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MAGNETIC ANOMALIES ON THE SOUTHEAST TANDILIAN SYSTEM (ARGENTINA)

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ABSTRACT

The magnetic characterists in the continental SE end of the Tandilian System (Argentina) are studied. The main magnetic trend show features of relatively shallow basement, but there are a northward distinctive block and rocks of the important magnetic susceptibility constrast southwestward. The susceptibility range increase award NE. Two important magnetic anomalies with NW-SE trend, normal to coastline, latitude are defined. Thus, the magnetic method allow us to define two important thrusts: at the boundary of the Salado and Interserrana Basins (Prov. Buenos Aires, Argentina) and the one in the oriental end of the Tandilian System

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INTRODUCTION

The coastal zone between Mar del Plata-Necochea-Miramar (Provincia de Buenos Aires, Argentina) comprise the SE continental border of the Tandilian System. It represents a typical block system, separated by means of fault groups, according to three principal tectonic domains: E-W, NE-SE y NW-SE (*Teruggi y Kilmurray*, 1975). In this study it is embraced from south border of the Salado Basin, SE edge of the Tandilian System, and the SE continental extreme of the Interserrana Basin (Fig. 1).
The Tandilian System, and its prolongation in the submarine platform, would have a northeastward rough transition (Salado Basin), and smooth toward southeast (Colorado Basin).
Figure 1 shown the Salado Basin location bording the continental margin of the South Atlantic Ocean. There are three sedimentay basins (Salado, Colorado, and the basin of the Plata Este) that have a common origin, associated with the South Atlantic spreading (*Urien*, 1981). The Salado Basin belongs to the Inferior and/or Middle Cretaceous. On its NE border, toward the continental platform, the basin contains mainly basic rocks of the Inferior Cretaceous and/or SupraJurassic.

ANALISIS DE LOS DATOS

The Total Intensity F of the Earth´s Magnetic Field was measured in 421 stations, with a mean equidistance of 4 km, over an area between (37° S, 56°8 W) and (38°6 S, 59° W). The measurements had beeen corrected to obtain the crust magnetic anomalies, ranging between -100 to +280 nT (Fig. 1), There are two important anomalies of +200 nT about (37°5 S, 57°3 W) and +260 nT in (37°2 S, 57°6 W). The maximum altitudes reach 140 m. It is observed in the **figure** 1 the location of the stations and the analized profiles, too. It is possible to see that the magnetic trend have a NE-SW strike, with the maximum values toward the northeast.
In general, there are a strong correlation between the magnetic anomalies, the topography, and the ferrimagnetic geologic structures in depth.
The obtained magnetic data was corrected by effect of the diurnal variation of the Earth´s Magnetic Field, by means of the determination of the Nocturnal Reference Level (NRL), from the registers (magnetograms) of the "Las Acacias" Magnetic Observatory (φ = 35° 00'5 S, λ = 57° 41'65 W) (*Gianibelli et al.*, 1985).
We must to apply the correction corresponding to the International Geomagnetic Reference Field (IGRF) to determine the crust magnetic anomalies (*Cabassi et al.*, 1988; *Gianibelli et al.*, 1989).
Upward prolongation to different altitudes (H=5, 10, and 15 km) had beeen realized. Then, from the smooth curve obtained by this method, the regional and residual anomalies are determined. The prolongated curves to 10 km had been selected because the local effects are minimized without regional information loss. The smooth curve had been inverted from this altitude to obtain the regional structure that justified it. Then, the magnetic response that would produce this geological structure on the topographic level had been calculated, representing the true regional effect (*Pacino e Introcaso*, 1985).

INTERPRETATION OF THE ANALIZED SECTIONS AND CONCLUSIONS

One main profile from the observed magnetic trends in the crust isoanomalous chart is analized, with SW-NE strike (**I-I'**) parallel to the coastline. This section embrace the southeast border of the Interserrana basin and part of the Salado Basin (**fig.** 1)

Figures 2 a-d shows the sections I to III with SW-NE trend and the section IV with NW-SE direction, with the obtained crust magnetic anomalies and the altitudes. The anomalies reach 250 nT on sections III and IV, 200 nT in the profile I, and only 80 nT in the one II. A stepped tendency increasing northeastward is observed (I to III), embracing a range of small negative anomalies in the SW edge. This effect remark important constraints and the increase of magnetic susceptibility of rocks toward the NE, and maybe intrusive rock in the basement. Toward the NE there are crust magnetic anomalies exceeding 200 nT, remarking the possible existence of an important fault of great vertical rebound between 150 to 180 km distances through the sections. Perhaps there are two important faults in section II in 90 and 150 km (fig. 2b), or a probable litological change in basament rocks, over the inferior limit of Salado Basin and Tandilian System. *Kostadinoff et al.* (1995) had found low magnetic susceptibility in basament rocks (less of 200×10^{-6} uem/g) on the Tandilian System. Therefore, it would be necessary a fault with rebound exceeding 5 km to obtain magnetic anomalies about 300 nT. For this reason, it would be plaussible to suppose the existence of high magnetic susceptibility rocks into the basament.

