STAGE DE FIN D'ÉTUDES

Analysis of morpho-sedimentary dynamics of a Mediterranean stream affected by human disturbance

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Objectives

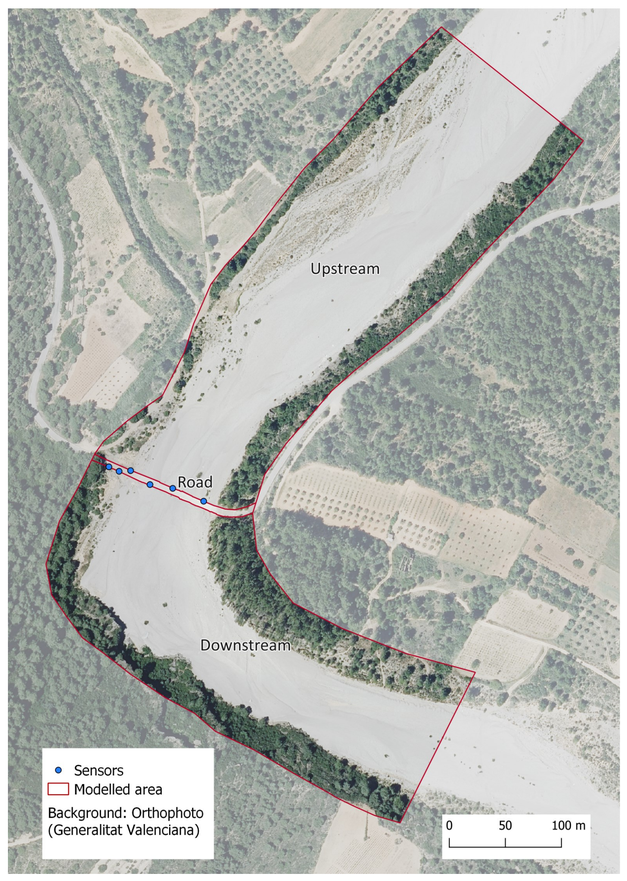
- **Overall objective**: to assess the trajectory of ephemeral streams over time, to gain a better understanding of morphosedimentary functioning, to anticipate their evolution in a context of climate change.

- **Main objective**: to model morphodynamic changes and sediment flow during flood events, using 2D HEC-RAS model (Hydrologic Engineering Center's River Analysis System).

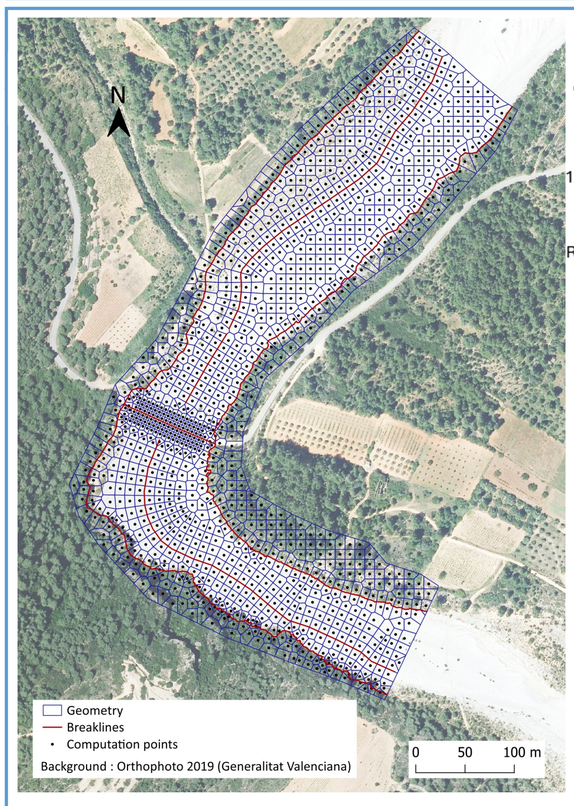
- **Other objectives**: to generate a suitable mesh for 2D hydraulic modelling, to estimate grain size distributions (GSDs) for the surface and subsurface layers.

