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► To cite this version:

Diana Chourio-Camacho, Jean-Louis Grimaud, Nicolas Desassis, Didier Renard, H el ene Tissoux, et al.. Adjustment of alluvial fill geometry to regressive erosion and bedrock lithology in the Oise valley, Seine River catchment (France). Quaternaire 13, Mar 2022, Strasboug, France. hal-04620920

HAL Id: hal-04620920

<https://hal.science/hal-04620920>

Submitted on 24 Jun 2024

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Adjustment of alluvial fill geometry to regressive erosion and bedrock lithology in the Oise valley, Seine River catchment (France)

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Session 2

Rivers are active agents of landscape evolution as they cut through bedrock and/or build alluvial plains upon it. They may be controlled by several factors such as tectonic deformation, climate (e.g., through base level and/or discharge variation) or bedrock lithology variations, when these changes overcome the internal dynamics of rivers. The geometry of the alluvial infill in valley bottoms is inherited from these episodes of incision and subsequent aggradation, which are thought of as mainly controlled by Late Quaternary climate changes in the Paris basin. Thus, constraining alluvial infill storage geometry is fundamental to link landscape evolution and fluvial sediment amount export.

The alluvial infill in the valleys of the Seine watershed is a key compartment in the hydrological exchanges between the bedrock, the alluvial aquifers, and the Seine River, and is also a place where many archeological artifacts may be found. The aim of this study is (i) to reconstruct the large-scale geometry at the interface between the bedrock and the alluvium of the Seine watershed (ii) to quantify the alluvium volume stored at the bottom of major valleys of the Seine watershed.

For this purpose, a database consisting of thousands of boreholes that crosscut the alluvium at the bottom of valleys has been created from the *Banque du Sous-Sols* (BSS) dataset within the Seine catchment.

These boreholes were used to retrieve the elevation of the bedrock-alluvium interface below the plain as well as the bedrock lithology. We focus on the Oise valley, where bedrock lithology varies due to Cenozoic deformations. The restitution of the geometry of the Oise valley bottom has been performed using three kriging techniques: without anisotropy, with a regional anisotropy (following the main orientation of the valley) and with local anisotropies (following the sinuosity of the valley). This last technique is made available thanks to a new geostatistics methodology based on *Stochastic Partial Differential Equation* (SPDE). Comparing these kriging techniques allow discussing on the calculated uncertainties. First results on raw data indicate the impact of lithology, regressive erosion on alluvium thickness and geometry along the Seine River and Oise valley. To constrain the timing of development of the valley, samples were taken along the Seine River to be dated by the *Electron Spin Resonance* (ESR) and *Optically Stimulated Luminescence* (OSL) methods.

Keywords: Paris basin, Oise valley, kriging method, ESR, OSL, Quaternary