

Paleogeographic evolution of the southwest Gondwana boundary during the Late Paleozoic: Paleomagnetism of the lower Choiyoi volcanics in the San Rafael block, Mendoza, Argentina

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New paleomagnetic data from a section of the Cochicó Group (Lower Choiyoi) in the San Rafael Block (34-35°S), Mendoza, Argentina, improve the knowledge of this part of Gondwana during the late Paleozoic. This area is the westward part of an orogenic belt, known as Cordón de las "Gondwánides" (Keidel, 1916) or "Sam Frau geosyncline" (Du Toit, 1927) which may represent the suture zone between the Gondwana and Patagonia terranes. This collision model is still uncertain and there are many controversies related to the age of the deformation of this belt (Figure1).

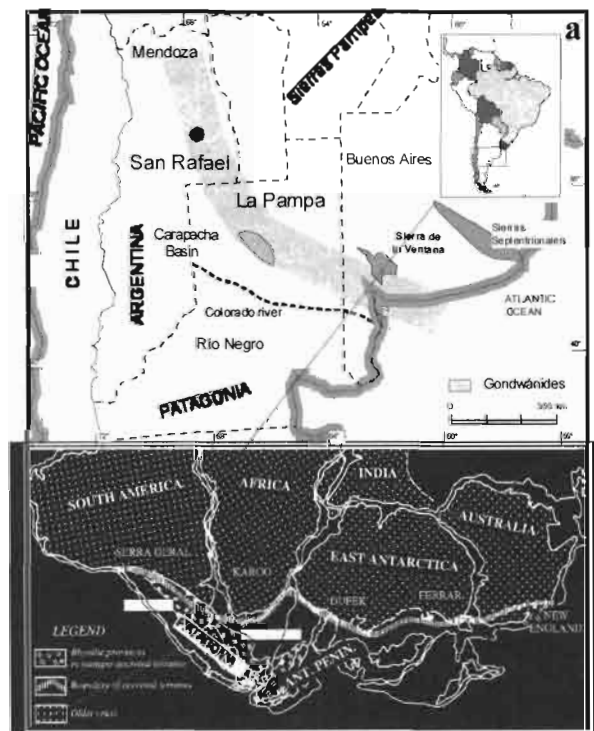


Figure 1: Location of the study area of the San Rafael block, province of Mendoza, Argentina, exposed in the orogenic belt known as "Gondwanides" (Keidel, 1916). This deformed belt has the same distribution of the gondwanic magmatism of Carboniferous-Permian age.

Paleomagnetism and the exploration of the magnetic fabric signatures (AMS) can be useful to evaluate the regional deformation and lead to a better understanding of the assembly, deformation, and fragmentation of

Gondwana / Pangea. The stability of the area implies that the obtained paleomagnetic poles are representative of South America. AMS will be used as a tool to determine the provenance of the ignimbrites and to correlate different cooling units from the Permian eastern and western basins of the San Rafael Block (Tommezzoli *et al*, 2002).

Gondwana magmatism in the San Rafael Block (Figure 2) is represented by the Choiyoi magmatic province which can be divided into a lower sequence, deposited in a magmatic arc during active subduction and an upper sequence coeval with a period of post-orogenic extensional collapse (Kleiman, 1999; Japas and Kleiman, 2002; Japas and Kleiman, 2004). The lower Choiyoi section in San Rafael (Cochicó Group) overlies unconformably the carboniferous sediments of El Imperial Formation (Figures 2 and 3). These rocks were emplaced syntectonically with transpressional deformation attributed to the San Rafael orogeny (Kleiman and Japas, 2002; Japas and Kleiman, 2004). The Yacimiento Los Reyunos Formation, at the base of the sequence, is composed of four interbedded facies: conglomerates (Psefítico Member), andesitic breccias (Andesítico Member), ignimbrites (Toba Vieja Gorda Member: TVG), and epiclastic redeposited eolian sandstones (Areniscas Atigradas Member). Samples from five ignimbrite cooling units and some of the interbedded sandstones were taken in a section located at La Pintada (Figures 2 and 3). A description of the ignimbrites was presented in a previous contribution (Tommezzoli *et al*, 2002).