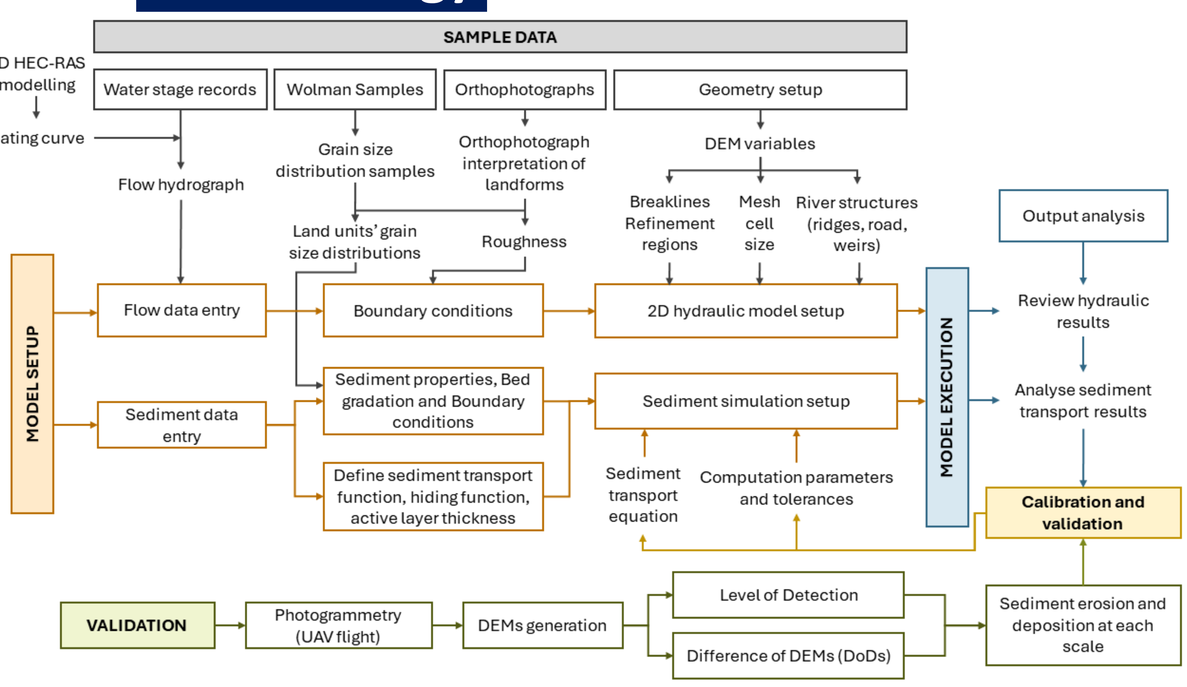
Study site

Rambla de la Viuda: a 76km-long Mediterranean **ephemeral** river.
Hydrology influenced by Mediterranean climate: hot dry summers and mild wet winters.



Methodology





The **HEC-RAS** software was chosen for the modelling due to its wide use and its reliability for sediment transport modelling. 2D modelling computation is based on a mesh (see on the left).

Mesh = compromise between **precision** and **computation duration.**

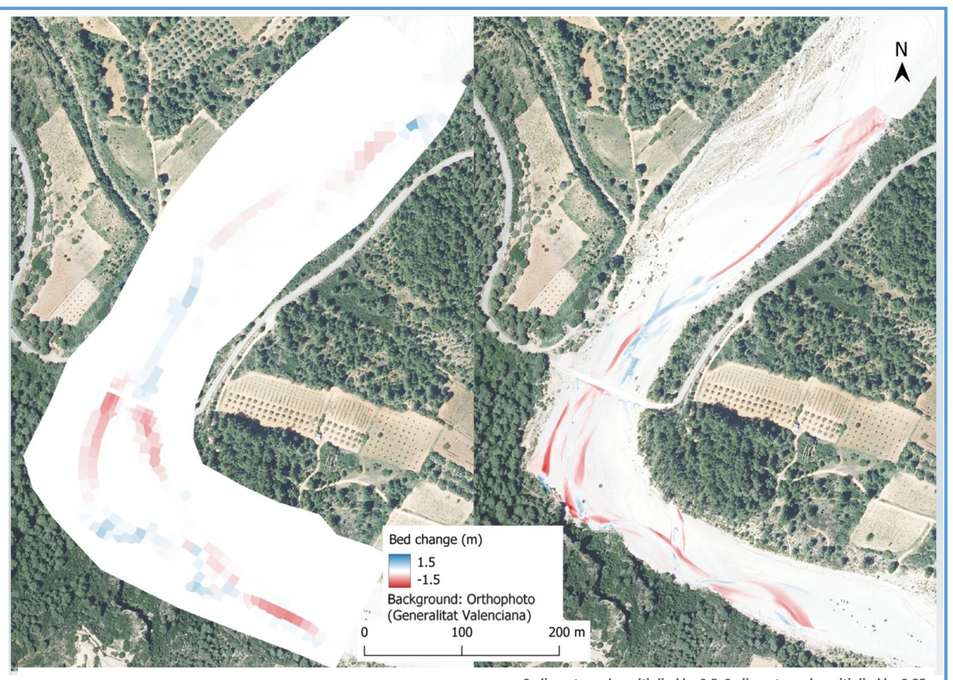
Results

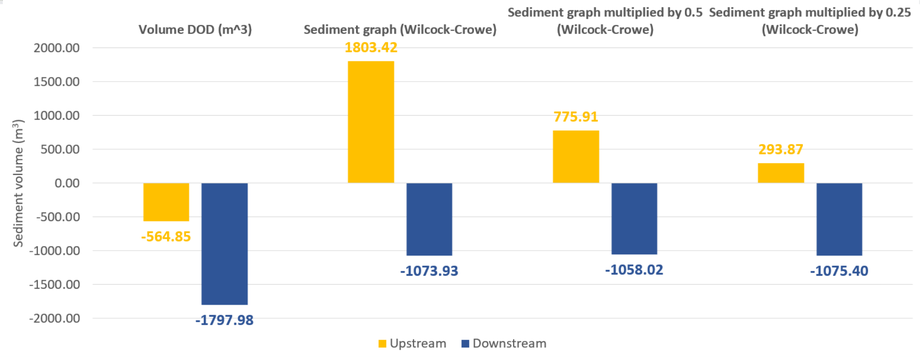
The comparison between the model's results and the DoD were carried out in terms of volumes and in terms of geomorphologic changes.

DoD = Difference of DTMs = **February 2020 DTM – June 2019 DTM**

Erosion and deposition patterns are well represented by the model.

The model's sediment volumes are close to the DoD sediment volumes, especially for the Sediment graph multiplied by 0.25 as boundary condition.





Conclusion

This internship has demonstrated the ability of HEC-RAS 2D modelling to describe the geomorphologic changes after a flood, and allowed to obtain the total bed load transport, and the sediment flow.

It has also shown that the model needs both temporal warm-up and spatial warm-up. The comparison between the model and the DoD indeed displayed in the upstream part that the patterns are now as well described as it the downstream part.

Models' computations lasted a maximum of 10 hours.

The upstream sediment boundary condition provides better results than the capacity ratio one. However, the capacity ratio boundary condition allowed to run the model without computing any sediment graph, which is often difficult to estimate.

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