

## Strike-slip tectonics in arc-continent collision; the Eastern Timor example

RUI DIAS

*Escola de Ciências e Tecnologia da Universidade de Évora; Centro de Geofísica de Évora; Centro Ciência Viva de Estremoz. E-mail: rdi@uevora.pt*

The general tectonic setting of Timor is generally well constrain and most authors (e.g. Audley-Charles, 2011; Keep & Haig, 2010 and references herein) agree with main tectonics units (fig. 1). These units could be followed from Flores / Savu longitude at west, to the eastern Babar one; such continuity emphasizes a monoclinic symmetry for more than 700 km. This led to several two-dimensional approaches trying to explain the geodynamical evolution of Timor (e.g. Audley-Charles, 2004; 2011; Harris, 2006). Although frequently they differ is several aspects (e.g. origin / age of the lithostratigraphic units, interpretation of their boundaries, age of main tectonic events and collision age) all emphasize the E-W to WSW-ENE continuity of the structures. Therefore it is not surprising that the main described structures are usually folds and thrusts subparallel to the general orogenic trend and related to the main shortening; this shortening was induced by the N-S to NNW-SSE subduction and subsequent collision between the Australian continental margin and the Banda volcanic forearc (Audley-Charles, 2011).

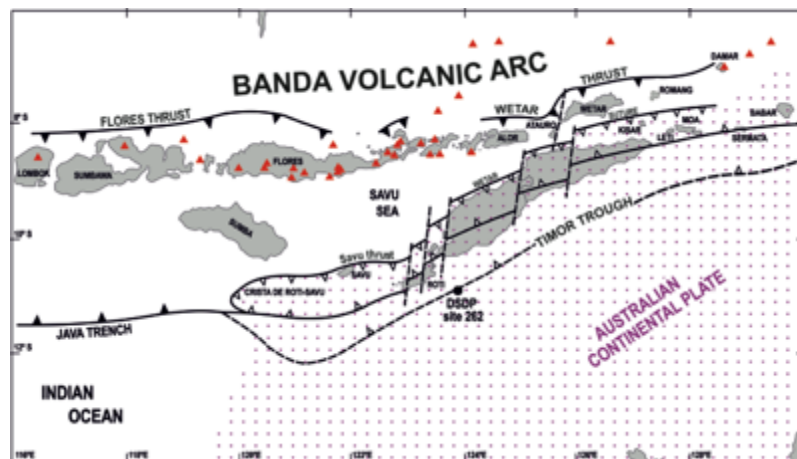


Fig. 1- Main tectonic units of Timor region (adapted from Audley-Charles, 2004; 2011; Harris, 2006).

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Nevertheless, often some of the regional tectonic sketches (e.g. Audley-Charles, 2004; Harris, 2006) show major N-S to NNE-SSW sinistral strike-slip faults that even behaves as major discontinuities during the quaternary uplift (Kaneko et al, 2007). Such structures show that the regional tectonic evolution was more complex and cannot be explained using only two-dimensional approaches.

Recent detailed structural mapping at 1/25 000 scale in Cribas region (Ferreira, 2011; Oliveira, 2011) led to new data concerning, not only the geometry and kinematics of submeridian sinistral strike-slip fault system, but also emphasize its relation with the major E-W Cribas anticline. This mapping was part of a cooperation project between the Secretaria de Estado dos Recursos Naturais (SERN) of Eastern Timor and the Évora University (Portugal) and will be part of the new Manatuto 1/50 000 geological map.

**CRIBAS GEOLOGY**

The Cribas region has been previously mapped at small scale either at 1/200 000 (Leme, 1968; Audley-Charles, 1968), or 1/100 000 (Partoyo et al, 1995). All these studies emphasize the presence of the E-W Cribas anticline, which became one of the main structural structures of Timor. Although frequently referred until recently (Ferreira, 2011; Oliveira, 2011) its geometry is poorly understood. The recent map shows (fig. 2) an open fold (both limbs plunge close to 25°), with a subvertical axial plane and a subhorizontal axis with two periclinal closures; in both limbs are frequently found second order folds with geometries compatible with the major Cribas anticline. All these structures are the older tectonic ones that could be put in evidence in the region, being considered due to the first and main tectonic event (D1; Ferreira, 2011; Oliveira, 2011). The D1 folds never develops a coeval associated cleavage, indicating that the observed deformation was attained in an upper structural level.

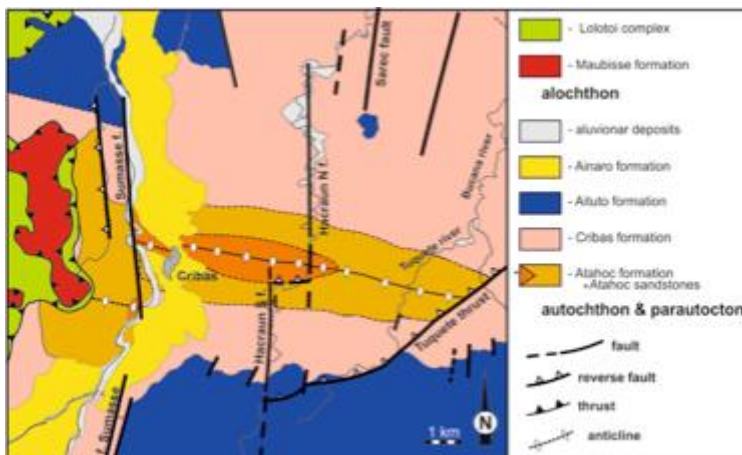


Fig. 2- Geological mapping of Cribas region (adapted from Ferreira, 2011; Valente Oliveira, 2011).