In the section IV, normal to the before mentioned, it is observed two important magnetic maximums about 260 nT. Perhaps there are a fault between them. These great anomalies determine important magnetic susceptibility constraints rather than basement relief.

From the isoanomalous map (**fig**. 1) it is observed two regions of very different magnetic characteristics NE-SW: to the SW the anomalies are very irregular, of low frequency and amplitudes; toward the N and NE there are two great anomalies ranging on 250-300 nT, of few areal extension, but the anomalies have lower wavelenght than in the south, although toward the NNE it is observed a region of more smooth anomalies, with relatively greater wavelenght. Here, the major anomaly presents a more steep slope , deepening probably the basement .

Therefore, it is possible to specify that the magnetic irregularity would be arise by metasedimentary, intrusives, and volcanic basement rocks, of relatively low magnetic susceptibility. On the other hand, the major stability toward the NE would be correlated with a more deep basement, from SW to NE, with overlying major sedimentary thickness, maybe on localized depression of the subsident region characteristic of the Salado Basin. Probably, a major deep tectonic feature due to control the division between both regions.

Fig. 3 shows the inversion model in section I-I', with magnetic susceptibilities about $300\text{-}350 \times 10^{-6}$ uem/g. It is possible to see deep blocks that progrades toward the Salado Basin axis. A better adjust toward the east side of the section would be obtained with a greater constrast of rocks of high magnetic susceptibility or major depths. We prefer the first option rather than the second one, because of the above mentioned.

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CRUST MAGNETIC ANOMALIES
Eq.: 40 nT

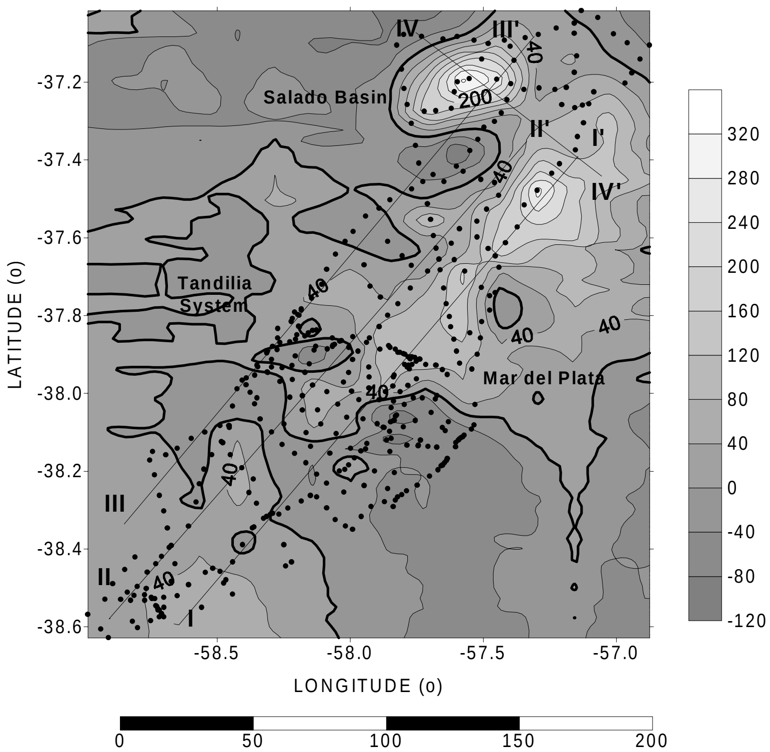

Fig. 1: Crust Magnetic Anomalies.
Location of the measured stations and analized profiles

