

ABSTRACT

Water is the primary natural source extensively used for demands from domestic, irrigation and industrial sectors. It is available in the form of surface water and groundwater. Due to rapid urbanization, industrialization, increased population and change in living pattern leads huge amount of demand on water source. Groundwater is the supreme source of freshwater compared to surface water. Nowadays, exploitation of groundwater beyond the aquifer sustainability is becoming a serious problem which results in huge distress condition to aquifer system.

Over exploitation of groundwater from the aquifer system is results with loss of pumping from wells, compression of top layer and reduction in crop production. It is essential to know the existing condition of aquifer system through spatial and temporal variation analysis on groundwater level fluctuations and physicochemical properties. New data driven techniques like Artificial Neural Network (ANN) and ANFIS (Adaptive Neuro Fuzzy Inference System) are very effective in hydrologic analyses and useful to predict nonlinear data.

In the present study, a complete evaluation is carried out on prediction of groundwater fluctuation and quality parameters during 2002 to 2016. Suitability analysis was performed to find the existing condition of groundwater for drinking and irrigation purposes. The analysis was based on groundwater samples collection during pre and post monsoon periods in the year 2016. The results obtained from laboratory are as per IS: 10500-2012 for fourteen physicochemical parameters which shows the quality standards for irrigation and drinking purposes.

Spatial distributions of physicochemical parameters of groundwater around the study area by using Arc GIS, water quality index analysis, Chloride & Sulphate concentrations, SAR, Wilcox Classifications, Doneen's Classifications, Residual Sodium Carbonate (RSC), Piper diagram, Gibb's diagram, Chloro-Alkaline Indices (CAI) and US Salinity laboratory classifications. Regional groundwater model is also developed to find the existing condition of groundwater fluctuation and quality pattern of the study area by using Visual MODFLOW.

Optimum pumping and recharging locations are suggested based on three dimensional finite different model developed through field boundary condition, evaporation rate, recharging rate, lithology and aquifer properties. From soft computing models, WT-ANFIS is identified as the best one for the prediction of groundwater fluctuation and ANN model is identified the best for quality parameter prediction.

Keyword: Groundwater, Fluctuation, prediction, forecasting, wavelet, continuous wavelet, ANN, ANFIS.