



Quaternary deformation around the Palo Negro area, Pampa Norte, Argentina

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ARTICLE INFO

Article history:

Received 8 April 2009

Accepted 14 December 2009

Keywords:

Neotectonics

Terrain analysis

Late Quaternary deposits

Pampa plain

ABSTRACT

The Pampa Norte region is a great plain characterized by low slopes and accumulation of hundreds of meters of thick loose sediments. A high morphostructure denominated San Guillermo block stands out in the central plain, the Tostado–Selva scarp forming its western boundary. It is located in an intraplate setting characterized by low tectonic activity. However recent uplift can be inferred by means of terrain analysis and the sedimentology of the Palo Negro Fm. Pond deposits (Palo Negro Fm.) observed in the scarp suggest topographic inversion during the Late Quaternary in the Palo Negro area. The morphology indicates that the deformation was widely distributed, forming a gentle (ca. 5 m amplitude and 13 km wavelength) asymmetric fold. Low sinuosity lineaments located in the base of the scarp, coincident with knick points in the topographic profile, can be interpreted as the projection of tip-lines by high-angle fault-propagation. This geometry is compatible with reverse kinematics on blind faults.

A deformation style with reactivation of pre-existing faults is consistent with structural observations. Seismic reflectors suggest the presence of Cretaceous high-angle normal faults, and the orientation of lineaments is similar to the orientation of the graben systems and transverse accommodation zones originated during the opening of the South Atlantic Ocean.

One OSL dating of 67.4 ± 5.1 kyr B.P. (from Palo Negro Fm. supposed as deposited on a flat plain floor) and a height difference of 9.5 m measured in the Tostado–Selva scarp account for an averaged uplift rate of 0.14 mm/year.

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1. Introduction

A good attention has been paid to establish the mechanisms of deformation within intraplate settings in the last years (Crone et al., 1997; Cloetingh et al., 2005; Clark and McCue, 2003). Geological, geomorphological, and geophysical information has been applied in order to verify neotectonic activity in relatively stable regions in South America. Mainly Brazilian researchers, have advanced by establishing constraints to neotectonic character of the deformation and the stress fields, from seismological data such as focal mechanisms obtained from instrumental record (Assumpção, 1992, 1998), breakouts in boreholes (Lima et al., 1997; Lima, 2000) and geological information (Riccomini et al., 1989; Bezerra and Vita-Finzi, 2000; Bezerra et al., 2001, 2006; Saadi et al., 2002; Modenesi Gautieri et al., 2002; Salmuni et al., 2003). Furthermore, a number of groups have recently exploited the numerous available data regarding remote sensors products, both optical and radar satellite data (Assine and Soares, 2004; Grohmann, 2004; Grohmann et al., 2007). These studies indicate the existence of Quaternary, particularly Holocene faulting in almost all geological provinces of Brazil (Riccomini and Assumpção, 1999).

In Argentina, most of the neotectonic and paleoseismological studies in intraplate setting are restricted to adjacent region of the Sierras Pampeanas (Costa, 1996; Costa and Vita-Finzi, 1996; Costa et al., 2001; Sagripanti et al., 2003). This morphostructure was defined as a broken foreland system, produced from the flat-slab subduction of the Nazca Plate underneath the Sudamerican plate, between 27° SL and 33° SL (Jordan and Allmendinger, 1986).

In the Chaco–Pampean Plain, structural problems have been frequently tackled based exclusively upon evidence coming from remote sensors (Pasotti, 1974; Iriondo, 1989; Rossello et al., 2005; Mon and Gutiérrez, 2009). Neogene deformation in the region was inferred preliminary from stratigraphic data (Stappenbeck, 1926; Kröhling and Iriondo, 2003). No examples of surficial ruptures by faulting were reported in the Pampa Plain (Costa et al., 2006; Brunetto and Iriondo, 2007). Hence, only indirect stratigraphic indicators of neotectonic deformation are expected in a region dominated by sedimentary aggradation. In this sort of setting, the correlation of lineaments, topography and stratigraphy has the aim to stress the presence of the blocks that conform the architecture of the region (Giambastiani, 1991). The combination of independent geomorphological and stratigraphic approaches is often used to fulfill the usual working sequence in neotectonic studies (Costa, 1996). We consider neotectonic to the deformation oc-

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curred during the Quaternary, represented in the Pampa Norte by a column of sediments, 60 m thick (Kröhlhng and Iriondo, 2003).

N–S Tostado–Selva fault, bounding the Mar Chiquita lake depression, is the main lineament in the Pampa plain, easily noticeable in satellite images. The expression in the field is an anomalous slope observed throughout hundreds of kilometers. In

several articles this lineament is referred as a fault. However, activity during Quaternary has not been verified yet.

