EGU23-10815, updated on 19 Oct 2023
https://doi.org/10.5194/egusphere-egu23-10815
EGU General Assembly 2023
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Study of morphodynamic change caused by wing dams at large spatio-temporal scale

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Low water depth can be a problem for navigation on large rivers. Since the last century, a frequently-used method of river regulation has been the installation of wing dams (wing dikes, spur dikes, groins). With their help, the riverbed narrowed during low water, which created a greater water depth and a higher water level. However, the narrowed flow also generated a higher bed shear stress, which, due to bed erosion, simultaneously increased the water depth and lowered the water level.

From a flood protection point of view, questions arise as to how wing dam fields change flood levels as a result of the bed change caused by such intervention. The complexity of the answer increases if we examine the problem not only in a cross-section (or short reach scale), but at long scale, as in the case of the Mississippi River, USA, where a system of wing dams hundreds of kilometers long was installed.

We analyzed the problem in two steps: we apply a 3D sediment transport model on a local scale, and the results are then upscaled and implemented in a 1D model to enable study of the problem at large spatio-temporal scale (hundreds of km, several centuries).