

recognize unique isotopic signatures which may confirm the presence of mineralisation in the district but which have no vector properties (Miscellaneous CSIRO Reports). I have not examined recently acquired ^{18}O data but I understand that neither this nor some of the trace element methods attempted to date have proved very useful; the haloes apparently are at mine scale only. Bruce Gemmell kindly provided ^{18}O data received to date and this shows some depletion by about 2 permil in the alteration stringer zone but otherwise no strong vector pattern at the larger scale. This is perhaps paradoxical in view of the extent of mappable alteration in the district although the greater abundance of oxygen relative to other elements used in isotope analysis leads to a smoothing out of alteration effects. In part this may relate to the common choice of East-West cross-sections to represent the ore environment when the trend of the district, including the Hellyer ore body, is structurally controlled (see above) and more south-south west oriented.

One technique that has not been tested is the use of whole rock strontium isotope ratios and strontium concentrations both of which were shown in a single Kuroko study (Farrell and Holland, 1983) to have vector properties at the scale of 1 km. Figure 4 shows their isotope data which suggested that Sr itself was depleted in a similar pattern by a factor of about 10 to 20 - their data set contains one outlier Sr concentration value which suggests that Sr on its own may be difficult to use.

The systematics behind this behaviour relate to the loss of Sr largely from primary sites in silicates as alteration proceeds during through-flow of high temperature seawater, itself modified by rock alteration deeper in the system. Strontium may be partially retained in the alteration system by coprecipitation with calcium and barium minerals and, to a lesser extent adsorbed onto alteration clays. These reactions lead to a resetting of the whole rock Sr-isotope ratio to values between that of the modified connecting sea-water and the primary whole rock ratio. In this way Sr and its isotopes provide a monitor of the cumulative water-rock ratio which is less sensitive to temperature than parallel oxygen isotope ratio variations.

Jack (1989) has tabulated a wide range of geochemical data for hanging wall and footwall rocks at Hellyer over an east west sample interval of about 1500 metres. His data analysis focussed on variation of the major elements and alteration indices but provided little discussion of trace element patterns. Strontium data are shown in Figure 5. Strontium depletion in the stringer zone by a factor of at least five with respect to less altered