

Introduction

- Effect: vegetation modulates water flow, sediment and landforms
- Response: influence of geomorphic changes on vegetation dynamics
- → Feedbacks between fluvial landform construction and vegetation establishment and succession











Multi-scale feedbacks – Micro-site



• We quantified the relation between response trait attributes of young *P. nigra* plants and their exposure to three different levels of mechanical stress



Methods – Study reach – micro-site

• **3 sites:** 1. highly exposed bar-head, 2. less exposed bar-tail, 3. chute channel



Objectives – micro-site

Explore if differences in morphological and biomechanical responses exist between the *P. nigra* populations in relation with exposure to mechanical stress

Three contrasting locations:

- (i) the most exposed upstream location of the alluvial bar (bar-head);
- (ii) the less exposed downstream location of the alluvial bar (bar-tail);
- (iii) within a **chute channel** which is sheltered during low annual floods but more exposed to concentrated water flow during more important floods

Methods – micro-site

- Excavation of *P. nigra* individuals
- Total of **96** *P. nigra* individuals
 - bar-head: 46
 - bar-tail: 40
 - chute channel: 10
- Without breakage of the root **62** individuals (23, 32, 7)
- Dendrochronological analysis → same age (2 years)
- Statistics (Kruskal-Wallis, discriminant analysis) → difference between sites, description of groups





Results – micro-site

- Different exposure → difference in response traits
 - **Bar-head**: small flexible stems and a strong root system which favour higher mechanical resistance
 - Priority to survival, limiting engineering effect



Results – micro-site Bar-tail: taller, less flexible stems and finer root systems Priority for resource acquisition and positive growth response to sediment burial Greater biomass → greater sediment trapping → suggesting positive feedback

Conclusion

- Response trait development → influence of plant capacity to enhance fluvial landform construction
- Plant response trait differences → different biogeomorphic evolutionary trajectories on alluvial bars from a functional trait perspective
- Role of functional trait diversity in plant resilience and in controlling the extent of fluvial landform construction





