Jurassic granites in the northern portion of the Somoncurá Massif, Río Negro, Argentina

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RESUMEN

Recientes trabajos de mapeo y muestreo llevados a cabo en el área de El Cuy, provincia de Río Negro han permitido establecer que los granitos allí aflorantes son similares a las otras unidades Jurásicas de Patagonia. Las mismas podrían estar relacionadas con el inicio de la ruptura de Gondwana aunque para aseverar esto último se requiere contar con estudios isotópicos de otros sectores del Macizo de Somoncurá.

Las determinaciones realizadas indican que estos cuerpos se intruyeron en el Jurásico temprano a los 192 Ma. Los bajos valores de e Nd y valores iniciales $^{87}Sr/^{86}Sr$ moderados sugieren que ha ocurrido algún tipo de interacción con la corteza Precámbrica.

INTRODUCTION

The Somoncurá Massif Magmatic Belt occurs in the Somoncurá region of Río Negro Province, Argentina. This granitic province is exposed in a northwestern-southeastern trending belt, 450 km long and 200 km wide, with outcrops between 39° 30 to 41° 30' S and 65° 00 to 70° 00' W (Fig. 1). The Magmatic Belt is composed of Cambrian-Ordovician low-grade metamorphic rocks (Cushamen, Coli Niyeu and Nahuel Niyeu Formations), Silurian-Devonian migmatites, and foliated granites (Mamil Choique Formation, Yaminue Complex and Punta Sierra Granite). These older units were intruded by Permo-Triassic Gondwana intrusive complexes of the La Esperanza Plutonic Complex, Dos Lomas Volcanic Plutonic Complex, Navarrete Plutonic Complex and Treneta Plutonic Volcanic Complex, Garamilla Formation, Cayupil, Fita Ruin Granites, Almacén Michihuao Monzodiorite and Lipetrén Leucogranite.

Jurassic igneous activity in Patagonia consists predominately of volcanic rocks and includes the large (235,000 km^2) ignimbrite and Chon Aike / West Antarctica large igneous province (Pankhurst *et al.*, 1998). In contrast, examples of Jurassic plutonic rocks are scarce. The only known examples of Jurassic plutonism in the Somoncurá region are the Jara Diorite (170±10 Ma; Nuñez and Cucchi 1990, Cucchi 1991a and Cucchi 1991b), located in the southwest portion of the El Cuy region, the Pilcaniyeu super unit, located in the western part of the El Cuy region (194±4.6 Ma; Alonso 1987), and the Navarrete granodiorite (185±19, Pankhurst et al. 1993) and the Flores Granite (188±3, Pankhurst *et al.* 1993), both located in the southeast portion of the El Cuy region.

Field mapping and sampling was undertaken in the El Cuy area to relate the extensive granites of this area to those of the other regions of the magmatic belt.

REGIONAL GEOLOGY

In the El Cuy area, the older units are 1.) the Coli Niyeu Formation (Cambrian-Ordovician), which consists of very low grade metamorphic rocks, and 2.) a unit that is currently interpreted to be the Mamil Choique Formation (Ordovician-Devonian), consisting mainly of foliated granites (foliation striking 315°) that are locally highly deformed. Intruded into these older units are three distinct granitoids. Based on cross-cutting relationships from oldest to youngest these rock types include: non-foliated granitoids (the bulk of the intrusive complex), E-W trending rhyolite dikes that cross cut the granitoid rocks, and mafic dikes that cross cut both the granitoids and rhyolitic dikes.

PREVIOUS GEOCHRONOGICAL DATA

Caminos *et al.* (1988) dated the central part of the Somoncurá Batholith using the Rb-Sr method, to Early to Middle Carboniferous. These dates were superseded by Pankhurst *et al.* (1992) who revised the emplacement age to Permian to Triassic times (275-235 Ma). Other nearby units that encompass this age range include the La Pintada Granite of the Rio Chico area (260 +/- 5 Ma; Dalla Salda et al., 1994), the Sierra del Medio Granodiorite (269 +/- 27 Ma; Rapela *et al.* 1992), and the Río Collon Cura Granite (280 +/- 10 Ma; Linares *et al.* 1988).

