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EL CINTURON MAGMATICO DEL PALEOZOICO SUPERIOR-TRIASICO DE LA CORDILLERA FRONTAL CHILENA ENTRE LOS 28° - 31° S: "ESTRATIGRAFIA" IGNEA Y MARCO TECTONICO

THE LATE PALAEOZOIC - TRIASSIC MAGMATIC BELT OF THE CHILEAN FRONTAL RANGE (28° - 31°S): IGNEOUS "STRATIGRAPHY" AND TECTONIC SETTING

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The Main Andean Range between 28° - 31°S, Chile, is formed by large Late Palaeozoic - Triassic batholiths and extensive exposures of its synchronical volcanic cover (Pastos Blancos formation, Figure 1). They represent the northern extension of the Upper Palaeozoic magmatic belt of the Argentine Frontal Range. Host rocks of the granitoids are, at 29°S, a Carboniferous (?) metamorphic accretionary complex and early Palaeozoic granitoid gneisses (El Tránsito Metamorphic Complex, HERVE, 1982; La Pampa Gneisses, RIBBA, 1985) while at 30°S (Elqui Valley) there are scattered roof pendants of Early Palaeozoic (?) pelitic schists (El Cepo Metamorphic Complex, MPODOZIS & CORNEJO, 1985). The granitoids also intrude Devonian to Carboniferous sediments (Hurtado and Las Placetas formations, CORNEJO & MPODOZIS, 1979; NASI et al., 1985). Late Triassic to Tertiary sediments and volcanics of Andean "cover" cap the Palaeozoic magmatic rocks.

The Late Palaeozoic - Triassic granitoids extend 300 km along the main Cordillera axis from Río Grande (31°S) to Río Copiapó (28°S). Three major batholiths are included in this north-south belt: The Elqui-Limarí Batholith (MPODOZIS et al., 1976) in the south, the Chollay Batholith, in the Huasco Valley (NASI et al., 1985) and the Montosa-El Potro Batholith in the Copiapó area (MPODOZIS et al., in prep.). These batholiths are complex assemblages composed by a large number of individual plutons that belong to two major associations or "Super Units": "The Elqui Super Unit" (ESU, Carboniferous (?) and the "Ingaguás Super Unit" (ISU, Permian-Late Triassic). K-Ar, Rb-Sr and Pb-α ages range between 343-245 m.a. for the ESU and 276-197 Ma. for the ISU (MPODOZIS & CORNEJO, 1985; NASI et al., 1985).

The ESU plutons form large, tabular bodies along the west side of the magmatic belt (Fig. 1). Individual plutons are composed by coarse grained granitoids, showing oriented fabric in variable intensity. They are grouped into five major units : (1) "Manflas Unit", coarse grained, hornblende piroxene gabbros; (2) "Guanta Unit", coarse to middle grained, hornblende-biotite tonalites and granodiorites, with microdioritic inclusions; (3 "Montosa Unit", leucocratic, coarse grained, biotite granodiorites and granites; (4

