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Alternated pumping reduces the impact of freshwater diversion in the Pungue estuary

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The Pungue river is a strongly seasonal river that is shared by Zimbabwe and Mozambique. In Mozambique, its water resources are mainly used for water supply to the city of Beira and for irrigation of the sugar estate near Mafambisse. The latter is the main user with a pumping capacity of 7.2 m^3/s. During dry periods, salt water intrudes until and even past the water intake, resulting in the shutting down of pumps near high tide.
Previous research identified unexpectedly low salinities near the water intake during extremely low river discharge, while model simulations suggested substantially higher salinities. This contribution presents the theory that explains the observed anomalies, making use of the observations made by previous researchers aswell as newly retrieved data in 2009. In this theory the dynamic effects, introduced by on and off switching of the pumps at Mafambisse, is the main reason for the steady state model not to fit the observations. To test this theory, a virtual experiment with a dynamic salt intrusion model has been done of which the results are presented in this contribution.
An interesting conclusion from the experiments is that by alternated pumping, the salinity in the estuary remains close to the steady state salinity of the undisturbed discharge. This means that alternated pumping is a highly efficient way of water consumption with minimum impacts downstream.