

Department of Earth Sciences

Structural modelling of sedimentary basins



José Carlos Kullberg

Geologist

PhD in Geology (Structural
Geology and Tectonics)

Associate Professor

CICEGe (FCT /UNL)



Instituto Dom Luiz (IDL)



Objectives

- To model the tectonic structures of sedimentary basins.
- To study the structural evolution of meso-cenozoic basins of the West Iberian Margin during the Alpine cycle.
- To integrate these studies with stratigraphic information to accomplish a multidisciplinary approach for a better knowledge of the paleogeographic evolution of several marginal basins of Iberia (Portugal and Spain).
- To better understand the rule of overprinted tectonic events (e.g. diapirism and tectonic inversion episodes) in the final structuration of sedimentary basins.
- To test and apply semi-automatic detection procedures to obtain realistic fracturation patterns for oil reservoirs in Brasil.
- To develop research activities in the domain of Geological Heritage, for the classification and management of geological sites in Portugal, mainly in the Arrábida area for the presentation of a proposal for the nomination as Mixed World Heritage site (UNESCO).

Methodology

- Field work [1] and production of geological maps is the basic tool to gather information of deformation structures resulting from tectonic tensions during the evolution of sedimentary basins.
- Geometric and kinematic analysis of geological structures [2] using statistical tools is the next step to understand the rule of lithospheric tensions that conditioned the architecture of sedimentary basins, as well as the integration of direct and indirect data to produce 3D Discrete Fracture Network (DFN) models in fractured oil fields [3].
- Integration of structural data with FMI core logs and seismic profiles allows to develop numerical mechanical models based in order to determine the spatial distribution of the stress field, predict fracture types and orientations and provide fracture intensity maps.
- Integration of structural and geophysical tools (e.g. Anisotropy of the Magnetic Susceptibility) to determine the paleostress fields [4] that conditioned the tectonic evolution of sedimentary basins.

Expected Results

- The definition of the stress field orientation related to the extensional tectonics in the Lusitanian Basin during the Triassic/Jurassic.
- The recognition of the existence of two superimposed basins in the Western Iberian Margin, related with two different tectonic contexts between the transition of the Variscan/Alpine cycles (Tethys realm) and the initiation of the Iberian-Newfoundland separation (North Atlantic realm).
- The definition of outreach and relevant areas in the Arrábida region (Criteria 8 - Geology, Geomorphology, Speleology) for the proposal of classification of Arrábida to World Heritage of UNESCO [5].
- The classification of geological heritage sites in the framework of the Meso-cenozoic evolution of the Western Iberian Margin for the construction of a national database [6].

