rivers.

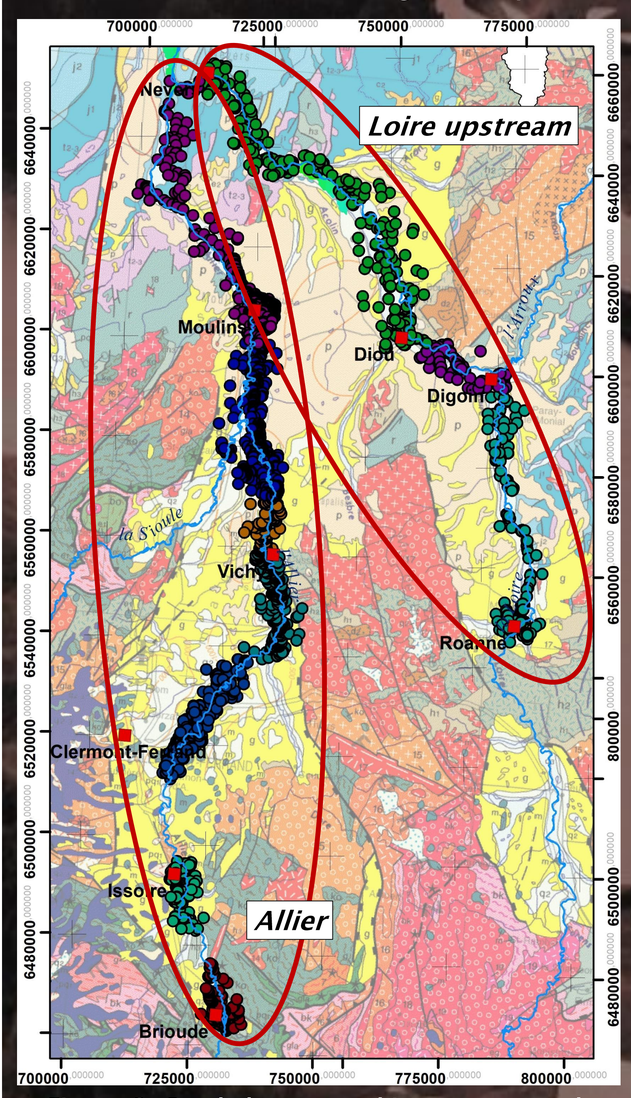

Figure 3 : Boreholes geographic coverage on the Loire upstream and the Allier rivers.

Data export and uniformisation from the national french database (BSS)
Loire downstream (fig.2) :
- 677 boreholes
Vienne (fig.2) :
- 253 boreholes
Cher (fig.2) :
- 664 boreholes
Allier (fig.3) :
- 1 509 boreholes
Loire upstream (fig.3) :
- 481 boreholes

Geostatistical analyses:
→ variogram map study (fig.4)
→ data analyses and experimental model selection (fig.5)
→ cross validation (fig.6)

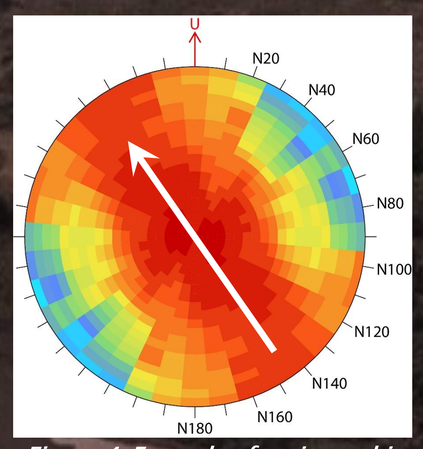

Figure 4: Example of variographic map (Brioude area, Allier upstream).

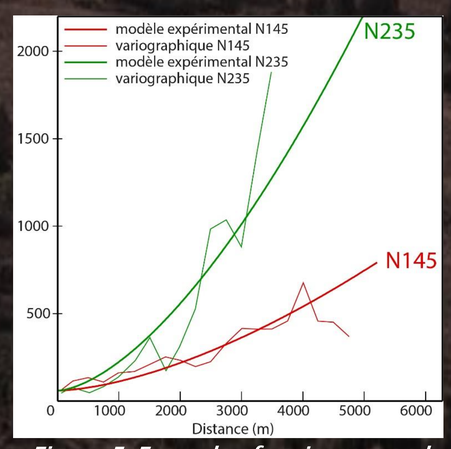

Figure 5: Example of variogram and experimental model (Brioude area, Allier upstream).

