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Stream sediment geochemistry of lower Walawe basin and its implications

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Stream sediment geochemistry (SSG) is mainly used in mineral exploration as well as in environmental studies. Stream sediments act as a sink for elements that are derived from the drainage basins and their composition represent the geochemical characteristics of the watershed. Fluvial process, surface geochemistry, catchment basin morphology and geology contribute to the formation of stream sediment anomalies. The lower segment of the Walawe Ganga, the third largest river in Sri Lanka, drains over the boundary of the two major lithological units of the country; the Highland and the Vijayan complexes and has been recognized as a mineralized belt. Hence, the objective of this research was to evaluate the applicability of SSG as a tool to explore mineralized areas in the upstream of Walawe basin. Sediment samples (n = 24) were collected at confluence points of high order streams (above 3rd) within the basin for chemical analysis and microscopic identification. X-ray Fluorescence Spectrophotometry and Atomic Absorption Spectrometry were performed for the determination of major and trace elements. Data interpretation was based on the statistical method of Principal Component Analysis (PCA) integrated with geological background. Geochemical maps were prepared by using Arc GIS 9.3 software. Three principal components describing 77% of the total variance were extracted and the first component shows higher correlation with Ti, Fe, Mn, V and Zr while the second and third components show high correlation with Al, K and Rb and, Ca and Sr respectively. Major and trace element maps prepared for each mineral showed that the mean concentrations of Ti, Zr and Zn in stream sediments are above the upper crustal values. Distribution of factor scores of the PCA analysis showed that they fully correlate with individual element diagrams of the constituent elements of the factors. High concentrations of Ti and Zr at certain locations could be due to heavy mineral accumulations on the stream bed or higher content of the heavy minerals in the contributing bedrock. High contents of Ni in the sediments correlate with the Ni-bearing serpentinite deposits located within the basin. Hence, the resulting correlation between the stream geochemistry and contributing lithology allows us to confirm that the applicability of SSG as a robust tool to explore mineralized zones within the Walawe basin.

Keywords: Mineralization belt, stream sediments, X-Ray fluorescence spectrophotometer

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