SEDMORNET focuses on river morphodynamics, the science of physical processes that studies changes in river forms, which represent a fundamental control of the integrity of many freshwater ecosystems and related biodiversity, and are at the base of river management for flood protection and risk prevention. Achievements of nearly 40 years in river morphodynamic studies mainly refer to unit processes occurring at specific scales under equilibrium assumption between flow and sediment transport, while non-equilibrium, unsteadiness and connectivity across multiple scales are essential drivers of the actual evolutionary trajectories of the river morphology. To address this fundamental gap, the core novelty of the SEDMORNET project will investigate the relation between sediment connectivity across and within scales and morphodynamic processes.

The position that refers to this call will focus on modelling of sediment connectivity effects on meander planform evolution (WP 3.2 of the project), related to the variability of water and sediment discharges.

We aim to include the overlooked, albeit crucial effect of variations of the channel hydraulic geometry in evolutionary models of river meanders. A nested modelling strategy will be used, whereby the reach-averaged values of channel width, depth and slope are computed by means of a 1D model that accounts for the different evolutionary stages of single meander loops and for variations of the sediment supply. These average hydraulic conditions then provide the required information for modelling the local flow field, bed evolution and channel migration rate by means of a semi-analytical 2D model. This nested strategy is expected to provide a suitable tool for analysing the role of the alterations of flow and sediment regime due to river damming, change in land use and climate change. Model results will be compared with field observations based on both in-situ acquired data and on remotely sensed information obtained through the custom developed Pyris software, which allow us to perform quantitative multi-temporal analyses of meander evolution (Monegaglia et al., 2018), taking advantage from the recent progress in satellite geosciences.

REFERENCE

Monegaglia, F., Zolezzi, G., Güneralp, I., Henshaw, A. J., & Tubino, M. (2018). Automated extraction of meandering river morphodynamics from multitemporal remotely sensed data. Environmental Modelling & Software, 105, 171-186.