Jun 26th, 2:00 PM - 3:20 PM

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Abstract: Regions of irrigated farmland in the South Platte River Basin (SPRB) in northeastern Colorado recently have experienced conditions of extremely shallow water table depths (< 1 m), which have resulted in waterlogged soils and flooded basements. Reasons for rising water table elevation likely are a combination of decreased groundwater pumping as compared to previous decades, an increase in surface water irrigation, seepage from earthen irrigation canals, and the implementation of recharge ponds. The objective of this study is to assess these individual contributions and their impact on water table elevations. In the first phase, a MODFLOW model is built for the LaSalle/Gilcrest area in the SPRB. The MODFLOW model is refined to a 3-day time step, and has 10 layers that describe the geologic layering in the aquifer, with a three-dimensional map of hydraulic conductivity constructed from lithology from over 400 borehole records. The model is calibrated for the 1950-2000 time period and then tested for the 2000-2012 using observation well data. Sensitivity analysis techniques are used to determine the contribution of sources and sinks (pumping, recharge, canal seepage, etc.). In the second phase, ANN (Artificial Neural Network) is applied to learn and predict the groundwater level in the same study region. 40 ANNs are trained for 40 monitoring wells from 1950-2000 and tested with the data of 2000-2012. The results shows ANN are faster and more accurate comparing to MODFLOW. Similarity is found in the results of sensitivity analysis of both methods.

Keywords: Groundwater, Numerical Modeling, Artificial Neural Network