PALEOZOIC TECTONIC EVOLUTION OF THE CENTRAL ANDES IN NORTHERN ARGENTINA AND CHILE

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RESUMEN: En este sector andino se presentan dos cinturones colisionales, intracratónicos, vergentes hacia el oeste: el Oclóyico (Ordovócico superior) y el Chánico (Carbónico superior). Evolucionaron entre las Sierras Pampeanas y masas continentales Pacíficas separadas o erosionadas tectónicamente.

KEY WORDS: intracratonic, continental subduction, collision, decollement.

INTRODUCTION

This part of the Central Andes shows two collision belts of different age, situated between the Pampean Ranges Craton to the east and continental "pacific" masses to the west. The Arequipa Massif would be a part of them. Their tectonic relationships, observed in the eastern slope of the Andes, allow to reinterprete some of the modells proposed till now.

THE PALEOZOIC BELTS

The Ocloyic belt, situated against the Pampean Ranges (Fig.1), is developed in a 5 Km sequence of turbidites interbedded with volcanics. It shows NNE-SSW folds associated with cleavage dipping to ESE (Puna). To the east the ductile deformation decreases gradually and the Ocloyic belt passes to a west –verging fault belt (Eastern Cordillera). The ordovician sequences with cleavage development are intruded by post-tectonic granitoides. The whole complex is covered unconformably by Silurian and Devonian shelf beds.

The Chanic belt consists in a 3500 m thick sequence of Devonian and Carboniferous turbidites, interbedded with basic and ultrabasic volcanics, grading to the east to shelf sediments (Bahlburg et al 1987). The turbidites are affected by WSW verging folding associated with ENE dipping cleavage (Bell, 1984). They are intruded by Upper Carboniferous granitoides and covered unconformably by Lower Permian beds. The Chanic belt shows a remarkable resemblance with the eastward –situated Ocloyic one, the difference being that its sedimentary, magmatic and tectonic evolution is much younger.

These belts are separated by a crystalline basement ridge (Fig. 1 and 2). They developed from intracontinental extensional basins (Bahlburg et al op cit.). They do

not show any participation of oceanic crust.

The closure of both collision belts is related to continental subduction along two parallel sutures. This mechanism was recognized by Matte & Xu Zhi, (1988) in other continents. The folding of the Ocloyic and Chanic belts could be related to basal decollements, which do not attain the surface, allowing the sliding of the Paleozoic sequences over the crystalline basement. Only the thrust of the crystalline basement over the Ocloyic belt is exposed. (Fig.2).

THE PRECAMBRIAN BASEMENT

The basement underlying the Paleozoic belts described above crops out in the Sierras Pampeanas Craton, Arequipa Massif and some intermediate small exposures. It is constituted by several accreted belts separated by transitional contacts, faults and ductile shear zones (Mon & Hongn, 1991). It is intruded by magmatic arcs containing plutonic bodies of different ages and origins. There are basic and ultrabasic belts too. The metamorphic belts show polyphase deformation due to the overprinting of distinct folding episodes. Part of the plutons are polydeformed too and affected by ductile shear zones.

Middle Cambrian and Ordovician sequences cover unconformably the north part and some sectors of the west border of the Pampean Ranges Craton. To the east it is covered by the Eopaleozoic sequences filling the Chaco- Paraná Basin. The age of the its components, according stratigraphic and reliable isotopic data, goes from the Precambrian-Cambrian border (600 Ma) till at least 1200 Ma (Villar & Coleman, 1986). Moreover there is a significant number of isotopic data yielding younger ages up until the Upper Paleozoic. These show a great dispersion and do not allow one to get a coherent geological picture, being that they are incompatible with the stratigraphic relationships exposed above. (Mon & Hongn, op cit.)

