Geophysical Research Abstracts, Vol. 7, 04272, 2005
SRef-ID: 1607-7962/gra/EGU05-A-04272

Neutral points and constrictive deformation in paleostresses analysis: The Cenozoic contraction of Iberia.

G. De Vicente (1,2), A. Muñoz Martín (1,2) R. Vegas (1,2), S. Cloetingh (3), A. Casas (4), J.M. González Casado (1,5) and J. Alvarez (1,2).

(1) Laboratorio de Tectonofísica Aplicada, (2) Departamento de Geodinámica. F.C. Geológicas. Universidad Complutense. 28040 Madrid. Spain (+34 913944827 e-mail: gdv@geo.ucm.es), (3) Vrije Universiteit Amsterdam. The Netherlands, (4) Departamento de Geología. F. Ciencias. Universidad de Zaragoza. Spain, (5) Departamento Q. A. y Geología. Universidad Autónoma de Madrid. Spain

Investigations on Cenozoic paleostresses are very abundant in the alpine ranges and basins of the Iberian Peninsula foreland. Nevertheless, these works have not advanced very much in the results interpretation. Some of the main reasons can be:

A) The microstructures cut relations, from which there are deduced the relative sequences of the paleostress tensorial solutions, do not give rise to clear global trends in the σy orientation changes.

B) The sedimentary infilling of the Cenozoic Iberian basins shows the presence of a series of widespread breaks, correlated in the main basins, suggesting the simultaneous movement of contractive structures with very different tectonic transport (The Iberian Chain turns out to be limited by centrifugal thrusts).

C) The macrostructural relations are not conclusive either, because the crossing structures have been interpreted also, as fold interference for different tectonic phases, as by means of deformation partitioning during the same event.

Two different mechanical solutions there have been proposed to explain the Cenozoic deformations of central Iberia. On the one hand, the performance of successive tectonic "phases" with very constant σy orientations. For other one, the operation, at least for the eastern peninsula, of a single N-S compression related to the Pyrenees.

Considering the macrostructural characteristics of the whole chains of the peninsula foreland (including those not nucleated on a previous rift as the Central System), as well as the principal fault corridors, suggesting the presence of important changes in the tectonic transport direction, and therefore of the local associate paleostress trends. Most of these orientations were simultaneously active during the Oligocene – lower Miocene. In this way, in the Atlantic area, sinistral strike-slip faults pass eastern wards, of having a N-S direction (Pontevedra - Padrón), to NNE-SSW (Regua-Verín and Vilariça-Braganza) and to NE-SW (Plasencia). The same rotation happens with the related dextral faults. This architecture suggests the performance of stresses with σy N-S orientation in central Iberia, which western wards progressively change up to NW-SE, near the Atlantic coast. This disposition is congruent with the indenter effect that, against Eurasia, was provoking the shock of Iberia - Africa (mechanically coupled), and with the Mid-Atlantic Ridge push that, together with the opening of King's Through, was producing a maximum compression towards the NW. From the Oligocene, the opening of the Valencia Through should have imposed NE-SW σy trend in the oriental end of the Pyrenean plate boundary. The global result was that, during the Oligocene - lower Miocene, paleostresses were converging towards the Iberia interior (centripetal σy).

In the same stage, there seems to have been constructed also good part of the NE-SW ranges (NW-SE σy) more close to the Atlantic coast: Central Portuguese System (Montejunto, Estrela) (Stapel,), Galicia south ranges, Ancares, west of the Regua-Verín faults system. The associate paleostresses must been controlled again by its major proximity to the Ridge push, indicating a more NW-SE shortening direction, which has been kept up until the present time.

In the Iberian Chain, the deformation constrictive conditions remained clear for the western wards escape of the Altomira Range, drawing a clear progressive tectonic transport bending directions from the SW edge of the Castilian - Valencia Branch. In the N edge of the Central System, the sedimentary infilling of the Duero Basin indicates the performance of a series of thrusts overlapped in a positive sequence towards its relative foreland (Duero basin), which seems to end in the lower Miocene (Andriessen). The associate paleostresses are NW-SE, unlike the S of Cameros Unit (San Leonardo de Yagüe area), where they are NE-SW, or of the N edge of the same Unit (N-S paleostresses). In any case, the N-S σy orientation, explains most of the important thrusts in the Iberian Chain (Cameros, Utrillas) and the transpresive character of area close to the Central System (Castilian Branch). Thus, if we draw a map of the Iberian Peninsula foreland ranges with its tectonic transport senses, during the Oligocene - lower Miocene, we can see how the main vergences are centripetal towards the Duero and Tagus basins. If the associate paleostresses show themselves, a

neutral point necessarily appears in the peninsular interior, which implies some deformation constrictive conditions. In these circumstances almost every discontinuity is potentially active, so the presence of first order faults (discontinuities affecting the entire upper crust) can nucleate the deformation imposing, for its previous orientation to the Cenozoic deformation, the stresses characteristics and tectonic local transport.Thus the witness would be explained also in the results of paleostesses analysis inside Iberia, in which almost always there appear four well definite σy maximums (N-S, NE-SW, E-W and NW-SE): They would be a fault pattern underlying reflex. This way, the time of main peninsular interior deformation would be the result of a single process accompanied by some constrictive deformation conditions, the mechanical coupling between Africa and Iberia and the appearance of a stresses neutral point in the peninsular centre during the Oligocene - lower Miocene.