BASIC MAGMATISM IN A MID-TERTIARY TRANSTENSIONAL BASIN, ISLA MAGDALENA, AYSEN, CHILE.

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RESUMEN: El complejo igneo basico de Isla Magdalena, de probable edad Terciario medio, está constuido por metabasaltos, asociados a un enjambre de diques dolerítico y escasos gabros. Los diques se emplazaron en el basamento metamórfico paleozóico y en la serie volcano-sedimentária marina que contiene los basaltos, antes de su litificación. Se sugiere que estos eventos ocurrieren en una cuenca extensional asociada a movimientos de rumbo durante subducción oblícua, la que fue cerrada cuando esta se hizo más ortogonal.

KEY WORDS: Patagonia, Basic volcanism, Tertiary, Strike-slip, Transtension.

INTRODUCTION

Isla Magdalena is an island ca. 50x50 km, in the North Patagonian Andes. It is located immediately west of the main branch of the Liquiñe-Ofqui fault zone, a major coast-parallel strike-slip lineament (Fig.1), north of the Taitao triple junction. It is the site of a basic igneous complex of widespread pillow metabasalts, an associated dolerite dyke swarm, and occasional gabbros. The presence and nature of such rocks is critical to the understanding of the teconic environment.

GEOLOGICAL SETTING AND RESULTS

This complex is developed, at least in part, on older continental crust. The metamorphic basement rocks comprise mica-schists and greenschists, Rb-Sr analyses of which have yield a rough errorchron age of 467±55 Ma. This is significantly older than previous Rb-Sr ages obtained from the accretionary complex in western Aysen, although it is within error of its Devonian age of sedimentation inferred from sparse fossil evidence.

The dolerite dykes that intrude this basement have individual thicknesses of 1-3 m and a strongly preferred NNE-SSW orientation. In some western outcrops the dyke swarm is intensely developed, with intervening schist screens only slightly wider than the dykes themselves. The pillow metabasalts occur within a marine turbidite sequence mainly composed of alternating sandstone-shale horizons, cherts and

