

Introduction

Apart from zonation patterns, the use of alteration geochemistry as a vector in exploration depends on the identification of an element (or set of elements) or isotope which distinguishes between concentration changes due to the environment of formation of the deposit and primary concentrations in the host rocks. It also depends on the assumption that alteration geochemistry varies systematically around an ore body.

Farrell and Holland (1983) suggested that both the Sr isotope ratio and Sr concentrations varied systematically with distance around the Japanese Fukazawa volcanogenic massive sulphide deposit. The pattern found in their limited data set could be readily related to alteration due to seawater-rock reaction during the formation of the deposit. This pattern suggested that;

- strontium isotope ratios decreased progressively over 5 kilometres away from the deposit
- strontium isotopes, which were directly related to the fluid present during ore formation, might be useful as a vector for exploration.

As part of an analysis of the Hellyer district in relation to the applications of geochemistry during a deep exploration programme (Henley, 1990), it was suggested that this isotope vectoring method was worth a limited investigation. This report describes the results of a pilot study and their interpretation.

Sampling and Analysis

Recent detailed alteration studies of the altered footwall andesites and dacites at Hellyer (Jack, 1989, Gemmell, 1989, 1990) provided the essential springboard to this study as well as the opportunity to cross check strontium isotope systematics for the deposit with the results of other techniques. Samples were taken from a drill hole cross section previously described by Jack (1989) and Gemmell (1990) together with a small number of additional samples suggested by Gemmell.

Sample locations are shown in plan and cross section in Figures 1 and 2.

Whole rock Sr isotope data were obtained under contract from DSIR Physical Sciences in New Zealand together with Sr and Rb concentration data obtained by XRF analysis at the Victoria University of Wellington. These data are provided in Table 1 together with whole rock geochemical data.