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3D hydrodynamic modelling to optimize the hydraulic efficiency of the weirs and turbines intakes of the Néstor Kirchner dam in Santa Cruz, Argentina.

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ABSTRACT

In this work 3D hydrodynamic modeling were performed on the weir channel access and the turbines intakes of Nestor Kirchner dam in the province of Santa Cruz (Argentina). Different alternatives of the layout scheme of the channel, the weirs geometry and turbine alignment have been considered to optimize the design and the hydraulic efficiency of the hydraulic components.

Operational flow scenarios have been simulated in order to verify the conditions of weir and intake inflow. Streamlines, eddies generation, flow distribution of the flow have been analyzed to define the best hydraulic operating conditions.

The numerical Delft3D model, developed by Deltares, has been used. The hydrodynamic model allows the simulation of unsteady flow in three dimensions. The numerical solution scheme is finite difference, using curvilinear coordinates and vertical σ. It also allows the generation of a computational domain with different degrees of mesh refinement.

As a result of the study, improvements in the geometric design of the hydraulic components have been outlined and considered as a support tool for defining the most convenient alternative, to maximize the hydraulic efficiency of weirs and turbine intakes.