

ED 398 Géosciences, Ressources Naturelles et Environnement

Proposition de sujet de thèse pour la rentrée universitaire 2016-2017

Sedimentary filling of abandoned channels

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Context – The geomorphic evolution of alluvial plains is tied to the interactions between river dynamics and external forcing such as substrate deformation, climatically-induced discharge variations or more recently anthropogenic activities. In these plains, rivers migrate laterally, erode their banks, transport and deposit sediment as lateral bars, islands or overbanks during floods, and may abruptly change their course by establishing a new path thus abandoning the channel they previously occupied. The sedimentary filling of abandoned channels made of mud and sand can in turn influence river evolution by offering different resistance to erosion. Furthermore, the distribution of the sedimentary facies is responsible for a complex organization of bodies with different permeability, thus controlling subsurface fluid circulation. Currently, few constraints exist on the geometry of channel fills, which is a limitation for testing their impact on, for example, reservoirs connectivity.

Objectives – The goal is to bring new constraints on the geometry of sedimentary filling in abandoned channels as well as on the factors controlling this filling.

Planning – Abandoned channel filling will be studied by combining field and theoretical approaches. First, a sampling campaign based on borehole coring will be carried out on natural examples of recently abandoned channels, for example along the Seine River. This task will allow characterizing the geometry of channel fills as well as the physical properties of channel content (permeability, resistance to erosion). The field results will be completed by an extensive synthesis of channel fills existing on active plains but also in the stratigraphic record. Second, the factors controlling channel filling and their impact on the geomorphic evolution of alluvial plains will be tested using modeling. The impact of abandonment dynamics on facies distribution in channels will be tested. This work will help implementing the FLUMY software developed in the Centre de Géosciences in Fontainebleau, which allows simulating meandering rivers and the associated sedimentary deposits. The implementation of this software will allow testing the impact of channel abandonment dynamics on the stratigraphic record. Finally, the results of this PhD will be invested to study the impact of variable channel fills on underground flows using numerical models.

Profile required- The candidate will have a good background in river dynamics (sedimentology - geomorphology). He/she 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 numerical modeling will be appreciated. Furthermore, a good background in geosciences, environment and reservoir will help putting the results of the PhD into perspective.