

ABSTRACT

Stream sediments are characterized largely by their variability in composition, 'grain size', 'sorting' and colour. This variability is a function of geology, terrain and climate of the 'catchment areas sampled in the stream. Routine study of stream sediments in geochemistry is an accepted principal method of 'low-cost' reconnaissance in mineral exploration programmes.

Trace elements in the lattice of the mineral rock, account for their distribution in stream sediments. Systematic programmes of stream sediment sampling and their chemical analyses have proved useful in the preparation of geochemical maps for environmental effects and monitoring for mineralisation.

Previous reported work in Sri Lanka with stream sediments relate to its use for monitoring for uranium mineralisation. The present study relates to chemical analyses of stream sediments from both Highland group and Highland eastern Vijayan boundary, identified as potential 'target' area for 'base' metal mineralisation.

Au, Co, Cr, Cu, Fe, Mn, Mo, Ni, Pb, Th, U and Zn in more than 200 heavy mineral concentrates

from stream sediments draining the Highland group and Highland/Vijayan boundary rocks, were sampled from locations in Ratnapura, Rakwana, Pelmadulla, Balangoda, Haputale, Nuwara Eliya, Kandy, Matale, Mahiyangana, Bibile, Madagama, Nakkala, Moneragala, Buttala, Wellawaya, Tanamalwila and Angunakolapalassa.

The thesis reports use of Instrumental Neutron Activation Analysis in the determination of Uranium and Thorium. Atomic Absorption Spectrometry and Electrothermal Atomic Absorption techniques for other trace elements and gold. The effect of acid 'mixtures' for digestion of samples has been investigated. The results show HF/HNO₃/HCl mixture prove best. Studies of parameters such as sample variability, particle size, and grinding showed that a -70 mesh particle size should be used, whilst, only a marginal enhancement was obtainable on 'grinding'. Preconcentration with Methyl Isobutyl Ketone (MIBK) was employed in the analysis for gold.

The results obtained in this study indicated sporadic occurrence of gold, notably in the north of the studied area and in the Highland/Vijayan boundary. Such occurrence of gold had not been previously reported. Related work only refer to

identification of gold in western and southern parts of Sri Lanka, associated with an assemblage of heavy minerals in gem 'beds'.

Our studies also show high correlation of Co, Ni, and Mn with gold levels. Inter-element correlation of uranium and thorium was shown to result in anomalous areas for uranium, indicative of possible uranium mineralisation. The existence of a previously unknown area of 'ultramafic rocks, near Balangoda, close to the plate boundary, within the Vijayan complex, was also indicated from high levels of chromium and nickel in the stream sediments.

The thesis investigates biogeochemical studies in serpentinite locations. A serpentinite rock region delineated by photogrammetric study of aerial maps, was confirmed by analysis of the residual soil. Anomalous levels of Molybdenum were found to be related to low copper levels. These sites were located between Horana and Ratnapura.

This work indicates the use of stream sediments, as a monitor in mineral exploration. Its use in agriculture, animal and public health should prove important.