



Late Quaternary incision dynamics in the Paris Basin: 3D restitution of alluvium geometry in the bottom of major valleys in the Seine catchment

1. Location

MINES ParisTech, PSL Research University, Centre de Géosciences, 35 rue St Honoré, 77305 Fontainebleau Cedex, France (Lab head: Vincent Lagneau)

2. Supervision

Mark Noble, professor (MINES ParisTech) ;

Jean-Louis Grimaud, (MINES ParisTech) jean-louis.grimaud@mines-paristech.fr; **Hélène Tissoux** (BRGM) ;

Paul Bessin, (Université du Mans) ; **Pierre Voinchet**, (Musée de l'Homme)

3. Description of the PhD project.

Objective(s) – This PhD thesis is part of the RGF program and will focus on Late-Quaternary incision dynamics along the major valleys of the Seine catchment, mainly by looking at the architecture of their bottom alluvium infill. The purpose is to characterize the geometry of the erosive contact between the bedrock and the alluvium in order to decipher between the respective impacts of lithology, climate forcing (changes in eustatism and/or hydraulic regime) and large wavelength deformation pattern. Expected implications of this study are:

- (Regional) bringing new knowledge on the relations between geological forcings and alluvial sediment architecture in the Paris Basin, where Quaternary geomorphology is studied in relation with human occupation
- (Thematic) looking at regressive erosion dynamics and river long profile adjustment to climatic forcing.

Context – Currently, large-scale adjustment of river long-profiles is studied mostly based on alluvium surface topography, which is the result of latter aggradation and is not a direct observation of incision dynamics. This study aims at testing if the two observation are comparable. The impacts of substrate lithology, large-scale deformation or knickpoint dynamics are classically invoked but remain not well quantified. Recent data on big rivers (Colorado, Niger) highlight for instance the stability of knickzones along river profiles influenced by lithology. The Quaternary Seine River is a potentially fruitful test-area to further look into these relations.

Planning – Valley bottom alluvium is an exceptional archive for all these questions in the middle of the Paris Basin. Because it is not often outcropping, it remains overlooked compared to incised terraces on valleys slopes. Nowadays, a great deal of borehole data is accessible thanks to archeological studies (INRAP), national compilations by the BRGM and tunnel digging in process in the frame of the Grand Paris project. This PhD will combine borehole compilation, geophysical analysis, field study and a few new dating to propose a harmonized map of valley bottom alluvial fills together with a 3D reconstruction of the base of the alluvium in the Seine catchment.

Profile required- The candidate will have a good background in river dynamics (sedimentology - geomorphology). She/he will be familiar with fieldwork as well as GIS software in order to build up a solid database on channel fills geometry, i.e. combining field data and existing literature. Some knowledge on programming and dating techniques will be appreciated. Furthermore, a good background in geosciences, environment and reservoir will help putting the results of the PhD into perspective.

Grimaud, J. L., Chardon, D., & Beauvais, A. (2014). Very long-term incision dynamics of big rivers. *Earth and Planetary Science Letters*, 405, 74-84.

Grimaud, J. L., Paola, C., & Voller, V. (2016). Experimental migration of knickpoints: influence of style of base-level fall and bed lithology. *Earth Surface Dynamics*, 4(1), 11-23.