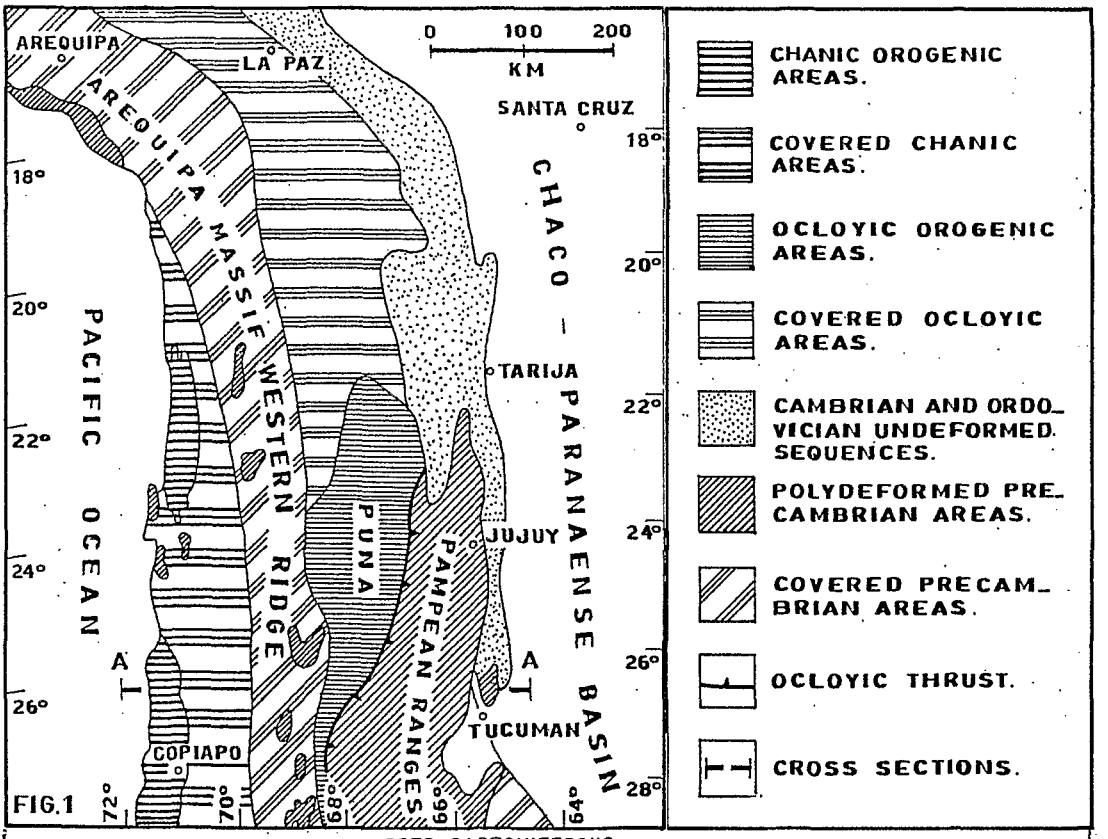
The connections between the Pampean Ranges Craton and the Arequipa Massif are not visible. According to the paleomagnetic studies of Shackleton et al. 1979, the last one has remained together with South American plate at least after 850 Ma.

