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Coastal aquifer management under drought conditions considering aquifer spatial variability

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Abstract The problem of pumping optimization of coastal unconfined aquifers is investigated. The Sequential Quadratic Programming (SQP) optimization method is combined with a numerical flow model based on the sharp interface assumption and Ghyben-Herzberg approximation. The objective is to maximize the total pumping rate, considering aquifer spatial variability and drought conditions due to climate changes, while protecting the aquifer from seawater intrusion. Using Monte-Carlo simulation, optimal pumping rates were calculated for different statistical properties of hydraulic conductivity and for various drought recharge scenarios. The results indicate that the maximum allowed pumping rates are significantly affected by the variance and correlation length of hydraulic conductivity random fields while recharge reduction leads to a significant reduction of maximum pumping.

Key words groundwater; seawater intrusion; Monte-Carlo