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GRANITOIDES DE LA CORDILLERA DE LA COSTA DE CHILE CENTRAL: GEOCRONOLOGIA Y MARCO GEOLOGICO

GRANITOIDS OF THE COAST RANGE OF CENTRAL CHILE: GEOCHRONOLOGY AND GEOLOGICAL SETTING

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Palaeozoic and Mesozoic granitoids constitute a large proportion of the Coast Range of central Chile between the Aconcagua river (32° 30'S) and the Tolten river (38°S). (Fig. 1).

The Palaeozoic granitoids which constitute the main part of the Southern Coastal Batholith (SCB) are restricted to this segment of the Coast Range: no rocks of similar age are known for some 500 km north of the Aconcagua river, and no Paleozoic intrusives are known from the margin of South America south of the area. The batholith is composed of tonalite, granodiorite, diorite and minor gabbro and granite. Near its northern end cordierite - garnet - sillimanite gneisses are included in the magmatic rocks. To the south, the batholith in flanked on its western side by a low P/T metasedimentary belt in which biotite, andalusite and sillimanite zones develop approaching the granitoids. In the Nahuelbuta mountains, metasediments also crop out east of the granitoids.

Stratigraphic evidence for the age of the Palaeozoic SCB granitoids is scarce. Near Algarrobo late Cretaceous sedimentary rocks uncomformably overlie the granitoids. Further south, late Triassic sedimentary sequences overlie the granitoids at Vichuquen, and Santa Juana.

U-Pb zircon ages in granitoids and amphibolites at Quintay (Corvalan & Munizaga, 1972) have indicated ca. 400 Ma. New and published Rb-Sr whole rock isochrons in granitoids in Reñaca (299 ± 31 Ma), Valparaiso (296 ± 5 Ma; Shibata et al, 1984), Algarrobo (284 ± 10 Ma), and in metasediments at Quintay (320 Ma; Cordani et al, 1976) indicate a main intrusive event in Permo–Carboniferous times. Rb-Sr data from Nahuelbuta also suggest that it belongs to this event, although older rocks could also be present. 344 ± 44 Ma and 384 Ma isochrons (Hervé et al, 1984) in metasediments of the low P/T belt associated with the granitoids near Pichilemu would also suggest an early Carboniferous age for the batholith there, if the heat source for the metamorphism were related to the emplacement of the pluton.

K-Ar ages on the Palaeozoic rocks give ages between 296 Ma and 245 Ma. Thus, biotite cooling ages are often similar to whole rock Rb-Sr isochron ages, which is indicative of shallow emplacement and/or rapid uplift without later reheating.

Initial 87Sr/86Sr ratios of these Palaeozoic plutons range from 0.706 to 0.707, indicating significant crustal contamination. However, they appear to be I-type granitoids on mineralogical characteristics and their northern end has been characterized as

