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METALLOGENESIS *of intrusive rocks of Victoria*

New datasets target gold and base-metal mineralisation

David Champion

Geoscience Australia has been compiling and synthesising datasets of various metallogenic parameters for intrusive and country rock units of the Tasmanides (or Tasman Orogenic Zone—the younger eastern part of Australia, which is joined to the continent's Proterozoic and older core along the Tasman Line) of eastern Australia.

The work is part of the Felsic Igneous Rocks of Australia project to assist the exploration industry in the search for intrusion-related mineralisation systems (see, for example, Champion & Blevin 2005). As reported in *AusGeo News 74* and *79*, this project is being undertaken as regional modules. Datasets for north Queensland are currently being prepared for release, and datasets for Tasmania are now completed and released as a joint Mineral Resources Tasmania–Geoscience Australia product.

In collaboration with Geoscience Victoria, the project is now extending into the Tasman Fold Belt of Victoria and is currently synthesising metallogenic data for that state. Products of this study, which will include downloadable data tables for Victorian rock units (linked to Geoscience Australia's National Map digital geology) will be released in early 2007.

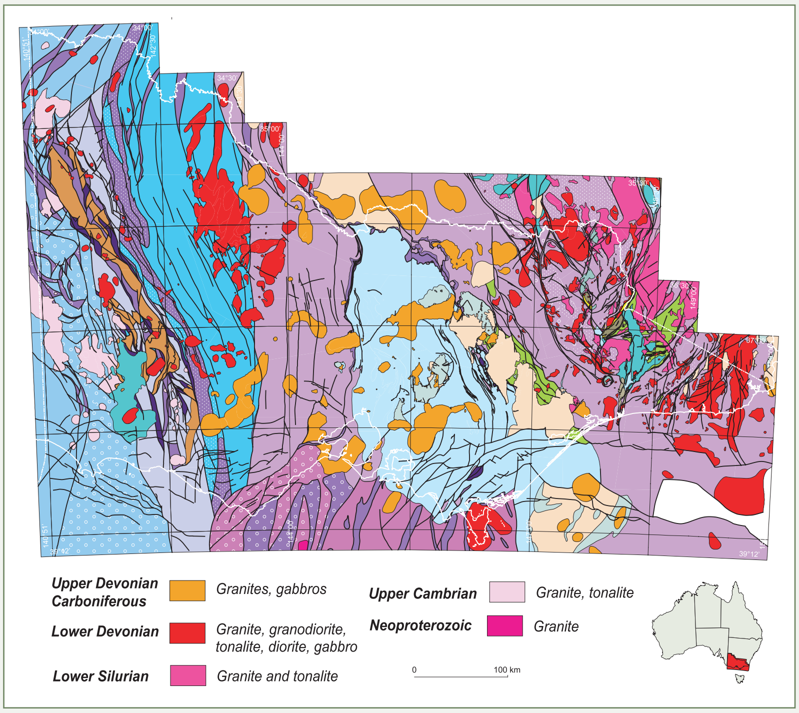

Figure 1. Simplified pre-Permian geology of Victoria. Geology map courtesy of Geoscience Victoria.

Preliminary implications for intrusion-related mineralisation

Granites comprise a significant part of the Lachlan Fold Belt in Victoria (up to 20% by surface area; figure 1). They are dominantly Silurian to Devonian, ranging from about 430 Ma to 350 Ma. Mineralisation associated with these granites includes a range of commodities, including tungsten, tin, molybdenum, copper and gold.

One of the project's primary aims is the compilation and interpretation of chemical-based metallogenic parameters for the granites, using the characteristics identified by Blevin and other workers (for example, Blevin 2004; see summary in Champion & Blevin 2005). The simplest first-pass regional approach has been to use the granite data to calculate parameters of oxidation state and degree of evolution. These parameters can then be used as defined by Blevin (2004)

