

THE EVOLUTION OF THE LOWER PALEOZOIC TRONDHJEMITE/GRANITE SUITES SW OF CACHI, NW-ARGENTINA

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Abstract

There are two similar, but very well distinguishable granitoid suites in the SW of Cachi. Large trondhjemitic to tonalitic, plagioclase-dominated intrusives on the one hand, tourmaline-bearing muscovite-microcline-granites on the other hand. In spite of different evolution, both are related to a Lower Paleozoic volcanic arc magmatism.

Key Words: NW-Argentina, Granitoids, Volcanic Arc Magmatism

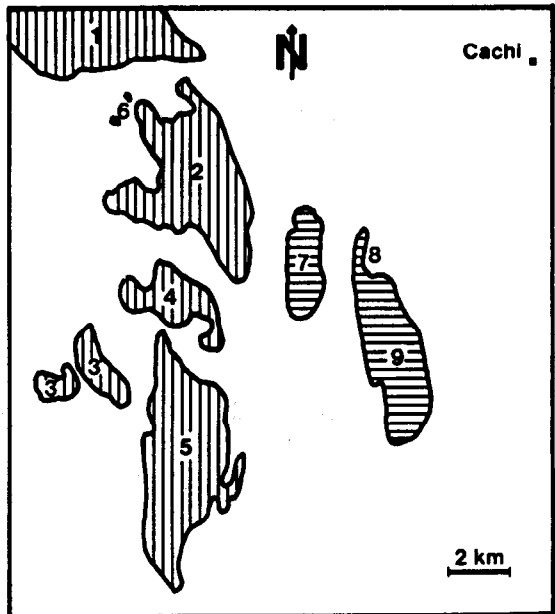
Fig. 1: Sketch Map of the Granitoids SW of Cachi

A - Trondhjemites to Tonalites

- 1 - Cachi
- 2 - El Alto
- 3 - Incauca
- 4 - El Huaco
- 5 - El Vallecito
- 6 - NW of El Alto

B - Granites

- 7 - Las Cabritas
- 8 - La Paya North
- 9 - La Paya



Resumen

Al suroeste de Cachi, dos unidades de granitoides se distinguen claramente. Una está compuesta de grandes intrusivos trondhjemíticos a tonalíticos, ricos en plagioclasa, la otra de granitos de moscovita y microclina, conteniendo turmalina. A pesar de su evolución diferente, las dos unidades están igualmente relacionadas a magmatismo de arco volcánico del Paleozoico inferior.

Introduction

The granitoid stocks SW of Cachi (Fig. 1) intruded into the clastic sedimentary rocks of the Puncoviscana Formation and caused a medium- to high-grade contact metamorphism.

New isotopic age determinations yielded Cambrian maximum data, even probably Ordovician intrusion ages (LORK ET AL. [1989]).

Both mineralogical and geochemical aspects divide the plutonites into two groups (figures 2 and 3) - A: Trondhjemites to tonalites, including the granitoids of Cachi, El Alto, El Hueco, El Vallecito, Incauca, NW of El Alto; - B: La Paya, La Paya North, Las Cabritas. For further discussion other NW-Argentinian granitoids with different characteristics were opposed as group C, including samples from Angostura, Brealito, Cañaní, Golomé, Santa Rosa de Tastil and Tacuill.

Mineralogical composition

Granitoids of typus "A" are mainly composed of plagioclase (50-70%), quartz (20-30%) and biotite (4-8%). They have a homogen-hypidiomorphic texture with grain sizes up to 6 mm.

In minor amounts idiomorphic "primary" epidote (see TURNER [1960]), muscovite, microcline (up to 1.7%), chlorite, sillimanite and dichroite occur, besides zircon, monazite, hematite, rutile and opaques.

Incauca samples show "cumulus"-like aggregations of idiomorphic plagioclase and an "intercumulus" of hypidiomorphic to idiomorphic quartz and diopside. The undeformed idiomorphic fresh plagioclases often contain old idiomorphic, strongly sericitized cores with high (up to 60%) anorthite contents.