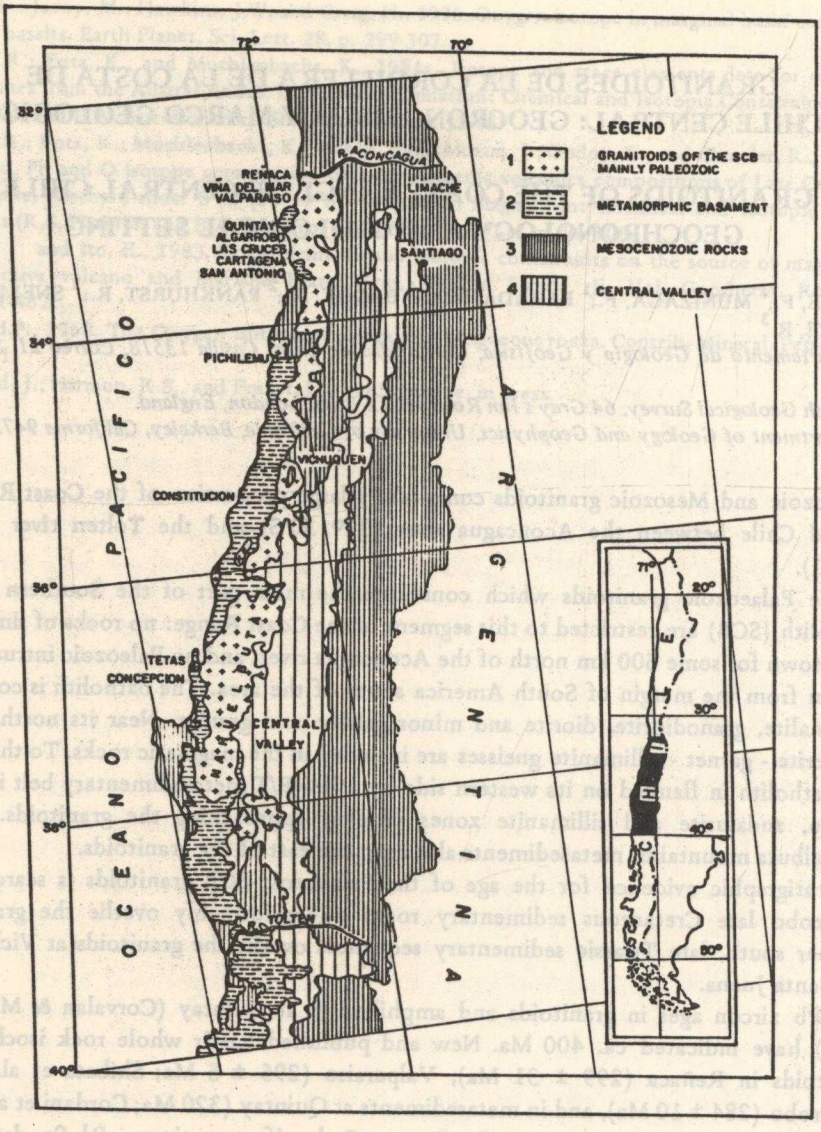

Fig.1. Schematic geologic map of the area between 32° and 40° S.
Fig.1. Mapa geológico esquemático del área comprendida entre los 32° y 40° S.

"ilmenite type" granitoids by Shibata et al (1984).

Granitoids with K-Ar ages between 220 Ma and 190 Ma occur as rather small bodies either west of the Palaeozoic plutons, or within their general outcrop areas as at La Estrella (Davila et al, 1969). The western bodies, e.g. Pichilemu, Constitucion (Gana & Hervé, 1983), Tetas, are mainly composed of monzogranitic rocks, and they cut the high P/T metamorphic belt, which is not however intruded by the Palaeozoic plutons. This

metamorphic belt, composed of accreted oceanic lithologies, underwent its main metamorphism 310 ± 10 Ma ago (Hervé et al, 1984). The Triassic plutons develop narrow contact aureoles in the schists (Godoy, 1970) which indicate a high level "epizonal" emplacement. At Zapata, a rather imprecise isochron of 205 ± 37 Ma for a pluton intruding the Palaeozoic batholith along its eastern margin and which may belong to this group, gives an initial 87Sr/86Sr ratio of 0.7036, lower than for the Palaeozoic granitoids but similar to those of Jurassic plutons exposed to the north of the Aconcagua river.

Mid-Jurassic plutons appear to be an important component of the batholith north of about 37°S. At several localities they intrude the well dated late Triassic sequences, and give biotite and hornblende K-Ar ages between 175 Ma and 143 Ma. They always crop out in close spatial relationship with the Palaeozoic granitoids, from which they are at times petrographically indistinguishable, which has precluded their precise mapping. Many Jurassic K-Ar ages were at first interpreted as randomly reset ages from Palaeozoic rocks. However, a 169 Ma whole rock isochron in metasediments in Quintay (Cordani et al, 1976), gave a first indication of an real Jurassic thermal event in the area. New Rb-Sr whole rock errorchrons at Quintay (167 ± 14 Ma), Mataquito (140 ± 78 Ma), and Las Cruces (162 ± 40 Ma), in heterogeneous, foliated granitoids and associated metamorphics, indicate a Jurassic tectonomagmatic event although in the last two cases high initial 87Sr/86Sr ratios may signify older protoliths. The huge bodies of pyroxene diorite included in the Puerto Oscuro facies (Parada et al, this volume), extend southwards into the Laguna Verde area, where a K-Ar biotite age of 165 Ma and a Rb-Sr whole rock three point isochron of 156 ± 47 Ma was obtained in rocks that were once considered as charnockites. A U-Pb zircon age of 163 Ma at Limache (Corvalan & Munizaga, 1972) indicates the presence of Jurassic intrusives 20 km inland of the Paleozoic rocks at the latitude of Valparaiso. The only indication of the initial ratio of the Jurassic intrusives is 0.7041 at Quintay, also lower than the average Palaeozoic ones.

A discontinuous belt of Cretaceous intrusions crops out in the eastern part of the Coast Range. These intrude Neocomian fossiliferous rocks, and have K-Ar ages between 118 Ma and 85 Ma (Corvalan & Munizaga, 1972; Davila et al; 1979). Granodiorite, tonalite, diorite and gabbro are associated with hydrothermal alteration and/or skarns with Cu-mineralization. South of about 36°S the Cretaceous granitoids no longer occur in the Coast Range but in the Main Range (Munizaga et al, this volume). K-Ar ages on mafic dykes in the Cartagena area range from 180 Ma to 115 Ma, with a 40Ar-39Ar age of 170 ± 5 (Irwin et al, in prep.).

The northern limit of the Palaeozoic rocks is defined by what appears to be an EW fault zone, which Corvalan and Munizaga (1972) interpreted as having been active as early as Jurassic times. The oceanic termination of this fault zone, at the mouth of the Aconcagua river, coincides with a mild inflection in the direction of the coastline (from NNE south of it to NNW north of it). Moreover, the Juan Fernandez ridge of the Nazca plate intersects the margin of the continent at this latitude. Thus the major break in the distribution of the Palaeozoic rocks is apparently controlled by a very long-lived tectonic feature. The continuity of the Mesozoic granitoids is not however affected by this boundary, since they can be traced continuously across the Aconcagua river. The Central Valley is well developed south of this break, along the whole length of the Coast Range which contains Palaeozoic granitoids, another close relationship with both old and new tectonic features.

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