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Understanding coastal groundwater processes in a changing climate: A perceptual model of global-scale coastal groundwater dynamics

Daniel Kretschmer¹, Robert Reinecke¹, Nils Moosdorf², Holly Michael³, and Thorsten Wagener¹

¹University of Potsdam, Potsdam, Germany (daniel.kretschmer@uni-potsdam.de)

²Leibniz Centre for Tropical Marine Research, Bremen, Germany

³University of Delaware, Newark, USA

Groundwater is the primary drinking water supply of billions of people worldwide. While groundwater is under pressure globally due to extensive water abstractions, proximity to coasts amplifies these pressures due to potential sea water intrusion that can endanger groundwater quality. It is unclear how climate change (changing potential groundwater recharge), as well as rising sea levels, will alter coastal groundwater dynamics, i.e., submarine groundwater discharge and seawater intrusion.

Various factors impact coastal groundwater dynamics, including groundwater recharge & extraction, hydraulic gradients, permeabilities, water densities, and oceanic activity (e.g., tidal pumping and wave setup). It is currently unclear how much these different factors control submarine fluxes along global coastlines. We developed perceptual models of coastal groundwater fluxes based on a literature review of regional and global models. Here we present our perceptual model and discuss it in the context of currently available global data, uncertainties, climate change, and whether it can be implemented with an existing Open Source global groundwater modeling framework (G³M-f).