Aquifer intrusion monitoring applying Control Source Audio Magnetotellurics

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Tordera deltaic aquifer system is located in the Mediterranean coast of Spain. Forms a small delta of 21 square km of detrític Quaternary materials conforming a heterogenic aquifer system confined by Paleozoic granite rocks. Due to tourist and industrial development groundwater resources have incremented its demand during last fifteen years, and as a consequence salt-water wedge has progressed inland. This work presents a time-lapse hydrogeophysical experiment in order to study the dynamics of the seawater influence inland over time. The Controlled Source Audiomagnetotelluric method (CSAMT) has been proved as a sensitive method that can reflect changes in the electrical resistivity as a result of groundwater salinity changes. In addition, this method has been ideally suited for the required resolution and investigation depth for this coastal detrític environment. Preliminary geophysical and hydrogeological information evidenced the position of one of the main seawater flux flow intrusion paths on the western area of the delta, related to an ancient paleochannel. Therefore, the hydogeophysical experiment corresponds to the seawater wedge monitoring along this preferential seawater path. Same profile has been surveyed every four month form April 2004 to December 2005, and seawater bearing units have been recognized clearly getting an image of the seawater intrusion dynamics. Specifically, the analysis of the 2D model sequence reveal tendencies of the seawater wedge associated with the deep low resistivity layer, that are well correlated with the hydrologic state of the system. In addition, it has been assessed the relations between chlorine concentration, water resistivity and bulk resistivity of the April 2004 model for collocated data.