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Integrated hydrological modelling of a managed coastal Mediterranean wetland (Rhone delta, France): initial calibration

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Abstract. This paper presents a model of a heavily managed coastal Mediterranean wetland. The hydrosystem studied, called "Ile de Camargue", is the central part of the Rhone river delta. It comprises flat agricultural drainage basins, marshes, and shallow brackish lagoons whose connection to the sea is managed. This hydrosystem is subject to strong natural hydrological variability due to the combination of a Mediterranean climate and the artificial hydrological regime imposed by flooded rice cultivation. To quantify the hydrological balance at different spatial and temporal scales, a simplified model is developed — including the basin and the lagoons — using a time step that enables the temporal dynamic to be reproduced that is adapted to data availability. This modelling task takes into account the functioning of the natural and anthropogenic components of the hydrosystem. A conceptual approach is used for modelling drainage from the catchment, using a GIS to estimate water input for rice irrigation. The lagoon system is modelled using a two-dimensional finite element hydrodynamic model. Simulated results from the hydrodynamic model run under various hydro-climatic forcing conditions (water level, wind speed and direction, sea connection) are used to calculate hydraulic exchanges between lagoon sub units considered as boxes. Finally, the HIC ("Hydrologie de l'Ile de Camargue") conceptual model is applied to simulate the water inputs and exchanges between the different units, together with the salt balance in the hydrosystem during a calibration period.

Keywords: water management, conceptual hydrological model, hydrodynamic model, box model, GIS, Rhone delta, Camargue.

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