ARC AND FOREARC BRITTLE DEFORMATION IN TRANSPRESSIVE REGIME OF THE LOWER CRETACEOUS, COASTAL RANGE (26°-27°S), CHILE: Microtectonics antecedents

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INTRODUCTION

The inversion of microtectonics data, obtained from mesoscopic faults associated with the main alignements of a structural system, allows to make a more thorough description of the kinematics and interpret it in the regional setting. In this work we compute stretching and shortening axis *(strain)* (e.g. Marret y Allmendinger, 1990) for a set of structures contained in the domain of Atacama Fault System (AFS) (Saint Amand, 1960), "El Salado" segment (Naranjo, 1987), particularly between 26° and 27°S.

These antecedents, jointly with available paleomagnetic data, magmatism ages and mineralization characteristics associated with AFS, allows to apply for a partition model of deformation for the discussed area.

MICROTECTONIC DATA

NS alignments : represented by the AFS main traces, relevant to anastomosic cleavage areas and occasionally to *sensu stricto* faults with subhorizontal striae. The kinematics indicators describe a generally sinestral lateral displacement. *(Fig.1)*

NE-SW alignments : of little frequency, thogh with lengths surpassing 10 km, are remarkedly associated to mineralization occurrences of Fe-Cu. In the Cerro Negro mining district, mainly normal mesoscopic faults defining a NW-SE maximun stretching axis and a subvertical shortening axis.

NW-SE alignments : represented in the forearc region, AFS west, for a set of mainly sinestral displacement faults and wich would be linked to the clockwise block rotation. In jurassic rocks, this rotation reaches 35° with no important latitudinal displacement (Taylor, 1994). In the AFS domain this set is recorded too, particularly well exposed in the Manto Verde Fault (MVF) (Linsay *et al.*, 1994), in the los Pozos-Manto Verde mining district. The MVF, displayed at aproximately 30° between the AFS central and eastern branches, relevant to a group of mainly normal or sinestral-normal displacemet mesoscopic faults. Said kinematics defines a maximun NE-SW horizontal stretching axis and vertical shortening axis.

DEFORMATION MODEL

The geometry of the structural system and the described kinematics, allows to infer a domain of arc where the deformation would be partitioned in a simple shear component, without greater displacement in the borders of the shear zone (AFS main alignments), and with extension associated to NW-SE

structures (MVF). A simultaneous component of pure shear is justified by the low angle of the MVF and the borders of the shear zone taken in to account. On the other hand, the forearc domain would reflect the remaining pure shear fraction absorved with leakage of blocks or "slivers" in the NW-SE structures, developed in a sector of coast prortruding towards west. Moreover, the NE-SW structures could be linked to the first and solve space
problems associated with the blocking rotations. The reduced component of lateral displacement described, as well the geometric display of structures in the arc and forearc, allow to assume a transpressive deformation system of "pure shear dominated" (Tikoff y Teyssier, 1995) associated with a slanting subduction of important component (convergency angle greater than 20o).

Chronologic relationships, though imprecise, allows to describe the following sequence of events:

Jurassic-Lower Cretaceous (156-125 Ma) : Extensional (Grocott *et al.*, 1994), or transtensional arc. First clockwise rotation (15°-20°) (Taylor *et al.*, 1993) of jurassic rocks through preceding structures of NW-SE direction in the forearc domain. Said event could be related to a very low spreading rate in the Phoenix-Farallon ridge and the reducedconvergency velocity resulting from considering fixed the Sudamerican plate, previous to the Atlantic ridge opening (Uyeda y Nakamori, 1979, Mpodozis y Allmendinger, 1992).

Valanginian-Cenomanian (125-115 Ma) : Change of tectonic regime. Ductile deformation in the sinestral transpresive regime in the central and eastern branches of the AFS. Fe mineralization in the AFS main branches, associated with the upper structural level. Fe-Cu mineralization on the arc domain (Manto Verde-Los Pozos district) associated with the same level.

This deformation events would only be initially related to the important spreading rate of the Pacific ridge (125 Ma) with convergency direction towards the SE. Indeed, it is empirically accepted the inconsistency of intraarc megafaults and "extensional" subduction regimes (or "Mariana" type by Uyeda y Nakamori, 1979) (Jarrard, 1986), as the one generated as from this period. Instead this, an important extension in the backarc region is developed. This event would be registered in the full development of marginal basins in the continental margin. Therefore, after the initial deformation of the period, the AFS would provisionally abandoned.

Aptian-Albian (115-100 Ma) : Pure-simple shear in the arc domain. Reactivation of NW-SE (MVF) extensional structures displacing mineralized bodies. Pure shear in the forearc domain with NW-SE structures reactivation and clockwise rotations (20°-15°) (Taylor *et al.*, 1993).

These transpressive deformation events coincide with the opening of Atlantic ridge (somewhat subsequent to the 115 Ma, in this latitude) (Rabinowitz y La Brecque, 1979). Though the Pacific ridge spreading continued, the displacement of Southamerican plate generate less favorable conditions for the backarc subsidence (Uyeda y Nakamori, 1979; Mpodozis y Allmendinger, 1992).

Albian-Santonian (100-85) : Extension in the backarc region. This event would be related to the extinguishing of the Phoenix-Farallon ridge at 100 Ma by reducing the speed of the subducted plate. This would cause the reactivation of the marginal basin area and the new abandonement (?) of the AFS. The period could end with the inversion phase of the basin (pre-Santonian) followed by a new Upper Cretaceous-Paleocene regional extension.

The microtectonic analysis in progress, as well as the dynamic models subject to built on it, added to a better chronologic constrain of the deformative events, will contribute with antecedents concerning the evolution of the continental margin, expressed in the arc and forearc domains, during part of the Lower Cretaceous.

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