NEW AGES (U-Pb,Rb-Sr,K-Ar) FROM SUPPOSED PRE-CAMBRIAN UNITS IN NORTHERN CHILE: SOME GEOTECTONIC IMPLICATIONS

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INTRODUCTION

Since the first dating of Proterozoic rocks (1,000 Ma) on the westflank of the Altiplano in northernmost Chile (Pacci et al., 1980) other rock units at different localities have been surveyed in order to determine their possible Precambrian age. Mentions of the existence of Proterozoic ages or of ages near the Proterozoic-Phanerozoic boundary have been made by Damm et al. (1990) and Díaz et al. (1985).

The presence of rocks of that age supported the existence in the basement of the Andes of northern Chile of the Arequipa-Antofalla Craton Massif (Ramos, 1988), considered to be an allochtonous terrane of Laurentia provenance by Dalziel et al., (1994).

A dating program was carried out to ascertain the Proterozoic age of the Belén Metamorphic Complex (BMC), and the Mejillones Metamorphic Complex (MMC) (Fig. 1).

Samples were dated at the Centro de Pesquisas Geocronológicas of the Instituto de Geociências, Universidad de Sâo Paulo, Brazil, by M.A.B.

GEOLOGIC FRAMEWORK

The Belén Metamorphic Complex (BMC) forms a narrow strip along a high angle, west-vergent thrust system located on the western slope of the chilean Altiplano plateau between Chapiquiña and Tignamar (Muñoz and Charrier, in press) (Fig. 1). Along these faults the CMB is westwardly thrusted over late Tertiary deposits. Unconformably covering the BMC are Jurassic marine deposits, and Tertiary volcaniclastic and continental sedimentary deposits (Montecinos, 1963; Salas et al., 1966; Pacci et al., 1980; Muñoz et al., 1988; Muñoz, 1991; García, 1996). The BMC is mainly composed by foliated amphibolites and subordinately by quartz mica schists, gneissic schists, orthogneisses and serpentinites. It is intruded by a small gabbro stock and mafic, aplitic and felsic dikes.

The Mejillones Metamorphic Complex (MMC) consists of mica-schists, amphibolites, gneisses and migmatites (Baeza, 1984) intruded by mafic and granitic phutonic rocks (Fig. 1).

GEOCHRONOLOGIC IMPLICATIONS

In the Belén Metamorphic Complex (BMC) the following ages were obtained:

1. 544+/-22 Ma (Rb-Sr, whole rock isochron) in the quartz mica schists of Quebrada Saxamar (locality 3, Fig. 1).
2. 536 to 516 Ma (K-Ar on minerals) in the Quebrada Saxamar schists (locality 3, Fig. 1).
3. 507+/-48 (U-Pb zircon age) in the quebrada de Achacagua orthogneiss (locality 2, Fig. 1).
4. 475+/-31 Ma (U-Pb in zircon) on granitic veins at Quebrada Saxamar (locality 3, Fig. 1).
5. 417 to 365 Ma (K-Ar on minerals) for the Saitoco orthogneiss (locality 1, Fig. 1).

Ages in 1 and 2 are considered to be associated to the regional metamorphism of the BMC. The younger 516 Ma K-Ar age (see 2) could indicate uplift and cooling of the metamorphic complex.

Intrusive events (3 & 4), though largely concordant within errors, appear to be slightly younger than ages (1 & 2) in the metamorphic rocks.

Ages for the Saitoco orthogneiss, given in 5, are considered to be cooling ages of the intrusive body.

Model Nd-Sm ages of 1,746 and 1,543 Ma of the Quebrada Saxamar schists testify of a long previous crustal origin of its constituents.

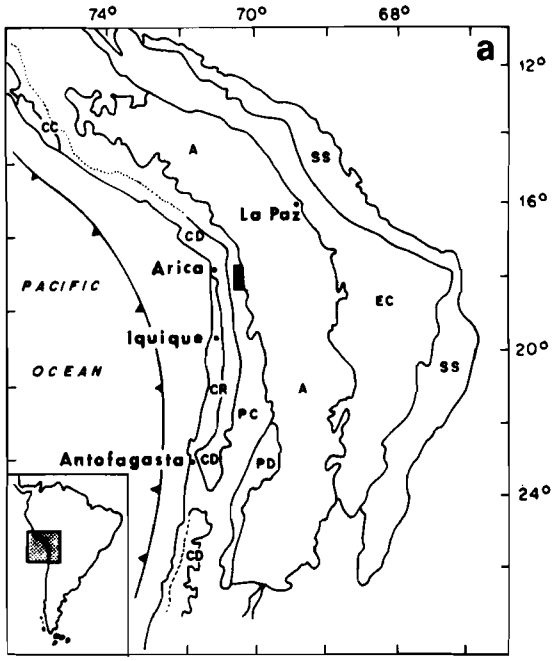
In the Mejillones Metamorphic Complex (MMC) the Jorgino Formation, constituted by gneisses and amphibolites gave K-Ar ages of 147 and 162 Ma (biotite) and 159 Ma (hornblende). Crosscutting granite veins were dated at 144+/-1 Ma (U-Pb in zircons) and 152 and 143 Ma (K-Ar in muscovite).