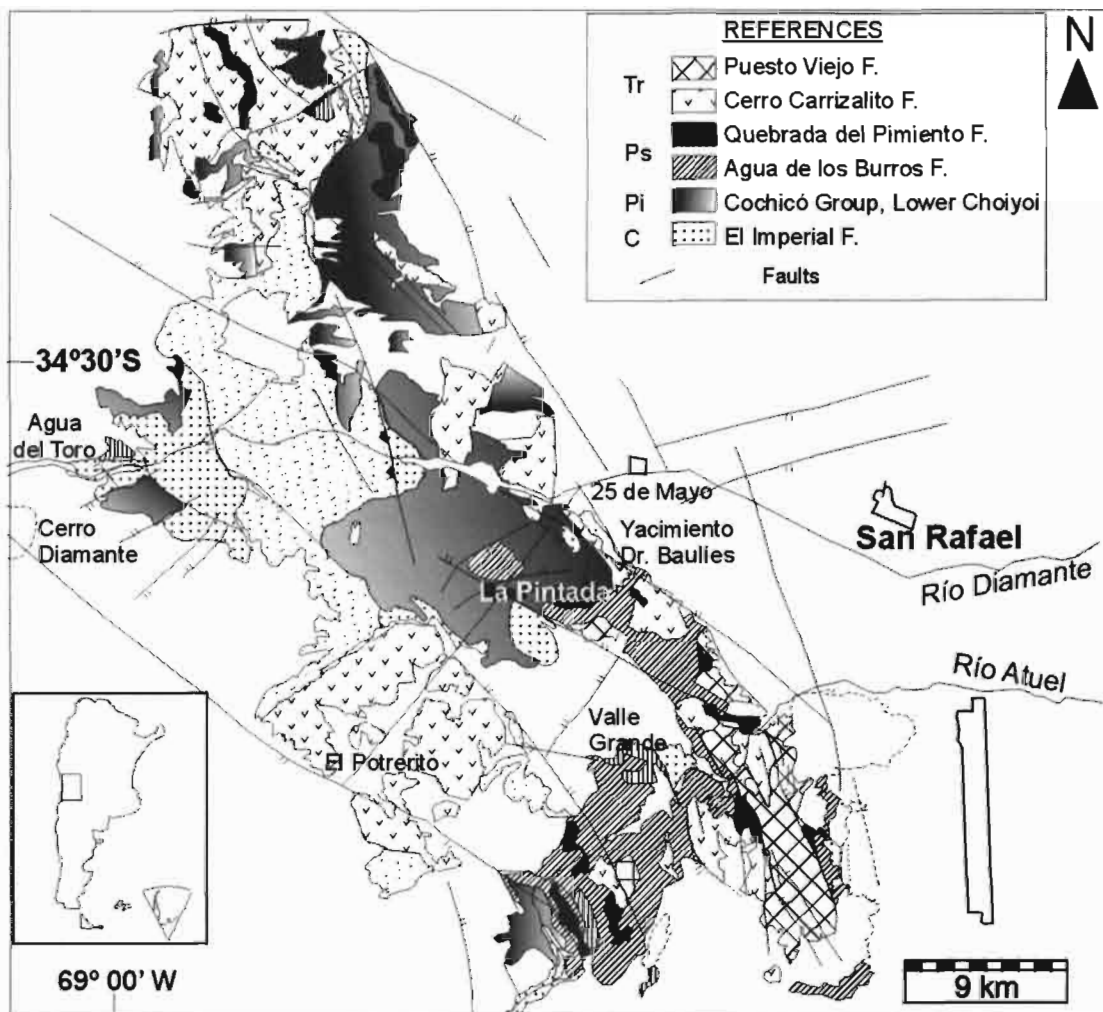


Figure 2: Geological map of the San Rafael Block showing the location of La Pintada profile.

At least six drill cores or four hand samples were collected per site. They were oriented in the field using magnetic and/or sun compasses. Usually, three cylindrical specimens (2.2 cm long. x 2.5 cm diameter) were cut from each core. The specimens were submitted to standart studies. In this paleomagnetic study are presented the results from 10 sites, sampled from the base to the top (Figure 3). Samples were demagnetized with thermal procedures. A characteristic remanent magnetization (ChRM) was isolated in 7 sites, with stable behavior and positive inclination (reverse magnetization). In two sites the lithology was unfavorable and the other site resulted in a positive conglomerate test at the top of the sequence. Unblocking temperatures of the CHRM component were 375° and 680° indicating that this component is carried by titanomagnetite and hematite (formed during the period of ignimbrite cooling). Remanent magnetization ranges around 50 to 1200 mA m⁻¹. All sites showed very good within site consistency ($\alpha_{95} < 15^\circ$ and $k > 20$).