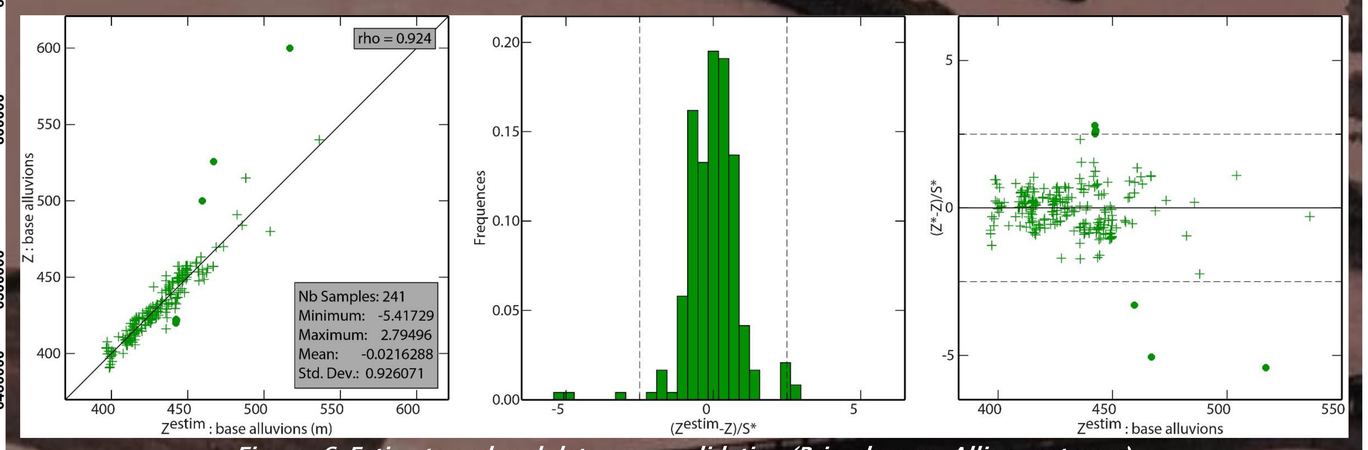

Figure 6: Estimate and real data cross validation (Brioude area, Allier upstream).

