Geophysical Research Abstracts
Vol. 12, EGU2010-10913-2, 2010
EGU General Assembly 2010

Hydrochemical Characterization of Groundwater of Jena Biodiversity Experiment Area

Sisay Girma Tessema (a,b), Daniel Mirgorodsky (a), Dirk Merten (a), Sabine Attinger (a,b), and Georg Buechel (a)

(a) Friedrich-Schiller-Universität Jena, Institute of Earth Sciences, Jena, Germany , (b) Helmholtz Center for Environmental Research, Leipzig, Germany

Groundwater samples have been collected in years 2006 to 2009 from eighteen shallow groundwater wells of Jena biodiversity experiment area for hydrochemical investigations and then for studying how it affects aboveground plant diversity. In this study only the hydrochemical characterization is considered. Hydrochemical modeling using PHREEQC 2 (Parkhurst, Appelo) was used to interpret the possible reactive precipitates (minerals) in the groundwater of the study area. Factor analyses, descriptive statistics, together with cluster analysis were used to gain an insight of groundwater hydrochemical processes and composition of the Jena biodiversity experiment area. Factor analysis was used to identify the governing underlying processes and hierarchical cluster analysis was used to detect the spatial similarity between the sampling points. The hydrochemical modeling by using PHREEQC shows that, Calcite (CaCO3), Chalcedony (SiO2), Dolomite (CaMg(CO3)2, Quartz (SiO2), Rhodochrosite (MnCO3) and siderite (FeCO3) (only in some areas) are found to be reactive minerals and responsible for change in composition. Factor analysis results indicate that there are four dominant processes or factors which account for 91% of the variance of the dataset. The result shows that 55% of the variation of the groundwater hydrochemical data is due to Na, K, Ca, Mg, Cl, Sr, SO4, and HCO3 and pH which reveal groundwater-geologic matrix interaction. Eh, Fe and Mn are the second factor which accounts for 18.45% variation of the hydrochemical data. This indicates redox and redox sensitive elements play role for the change in hydrochemical data. Si and T also contribute to the variation, but to a lesser extent. Cluster analysis result shows that the the groundwater wells in block 3, plots 2 and 13 have generally different composition than other wells.Ca-HCO3 is the dominant water type in this two sampling points (wells). Some of the elements of the groundwater also show seasonal variation. HCO3, U, and Ba are generally higher in summer season than in wet season.

Key words: Hydrochemical data, Hydrochemical modeling, Multivariate analysis, Groundwater