The mineralogical composition of the trondhjemitic to tonalitic suite keeps relatively constant, standard deviations range very low.

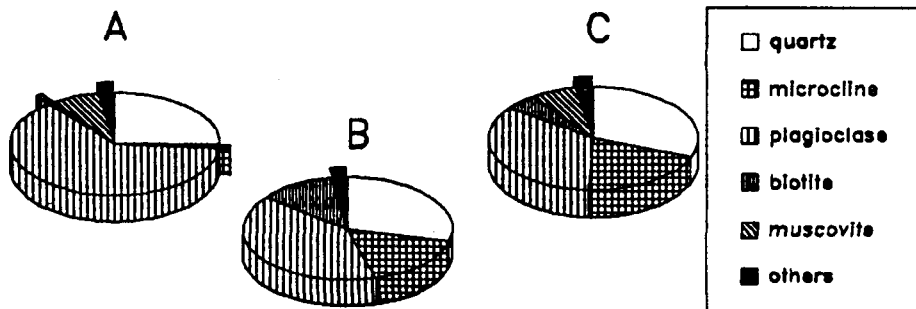


Fig. 2: Modal composition of the Granitoids SW of Cachi - A: Trondhjemites and tonalites (average of 85 modal analyses); - B: Granites (average of 28 modal analyses); C: Granitoid samples of other NW-Argentinian localities; for more specific information see figure 3;

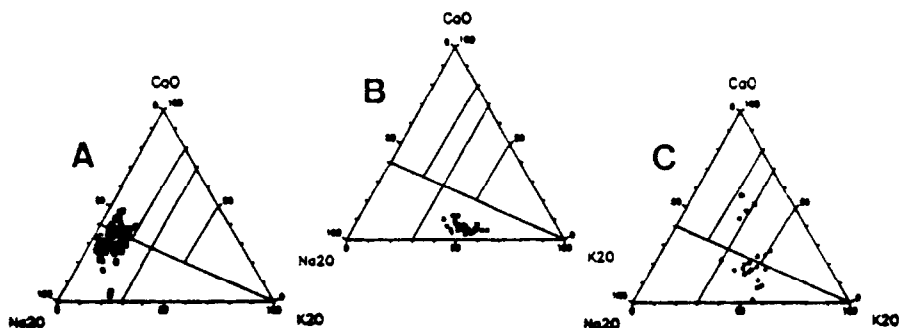


Fig. 3: Na₂O-K₂O-CaO-Diagram - A: Trondhjemites to tonalites of Cachi, El Alto, El Huelco, El Vallecito, Incauca and NW of El Alto; B: Granites of La Paya, La Paya North and Las Cabritas; C: Other NW-Argentinian granitoids as Angostura, Brealito, Cañani, Golomé, Santa Rosa de Tastil and Tacuil;

The granites of group "B" consist of microcline (10–35%), plagioclase (25–50%), quartz (20–35%), muscovite (up to 15%) and turmaline (0.1–1.5%). In variable amounts biotite, dichroite, garnet and sillimanite appear. The texture is dominated by mostly sheared porphyric microclines (up to 10 mm) and, due to strong deformation mechanisms, distinct mica bands.

Geochemistry

The trondhjemites/tonalites as well as the granites show very high silica (74–75%) and alumina (14%) percentages. Besides this, typical group "A" rocks generally contain Na₂O (5–6%), MgO (up to 1.2%), P₂O₅ (0.085%), very low K₂O (up to 1%, mostly below 0.6%), CaO (3–4%), MnO (0.04%), TiO₂ (0.15%) and Fe₂O₃ (1%).

High ratios of Sr (about 350 ppm) and low amounts of Y (up to 12 ppm), Rb (up to 50 ppm), Nb (up to 10 ppm) are the main trace element characteristics. REE determinations show VAG-typical smooth patterns (figure 5) with low ratios and imperceptible to slightly negative Eu-anomalies.

Granites of Group "B" show the following average major element contents: SiO₂ (75%), Al₂O₃ (13–14.3%), Na₂O (3.8), MgO (0.3), P₂O₅ (0.25%), K₂O (4.5–4.8%), low CaO (0.5–0.8), TiO₂ (0.07%), MnO (0.05) and Fe₂O₃ (1%).