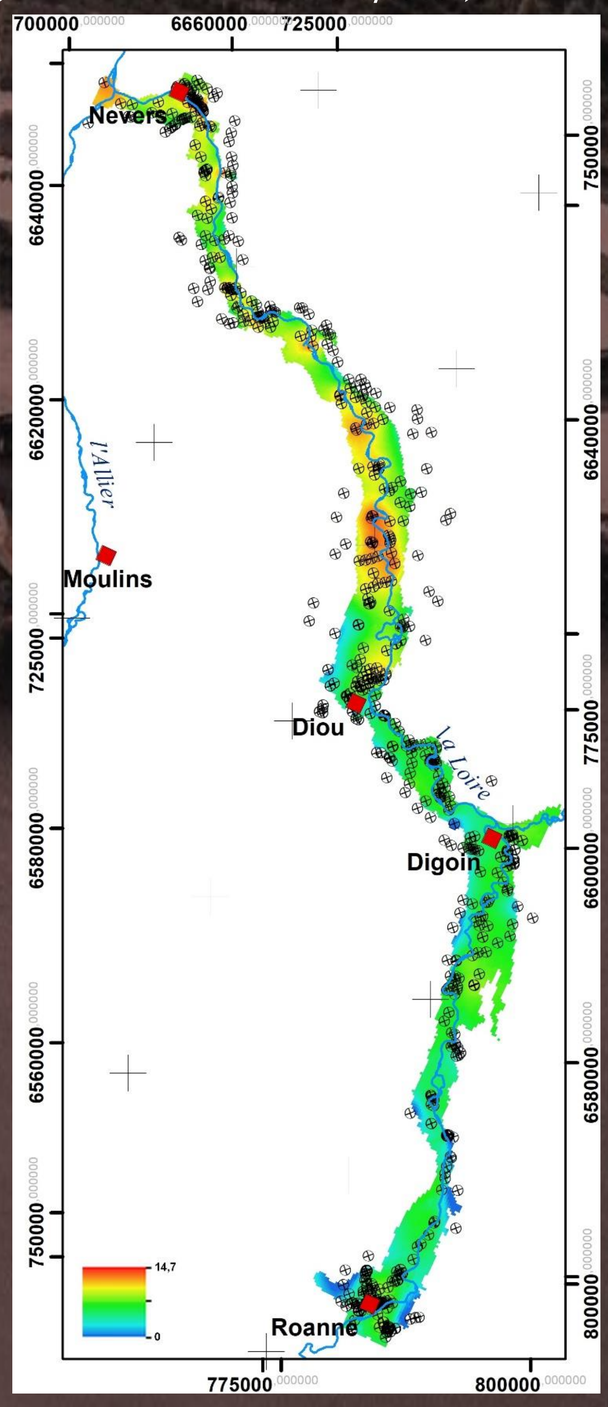

Figure 9: Alluvial thickness in the Loire upstream valley

3. Results and perspectives

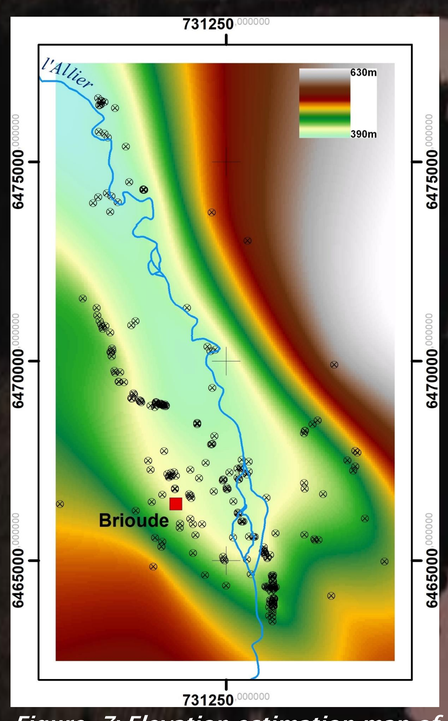

Figure 7: Elevation estimation map of the alluvial/bedrock boundary in the Brioude area (Allier).

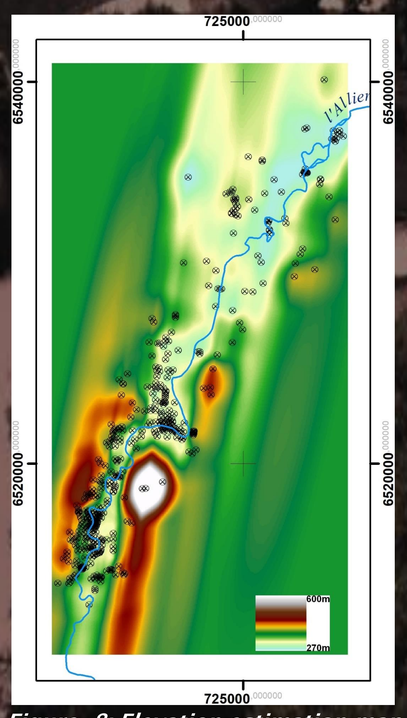

Figure 8: Elevation estimation map of the alluvial/bedrock boundary in the Maringues area (Allier amont).

→ multi-operational database available
→ 3 elevation estimation maps of the alluvial/bedrock boundaries in the Allier valley (Brioude (fig.7), Issoire and Maringues (fig.8))
→ 2 alluvial thickness maps (Loire upstream valley (fig.9) and Cher valley)

In progress:
→ the last estimate elevation maps of the alluvial/bedrock boundary in the Allier downstream, the Cher and the Loire downstream rivers
→ the alluvial estimate thickness maps of the Allier and the Loire downstream rivers
→ Cutting estimation maps by the surface right-of-way of alluvial plains
→ Estimation of the sediment volume in the bottom of the valley in the Loire catchment

This study is a part of the COSAL research project, co-financedoperation by the Loire Bretagne Water Agency and the European Union, Europe is committing to the Loire basin with the European Regional Development Fund (convention n°2017-EX001782).