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Inequivocal cotectic evolution in calc-alkaline tonalite-granodiorite batholiths, Velasco Cambro-Ordovician batholith, Famatina belt, Argentina

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Calc-alkaline batholiths that form upper crustal sections and originate principally at active continental margins, have a characteristically hybrid geochemical signature. Mantle (fresh) and crustal (old) components are identified by isotope geochemistry. However, the way by which this hybrid signature is acquired remains largely debated. The use of major-element relations properly projected onto phase diagrams may help to discern between primary (exclusively magmatic) from secondary (acquired by non-magmatic processes) geochemical trends. Tonalites and granodiorites of the Famatina (Cambro-Ordovician) magmatic belt from South America follow a regular geochemical trend comparable to a liquid line of descent traced from experimental liquid compositions in calc-alkaline systems. The identification of these cotectic trends is crucial to interpret correctly the meaning of geochemical variation trends in terms of phase equilibria. Because these cotectic trends are changing with intensive variables as pressure and oxygen fugacity, the use of adequate projections and the available experimental data may be used to constraint pressure of magma generation and(/or fractionation. In the case of the Palanche series, shown here, we conclude that rocks correspond to a low-pressure (P<400 MPa) fractionation trend formed by fractionation of hornblende, pyroxene, plagioclase feldspar and magnetite at high oxygen fugacity conditions at values of two log units above the FMQ (fayalite-magnetite-quartz) buffer. It is concluded that assimilation and/or magma mixing have not play a relevant role in producing the observed geochemical variation trends. However, other plutons form the same batholith show clearly a non-cotectic evolution resulting from interaction with pelitic migmatites and upper crust anatectic melts. These relations are fundamental to assess the role of lithosphere processes in the generation of new crust at expenses of batholiths formed at active continental margins during the Phanerozoic.