They have low Sr (60–85 ppm), but relatively high contents of Y (up to 25) and Rb (200–300 ppm). Due to strong contamination they show a very variable trace element distribution.

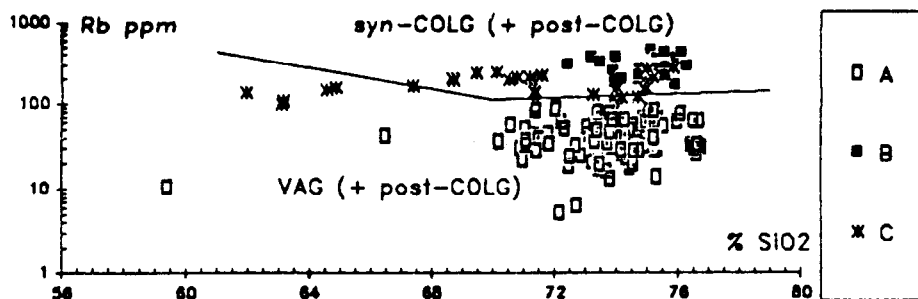


Fig. 4 - SiO₂-Rb-variation-diagram, showing the fields of syncollision-granites and volcanic arc granites (dividing line determined by PEARCE ET AL. [1984]); Group A: Trondhjemites to tonalites; Group B: Granites; Group C: Other NW-Argentinian granitoids for reference

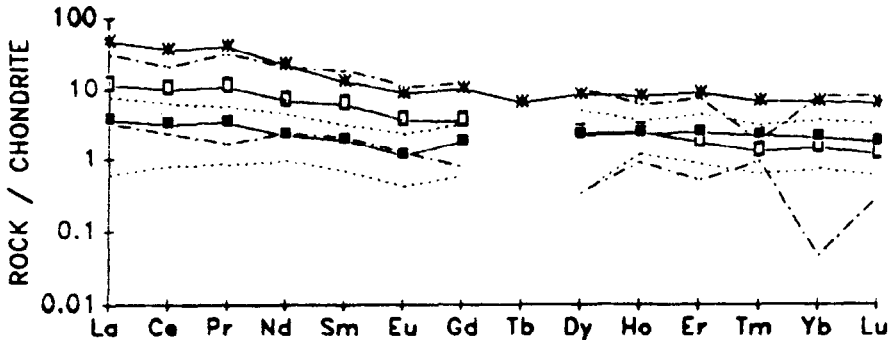


Fig. 6: REE distribution patterns of granitoids SW of Cachi - Open squares: trondhjemites and tonalites of Cachi, El Alto, El Huaco, El Valleto, Incauca and NW of El Alto (average of 34 samples); closed squares: granites of La Paya, La Paya North and Las Cabritas (average of 9 samples); stars: granodiorite of Cañani (one sample for reference)

REE geochemistry yields the same pattern trends as the "A" group with slightly negative Eu-anomalies. Compared to the trondhjemites and tonalites, the contents of LREE are smaller (about the half), but HREE are relatively enriched and reach about the same values as "A".

Conclusions

The granitoids of the two groups on the one hand show many similar attributes, especially in REE geochemistry, on the other hand they differ totally in mineral content due to significant geochemical differences mainly in K_2O , CaO , Rb and Sr values. The two groups do not derive from each other.

Several hints seem to indicate group "A" rocks as a product of partially to totally anatexis of older (Cambrian) VAG-protoliths, presumably of old pyroxene-plagioclase cumulates.

Group "B" rocks can be interpreted as remelted differentiates of the earlier VAG-suite(s). Due to strong contamination and deformation, at least a lot of hydrothermal and metasomatic activities, they lost their original aspect and got syn-collision characteristics.

Acknowledgements

Special thanks to A. Lork and C. Schmitt-Riegraf (Münster), to K. Weber-Diefenbach, S. Friedrich, K. Paschert and E. Böck (München).

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