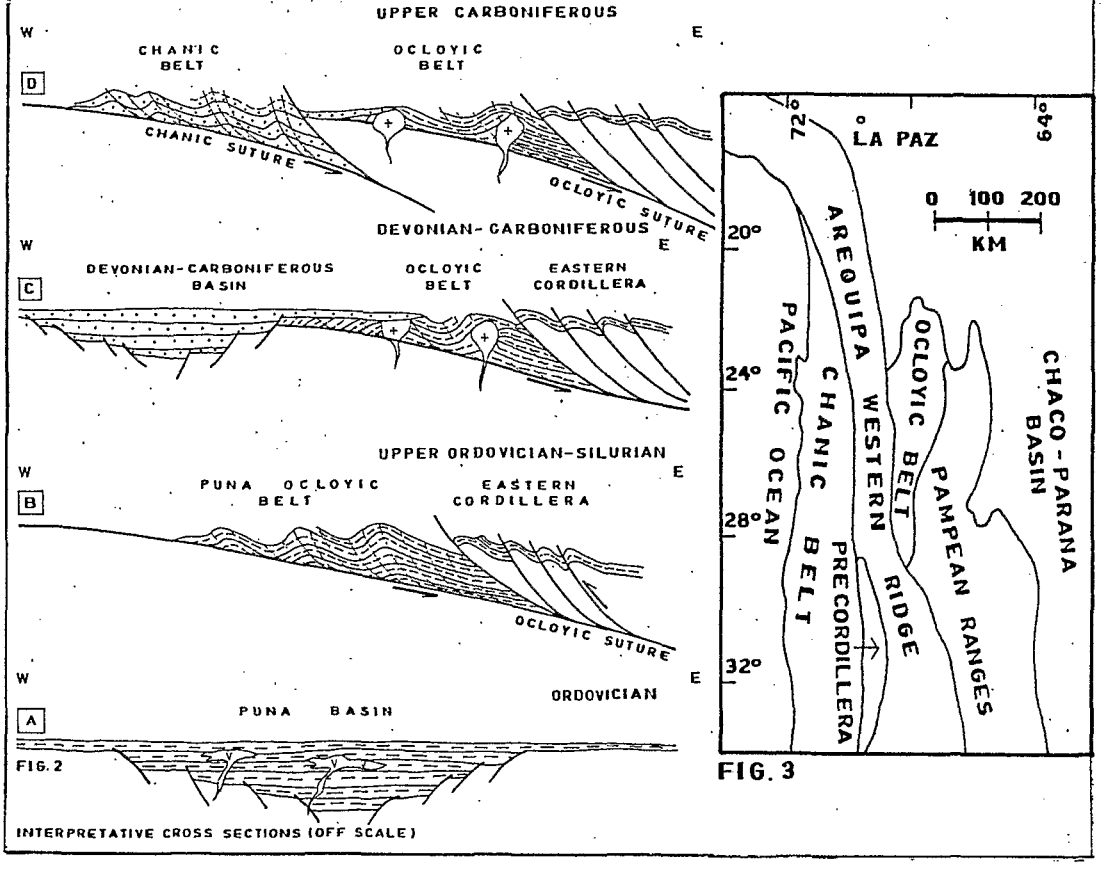
RELATIONSHIPS BETWEEN THE PRECAMBRIAN BASEMENT AND THE PALEOZOIC FOLD BELTS

Between 22° and 24° S the Cambrian and Ordovician sequences of the Ocloyic belt are covering unconformably the basement. South of 24° S, the basement is thrust over the ordovician sequences of this belt along more than 300 Km (see Fig. 1 and 2). The Chanic belt north of 25° S is lying over Precambrian Arequipa Basement and to the south over the west extension of the Precordillera Ocloyic belt (Fig. 3).

GEOTECTONIC HYPOTHESES AND DISCUSSION

During Paleozoic time the deformation migrated to the west with the generation of the Eopaleozoic Ocloyic belt (Upper Ordovician-Silurian) and then the Upper Carboniferous Chanic belt. Both show intracratonic evolution and they were closed by continental subduction. This scheme is in agreement with most of the observed facts and available information. It remains as a problematic question the destiny of the continental masses situated to the west of the paleozoic fold belts. Dalla Salda et al.


AREQUIPA
LA PAZ
SANTA CRUZ
TARIJA
JUJUY
TUCUMAN
COPIAPO
AREQUIPA MASSIF
WESTERN RIDGE
PACIFIC OCEAN
PUNA
PAMPEAN RANGES
CHACO - PARANAENSE BASIN
0 100 200
KM
18°
20°
22°
24°
26°
28°
72°
70°
68°
66°
64°
A
A
CHANIC OROGENIC AREAS.
COVERED CHANIC AREAS.
OCLOYIC OROGENIC AREAS.
COVERED OCLOYIC AREAS.
CAMBRIAN AND ORDOVICIAN UNDEFORMED SEQUENCES.
POLYDEFORMED PRECAMBRIAN AREAS.
COVERED PRECAMBRIAN AREAS.
OCLOYIC THRUST.
CROSS SECTIONS.
FIG.1


UPPER CARBONIFEROUS
W
E
D
CHANIC BELT
OCLOYIC BELT
CHANIC SUTURE
OCLOYIC SUTURE
DEVONIAN-CARBONIFEROUS
C
DEVONIAN-CARBONIFEROUS BASIN
OCLOYIC BELT
EASTERN CORDILLERA
UPPER ORDOVICIAN-SILURIAN
B
PUNA OCLOYIC BELT
EASTERN CORDILLERA
OCLOYIC SUTURE
ORDOVICIAN
A
PUNA BASIN
FIG. 2
INTERPRETATIVE CROSS SECTIONS (OFF SCALE)

LA PAZ
0 100 200
KM
20°
24°
28°
32°
72°
64°
AREQUIPA
WESTERN
CHANIC BELT
PRECORDILLERA
RIDGE
OCLOYIC BELT
PAMPEAN RANGES
PACIFIC OCEAN
CHACO-PARANA BASIN
FIG. 3

1992 postulate that they were displaced to the north and that they could be incorporated to the Appalachian Orogenic belt. The erosive subduction is other possible mechanisme, Stern & Mpodozis, 1991 postulate that, at least, 200 Km of Prejurassic basement was eliminated after Mesozoic in the west border of South America.

Other geotectonic hypotheses for instance Coira et al, 1982, attribute the evolution of the Paleozoic fold belts to fore arc basins, incorporating to the modell the granitoides of the west border of the Sierras Pampeanas Craton as an Ordovician-Silurian magmatic arc. According the observations of Mon & Hongn, (1991) the greater part of this border is constituted by multiply –deformed precambrian granitic and metamorphic rocks thrust over the Ordovician sequences. The presence of a simple Ordovician-Silurian magmatic arc in this domain could not be confirmed.

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