

## HYDROGEOCHEMICAL MODELLING BY FACTOR ANALYSIS IN SOUTH-WEST NEYVELI BASIN, CUDDALORE DISTRICT, TAMILNADU.

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### Abstract

Study of geochemistry of groundwater is an important aspect for its suitability for various utility / Purposes. Each groundwater system in an area has a unique chemistry due to chemical alteration of meteoric water and recharging of aquifer system which results to change in the chemical quality of groundwater. It depend on many factors like duration of rock water interaction dissolution of mineral species, sea water ingress and other anthropogenic impacts. Statistical methods has a better representation of hydro chemical data rather than near graphical plots & diagrams due to the finite number of variables, where variables are limited to conventional major ions to establish superior relationship by introducing certain procedures among various statistical techniques, factor analysis was found to be useful for understanding hydro chemical dependence and processes controlling them with the above objective study has been made to perform factor analysis for the hydro chemical data of south west Neyveli basin.

The hydro geochemical data of major and minor elements namely Ca, Mg, Na, K, HCO<sub>3</sub>, CO<sub>3</sub>, Cl<sub>2</sub>, SO<sub>4</sub>, PO<sub>4</sub>, H<sub>4</sub>SiO<sub>4</sub> & F for 30 groundwater samples for Post Monsoon season (February 2013) was collected from the above study area factor analysis (FA) was carried out by using statistical package for social sciences (SPSS) software version 17.0 statistical software. The purpose to perform factor analysis is to get an overall picture about ionic constituents where various hydro chemical facies and other variables could be compressed within three or four factors.

By factor analysis, major factors were extracted from loaded matrix and number of factors to be considered are determined by an accepted Eigen value, which is normally greater than 0.2 in the south west Neyveli Basin. Eigen values greater than 0.5 was taken as most of values were from 0.4 to 0.8. The factor score is factor analysis made by individual samples based on extracted factors has given complete model about the hydro geochemistry of groundwater in the basin. Factor analysis validates hydro geochemical facies of Post monsoon season; it exhibits NaHCO<sub>3</sub> types from the western part of cretaceous rock weather after monsoon water in & around west central part represents Na HCO<sub>3</sub> type due to chemical weathering due to process of hydrolysis in Factor-1. Na Cl facies formed to prevail in eastern part of the study area adjacent to tertiary uplands & laterites due to weathering of Feldspathic stand stone of cuddalore series. Potassium is closely correlated with CO<sub>3</sub> in Factor 2. In post monsoon season the concentration of Na + K is not high when compared to Ca & Mg ions and viz a viz in all locations as it indicates the ionic exchange Process after the monsoon season. Factor-3 represents the concentration of PO<sub>4</sub> & H<sub>4</sub>SiO<sub>4</sub> this confirms the applications of PO<sub>4</sub> for agricultural crops along the alluvial part of the study area and SiO<sub>4</sub> reduction along the contact zones of tertiary's with archeans and from mottled Cuddalore sandstone in the central part of the Basin.

*Keywords:* Factor analysis, Eigen values, chemical weathering, ionic exchange and silicate reduction.