Extension Vs. Compression in the Lengguru Fold-And-Thrust Belt (Papua New Guinea): From JERS SAR Imagery Mapping to 3D Geologic Modelling

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The fold-and-thrust belt of Papua New Guinea referred to as the Lengguru or Bird's neck block results from the on-going collision between the Australian and Pacific plates. This area is characterized by dense vegetation, frequent cloud cover and heavy precipitation that lead difficulties both for fieldwork and interpretation of optical satellite imagery. Radar images remain the most suitable data for geologic mapping. We performed the analysis of 13 JERS radar scenes on the south-western part of the Bird's neck. We evidenced both compressional and extensional features. Compression is distributed over a 180 km long and 100 km wide belt and consists of N150°E-trending folds and south-west verging thrusts that formed during the Plio-Quaternary. The belt as a whole is submitted to a broad (100 km wide) extension consisting of tension fractures and normal faults forming horsts and grabens that mimics a fan-shaped feature extending from N10°E in the NW to N85°E in the SE. Extension within the Lengguru orogenic belt may be associated to a process of gravitational collapse in a context of tectonic escape, the Banda Sea acting a free boundary. In order to quantify the geology, we built a volumetric (3D) model from an innovative method based on the combination of our mapping derived from the analysis of radar images and a Digital Elevation Model. The Such 3D geologic map highlights with extreme clarity the structural pattern of the area.

This study enhance the interest, for petroleum exploration, of radar images as well as the 3D quantitative modelling based upon precise analysis of surface features.

Key words : SAR, 3D modelling, extension, compression, Lengguru, Irian Jaya