NATURE OF THE FRONTAL CORDILLERA METAMORPHIC ROCKS IN THE RIO DE LA TUNAS AREA, MENDOZA PROVINCE, ARGENTINA

María A. Ruviños(1) and Daniel A. Gregori(1-2)

(1) Departamento de Geología, Universidad Nacional del Sur, San Juan 670 8000 Bahía Blanca, Argentina
(2) Departamento de Geología, Universidad Nacional el Sur y CONICET, San Juan 670-8000 Bahía Blanca, Argentina

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INTRODUCTION AND GEOLOGICAL SETTING

The Frontal Cordillera Basement (FCB) conforms a NNE-SSW elongated belt, 230 km long, running from the Rio Tunuyán in the south to the Precordillera in the north. Along this belt lithological differences can be appreciated. In the Precordillera area, most of the components of the basement are low grade metamorphic rocks such as calcareous schists, limestones, slates and phyllites. Scarce basic igneous rocks are interbedded in the metasedimentary sequence. The ultrabasic rocks are mostly represented in the northern area, (Cortaderas, Rivadavia and Mendocina Mines). In the Rio de Las Tunas area (Fig. 1) the basement rocks are represented by micaceous and quartz-feldspar schists, calcareous schists, limestones, metapelites, pillow lavas and igneous basic rocks. In the Rio Tunuyán area the basement rocks are mainly micaceous and quartz-feldspar rock, but not detailed work has been done. The FCB was considered by Ramos et at. (1986) as remains of the Chilenia terrane, that collided against the western border of the Gondwana during Devonian times. However only a few papers relative to the nature of the FCB rocks have been published (Caminos, 1965; Villar, 1969; Caminos et al., 1982; Villar and Donnari, 1989; Bjerg et al, 1990; Haller and Ramos, 1993; and Gregori and Bjerg, in press). Most of them are focused on the characteristics of the mafic and ultrabasic rocks but not on the metamorphic rocks. In this paper we present new lithological facies data and a brief description on the structure of the FCB rocks in the Rio de las Tunas, in order to obtain new information on the nature of these rocks.

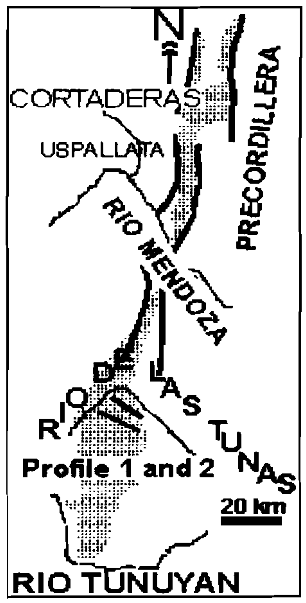

Figure 1. Map of localities.

DESCRIPTION OF THE LITHOLOGICAL FACIES

Micaceous, calcareous and amphibole schists: This group encloses a set of metasedimentites, most of them rich in calcareous minerals, sometimes with nodular and horizontal layered segregation of quartz according with the schistosity. The micaceous schists contain muscovite and biotite in similar percentage. In the first profile (Fig. 2A), the amount of calcite increase and micas decrease gradually to the west, to turn into calcareous schists. In the calcareous schists the representative mineral is coarse grained calcite. Low quantities of tremolite occurs in thin lenses, interbedded with micaceous components. They usually conform fining upward sequences, foliated in the bottom grading to massive in upper layers. Small outcrops of amphibole schists, composed by segregation of quartz, feldspar and plagioclase alternating with layers of tremolite and epidote are interbedded in the other rocks

Metapelites: This group include fine grained lithologies, sometimes containing garnet. Most of them have high quantities of calcareous minerals giving these rocks a marly composition. Metapelites are deformed showing schistosity according with the regional foliation. They are interlayed with schists, forming the top of fining upward sequences.

