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# GEOCRONOLOGIA DE LOS GRANITOIDES DE LA REGION DE LOS LAGOS, CHILE (39°-42° LAT. S)

# GEOCHRONOLOGY OF THE GRANITOIDS OF THE LAKE REGION, CHILE (39°-42° S. LAT.)

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In the Andes of Central Chile (28°-31°S. Lat.) several authors (Farrar et al., 1970; Munizaga & Vicente, 1982; Drake et al.. 1982) have established the existence of an asymetric geochronological zoning in the mesocenozoic plutonism. Parallel N-S bands of Jurassic, Cretaceous and Tertiary granitoids occur, the first ones restricted to the Coast Range, the latest to the Main Range. Those mesocenozoic plutonic bands are flanked to the west by the Palaeozoic metamorphics of the Coast Range, and to the east by the Palaeozoic granitoids, volcanics and metamorphics of the Frontal Cordillera in Argentina.

Between 39° and 42°S. Lat., (Fig. 1) granitoids which have been considered by Ramos (1983) & Munizaga et al. (1984) to represent the northern end of the Patagonian batholith, make up the bulk of the chilean flank of the main Andean Range. Stratigraphic evidence allowed Hervé et al. (1974) and Moreno and Parada (1976) to establish that granitoids of ages ranging from Palaeozoic to Tertiary were present in the area. Except for small diorite stocks intruding the Upper Cretaceous–Lower Tertiary volcanic Curarrehue formation and the Panguipulli batholith which intrudes the Permian (? ) Panguipulli formation, the limits of the individual plutons have not been determined in the area because of sparse outcrops and dense forest cover.

The geochronological data presented here, indicates the presence of late Palaezoic, Jurassic, Cretaceous and Late Tertiary plutonic rocks in the area, but their spatial distribution is yet not clear, and apparently differs markedly from that of Central Chile.

Palaeozoic K-Ar ages between 295 and 282 Ma have been obtained in granitoids at the northeastern shores of Lago Ranco and at the northwestern end of Lago Riñihue. There is no knowledge if these two separate outcrops constitute a single continous body or not. Rb-Sr determination of the samples with Palaeozoic K-Ar ages give an errorchron of 253±55 Ma with an initial $^{87}Sr/^{86}Sr$ ratio of 0.7067. It is a possibility that these Palaeozoic outcrops are part of a NW belt extending from the Nahuelbuta mountains (see Hervé et al., this volume) to the North Patagonian Massif, where rocks of similar lithology, age and initial ratio occur.

The Panguipulli batholith in its type locality around lake Panguipulli (Parada, 1977) has Jurassic K-Ar ages (171 and 164 Ma) a and a 160 ± 20 Ma Rb-Sr isochron ); Parada y Munizaga, 1978). Ten new determinations, which include rocks assigned by lithology to the Panguipulli batholith which outcrop at lakes Panguipulli, Riñihue and Ranco, have