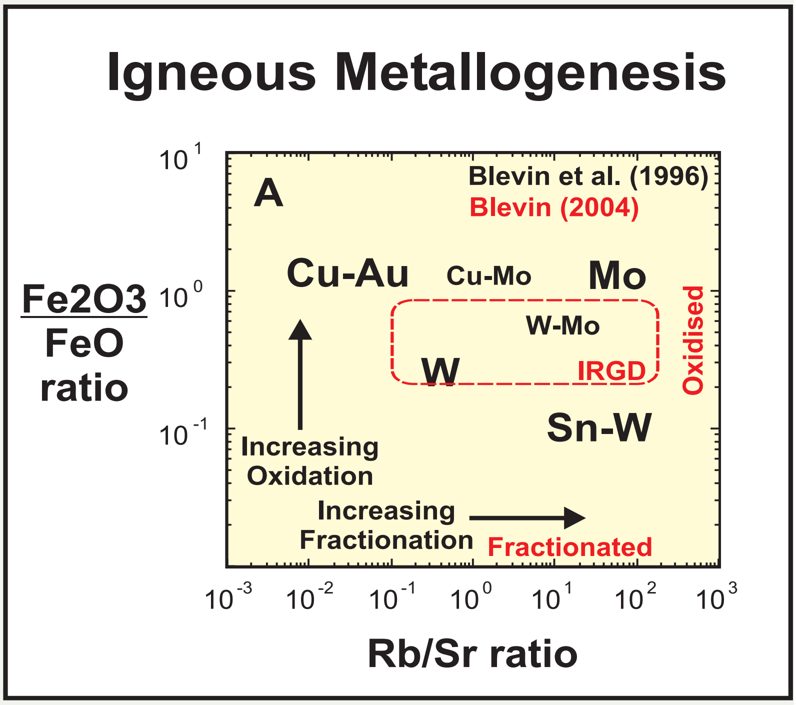

Figure 2. A. Relationship between the oxidation state (calculated using total rock Fe_2O_3/FeO ratio), and the degree of compositional evolution (calculated using total rock Rb/Sr ratio) of granites, and related metallogenic associations, as documented by Blevin et al (1996) and Blevin (2004).

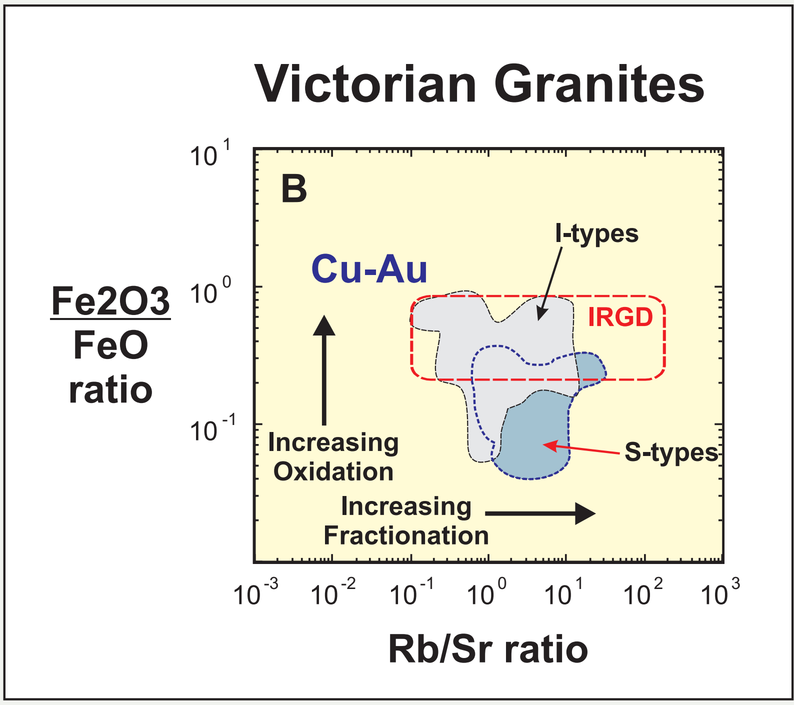

Figure 2. B. Oxidation – compositional evolution plot, contoured using available geochemical data for Victorian granites. The bulk of the geochemical data for the I-type granites (grey field) strongly overlaps with the suggested field (Blevin 2004) for intrusion-related gold.

to highlight mineral potential (figure 2).

Use of this technique is relevant for regional application to new exploration models, and particularly for intrusion-related gold systems (Thompson et al 1999, Blevin 2005), given that Bierlein & McKnight (2005) have recently documented several examples of intrusion-related gold mineralisation in western Victoria, and raised the possibility of additional, as yet undiscovered, mineralisation of similar styles elsewhere in the state.

Geoscience Australia has access to public and confidential geochemical data for over 200 Victorian granite units. A preliminary classification of this geochemical data, plotted (contoured) on the oxidation–fractionation diagram of Blevin (2004; figure 2), illustrates a number of points.

First, it is evident that the granites collectively span a range of compositions, encompassing various metallogenic associations, consistent with known mineral occurrences for the state. Second, it is apparent that only a few of the granites (for which we have data) have characteristics considered prospective for the granite-related porphyry copper–gold class of deposits (such as those associated with Ordovician magmatism in New South Wales, for example Cadia). Third, it is clear that the majority of Victorian I-type granites have chemical characteristics similar to those of granites known to be associated with intrusion-related gold mineralisation (figure 2). This does not necessarily indicate these granites will have associated gold mineralisation, but does show that much of Victoria has the potential for such mineralisation, consistent with the suggestions of Bierlein & McKnight (2005).

General models for intrusion-related gold systems also highlight the importance of continental sedimentary assemblages as host rocks, especially those with carbonaceous or carbonate-bearing units (see the compilation table in *AusGeo News 79*). These and other parameters are currently being compiled for all pre-Mesozoic Victorian country rock units. All synthesised data will be linked to Geoscience Australia's National Map digital geology. This linkage will allow integrated use of the country rock and granite data in a spatial environment, and will help to refine area selection for intrusion-related gold and other commodities in Victoria.

More information

phone Dave Champion on +61 2 6249 9215
email david.champion@ga.gov.au

Related websites/articles

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AusGeo News 79
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Geoscience Australia's Felsic Igneous Rocks of Australia project
link

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