Keynote Paper 3

Stream sediment geochemistry of Sn, Au and associated elements in Southeast Asia

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This paper summarises and reviews some detailed orientation surveys, case histories and experimental studies of the behaviour of cassiterite and gold in streams in SE Asia as a basis for recommendations on the design and interpretation of exploration geochemical surveys for these elements.

In the tropical rain forests of SE Asia the frequent rain storms mobilize stream sediments and rapidly flush very fine sand, silt and clay from the stream bed in suspension. This flushing process causes fine heavy minerals such as cassiterite and gold to preferentially accumulate on the bed of the stream. The most consistent and longest geochemical dispersion trains for elements transported as heavy minerals are thus found in the very fine sand fractions (< 100 μm). Use of coarser fractions, collected at heavy mineral trap sites, gives more erratic geochemical anomalies that are often displaced downstream away from their source. During interpretation these displaced anomalies can be recognised by: (i) ratioing Au or Sn values to either abundance of a ubiquitous heavy mineral (e.g., magnetite) or the transport equivalent size of the stream sediment; (ii) by absence of mobile pathfinder elements (e.g., As and base metals); or (iii) from field observations of stream width, velocity, bed roughness and gradient that permit favourable sites for heavy mineral accumulation to be identified.

Where removal of the rain forest and conversion of land to agricultural production greatly increases rates of soil erosion, the accumulations of heavy minerals can be diluted to the extent that Au anomalies may go undetected. Possible answers to this problem are: (i) use of more sensitive analytical procedures; (ii) elimination of the silt-clay fraction and analysis of fine sand (53–100 μm) fraction; or (iii) use of heavy mineral concentrates. Once soil erosion is minimized by re-establishing a cover of ground vegetation, as in mature rubber plantations, fine sediments are again flushed from the stream bed and geochemical anomalies return to more natural conditions with accumulations of heavy minerals on the stream bed.

Warta Geologi (Newsletter of the Geological Society of Malaysia), Vol. 22, No. 3, May-June 1996