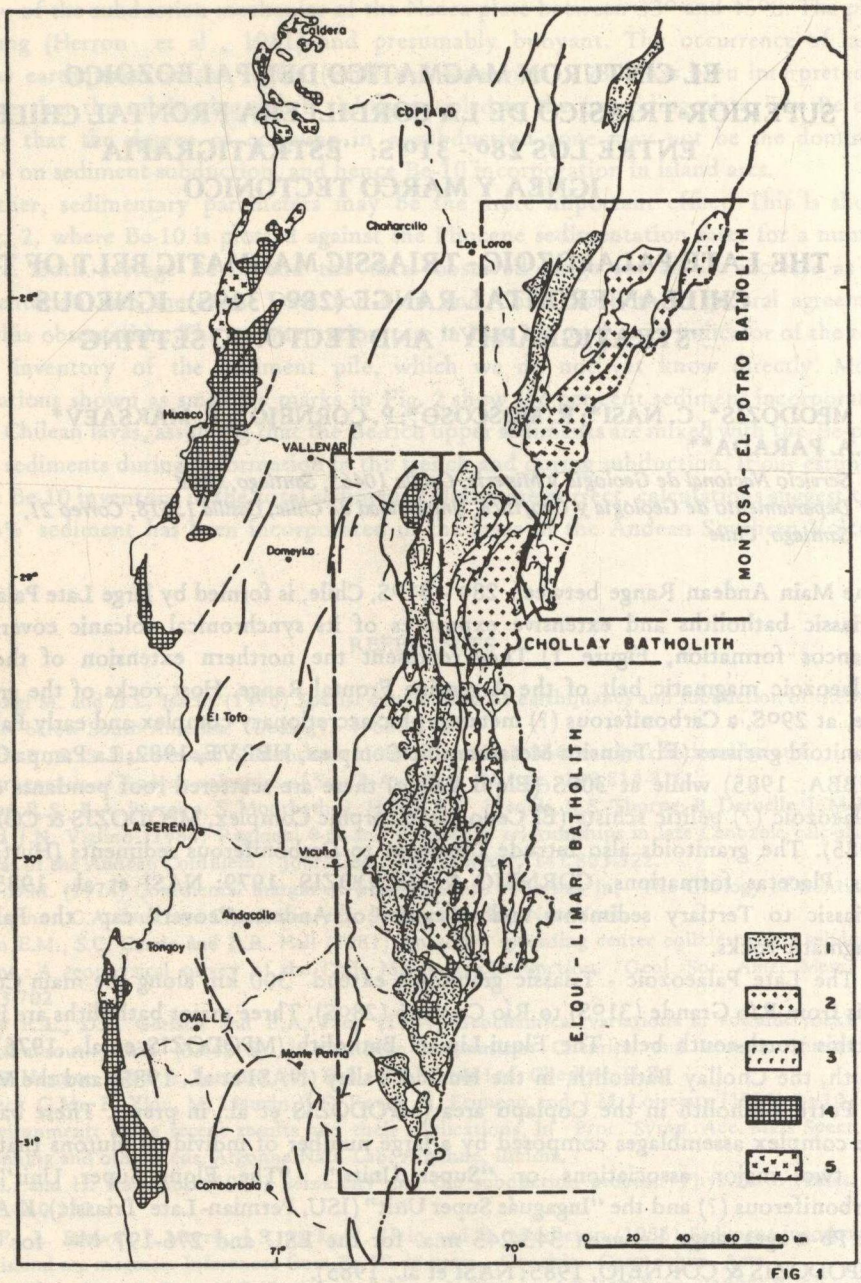

Fig.1. Distribution of Paleozoic units in the Coastal Range and Chilean Fontral Rangel between 27° 30'-31 S (1) Elqui Super Unit: (2) Ingaguás Super Unit; (3) Pastos Blancos Formation; (4) Pre-Batholithic metamorphic and metasedimentary complexes (5) Paleozoic granitoids of the Coastal Range.

Fig.1. Distribución de las unidades paleozoicas en la Cordillera de las Costa y Cordillera Frontal Chilena entre los 21°30'-31 S (1) Super Unidad Elqui; (2) Super Unidad Ingaguás; (3) Formación Pastos Blancos; (4) Complejos prebatolíticos, metamórficos y sedimentarios; (5) Granitoides paleozoicos de la Cordillera de la Costa.

"Cochiguás Unit", biotite ± "muscovite" leucocratic granodiorites and granites; (5) "el Volcán Unit", coarse to very coarse, strongly deformed, white-reddish, leucocratic biotite granodiorites and granites with pelitic xenoliths. North to NNE trending, mafic dyke swarms, are commonly related to the ESU plutons, specially in the Elqui region (30°S).

The ISU is formed by a large number of plutons cropping eastward of the Carboniferous granitoids (Fig. 1) together with minor stocks that in the Elqui-Limarí Batholith cut across the western Carboniferous granitoids, showing vertical walls and flat roofs. ISU granitoids are non deformed shallow level intrusives, generally devoid of associated dykes. Four major units and small isolated gabbro outcrops ("La Laguna" gabbros) are included in the ISU: (1) "Los Carricitos Unit", middle grained, biotite hornblende granodiorites, (2) "El León Unit", middle grained, hololeucocratic, "pink" granites with very low biotite content (3) "Chollay Unit", coarse grained, hololeucocratic, pink granites (4) "Colorado Unit", hololeucocratic coarse to fine grained "red" granites, some of which have miariolithic cavities and graphic quartz-feldspar intergrowths and "quartz-eye" subvolcanic granitic porphiries.

Both Super Units are distinct associations of calcalkaline plutons similar to other calcalkaline granitoids of active continental margins (Fig. 2). However, alkaline affinity of some leucogranites has been reported (Parada, 1981). The two Super Units have different origins and its nature seems to have been controlled –to a great extent– by changes in the nature of the pre-batholithic crust. Carboniferous (ESU) plutons were emplaced at mid-crustal levels under a relatively high stress regime undergoing pervasive cataclastic, partly synmagmatic, deformation. The earlier intrusives are mantle-derived, metaluminous granitoids, that according the criteria of CHAPPELL and WHITE (1974) and TAKAHASHI et al., (1980) have "I type" affinities (Manflas gabbros and Guanta Unit tonalites), and show low Sr87/Sr86 initial ratios (PARADA et al., 1981; HERVE, in RIBBA, 1985). The late facies are peraluminous S type granites (El Volcán Unit) with an intermediate group of muscovite bearing plutons (Cochiguás Unit). The generation of the younger ESU plutons seems to have involved an important participation of metasedimentary crustal component (see Parada, this volume). The Permian-Triassic ISU also shows earlier metaluminous I type granodiorites (Los Carricitos Unit) and much more evolved, but sligthty peraluminous late muscovite granites (El León-Chollay - Colorado Units). While the granites exposed along the western margin of the Elqui-Limarí batholith have S and I type affinities, the bulk of the Permian-Triassic granites located eastward (Figure 1) are true I type granites. Extremely high silica contents (75-78°/o SiO2) and the Sr87/Sr86 initial ratios (PARADA et al., 1981) suggests an origin by partial melting of preheated continental crust, probably in relation to the underplating of mantle derived magmas, at the base of the crust. The less peraluminous character of the high silica ISU granites seems to reflect a change from a "metasedimentary" prebatholithic crust in the west, to a more "granitic" one at the east. Relicts of the first one could be the metamorphic accretionary El Tránsito, or El Cepo metamorphic complex, while the granitic La Pampa Gneisses could be representative of the latter.

