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Research Paper/

Electrical Resistivity Imaging of Seawater Intrusion into the Monterey Bay Aquifer System

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Abstract

We use electrical resistivity tomography to obtain a 6.8-km electrical resistivity image to a depth of approximately 150 m.b.s.l. along the coast of Monterey Bay. The resulting image is used to determine the subsurface distribution of saltwater- and freshwater-saturated sediments and the geologic controls on fluid distributions in the region. Data acquisition took place over two field seasons in 2011 and 2012. To maximize our ability to image both vertical and horizontal variations in the subsurface, a combination of dipole–dipole, Wenner, Wenner-gamma, and gradient measurements were made, resulting in a large final dataset of approximately 139,000 data points. The resulting resistivity section extends to a depth of 150 m.b.s.l., and is used, in conjunction with the gamma logs from four coastal monitoring wells to identify four dominant lithologic units. From these data, we are able to infer the existence of a contiguous clay layer in the southern portion of our transect, which prevents downward migration of the saltwater observed in the upper 25 m of the subsurface to the underlying freshwater aquifer. The saltwater and brackish water in the northern portion of the transect introduce the potential for seawater intrusion into the hydraulically connected freshwater aquifer to the south, not just from the ocean, but also laterally from north to south.