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When the same hydraulics conditions lead to different depositional patterns: case of an idealised delta

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Deltas are complex hydrosystems and ecosystems resulting from the interactions of a river system with a water body almost at rest. Anthropogenic factors (hydropower, flood management, development in the floodplains) lead to dramatic changes in sediment transport in the rivers and in sediment management practice. From continuous, the sediment transport becomes increasingly intermittent, with long periods of deficit in the sediment supply and short periods characterized by large supplies. Understanding how these intermittencies in the sediment supply affect the delta morphodynamics is of paramount importance for predicting the possible evolution and functioning of deltas.

Deltas can reasonably be idealised as a reservoir, with an inlet channel representing the river and the sudden enlargement of the reservoir representing the water body at rest. Using such an ideal configuration enables the assessment of the influence of individual geometric and hydraulic parameters on the depositional patterns responsible for the morphodynamic evolution of the delta. Recent literature has shown that for very similar hydraulic boundary conditions, two very different types of flow fields may develop (“straight jet” vs. “meandering jet”), leading to totally different depositional patterns. In turn, these distinct depositional patterns affect the flow itself through a two-way coupling between the hydrodynamics and the morphodynamics of the deposits. These complex processes will be discussed in the proposed presentation, based on the results of over 160 experimental tests and corresponding numerical simulations.