Calcareous rocks. Calcareous rocks include limestones, mudstones and associated marbles. They are significant constituents of the FCB. Limestones are composed by coarse grained impure calcite. Usually, they are massive and interbedded with schists and pelitic rocks. These rocks are assembled as coarsening upward sequences showing disturbed structures, resembling calcareous bars. In the first profile (Fig. 2 a y b), they present low scale folding. In most cases the calcareous rocks conform extended bodies that changing to schists westwards. The mudstones occurs in the Rio de las Tunas profile (Fig. 2b) about 2 km. west of the cross section beginning. They show transitional contacts from limestones to mudstones, due to the increment of mud amount. A typical feature is the presence of stratification and banded structures. Folding in the order of 1-2 cm. is common. Silicified layers mainly restricted to the contact with metabasites are present in mudtones. Marble is a rare component in the basement. It is composed of white, coarse grained calcite enclosing big crystals of chlorite. This rock is interlayered with thin layers of calcareous and micaceous schists.

Metabasites and related rocks: Metamorphosed basic rocks and associated metasomatic rocks, as blackwall, are very voluminous in the FCB. The metabasites include four groups: pre-metamorphic dikes, syn metamorphic, post-metamorphic bodies and pillow lavas. Pre-metamorphic dikes have been mostly recognised in profile 1 (Fig. 2a). They are 1-2 m thick and intrude the sedimentary sequence. Porphiritic texture composed by hornblende, plagioclase and minor quantities of feldspar is typically displayed. Main metamorphic mineral is garnet and occurs as widespread coarse crystals. Abundant calcareous minerals replacing plagioclase conform a fine white matrix. The rocks are strongly affected by metamorphism and deformation. Syn and post metamorphic bodies were recognised in both profiles. Syn- metamorphic rocks are abundant in the 12 Hermanos Mine profile. They occur as dikes up to 60 m thick or sheet flows Dikes show porphiritic texture changing çonsecutively from coarse to fine grained attributed to dike in dike processes. Flow remains display alternating layers of brecciated and massive rock up to 3m thick beds. Foliation at the bottom of the beds and vesiculation at the top is clearly observed. Samples are composed by plagioclase and hornblende. According with the petrological and textural characteristics they are classified as amphibolites. Acidic segregation was found in transitional contact of 1 m thick within the syn metamorphic bodies. They are more abundant and better exposed in profile 2 (Fig 2 c) in up 5 m wide expositions whereas the acidic body itself reach thickness of 2-3 m. The rocks exhibit a coarse grained granular texture, mainly composed by quartz, plagioclase and biotite. The post-metamorphic bodies were recognised only in the first profile. They conform dark bodies up to 100 m diameter, intruding the calcareous schist and mudstones. These rocks are relatively undeformated and retain their original microgranular texture. Important outcrops of pillow lavas were identified at the studied area. They appear interbedded with calcareous and micaceous schist, as well as metapelites. These rocks have suffered alteration and deformation. Blackwall (40 m thick) and talc schists restricted to the contact between the pillow lavas and the schists are common. Lava bodies are altered to a talc and serpentine minerals. Individual pillow size ranges from 20 to 40 cm, but in some cases diameters up to 1 m were observed.

ARRANGEMENT OF LITHOLOGICAL FACIES AND STRUCTURAL CHARACTERISTICS

The FCB contains a variety of interlayered metasedimentary and metavolcanic rocks. Micaceous metasedimentary rocks are confined to the eastern area, grading into thick calcareous bodies westwards. Metasediments conforming fining upward and minor coarsening upward sequences are restricted to the eastern middle section. Limestones and marbles are predominant at the northwestern sides. (Fig. 2). Mudstones interlayered with metabasites are restricted to the west area. Metapelites are a