RESULTS

A working hypothesis had been that the El Cuy bodies were correlated to these Permo-Triassic units. Rb-Sr, Sm-Nd, and isotope dilution REE analyses were carried out at the University of Wisconsin-Madison Radiogenic Isotope Laboratory to investigate this possibility. Three types of samples were analyzed: whole rock granite samples of the non-foliated type from two active quarries (QA-1, QA-2, QA-3, and QA-5; Fig. 1); mineral separates from one of these samples (QA-5); and whole rock samples of crosscutting rhyolite, aplite, and granodiorite dikes. The major element compositions of these non-foliated granitic rocks are calc-alkaline and plot in the high silica rhyolite field on a total alkali-silica plot (Bjerg *et al.* 1997; SiO_2 67.9 to 75.7 wt.% and K_2O 3.1

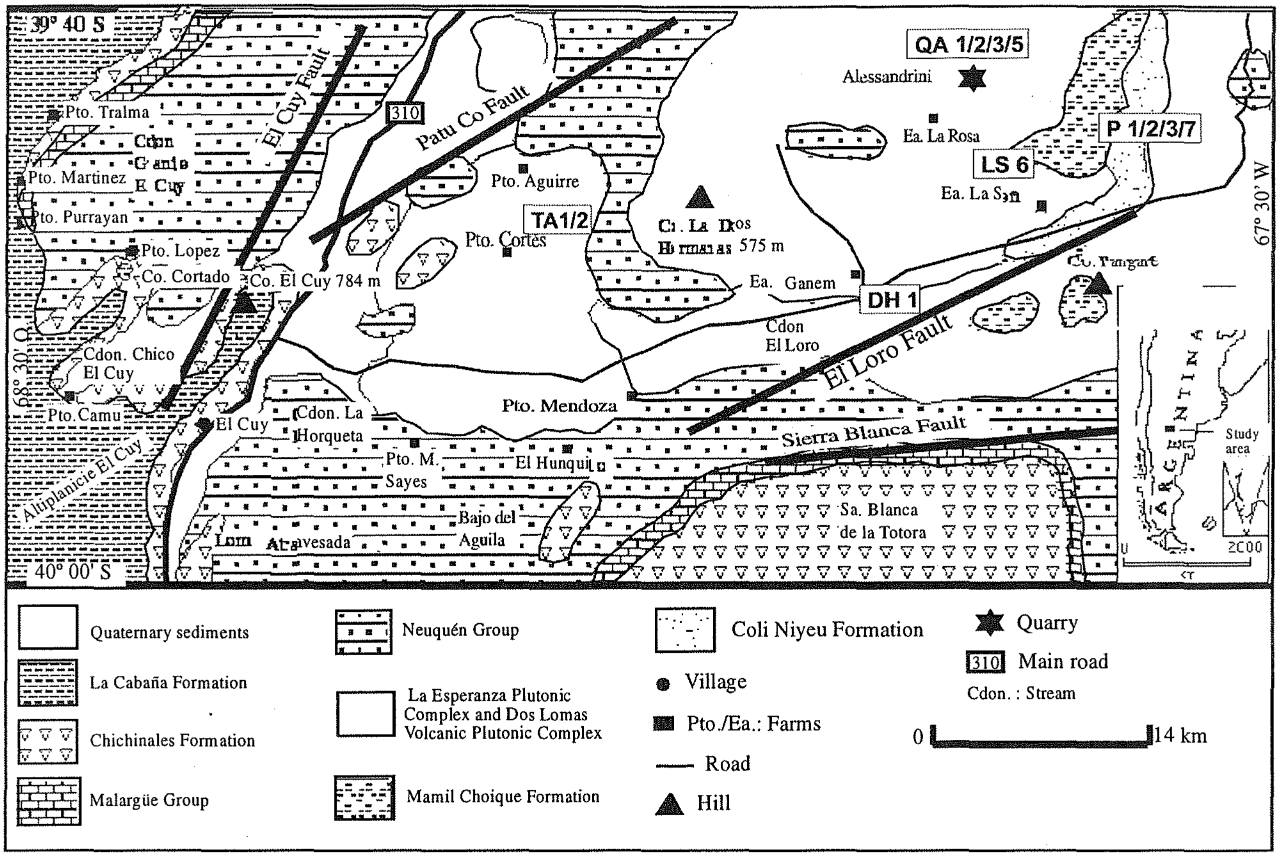

Figure 1. Geological sketch map of the El Cuy region.

to 4.9 wt.%). Moreover, the major element compositions of the non-foliated granites overlap the composition of the older foliated granitic rocks (Mamil Choique Formation?).

