

Origin of coeval TTG, I- and S-type granites during crustal extension

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Three granitoid types comprise the Famatinian belt along the SW margin of Gondwana: (1) small bodies of high-Na tonalite-trondhjemite-granodiorite (TTG) occurring only in the foreland region, (2) major I-type metaluminous gabbro to monzogranite, and (3) S-type granite, mostly cordierite-bearing, both as small bodies in the roof of the I-type plutons and large batholithic masses. New SHRIMP U-Pb geochronological data show that all three types were emplaced during the same Early to Middle Ordovician magmatic cycle (ca. 465-490 Ma). For the S-type granites, initial Sr and Nd isotope compositions and inherited zircon cores, suggest anatexis of upper crustal metasediments and/or higher-grade gneisses of the supracrustal envelope. Systematic changes across the belt in the REE patterns of the I- and TTG granitoids suggest variable residual mineralogy. Given a mafic common source near the base of the crust, these REE patterns can be explained by melting at different pressures, with garnet as residual phase for the TTG. A relatively thin crust is estimated from melting pressures for the I-type granitoids, consistent with the high-T/ low P conditions in metamorphic rocks of the envelope. Magmatism is thought to relate to opening of a Tremadocian-Llanvirnian back-arc basin. The extensional rather than collisional environment inferred for the generation of the Famatinian granitoids may relate to the final gravitational collapse of the Cambrian Pampean orogen, enhanced by trench roll-back during the Early Ordovician convergence.