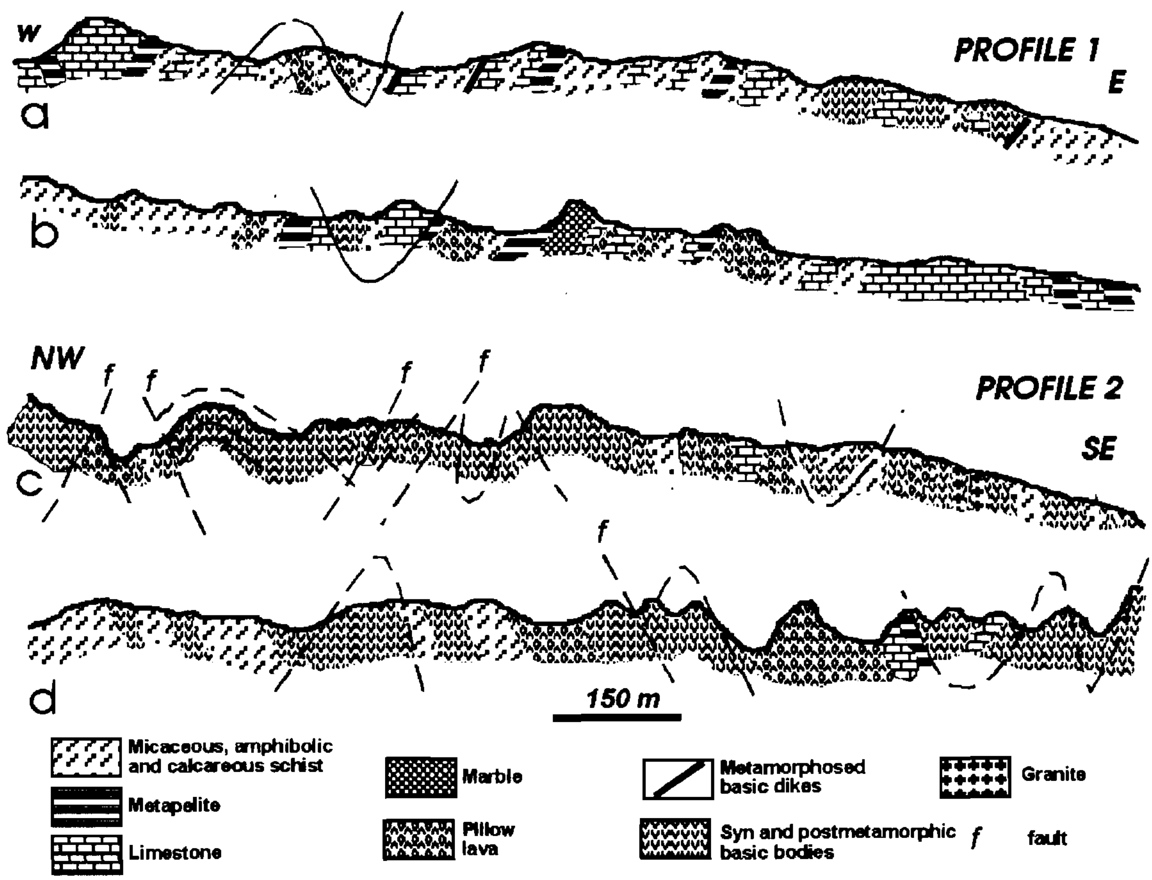

Figure 2. a-b: Rio de las Tunas profile. c-d: 12 Hermanos Mine profile.

rare element in this FCB section. They are interbedded with schists and metacarbonates forming the top of western sedimentary sequences. A remarkably large body of syn-metamorphic basic rocks predominates in the 12 Hermanos Mine profile represented by lava flows sequences. In the eastern side of the area the sheet flows are predominant. Similar textures and setting assemblages suggest the same volcanic origin for these rocks. conforming a typical volcanoclastic sequence. Pre and post metamorphic volcanic bodies are restricted to the northern area. Finally, pillow lavas are an important component in FCB, but specially predominant southwards. Localities in which well-preserved volcanic features were observed they form discontinuous layers with sharp conformable contact against the metasedimentary units. A brief structural analysis of the different components of this metamorphic belt section has been sketched. The FCB rocks have suffered a strong deformation represented by an important high scale folding (wavelength ~ 100 m) with minor low scale folds (wavelength ~ 10-20 cm) associated. In the second profile (Fig 2 d) metabasites exhibit overprint folding in two main directions: N 60°E and N 30° W. Folding features are interrupted by faulting representing a later deformational event.

CONCLUSIONS

The clastic rocks of the FCB (calcareous and micaceous schists) were probably deposited in a marine platform environment, whereas the metapelites, lava flows and pillow lavas denote deeper environments. This assemblage represents an up to 3 km thick tectonic mélange. Similarities in the lithology and the emplacement features of the FCB components with California Klamath Mountains (Donato, 1989) suggest they are parts of an ophiolitic sequence. Villar & Donari (1989) described and interpreted an assemblage of mafic rocks to the south of 12 Hermanos Mine profile as belonging to an ophiolitic sequence. Also metavolcanic rocks with similar characteristics were recognised by Gregori & Bjerg (in press) in the Arroyo Metales, 20 km southwestwards. In the Precordillera, similar arrangements were found by Haller & Ramos (1993) and Davies et al (in press).

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