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Integrated modelling for the discharge of brine from desalination plants into coastal waters

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ABSTRACT

Reverse osmosis desalination plants (RODP) located in many arid or semi arid coastal areas or islands worldwide provide a solution to the problem of water scarcity by supplying fresh water to the local population. However, the constant discharge of large quantities of brine into the sea may cause harmful effects on marine flora and fauna due to excess salinities. These effects can be avoided by selecting properly the configuration and location of the water outfall system of RODP via the performance of a hydrodynamic study of the brine effluent using integrated models. This work presents (1) the mixing regions of brine effluent flow, which are the near field (NF), intermediate field (IF) and far field (FF) regions, (2) the normally used brine outfall configurations which fall into three groups: (a) the onshore surface, (b) the offshore submerged single port and (c) the offshore submerged multiport outfall, (3) the existing regulations for brine discharge salinity, (4) a comparison between the onshore surface and offshore submerged single port discharge from a typical RODP in a Greek island, through an application using the CORMIX model, showing that dilution is much greater for the second outfall type mitigating to a great extent the potential environmental adverse impacts and (5) the basic steps towards development of an integrated model for the performance of hydrodynamics studies for brine effluents from RODP which couples the NF CORMIX-CorJet model with the FF model FLOW-3DL.

Keywords: Brine; Desalination; Hydrodynamics; Environmental impact; Numerical modelling

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