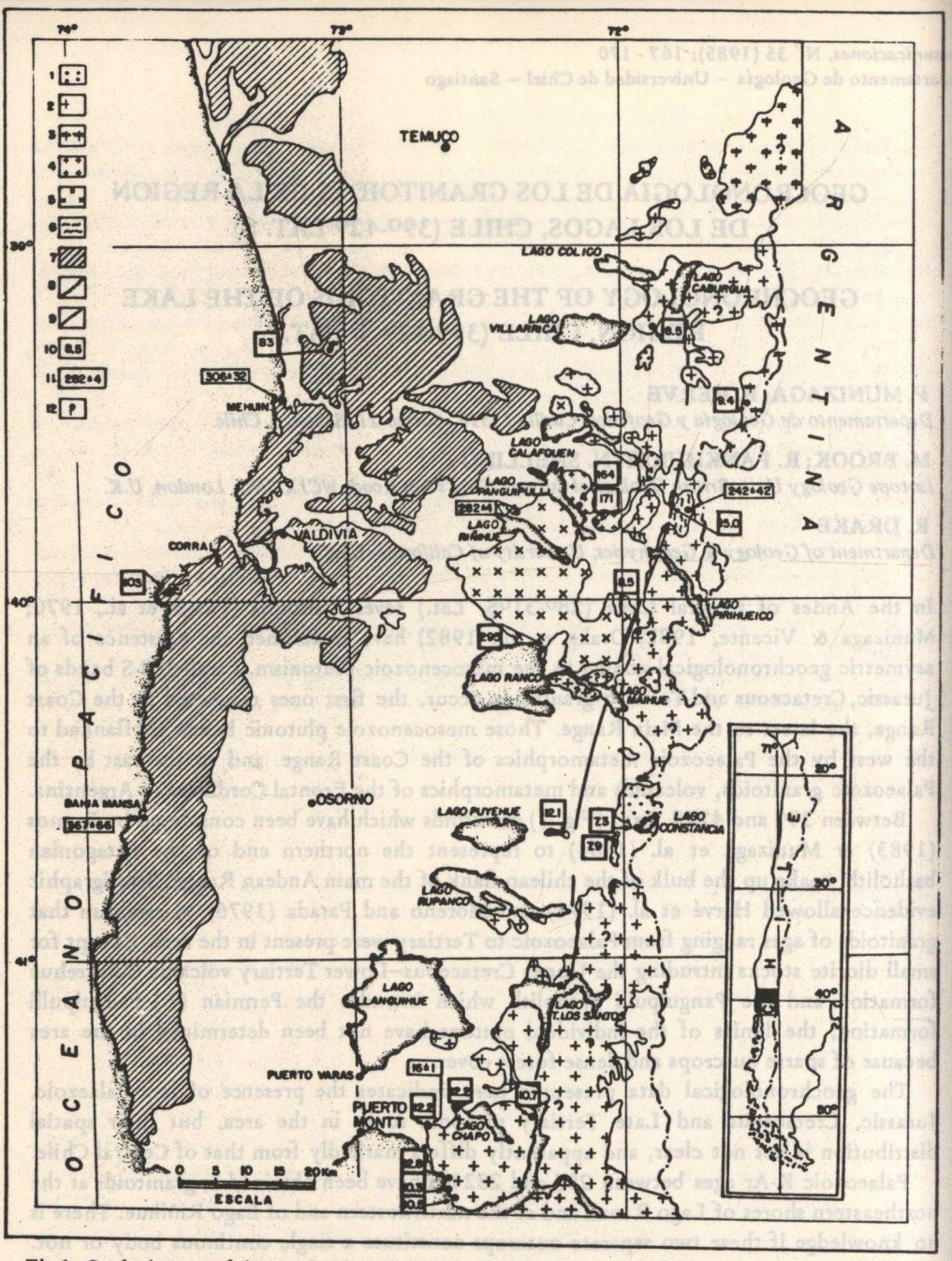


**Fig.1. Geologic map of the granitoids and the Coast Range metamorphic complex in the Lake Region.**

**Fig.1. Mapa geológico esquemático de granitoides y metamorfitas en el Región de los Lagos.**

1. Upper Miocene Granitoids
2. Lowe to Middle Miocene Granitoids
3. Cretaceous Granitoids
4. Jurassic Granitoids
5. Paleozoic Granitoids
6. Liquiñe Metamorphic rocks
7. Coast Range Metamorphic complex
8. Border Line
9. Liquiñe-Ofqui Megafault Trace
10. K-Ar age
11. Rb-Sr whole rock isochron age
12. Tentative chronologic assignation

1. Granitoides Mioceno Superior
2. Granitoides Mioceno inferior a medio
3. Granitoides Cretácicos
4. Granitoides Jurásicos
5. Granitoides Paleozoicos
6. Metamorfitas de Liquiñe
7. Complejo Metamórfico de la Cordillera de la Costa.
8. Límite Chileno-Argentino
9. Traza Megafalla Liquiñe-Ofqui
10. Edad K-Ar
11. Edad Rb-Sr isócrona total
12. Asignación cronológica tentativa.

