Distribution of soluble heavy metal concentrations in natural acid soils at depths under tropical, sub-tropical and temperate forests of China

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Climatic conditions such as temperate and rainfall, the types of soils and vegetations may affect the biogeochemical behaviour of heavy metals in natural acid forest soils, which in turn affects soil biological process. However, to date our knowledge is limited with regard to the effect of forest types and climatic conditions on the distribution of soluble heavy metals in natural acid soils. Seven acid soil layers at 0-20 cm depth and litter samples on the above ground were taken under a tropical seasonal rainforest (>N), a sub-tropical monsoon evergreen broadleaf'E, 21°56′180 years, 101°16 forest (>N) and three temperate ('E, 23°10′400 years, 112°32>180 years, N) forests in China, having different natural atmospheric N'E, 42°24′128°28 depositions, climatic conditions and tree species. These natural acid soils were used to study the effects of forest types on the concentration and translocation of both water and exchangeable heavy metals (e.g. Na, Mg, Ca, Ba, Al, Mn, Ni, Cu, Zn, Cd, Pb) in soil profiles and on other properties of soils, and their total concentrations in litters were measured by inductively coupled plasma-mass spectrometry. Contrary to the distribution of soluble Al and Pb in soil, there was a more accumulation of soluble Ca, Mg and Ba in the 0–20-cm soil layer under temperate than under tropical and sub-tropical natural broadleaf forests. In tropical, sub-tropical and temperate forests, a maximal accumulation of most soluble heavy metals occurred in the 0–2.5-cm soil layer, and it varied with forest and soil types. However, the concentration and translocation of soluble Al and Pb in acid forest soil profiles was contrary to that of most heavy metals, and was variable with climatic conditions and tree species. According to eigenvectors of a principal component analysis and correlation analysis, it is suggested that soil properties such as pH and organic C and the properties of litters can contribute to the biogeochemistry of selected heavy metals in natural acid forest soils under different climatic conditions.

Key words biogeochemistry; climatic condition; forest type; heavy metal; natural acid soil

Characteristics of natural low pH groundwater in the coastal aquifers near Beihai, China

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Groundwater with low total dissolved solids (less than 200 mg/L) occurs in the unconfined and confined aquifers near Beihai in southern Guangxi, China. Under natural conditions the groundwater ranges in pH from 3.33 to 7.0 with an average value of 5.12. The pH in the unconfined aquifer varies from 3.67 to 7.0 with an average value of 5.17 and the pH in the confined aquifer is in the range 3.33–6.97 with an average value of 5.07. The pH in the groundwater does not show significantly increasing or decreasing trends with time. Fluctuations in pH exist at some of the monitoring wells and the pH in groundwater is a bit higher in the rainy season than in the dry season. Monitoring data show that the pH in rainwater is higher than in groundwater in the unconfined aquifer, whereas the pH in the latter is a bit higher than in the confined aquifer. A slightly decreasing trend in the pH was also found from the inland area to the coastal zone. The occurrence of weakly acidic groundwater in this area is attributed to the recharge from low pH precipitation and the multi-aquifer and leaky groundwater system. Dissociation of carbonic acid may be responsible for the low pH in the groundwater.

Key words pH; acidic groundwater; coastal aquifer; Beihai, Guangxi, China

The effects of microbial activity on the geochemistry of highly acidic crater lakes: An example from Laguna Caliente, Poas volcano (Costa Rica)

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