CONCLUSIONS

The above results indicate that the main signature in the BMC are Pampean (middle Cambrian) plutonic and metamorphic events. Our data cast some doubt on the validity of the 1,000 Ma event previously determined in the BMC (Pacci et al., 1980), because there is no indication of it in the analysed samples, which were collected at the same localities as the previously dated 1,000 Ma dated rock suite.

The Jorgino gneisses and amphibole schists (MMC) bear the evidence of a Jurassic intrusive event that may have reset the K-Ar system of the metamorphic rocks, which might be older as previous Rb-Sr studies indicate. The BMC bears no evidence of Mesozoic events as the MMC which is located farther West, at the leading edge of South America.

Fig. 1. Location map of the studied region in South America. a. Morphostructural units of the central Andes of Northern Chile, Southern Perú, and Western Bolivia: CR. Coastal Range, CD. Central Depression, PC. Precordillera, PD. Preandean depression, A. Altiplano, EC: Eastern Cordillera, SS. Subandean Sierras. b. Geological sketch map of the western Altiplano between Chapiquiña and Tignamar with sample localities in the BMC (based on García, 1996): 1. BMC, 2. Livilcar Formation (Jurassic, marine), 3. Lupica Formation (Lower Miocene), 4. Joracane Formation (Middle Miocene, syntectonic conglomerates), 5. Porphyric intrusives (Middle Miocene), 6. Huaylas Formation (Upper Miocene, syntectonic conglomerates), 7. Plio-Pleistocene deposits, 8. Sample localities.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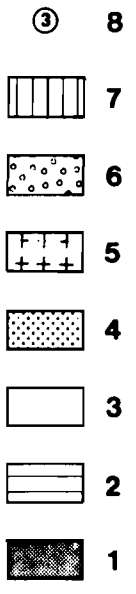
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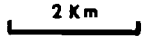
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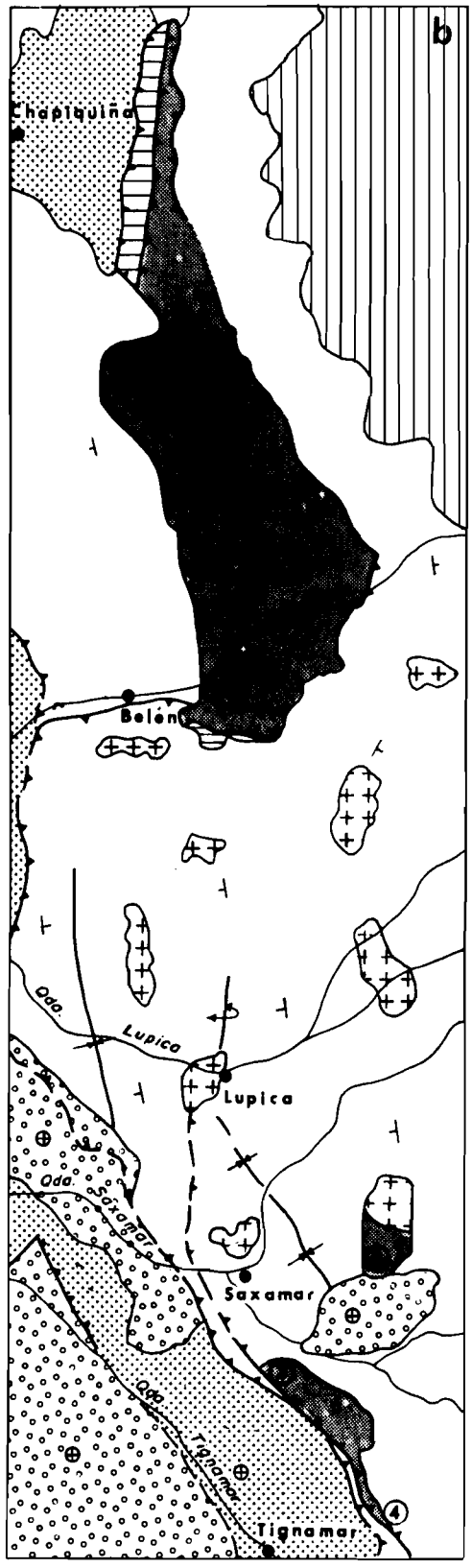
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Fig. 1

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