yielded a 200±18 Ma errorchron (MSWD=14) and a $Sr^{87}/Sr^{86}$ initial ratio of 0.7049. The samples of the Panguipulli batholith with Jurassic K-Ar ages define an errorchron of 195±24 Ma (MSWD=14) with 0.7048 as initial ratio. These data are interpreted as strong evidence of Jurassic plutonism in the area. Granitic pebbles are found in breccias of the Upper Cretaceous–Lower Tertiary Curarrehue formation.

Cretaceous K-Ar ages of around 90 Ma are confined to the northeastern portion of the area, e.g. Momolluco and Puesco, where a NNW belt of similar age comes in to Chile from the Argentinian slope of the Main Range. Cretaceous Rb-Sr whole rock isochron ages are known in Aysen (Hervé, 1984) much further south along strike in the batholith, with reset Miocenic mineral K-Ar ages.

Miocene K-Ar ages in granitoids are distributed all along the area in the vicinities of the Liquiñe-Ofqui megafault. Some of them may be reset ages as in Aysen, but south of Llanquihue Lake at the Avellanito quarry, a Rb-Sr whole rock isochron of 16±1 Ma with initial $^{87}Sr/^{86}Sr$ initial ratio of 0.7045 was obtained on the same rocks which yield 10-12 Ma K-Ar ages. Mapping of the area, reveals that the Miocene plutons have huge extension. and that at the latitud of Puerto Montt they extend up to the westernmost granitic outcrops.

The composite and complex batholiths of the Main Range in the considered segment of the Andes, are separated by the Central Valley from the metamorphic rocks of the late Palaeozoic accretionary prism, which were metamorphosed under supposedly rather high P/T conditions. The age of metamorphism is probably indicated by the 309±88 Ma errorchron of the schists at Mehuin, and 367±34 Ma at Bahia Mansa, cooling K-Ar ages of 240 Ma have also been obtained in white mica concentrates.

The metamorphics are intruded by small granitoid stocks of Cretaceous K-Ar ages as at Corral (103±3 Ma) and Los Boldos (86±3), in what appears to be a belt of small plutons 130 km W of the contemporaneous Cretaceous granitoids of the Main Range.

The distribution pattern of the age of the granitoids in the Andes between 38° and 41°S differs greatly from that in Central Chile. Though a similar disposition of the palaeozoic rocks east and west of the mesozoic ones also is apparent, the distance between them (100-150 km) is less than half the one at 32°S Lat. (300-350 km). The Mesozoic and Cenozoic plutons appear to be spatially superposed in the studied area, no stripes with easterly decreasing ages can be observed. Miocene plutons tend to occupy a central position in the batholith, spatially related to the N-S trending Liquiñe-Ofqui fault which appears to control their emplacement. The volume of the miocene plutons is much bigger that in the Andes of Santiago.

The volcanic products of a Miocene andesitic arc are present in the Coast Range and Central Valley at the considered segment of the Andes, indicating that the exposed level of the Miocene plutons in the Main Range is much deeper, which suggests a rapid post-Miocene uplift and erosion of the latter.

The $^{87}Sr/^{86}Sr$ ratios of the granitoids tend to decrease with time, as is also the case in the Southern Coastal Batholith (Hervé et al., this volume) and in the Antartic Peninsula (Pankhurst, 1982).

It can be speculated that the lack of a definite migration of the magmatic foci in the area is related to the lack of tectonic erosion of the continental margin during the mesocenozoic. This could explain why the palaeozoic accretionary complex outcrops are wider (in an E-W direction) in this segment of the Andes that in those where a mesocenozoic geochronological zoning has developed. A steady state subduction zone,

with no changes in the angles of subduction below the continental margin would favor the observed distribution of granitoids between 38 and 41°S Lat.

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