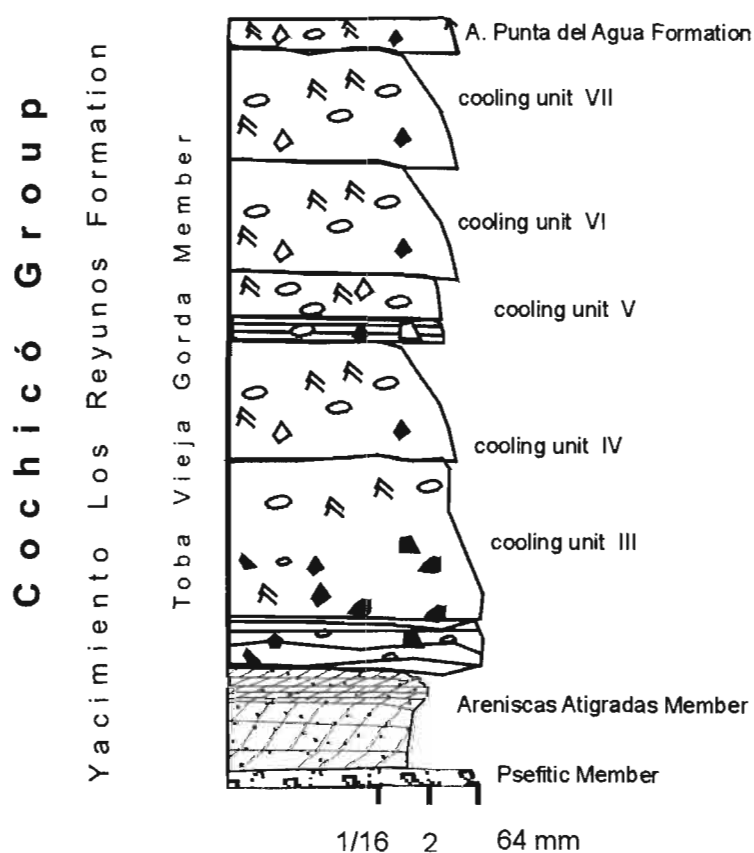


Figure 3: Stratigraphic section of the Yacimiento Los Reyunos Formation at La Pintada.

These stable remanent magnetization were grouped in the same Population: "*in situ*" mean direction is: $D=163.9^\circ$, $I=42.8^\circ$, $\alpha_{95}=17.9^\circ$, $k=12.28$, $N=7$. At 100% unfolding is: $D=142.9^\circ$, $I=53.15^\circ$, $\alpha_{95}=15^\circ$, $k=17$, $N=7$. Application of the stepwise fold test showed that the best clustering is obtained after 61% unfolding: $D=153^\circ$, $I=50.4^\circ$, $\alpha_{95}=12.7^\circ$, $k=23.4$, $N=7$. According with this result it appears that this magnetization is syntectonic and was acquired during the Kiaman Reverse Superchron. However, there is no statistical meaningful difference between those positions: pre - post or syntectonic. But, as the magnetic mineralogy is primary, and there is a

positive conglomerate test through the top of the sequence, this magnetization cannot be considered either syntectonic or posttectonic. The paleomagnetic pole corresponding to 100% unfolding is at: Lat: 60.35°S, Long: 7.42°E; $\alpha_{95}=17.5^\circ$, $K=12$. This pole would be of approximately 280 Ma (unpublished U/Pb SHRIMP age by Basei, M.A.S., Rocha Campos, A.C. & Nutman, A.P.) and is consistent with other Early Permian syntectonic paleopoles for South America: as Tunas I (Tomezzoli and Vilas, 1999); Hoyada Verde (Rapalini and Vilas, 1991) and Ponón Trehue (Truco and Rapalini, 1996) which were assigned to the San Rafael orogeny. As it was mentioned already, structural and geochemical studies of the Cochicó Group indicate that volcanism was emplaced during transpressive deformation related to this orogenic phase (Kleiman and Japas, 2002; Japas and Kleiman, 2004) in agreement with the paleomagnetic data. New paleomagnetic studies in the area will allow a regional correlation with other Paleozoic basins and among the ignimbrite cooling units.

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