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The D1 structures are overprinted by a pervasive but heterogeneous fracture network, dominated by major N-S subvertical faults. Concerning the kinematics, these faults are dominated by a sinistral strike-slip component, as well expressed by different strain markers at all scales:

- minor structures (e.g. calcite deposits related with fault plane irregularities) associated with slickenside striations;
- en-echelon calcite veins;
- bedding deflection, which turns from the regional E-W trend to NE-SW or even NNE-SSW in the vicinity of major faults;
- offset of the subvertical E-W Cribas D1 anticline axial plane, by the mains Sumassa wrench fault (fig. 2);
- secondary structures developed in step over wrench faults terminations (fig. 3.1), like the ones found in relation with the N and S Hacraum superposition (fig. 2);
- thrust faults developed in strike slip fault terminations (figs. 2 and 3) like the Tuquete one (fig. 2) which are frequent in the Manatuto 1 / 50 000 geological (*in prep*).

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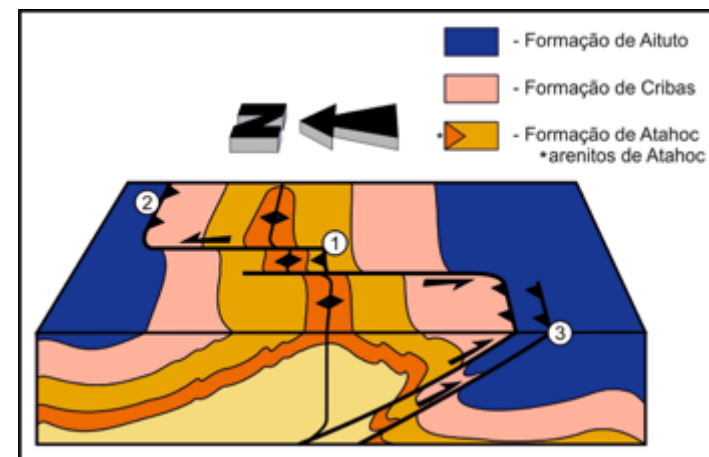


Fig. 3- Main structural features related to the D2 strike slip faults in the Cribas region.

The overprinting features between some of the previous structures related to the fracture network and the D1 structures, show that the more brittle ones are related to a younger major tectonic event which is considered has D2 (Ferreira, 2011; Oliveira, 2011). The D2 widespread structures found in Cribas sector is not a local process. Indeed, the structural mapping that is been doing in the Manatuto - Lacluber regions shows that N-S D2 sinistral strike slip faults are one of the major structural features of the region: their importance is reflected by the regional fluvial pattern that tends to follow the main fractures. The work done until know indicates that the D2 structures of Cribas region (fig. 2; e.g. Sumasse, N-Hacrum, S-Hacrum, Sarec and Tuquete faults) are part of a major system, the Manatuto - Pualaca one, where the sinistral kinematics dominate; this should correspond to one of the major faults related to the collision Australian continental margin - Banda volcanic forearc (fig. 1) that although predicted in small scale maps (Audley-Charles, 2004; Harris, 2006) have a "precise location is unknown" (Audley-Charles, 2011).

Often the N-S fault planes present evidences (cross cutting striations and related kinematic markers) of a late reactivation where the dip-slip component predominates. We interpreted these late movements as a D3 tectonic event that is probably related to the quaternary E-W differential uplift (Kaneko et al, 2007).

## N-S TO NNE-SSW STRIKE SLIP D<sub>2</sub> FAULTS; A GENETICAL MECHANISM

As previously described, the D<sub>2</sub> fault pattern are superimposed on the D<sub>1</sub> structures, that in Cribas region has a predominant E-W trend. The overprinting relations, as well as the close orthogonality between major structures trend, indicate that they are related to different tectonics events, although in the same plate tectonic context. We propose that the D<sub>2</sub> faults have been the result of the irregularities of the Australian continental margin. Such irregularities should have induced a diachronic arrival of the Australian margin to the subduction zone; the blocking of the subduction predicted by Audley-Charles (2004) must than have occurred at different times. If we admit that the blocking occurred first at West and propagates towards East, this should have induced N-S sinistral major faults in order to accommodate the deformation in the tectonic collision zone. This geotectonic setting is consistent with the paleogeography recently proposed (Hall, 2011) where the major Banda embayment at East should have slightly delayed the blocking of the subduction in this eastern region. This first order continental margin irregularity, doesn't exclude the existence of minor ones, due to the existence of smaller promontories (as predicted by Keep & Haig, 2010) that should have generated local structural perturbations in a more consistent regional tectonic pattern.

## ACKNOWLEDGEMENTS

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This work should not be possible without the strong cooperation of Gabriel Oliveira and Valente Ferreira.

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