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THE VINQUIS GRANITIC COMPLEX: AN EXAMPLE OF CARBONIFEROUS F-RICH PERALUMINOUS A-TYPE GRANITE IN THE PRE-ANDEAN SW GONDWANA MARGIN, SIERRAS PAMPEANAS, ARGENTINA

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A-type granites are rocks with distinct mineralogical and geochemical characteristics. However, the genesis of A-type granites has been controversial, leading to much discussion over the past 30 years. In general, petrogenetic models for A-type granites commonly invoke igneous source rocks and petrogenesis of peraluminous A-type granites is especially poorly known. In this article we report in situ U-Pb and Hf isotope data from zircons, whole-rock Sm-Nd, and whole-chemistry data from a peraluminous A-type granite (named here as Vinquis granitic complex, VGC), in order to evaluate their origin. The VGC, Sierras Pampeanas, Argentina, is formed by unusual F-rich peraluminous A-type monzogranites. A precise LA-MC-ICP-MS U-Pb zircon crystallization age of 353 ± 9 indicates that the VGC was emplaced during Early Carboniferous time, along with an extensive metaluminous A-type magmatism previously reported by Dahlquist et al. (2010) and Alasino et al. (2012).

The VGC displays high and restricted SiO_2 contents between 71.6% and 74.8 wt.%. On both [FeO^t/(FeO^t+MgO)] vs. SiO_2 and [(Na_2O+K_2O)−CaO] vs. SiO_2 diagrams (Frost et al. 2001) the samples plot in the ferroan and alkali-calcic to calc-alkalic fields with Fe* = [(FeO^t/(FeO^t+MgO)] = 0.79 % and [(Na_2O+K_2O)−CaO]= 7.38% (average values, n = 6), thus showing an metaluminous A-type granitoid signature. Relatively high concentrations of the some High Field Strength Element = HFSE (average contens in ppm, Nb = 19, Th = 15, and Ga = 21) and moderately fractionated to flat REE patterns [$(La/Yb)_N$ = 11.42] showing significant negative Eu anomalies (Eu/Eu* = 0.41) are also typical features of metaluminous A-type granites. A high F content in the magma is inferred from biotite compositions with high F concentration (average F = 1.17–1.44 wt%), a distinctive characteristics of metaluminous A-type granites. Conversely, the VGC is peraluminous with aluminium saturation index ranging from 1.11 to 1.22 and distinctive high P_2O_5 content (average 0.32 wt%). In addition, the VGC has some minor geochemical differences from Carboniferous metaluminous A-type granites of the Sierras Pampeanas (Dahlquist et al. 2010). The latter have a strong ferroan signature (Fe* = 0.94), lower P_2O_5 content (0.08 wt%), higher HFSE concentrations, flat REE pattern ([$(La/Yb)_N$ = 6.47], and pronounced negative Eu-anomalies (0.20). The Rb/Ba and Rb/Sr ratios reported for the metaluminous A-type granites (Dahlquist et al. 2010) are higher than in the VGC.

The peraluminous composition of the VGC and Hf isotope data from magmatic zircon and granite whole-rock Sm-Nd (average ϵ_{Hf353} = -6.32, e_{Nd353} = -7.1), together with abundant inherited Ordovician and Cambrian zircon (n =10), strongly suggest a dominant metasedimentary source. Therefore, the particular A-type geochemical signature of the VGC can be attributed to a metasedimentary source as suggested by Anderson and Bender (1989) for the anorogenic peraluminous granites of the USA.

The data indicate that VGC was emplaced during the Carboniferous magmatic event that included intraplate- and arc-type magmatism in SW Gondwana (Dahlquist, this volume). We conclude that the VGC was emplaced in an intraplate setting and that this magmatism included both metaluminous and peraluminous A-type granites.

Anderson & Bender, 1989. Lithos 23, 19-52.
Alasino et al., 2012. Gondwana Research 22, 992-1008.
Dahlquist et al., 2010. Lithos 115, 65-81.
Frost et al., 2001. Journal of Petrology 42, 2033-2040.