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Baldaio lagoon hydrodynamics and flooding. Evolution of natural and shellfish production.

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INTRODUCTION AND PRESENT PRACTICE

Most of the physical processes which take place in aquatic systems are governed by hydrodynamics. The flow conditions in estuaries are highly dependent on boundary conditions, both natural and artificial (Chau, 2010). Since many years, estuarine systems have been related to the potential commercial productivity of their resources, which should be in equilibrium with the environment. The case of Galician river mouths and estuaries is one of them, where shellfish collection, together with tourism, is one of the most important economic activities in these areas. (Peña et al., 2008). Natural flooding is a key factor in this production.

The Baldaio coastal lagoon is located in northwest Spain and is included in the Regional register of natural protected areas, opened to the Atlantic Ocean, with strong meteorological conditions. Tide levels range up to 4.58 meters. Nevertheless, shellfish extractive activity is permitted in the lagoon. During the last decade, several projects aimed to increase the efficiency of the shellfish extraction were developed, including the construction of control gates which regulate the lagoon hydrodynamics.

NUMERICAL MODEL, RESULTS AND CONCLUSIONES

The Turbillon numerical model (2D shallow-water, finite-volume method) has been successfully applied to model the hydrodynamics of the coastal lagoon. Five different scenarios were studied in order to understand the hydrodynamic response and flooding of the system to gate operation. Three of these scenarios were modelled considering fully opened gates, under neap, mean and spring tidal levels, and the other two situations were modelled with different gates openings under mean tidal conditions.

The total surface of the lagoon is around 2.43 Km2, and was discretised with a finite volume mesh of 11662 elements, using a Manning coefficient of 0.025 in sandy zones and 0.050 in vegetated ones, and a dry-wet tolerance parameter of 10-3m. The gates were simulated as an internal boundary condition.

The main conclusion of this study is the important role that the gates play in the hydrodynamics of the lagoon, as it was expected. These gates are responsible of a strong tidal asymmetry inside the lagoon, with a phase lag of around 3.5hr between high tide and the time at which maximum flood level occurs inside the lagoon. Southwest and east areas remain stable and with small depths, with reduced flow circulation that could affect the environment. This project's team suggests changes in the current situation, for flooding and sediment accumulates in the gates due to the deficient maintenance of the shellfish local association.