From a tectonic point of view the two Super Units represent two stages in the development of a Late Palaeozoic-Triassic magmatic "arc" along the pacific margin of Gondwanaland. After the docking of a collage of diverse terrenes to the primitive continental margin of South America during the early Palaeozoic (RAMOS et al., 1984), a new subduction zone was established west of the recently accreted terranes. The ESU

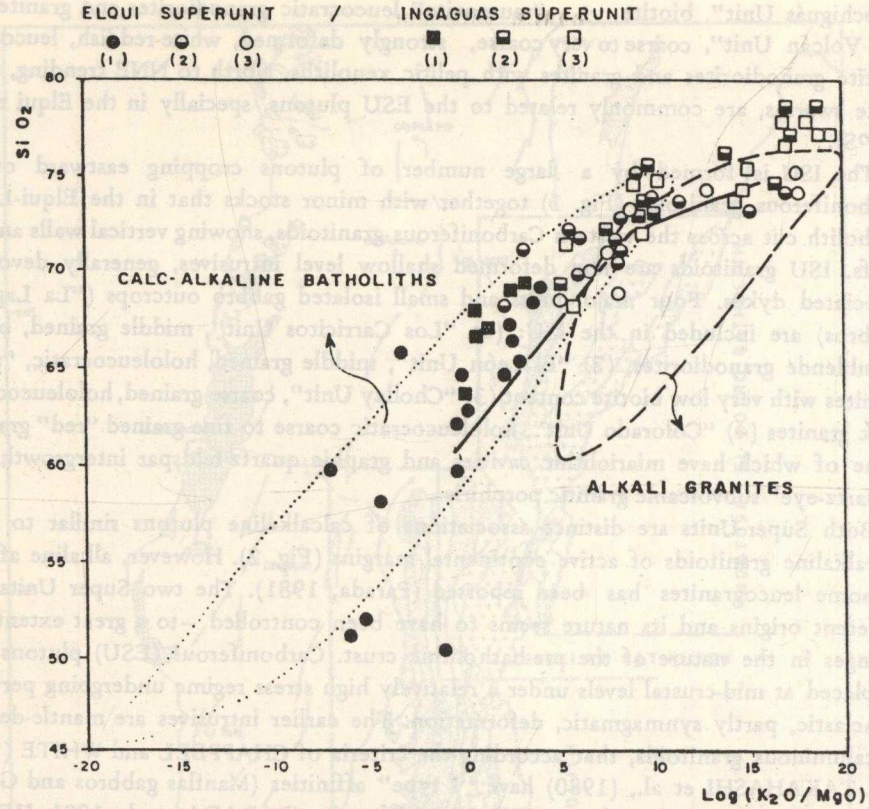

Fig.2. Plot used by Rangers and Greenberg (1981)to discriminate between calc-alkaline subduction related, and alkali granite suites. The solid line shows the trens for the Sierra Nevada Batholith. *Elqui Super Unit:* 1) Guanta Unit; 2) Cohiguas Unit; 3) El Volcán Unit. *Ingaguás Super Unit:* 1) Los Carricitos Unit; 2) El León Unit; 3) Colorado Unit.

Fig.2. Diagrama de Rogers y Greenberg (1981) que discrimina entre granitoides calcoalcalinos y alcalinos. La línea continua corresponde al Batolito de Sierra Nevada. *Super Unidad Elqui:* 1) Unidad Guanta; 2) Unidad Cochiguás; 3) Unidad El Volcán. *Super Unidad Ingaguas:* 1) Unidad Los Carricitos; 2) Unidad El León; 3) Unidad Colorado.

originated as a consequence of eastwards directed subduction in the Carboniferous when large batches of tonalitic magmas intruded the coeval growing accretionary prism. The resulting crustal thermal perturbation gave rise to the formation of peraluminous S type granitoids, like those of the El Volcán and Cochiguás Units. After a reorganization in the magmatic regime in the Late Carboniferous the magmatic foci migrated slightly eastwards in such a way that large scale melting of more granitic crust with minor participation of metasedimentary rocks linked to an extensional tectonic regime, played an important role in magma generation (Cf. Parada, 1983).

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