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Saltwater intrusion in delta regions around the globe

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Saltwater intrusion into estuaries is a natural phenomenon which impacts freshwater availability for irrigation and human consumption. The intrusion length is dependent on the river discharge, sea level fluctuation and deltaic shape. As climate change impacts the sea level fluctuations and river discharge in many areas in the world it is expected that the intrusion length of rivers will change in the coming decades. However, global scale assessments are currently lacking, since estimates of the intrusion length are usually done for individual rivers, with complex models requiring extensive spatio-temporal data.
In this study, we provide a first global estimate of saltwater intrusion in estuaries. To do this, we first evaluate an existing predictive model for the salt water intrusion length on a local scale, before transitioning to global input data of river discharge, deltaic shapes and sea level. We assess the predictive quality of the model and its sensitivity in regard to uncertainties in (global) input data before giving an estimate of salt intrusion globally.
By using large ensemble-simulations of discharge on a global scale in a warmer climate (+2 °C), we further project impacts of climate change on the saltwater intrusion length and identify highly affected delta systems. The ensemble-simulations allow extreme events and respective estimations of frequency and magnitude. This is especially relevant since high salinity levels usually occur during droughts when river discharge is low and freshwater resources are diminished.