A mineral and whole rock Rb-Sr isochron for sample QA-5 from a granite quarry located on the banks of Bajo Soledad (39° 43' 22" S, 67° 44' 13" W) is shown in Fig. 2. The feldspar, biotite, and two whole rock analyses yield an age of 192 ± 0.21 Ma (MSWD = 0.326) and an initial $^{87}Sr/^{86}Sr$ ratio of 0.70589 ± 0.00001. If only whole rock samples from the two quarries (two granite samples, one crosscutting aplite and one granodiorite dike) are used, an age of 195 ± 6.7 Ma (MSWD = 4.91) is obtained.

Initial $^{87}Sr/^{86}Sr$ ratios and epsilon Nd values (calculated at 192 Ma) of this non-foliated suite of granitic rocks from the El Cuy region are negatively correlated, and $^{87}Sr/^{86}Sr$ ratios range from 0.7066 to 0.7056 and epsilon Nd values range from -4.2 to -5.9. The Sr isotopic composition of these young granitic rocks in part overlaps the initial Sr isotopic composition of Jurassic volcanic rocks from throughout Patagonia (average initial $^{87}Sr/^{86}Sr$ ratios of 0.7067 +/-0.0005; Pankhurst and Rapela, 1995), but initial $^{87}Sr/^{86}Sr$ ratios of these non-foliated granites extend to lower ratios.

REE patterns (Fig. 3) show slight negative Europium anomalies (Eu/Eu* = 0.37-0.50) except for the HREE-depleted sample TA-1, which is a plagioclase - K feldspar rich aplite dike that has a positive Eu anomaly (Eu/Eu* = 2.6). In general, the samples have a flat but slightly concave up HREE pattern. Sample QA-3, a granodiorite dike cross-cutting the QA-1 granite, is REE-enriched compared to the other samples.

DISCUSSION AND CONCLUSIONS

Large portions of the Somoncurá Massif are contemporaneous with the Permo-Triassic Choiyoi province of the Central Andes (Rapela and Kay 1988; Pankhurst *et al.* 1992), and these results provide evidence for intrusion of granites in the northern part of the Massif during Early Jurassic time at 192 Ma. The moderately low epsilon Nd values and moderate initial $^{87}Sr/^{86}Sr$ ratios suggest some interaction with Precambrian crust. These granites may be similar to other Jurassic units in Patagonia and could be related to the incipient break-up of Gondwana (Pankhurst and Rapela 1995; Pankhurst *et al.* 1998); further isotopic studies may constrain the proportions of mantle and crust that were associated with continental break-up.

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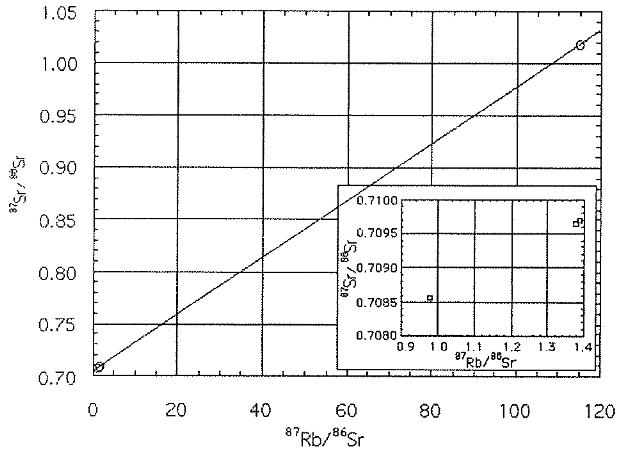

Figure 2. Rb-Sr isochron for locality QA-5

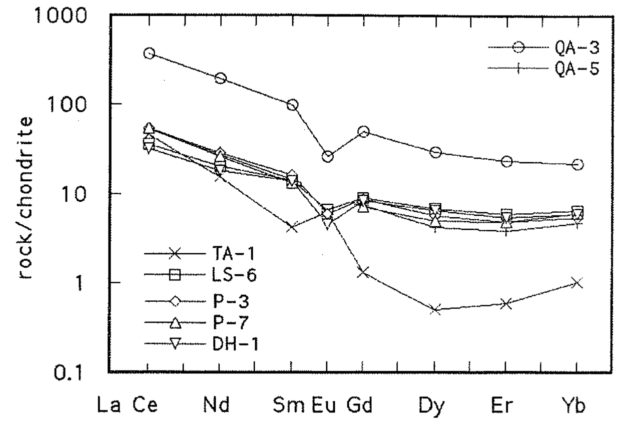

Figure 3. REE patterns

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