Quebrada del Toro and Angosto de La Quesera, Eastern Cordillera, Salta Province

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Introduction

A series of stops are planned through the Quebrada del Toro, which is located to the west of Salta City (by national road 51 driving to the Chilean border), to show diverse aspects of the geology of the Eastern Cordillera southwestern area.

Quebrada del Toro (El Toro Creek)

Stop 1. To the south of the El Toro Lineament, the basement underlies the Cretaceous–Tertiary deposits; to the north of the El Toro Lineament, the Lower Paleozoic (MG and SVG) covers the basement. In Las Arcas creek the basement thrust on the Cretaceous–Tertiary deposits will be seen.

Stop 2. Alfarcito locality, at the foothill of the Tastil Granite. A contact metamorphic aureole caused by the intrusion of the granite in basement rocks will be shown.

Stop 3. Abra de la Cuesta, a panoramic view of the Alfarcito Valley, where the Toro and Tastil rivers junction occurs.

Angosto de La Quesera area

Stop 4. In the upper stream of the Toro River, between Abra Palomares and Finca del Toro (Figure 5), the Tastil granite (526 Ma; Hong *et al.,* 2003) divides two tectonic graves: the Tres Cruces basin to the east and La Quesera basin to the west (Figure 37, 38). In the last one, the SVG overlies a red granite in an isolated outcrop, which is separated from the main granitic body (Cencerro hill) by the La Quesera fault (FQ, Figure 37). The La Quesera creek runs accross one of the most interesting sections of the Ordovícico of the Eastern Cordillera, in the northeastern part of the outcrop.

The excellent observations and detailed descriptions by Keidel (1943) revealed a complex geology of the study area. Subsecuent contributions by Kilmurray & Igarzábal (1971), Fields (1973), Méndez (1974), Moya (1988a), Moya *et al.* (1994, 2003), Hongn *et al.* (2001 a,b), and Aceñolaza *et al.* (2003), dealt with diverse aspects of the rocks exposed at the Angosto de La Quesera. A synthesis of our data, observations and interpretations, will be presented.

The Paleozoic succession that covers the red granite in the Angosto de La Quesera corresponds to the SVG because it has compositional, petrographic and geochemical characteristics similar to the Cambrian–Tremadocian deposits of the SVG exposed in the Tres Cruces basin, where it was originally defined (Figure 1).

The Tastil Granite (La Quesera Granite *sensu* Keidel, 1943) in the stidied area unconformably underlies the SVG. Its age was referred to as Late Precambrian – Middle Cambrian (see Turner & Mon, 1979). The assumption of the La Quesera Granite intrudes to the Ordovician deposits (Hong *et al.*, 2001) is not followed here. The intrusion of little veins in the Paleozoic rocks pointed out by Hong *et al.* (2001) could be explained by the presence of Tertiary dacites, which affected these rocks in the southern part of the Eastern Cordillera. The SVG was intruded by these dacites in the El Moreno and Pueblo Viejo localities, north to the Angosto de La Quesera.

The SVG exposed in the Angosto de La Quesera underlies eolianites and limestones of the Salta Group through a low angular unconformity. The Paleozoic succession presents four clearly distinctive intervals, separated by unconformity surfaces:

i) The oldest interval integrates a thinning–finning upwards cycle composed by quartzitic medium sandstone that tier to a bioturbated heterolitic facies. Stratigraphic structures include flaser, wavey and lenticular bedding; sigmoidal boundles; abundant cross–beddings (herringbones), and reactivation surfaces. This interval may represent a slight shallowness, from subtidal to intertidal environments developed in a tide–domined shelf (Figure 38).

ii) The second interval only consists on clean sands, which represent the reestablishment of subtidal conditions.

The paleontological record in i) and ii) includes crushed remains of lingulids and abundant fossil traces, prevailing *Cruziana* isp., among others.

A conglomerate and sanstone interval corresponds to the glacimarine deposits of Keidel (1943). The contact of this interval with the underlying unit is a clear megawavy surface. It was apparently washed out during part of the Cardonal Formation deposition. At same time interval a regressive process developed in the rest of the basin, while the area herein considered (including marginal deposits) would have been subject to erosion (Figure 39).

Most remarkable features of the conglomerate are the size and roundness of clasts, the tight packaging and the scarce although conspicuous quartz–calcareous matrix. These parameters point out to a near source area and a high energy deposit that enabled to rework the thick material and to wash out the fine one. Most of clasts and blocks of psefites show identical lithologies of the underlying units (granite and quartzite). Some shaly and calcareous clasts yielded *Parabolina (N.) frequens argentina,* and conodonts referred to as the *Cordylodus angulatus* Zone by Aceñolaza *et al.* (2003). The matrix of the conglomerate carries abundant brachiopod remain, and the trilobites *Kainella meridionalis*, *Pseudokainella lata*, *Angelina kayseri, Leptoplastides marianus* and *Asaphellus catamarcensis* Kobayashi. Conodonts are represented by a low diversity assemblage (*Teridontus nakamurai* Nogami and *Variabiloconus variabilis*Lindström), which may be restricted to the *Paltodus deltifer* Zone (Upper Tremadocian) (Albanesi, in progress).

iv) The last interval is represented by a heterolitic succession composed in a thinning–finning upwards cycle. Most of banks begin with a coquina term that tier to quartzose or micaceous wacke, solid or with plane lamination of high regime. Striations, grooves and bounce casts are common. Sandstones are separated by interlaminations of wackes and siltstones with wavy and lenticular bedding. Some lenticular levels of trilobite and brachiopod coquinas, which show a rusty and fragile appearance, include: *Bienvillia* sp., *Protopeltura mesembria*, *Trilobagnostus hoeki, Geragnostus nesossii*, *Conophrys sulcatus, Skjarella notatifrons, Tolmachovia* sp., crinozoans, lingulid remains and orthids. Wackes and siltstones contain poorly preserved rhabdosomes of *Adelograptus* sp. cf *A. tenellus*, *Rhabdinopora flabelliformis* ssp. cf. *R. f. anglica*, *Callograptus* (*Pseudocallograptus*) sp., and *Bryograptus*? sp.

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