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Structure and Evolution of Chiang Mai Basin, Northern Thailand, Using Gravity Data Enhanced by Interpreted Seismic Information

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Abstract

Gravity data analysis and 2-D forward modelling, incorporating subsurface data constraints within the Chiang Mai Basin (CMB), Northern Thailand, yields a completed basin geometry and its structural development. CMB stands as the largest Northern Thaialnd's rift basins. Nevertheless, available subsurface geological data for the CMB has been obtained only from a published 2D seismic section, which could not be representative of the entire basin structure. To address this limitation, collected gravity data from the Department of Mineral Resources in 2015, coupled with published seismic and well data constraints have been utilized to construct a more accurate subsurface model. Interpretation from residual anomaly map and ten 2D gravity models shows the half graben structures controlled by the western boundary fault. The maximum modelled basin depth is approximately 2 km. The CMB can be subdivided into several sub-basins, each controlled by east-dipping normal faults and separated by uplifted horst structures. The largest sub-basin is located in the central part, its location is at east of Chiang Mai City, while the other smaller sub-basins are situated to the south and north. The rift basin is surrounded by mountain ranges of the Paleozoic sedimentary rocks to the east and the Doi Inthanon-Doi Suthep metamorphic core complex to the west. The western boundary is mapped by the basin boundary of the Chiang Mai Low Angle Normal Fault (CMLANF) which is a gentle-angle ESE dipping fault with a high desiplacment of 15-35 km. The low-angle dips appear to follow preexisting low-angle fabrics such as shear zones, and ductile foliations predominantly developed before the CMLANF acitivity.The edge detection techniques enhance the concealed fault structure in the basin related to high angle normal fault controlling the initall stage of rifting. Interpreted folding structures indicate the development of the CMB, associated with inverted tectonics during the multi-phase rifting in the Tertiary age.

Keywords: Chiang Mai Basin , extensional collape, low-angle normal fault, gravity, 2-D forward model