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Impact of Saline Ground water Pumping on density dependent Seawater circulation in Coastal aquifers

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Demand for more sustainable aquifer management solution has exacerbated in view of the seawater intrusion occurring in coastal aquifers, particularly in arid areas, where surface water is not aplenty. Feasibility studies showed saline ground water pumping from within saltwater wedge, aiding in mitigation of seawater intrusion and thus re-freshening the aquifer. Such pumping from nearshore aquifer mostly draws water from the sea. The impact is pronounced for higher pumping rates, where the interface would be lowered and toe position get shifted towards seaward side. This implies that, the change in fluid motion may reduce the outflow through seepage face, which in turn affect the circulation of seawater within the wedge. In the present study, a standard test aquifer was simulated with finite difference model, SEAWAT, to know the effect of change in hydraulic gradient due to pumping, on seawater circulation. Saltwater circulation rates were calculated as the ratio between the total inflow across the seaside boundary to terrestrial freshwater flow. The result demonstrated the shape of interface to resume a depressed conical form establishing a dispersed interface near the surrounding of saline groundwater well. This localized dispersion observed deduce the presence of weak density gradients between two fluids, hence reducing convective overturn. Performance analysis were carried out to infer the interaction between density dependent seawater circulation and change in hydraulic gradient for different pumping rates. This interaction needs to be known in advance before designing saline water pumping rates, as, significant transport of nutrients and contaminants occur within the saltwater wedge.