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systematics. Models such as this implicitly assume a homogenous porous medium as host to the convection system. Field experience of active terrestrial hydrothermal systems however demonstrates that the permeability characteristics of the host are bimodal reflecting the intrinsic porosity of the host lithologies and the higher permeability fractures which dominate flow in the system particularly during any transient behaviour such as might be induced by fault movement.

Henley(1990) has suggested that the distribution of VMS deposits in the Hellyer district may be controlled by a transcurrent fault array and associated basement-linked faults which may be manifest in the volcanic cover sequence as pseudo-growth faults. This has two important implications; firstly the occurrence of transient tectonic events impacting on flow and secondly the provision of a connection to deeper fluid reservoirs. In turn this provides an alternative explanation for the isotopic data and for the transient formation of individual VMS deposits. The strontium isotope(and lead isotope data, Gemmell, 1990), for example, shows that the Hellyer deposit is characterised by relatively heavy Sr signature compared to host rock and ambient Cambrian seawater, whereas the bulk of the alteration is characterised by signatures reflecting progressive exchange between a seawater dominated fluid and volcanic lithologies. This is illustrated by Figure 8 which also highlights the various fluid reservoirs which may contribute to VMS formation. Note that the bulk of the alteration may be ascribed to relatively shallow seawater circulation whereas VMS formation relates to transient fault controlled fluid flow from a deeper more exchanged reservoir.

Further investigations

The data set for the pilot project described in this report is small. Follow up studies have been instituted as follows,

- Downhole variation of Rb and Sr concentrations in MAC 11 and MAC 19
- Rb, Sr analysis and whole rock analysis of sample suites from the Mount Charter prospect - note that only one hole intersects the possible interpreted ore horizon footwall to date
- Recompilation of Hellyer whole rock geochemical data(from Jack, 1989) and analysis of Rb, Sr alteration patterns.