This contribution was concern on the stratigraphic evidences of recent deformation in the Tostado–Selva fault, in the Palo Negro area. Our hypothesis is the Palo Negro Fm. was deposited in swamps and ponds in a lower paleoaltitude, and it was uplifted

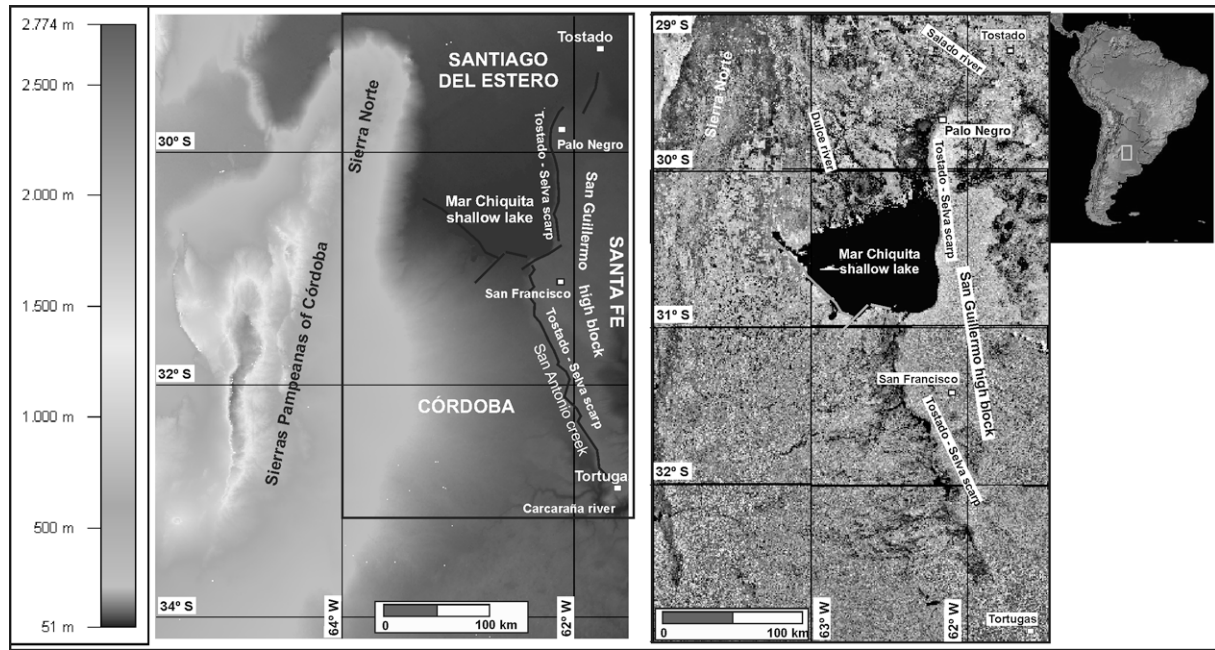


Fig. 1. Regional location. The main morphostructures of central Argentina are: Sierras of Córdoba and Sierra Norte in the west (easternmost part of a broken foreland; Jordan and Allmendinger, 1986); Mar Chiquita lake depression and San Guillermo high block, in Chaco–pampean Plain; (a) elevation map derived from a DEM (SRTM–NASA, 90 m); (b) map derived from Landsat ETM images.

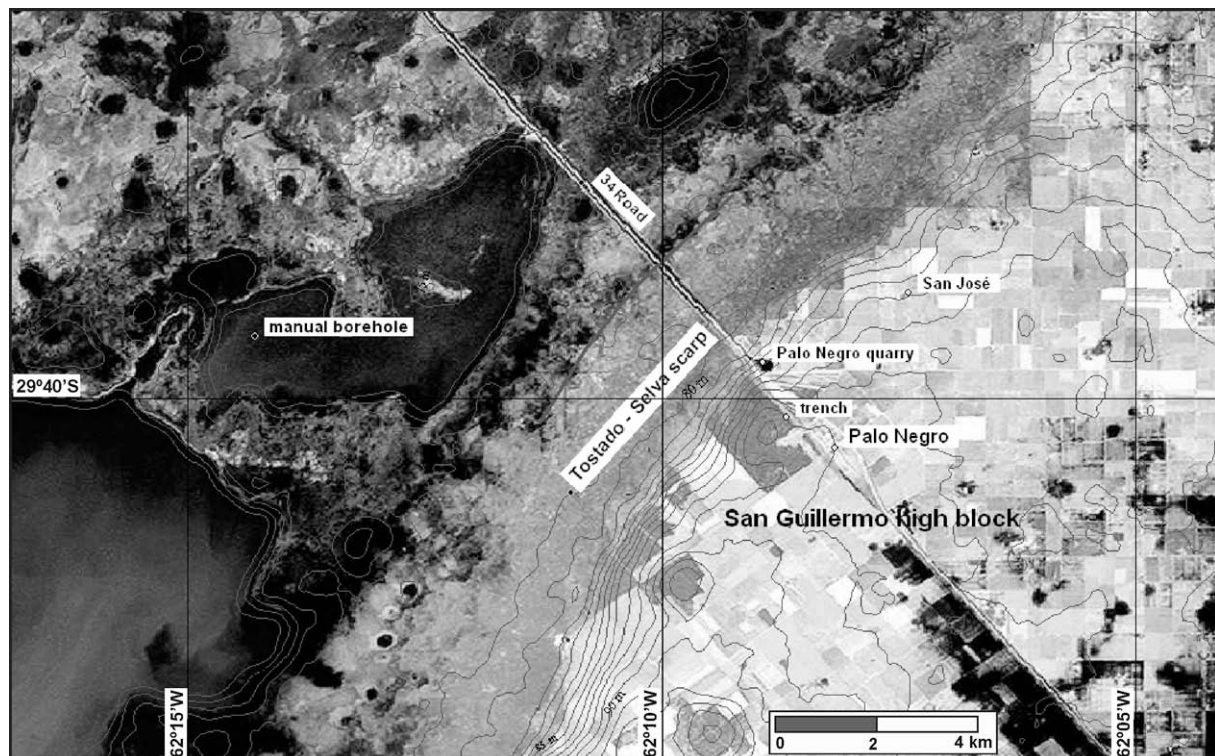


Fig. 2. Palo Negro area. The locations of outcrops and samplings are indicated in the map.

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