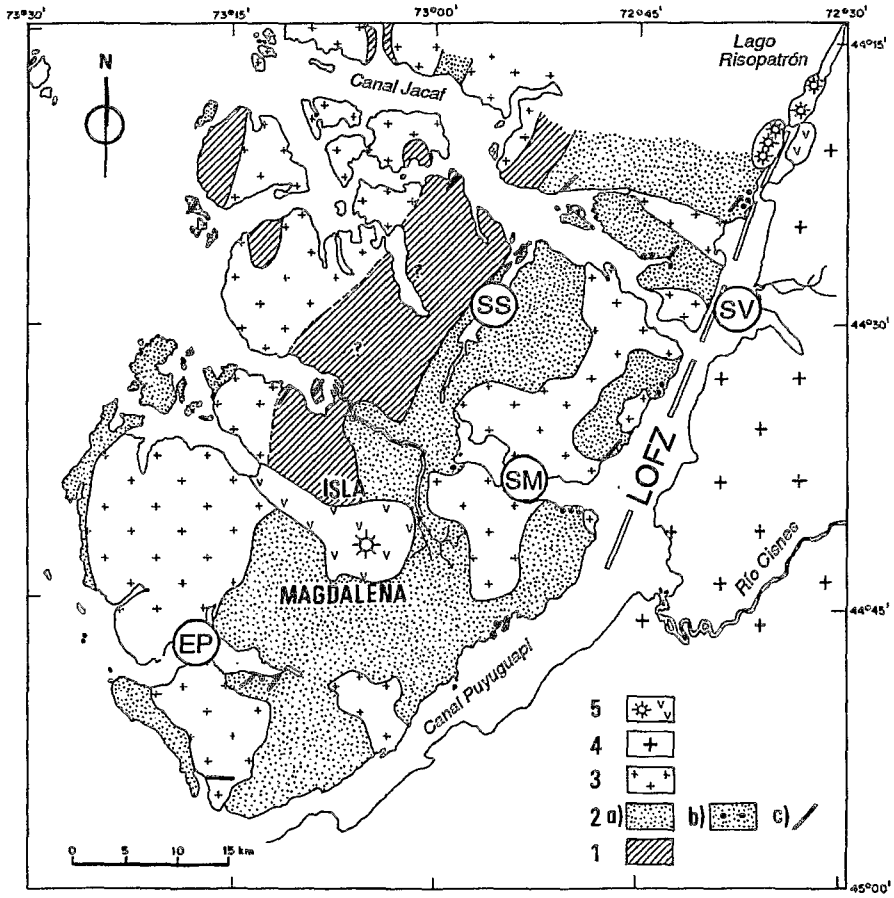

Fig.1: Geological sketch map of Isla Magdalena and surroundings. Legend: LOFZ= Liquiñe-Ofqui fault zone, SS= Seno Soto, SV= Seno Ventisquero, SM= Seno Magdalena, EP= Estero Pangal. Rock-types: 1= metamorphic basement; 2= mid-Tertiary igneous complex; (a)= volcano-sedimentary sequence, (b)= pillow basalts, (c)= dyke swarm locality; 3= Miocene granitoid plutons, 4= Undifferentiated Andean batholith, 5= Pleistocene-Holocene volcanic rocks and volcanoes.

silicic volcanic breccias. This low-grade metasedimentary sequence is also intruded by the dyke swarm; in some cases it can be that emplacement occurred into unlithified, and probably still wet, sediments. Siliceous intrusion into wet sediments also occurred.

Two distinct stages of metamorphism are observable in the pillow metabasalts; an early greenschist facies mineralogy being partially overprinted by a low-grade amphibolite assemblage. Only a faint foliation is developed, indicating a non-compressive environment during metamorphism, which was probably of diastathermal or contact type. Geochemical data suggest primary magmas with mixed within-plate/volcanic arc characteristics. A minimum age for the emplacement and metamorphism of the complex is given by Early Miocene (20 Ma) tonalite-diorite plutons that intrude both the volcano-sedimentary sequence and the basement. Rb-Sr whole-rock analyses of the metabasalts and of the associated slaty metasediments constrain the maximum age to less than 50 Ma, with initial $^{87}Sr/^{86}Sr$ ratios of close to 0.7043 and 0.7049 respectively (Fig. 2).

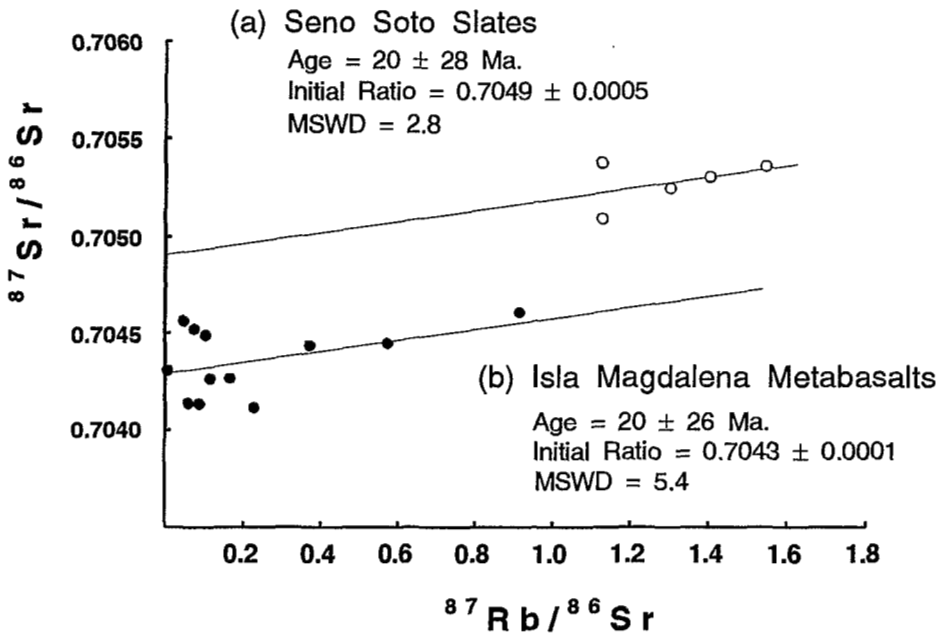

Fig. 2: Rb-Sr whole-rock isochron diagram for slates from the low-grade volcano-sedimentary sequence at Seno Soto (upper line), and for pillow basalts and matrix from the Seno Ventisquero area (lower line).

CONCLUSIONS

The volcano-sedimentary sequence was probably deposited in an extensional basin that formed in association with strike-slip faulting during mid-Tertiary times. NNE-directed oblique subduction at this time (40-25 Ma, Cande et al 1986) could have caused perpendicular extension, allowing ingress of the dykes, which might also have been feeders for the pillow basalts, into the sedimentary basin. When the subduction vector became orthogonal in Miocene times, the basin closed and was deformed under low-grade conditions. This change in the tectonic framework also lead to the subsequent calc-alkaline plutonism of normal Andean type.

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REFERENCE

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