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Groundwater Flow Model of Göksu Delta Coastal Aquifer System

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Like many other coastal areas, Göksu Delta (Mersin-Silifke, Southern Turkey) is a preferred place for human settlement especially due to its productive farmlands and water resources. The water dependent ecosystem in Göksu delta hosts about 332 different plant species and 328 different bird species besides serving for human use. Göksu Delta has been declared as Special Environmental Protection Zone, Wildlife Protection Area, and RAMSAR Convention for Wetlands of International Importance area. Unfortunately, rising population, agricultural and industrial activities cause degradation of water resources both by means of quality and quantity. This problem also exists for other wetlands around the world. It is necessary to prepare water management plans by taking global warming issues into account to protect water resources for next generations. To achieve this, the most efficient tool is to come up with groundwater management strategies by constructing groundwater flow models. By this aim, groundwater modeling studies were carried out for Göksu Delta coastal aquifer system.

As a first and most important step in all groundwater modeling studies, geological and hydrogeological settings of the study area have been investigated. Göksu Delta, like many other deltaic environments, has a complex structure because it was formed with the sediments transported by Göksu River throughout the Quaternary period and shaped throughout the transgression-regression periods. Both due to this complex structure and the lack of observation wells penetrating deep enough to give an idea of the total thickness of the delta, it was impossible to reveal out the hydrogeological setting in a correct manner. Therefore, six wells were drilled to construct the conceptual hydrogeological model of Göksu Delta coastal aquifer system. On the basis of drilling studies and slug tests that were conducted along Göksu Delta, hydrostratigraphic units of the delta system have been obtained. According to the conceptual hydrogeological model of Göksu Delta coastal aquifer system, Göksu Delta is restricted by limestones from north and northwest and reaches up to 250 m in thickness in the southern part. Moreover, a combined aquifer system of confined and unconfined layers has been developed within the delta. The groundwater flow direction is towards south and southeast to the Mediterranean Sea. Data from this study were used to calibrate the flow model under steady-state and transient conditions by using MOFLOW. According to the calibrated model, alluvium aquifer is primarily recharged by limestone aquifer and partially by Göksu River. Discharge from the aquifer is generally towards the Mediterranean Sea and in part to Göksu River in the southern part of the delta. Transient calibration of the model for the year 2012 indicates that Göksu Delta groundwater system is extremely sensitive for groundwater exploitation for agricultural purposes.