

GRENVILLIAN BASEMENT AND FAMATINIAN EVENTS OF THE SIERRA DE UMANGO (29°S): A REVIEW AND NEW GEOCHRONOLOGICAL DATA

Varela, R.¹; Basei, M.A.S.²; Sato, A.M.¹; González, P.D.¹; Siga Jr., O.²; Campos Neto, M.C.² and Cingolani, C.A.¹

1. Centro de Investigaciones Geológicas, Universidad Nacional de La Plata y Consejo Nacional de Investigaciones Científicas y Técnicas. Calle 1 N° 644, 1900 La Plata, Argentina. varela@cig.museo.unlp.edu.ar, sato@cig.museo.unlp.edu.ar, gonzapab@cig.museo.unlp.edu.ar, ccingola@cig.museo.unlp.edu.ar
2. Instituto de Geociências, Universidade de São Paulo. Rua do Lago 562, 05508-900 São Paulo-SP, Brasil. baseimas@usp.br, siga@usp.br, camposnt@usp.br

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INTRODUCTION

The Sierra de Umango (29°00'S-68°40'W) was interpreted as part of a northernmost Grenvillian-age rocks of Laurentian-derived terrane, accreted to the southwestern margin of Gondwana. The most important tectono-metamorphic and magmatic processes related to this collision occurred along the N-S trending Famatinian orogen since the Ordovician to Devonian (e.g. Dalla Salda et al., 1992, 1998; Ramos et al., 1998; Astini, 1998; Casquet et al., 2001), overprinting the magmatic and metamorphic rocks already affected by previous Grenvillian history.

In this paper we present new U-Pb ages that extends the outcrops of Grenvillian rocks to the north of the well known localities with Mesoproterozoic rocks, and also constrain the age of the subsequent overprinting events. The new ages together with the already existing data, allow us to understand the geological evolution of the Sierra de Umango in relation to the Lower Paleozoic Famatinian Orogeny.

GEOLOGICAL OUTLINE OF THE SIERRA DE UMANGO

The Sierra de Umango (Fig. 1) is located in the northern part of the Western Sierras Pampeanas (Caminos, 1979) and the Grenvillian basement rocks are composed of medium to high grade orthogneisses of basic to acid composition (Juchi Orthogneiss of Varela et al., 1996). The conventional U-Pb data (granitic orthogneiss) of 1108±13 Ma was interpreted as magmatic crystallization age (Varela et al., in press) as well as Rb-Sr whole rock isochron of 1030±30 Ma from the same rock was related to overprinting amphibolite-granulite facies metamorphic event (Varela et al., 1996). A garnetiferous orthoamphibolite has given a K-Ar hornblende age of 539±14 Ma and 442±15 Ma, consistent with post-intrusion amphibolite facies metamorphic event (Varela et al., in press).

The Grenvillian basement rocks are separated by shear zones from medium to high grade siliciclastic and calcareous sequence (Tambillo Metamorphites), composed mainly of schists and marbles with orthoamphibolites and minor gneisses and pegmatites. This sequence was interpreted as a platform covering the Mesoproterozoic cratonic basement (Varela et al., 2001).

The initial ratio ⁸⁷Sr/⁸⁶Sr and δ¹³C from marbles suggest a sedimentation age in the range 640-580 Ma (Varela et al., 2001). The Rb-Sr whole rock+minerals isochrons of 379±41 Ma and 373±7 Ma from two foliated pegmatites were interpreted as the age of the latest metamorphism and ductile deformation event (Varela et al., 2002). The Sm-Nd whole rock+minerals isochron of 392±50 Ma from an amphibolite intercalated in the sequence, also confirm the tectonothermal event at Middle to Late Devonian times.

The El Peñón Granite intruded the Tambillo Metamorphites of possible Neoproterozoic sedimentation age, and is composed of foliated granodiorites and granites. The conventional U-Pb zircon crystallization age of 473±17 Ma (Varela et al., in press) from El Peñón Granite was overprinted at least by two metamorphic events, at ~469 Ma (Rb-Sr whole rock isochron; Varela et al., 2000) and 409-381 Ma (K-Ar, muscovite; Varela et al., in press). The Early Ordovician metamorphism age was confirmed with the new U-Pb results (see below) and the Early to Middle Devonian ages partly overlap the time span of 392-373 Ma from the pegmatites and amphibolite.

NEW U-Pb RESULTS AND DISCUSSION

New conventional U-Pb data (zircon) from two tonalitic orthogneisses yielded ages of 1090±35 Ma -MSWD 0.038- and 1216±29/-16 Ma -MSWD 1.9- (Fig. 1, Table 1). These Mesoproterozoic datums are interpreted as representing the magmatic crystallization age of the igneous protolith of the Juchi Orthogneiss, and are also consistent with previous geochronological data.

Five zircon fractions from a biotitic paragneiss define a discordia line with upper intercept at 1139±82 Ma -MSWD 40- and lower intercept at 447±36 Ma (Fig. 1, Table 1). We consider the Mesoproterozoic data as that of the heritage age of the Tambillo Metamorphites (related to Grenvillian basement) and we interpret the Late Ordovician data as the metamorphic overprint related to Famatinian Orogeny.

Three monazite fractions from a mylonitic paragneiss define an ²³⁸U-²⁰⁶Pb age of 452±6 Ma, -MSWD 0.47- (Fig 1, Table 1). This data is interpreted as representing the same Late Ordovician metamorphic event of biotitic paragneiss.

