



Characterizing hydrochemical properties of springs in Taiwan based on their geological origins

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This study was to characterize hydrochemical properties of springs based on their geological origins in Taiwan. According to springs emerging from igneous, metamorphic and sedimentary rocks, stepwise discriminant analysis (DA) was used to establish a linear classification model of springs using hydrochemical parameters. Critical factors of hydrochemical parameters, which were capable of differentiating among groups, were explored based on geological origins of springs. This research considered two datasets on hydrochemical parameters – ion concentrations and relative proportions of equivalents per liter of major ions – to perform the classification prediction of springs and made a comparison between them. The analyzed results reveal that DA using relative proportions of equivalents per liter of major ions yields a 94.7% right assignation, which is better than DA using ion concentrations, especially for springs emerging from neutral-sulfate igneous rock and sedimentary rock. A low percentage of Na⁺ equivalents is a common property of springs emerging from both acid-sulfate and neutral-sulfate igneous rock. Springs emerging from metamorphic rock show low percentages of Cl⁻ equivalents and high percentages of HCO₃⁻ equivalents, and springs emerging from sedimentary rock exhibit high Cl⁻/SO₄²⁻ ratios. The hydrochemical characteristics of springs can provide us with simple guidelines to identify their geological origins.