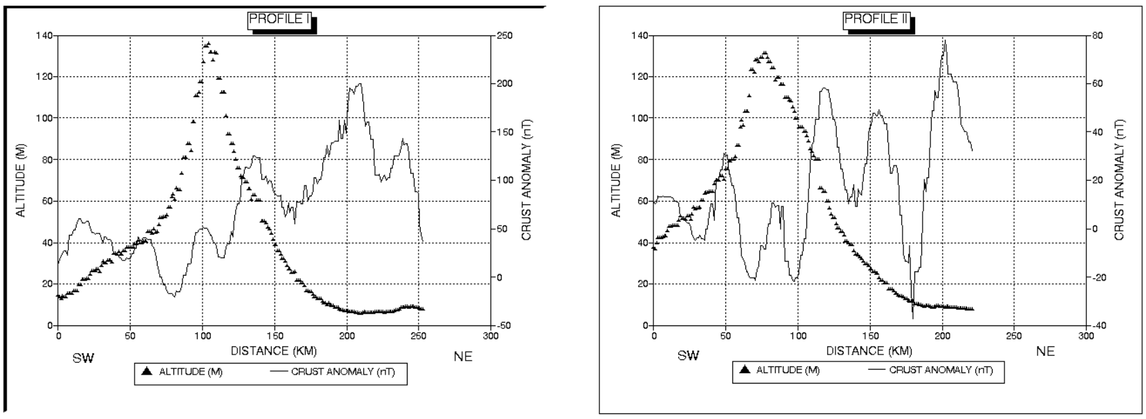

FIG. 2: PROFILES OF THE TOPOGRAPHY AND CRUST MAGNETIC ANOMALIES SHOWED IN FIG. 1. A) PROFILE I (SW-NE); B) PROFILE II (SW-NE)

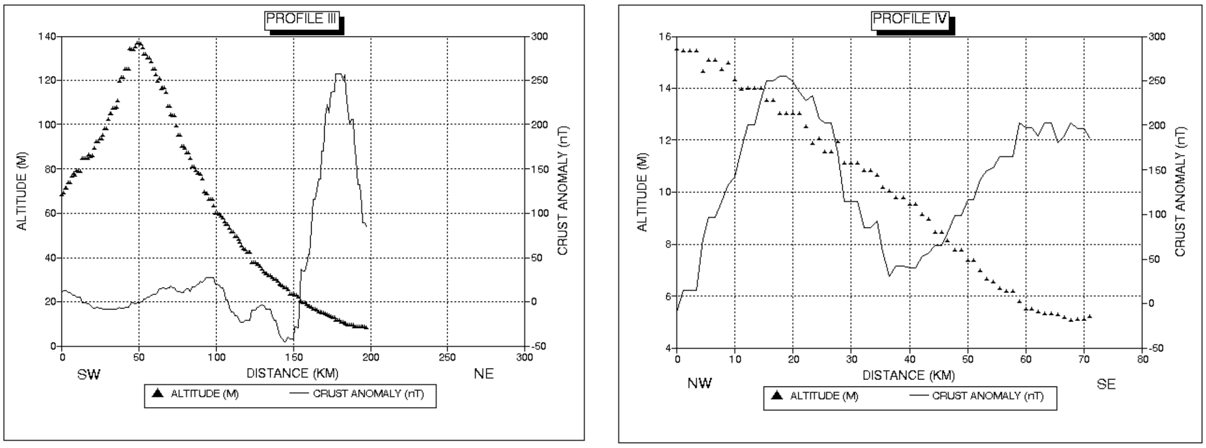

FIG. 2 (CONT.): PROFILES OF THE TOPOGRAPHY AND CRUST MAGNETIC ANOMALIES SHOWED IN FIG. 1.

C) PROFILE III (SW-NE); AND D) PROFILE IV (NW-SE)

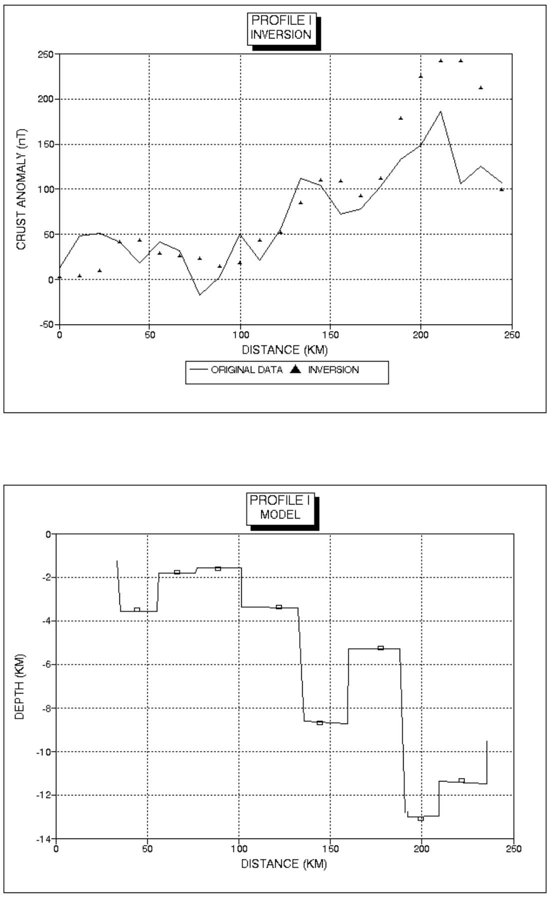

FIG. 3: A) MAGNETIC INVERSION 2-d; B) OBTAINED MODEL