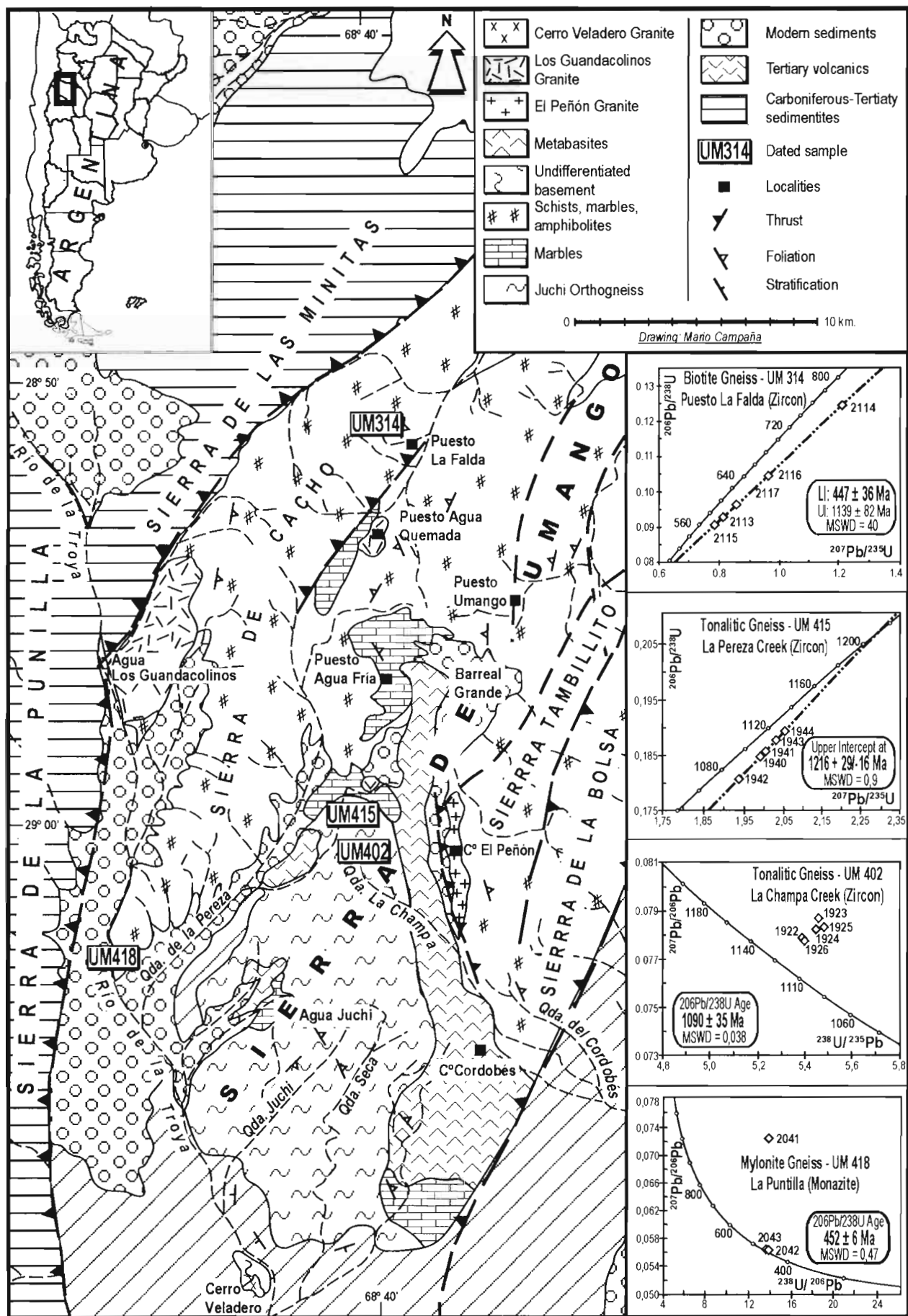


Figure 1. Geological map and diagrams of new U-Pb ages.

The new conventional U-Pb ages from the Juchi Orthogneiss confirm the Mesoproterozoic Grenvillian age previously reported, and also extends the outcrops of the orthogneisses to the north of Agua de Juchi section. Early to Late Ordovician regional metamorphism and deformation were interpreted as the orogenic event that affected the Mesoproterozoic basement during the collisional history of the Famatinian orogen. The Middle to Late Devonian ages were also interpreted as shear zone metamorphism (Varela et al., 2002).

All these Early Paleozoic orogenic processes (metamorphism and deformation) have been related to the collisional history of Famatinian Orogeny, in which the Sierra de Umango is considered as part of the Laurentian-derived allochthon. Further south to the Sierra de Umango at Sierra de Pie de Palo, Casquet et al. (2001) delineated a comparable tectono-metamorphic history related to the Early Paleozoic Famatinian events that overprinted the allochthon basement of Grenvillian-age.

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Table 1. New U-Pb zircon and monazite ages from Sierra de Umango.

Geologic unit	Locality	Dated rock type	Dated process	Method - Material	Age (Ma)
Orthogneiss Juchi	La Champa creek	tonalitic orthogneiss	magmatic crystallization	U-Pb - zircon in magnetic fractions	1090 ± 35
Orthogneiss Juchi	La Pereza creek	tonalitic orthogneiss	magmatic crystallization	U-Pb - zircon in magnetic fractions	1216 +29 / -16
Tambillo Metamorphites	Puesto La Falda	biotitic paragneiss	metamorphism and heritage age	U-Pb - zircon in magnetic fractions	lower int.: 447 ± 36 & upper int.: 1139 ± 82
Tambillo Metamorphites	La Troya river	mylonitic paragneiss	metamorphism	U-Pb - monazite	452 ± 6