

The Relationship between Gabbros & I-type Granites: An example from the Lachlan Fold Belt, SE Australia

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The Lachlan Fold Belt (LFB) hosts one of the best-exposed granite terranes in the world, providing an unparalleled opportunity to study granitoid petrogenesis. Most previous studies have focused upon the more typical magmas of intermediate to felsic compositions, with the aim of modelling the nature of the mafic end-members involved in granite genesis. Here we investigate the rare but important occurrences of mafic gabbro/diorite rocks associated with I-type granitoids, in the LFB, in order to constrain the petrogenesis of these mafic magmas and any spatially and temporally associated granitoids. We examine the implications these results may have on existing models and our understanding of crust-mantle interactions in south-eastern Australia.

We have chosen a group of intrusives from the Bonang Suite, located in eastern Victoria. The suite consists of a number of I-, S- and A-type granites and two gabbroic complexes. The Arte River Gabbroic Complex is located within the core of the Kuark Metamorphic Belt, spatially associated with a number of I- and rare A-type granites and the Scrubby Flat Gabbroic intrusion located to the north. The intrusion of these gabbros, is thought to have provided the heat source that drove metamorphism in the area [1].

Geochemical analyses reveal two distinct magma types in the Arte River Gabbro an alkali component, and a tholeiitic component. The complex is associated with a small tonalite/diorite lens with complex but sharp boundaries between the two. Sr-Nd isotope studies reveal two arrays, one between this lens and the alkali component and the other between the tholeiitic and the Scrubby Flat Gabbro located to the north-west of the main Arte River gabbro intrusion. Rb/Sr dating studies of biotite in both of the gabbros and diorite reveal cooling ages of 378 ± 4 Ma, while U-Pb geochronology of sphene from the diorite lens gives an age estimate of 410 ± 4 Ma.

Clearly the relationship between the differing gabbros and that of the associated diorite/tonalite lens is complex and further geochronological and isotopic studies will be important in constraining the petrogenesis of these magmas, any implications they have for the evolution of surrounding granitoids, and on a larger scale the relationship between gabbros and granitoids in the LFB.

References

[1] Hendrickx, M.A., William, C.E., Magart, A.P.M., Rooney, S., Vandenberg, A.H.M., Oranskaia, A. & White, A.J.R. (1996) *GSV VIMP Report 26*