Kinematic Analysis of Fold-Thrust-Belt Using Integrated Analogue Sandbox Modeling and 3D Palinspatic Reconstructions in Babar-Selaru Area, Banda Sea Region, Indonesia

Benyamin Sapiie (1), Meli Hadiana (1), Ade Kurniawan (1), Dicky Daniel (1), Harya Danio (1), Masamichi Fujimoto (2), Michio Ohara (2), Lisnanda Alam Perdana (2), and Afif Saputra (2)

(1) Indonesia (bsapiie@gc.itb.ac.id), (2) INPEX Oil Company, Indonesia (masamichi.fujimoto@inpex.co.jp)

Kinematic analysis of Babar-Selaru fold-thrust-belt is challenging and often difficult particularly in conducting seismic interpretation due to complex structural geometries. Resolving such as issue, in this study we proposed to use integrated seismic interpretation, analogue sandbox modeling and 3D palinspatic reconstructions. This paper is presented results of detail kinematic analysis for understanding tectonic evolution as well as mechanism of fold-thrust-belt in relation to their hydrocarbon prospect.

Babar-Selaru Area is located within the collisional boundary between Australian continental margin and Banda Arc region of Indonesia. The area is characterized by complex deformation zone of fold-thrust-belt, involving Mesozoic and Tertiary sedimentary sequences of Australian continental margin. The age of deformation is ranging from 8-5 Ma. Seismic interpretations show two styles of faults developed in the area, which are thrust and normal faults system. The last deformation observed in the Babar Selaru area is controlled by south verging imbricated thin-skinned thrust fault system, with the staircase style of fault detachment. Although, both structural styles occurred in separated locations, they are formed not only in the same time but also related in time and space. Total extension is ranging from 1–3 % where average shortening is in the order of 35-38%. Sandbox modeling is an effective way to study and understand the style, pattern and geometry of the deformed sedimentary sequences in the study area. Based on comparison of five settings experiments (mainly different geological boundary condition) with more than 50 different modeling; deformation is particularly controlled by types and thickness of lithology package and detachment geometry. These two parameters were quite sensitive in generating different deformation style and pattern in Babar-Selaru fold-thrust-belt. Therefore, choosing the right combination of stratigraphy model and material setting are particularly important to have best modeling results. The complexities of the thrust loading and flexure mechanism, causing Babar Selaru area has unique style of normal faults which are simultaneously active with thrust-faulting process.