Tectonothermal evolution, metasomatism and mineralisation, Eastern Fold Belt, Mt Isa Inlier

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Evolution of the Snake Creek Anticline

The Snake Creek Anticline, although poorly mineralised, is a key area in understanding the tectonothermal and metasomatic evolution of the Eastern Fold Belt. A SHRIMP zircon age of 1686 Ma for a tonalite, which shows mixing relationships with dolerite and gabbro, indicates that the Llewellyn Creek Formation which they intrude is older than other units of the Soldiers Cap Group (1654-1677 Ma; Page and Sun, 1998). The first major orogenic episode (ONS) following deposition of the Soldiers Cap Group produced a number of events, including D1 (E-W folds with shallowly dipping axial plane foliation) and D2 (steep EW folds and foliations) of Rubenach and Lewthwaite (2002). This was followed by E-W compression (OEW) that produced at least two steep events (D3, D5) and a shallowly-dipping event, D4 (Rubenach and Lewthwaite, 2002). The peak of metamorphism occurred late D3 (D2 of previous authors) or syn-D4, around 1595 Ma.

The timing of metamorphic and metasomatic minerals is summarized in Figure 1, while Figure 2 is a revised version of the P-T-t path for the Soldiers Cap Group, Snake Creek Anticline. A significant change from earlier work (e.g., Rubenach and Lewthwaite, 2002) concerns the timing of the main albitisation event in the Soldiers Cap Group as syn-D1, not syn-D3. Critical observations included finding albitites parallel to the axial planes of F1 folds, and albite inclusions in early cordierite and andalusite. The extensive albitisation at the Osborne Mine is

![Figure 1. Timing of growth, Soldiers Cap Group, Snake Creek Anticline.](image)

![Figure 2. P-T-t path, Snake Creek Anticline.](image)
also prior to the metamorphic peak, probably also syn-D1. Significant enrichment of chlorine in biotite is probably associated with albitisation, but the precise relationship is complex (Rubenach, in press).

To the west of the Snake Creek Anticline the stratigraphically older Corella beds have been juxtaposed against the Soldiers Cap Group by the Cloncurry Fault. The fault is probably an early structure, but lower metamorphic grades in the Corella beds indicate late additional movement on the fault subsequent to the metamorphic peak. Numerous intrusions of felsic granite (generally albitised) and dolerites occurred along the fault, and significant brecciation and Na-Ca alteration occurred synchronously with the intrusions (probably late in the history, around 1520-30 Ma). Figure 3 summarizes the peak assemblages and later metasomatic assemblages in the Corella beds.

**Cu-Au mineralisation in relation to the metasomatic evolution**

Figure 4 summarizes the magmatic, thermal, metasomatic and mineralisation history of the Eastern Fold-Belt. Although most of the Cu-Au deposits overlap with the emplacement of the Williams/Naraku batholiths and related brecciation and Na-Ca alteration, Osborne is a significant exception. The extensive albitisation, biotite alteration and localized Na-Ca alteration at Osborne are prior to the metamorphic peak, and are not obviously related to igneous intrusions.
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References


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