Trends and Sustainability of Groundwater in Highly Stressed Aquifers (Proc. of Symposium JS.2 at the Joint IAHS & IAH Convention, Hyderabad, India, September 2009). IAHS Publ. 329, 2009, 57-67.

Characterization of water level response to rainfall in Narava Micro Watershed, Andhra Pradesh, India

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Abstract Groundwater response to rainfall and its intensity has been investigated, using groundwater fluctuations from five bore wells located in Narava basin. The Narava micro basin, extending over an area of 105 km^2 is covered with khondalitic suit of rocks and gneisses of Archaean age. Hourly time series data on rainfall and groundwater levels are correlated to derive the characteristic response of one over the other in time and space domains. The lag time responses are studied with specific reference to local hydrogeological conditions and regional recharge characteristics. A comparison between the well hydrograph and the associated hyetograph clearly reflects different response and lag times. The lag time, ranging from 5 to 10 days between the occurrence of rainfall events and the corresponding response in groundwater levels, is observed to have a close relationship with local hydrogeological conditions. The well hydrograph was correlated with the hyetograph at the same locations to quantify the response between rainfall and recharge. The lag time in recharge characteristics with reference to rainfall events are observed to be influenced by local hydrogeological conditions, as well as its proximity to recharge areas. A thick weathered kaolin zone is responsible for a large lag time due to its low permeability characteristics. However, further intensity of rainfall appears to have a direct relationship with raised water levels and, does not seem to have a one to one relationship with recharge response time. In general, it is observed that 10 mm of rainfall is a threshold value for triggering the groundwater recharge. Low rainfall of less than 10 mm is observed to contribute either to soil moisture or quick runoff. Sharp temperature variations in the groundwater, of around 0.05 to 0.1°C, are associated with characteristic time lags and are prominently connected to recharge phenomena. The characteristic variation in groundwater temperature *vis-à-vis* atmospheric temperature and the temperature of recharge water indicates that the change in temperature of groundwater is due to recharge water rather than the decreased atmospheric temperature. An attempt is made to establish a quantitative relationship between recharge, rainfall, temperature, pressure and recharge lag time characteristics in different geological terrains in a closed micro watershed.

Key words water level fluctuations; response lag time; Narava micro watershed; hydrograph; hyetograph