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The Development of the Geological Structure of the Bengkulu Fore Arc Basin, Western Edge of Sundaland, Sumatra, and Its Relationship to Hydrocarbon Trapping Mechanism

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Abstract : The Bengkulu Basin is part of the Sunda Arc system, which is a classic convergent type margin that occur around the southern rim of the Eurasian continental (Sundaland) plate. The basin is located between deep sea trench (Mentawai Outer Arc high) and the volvanic/ magmatic Arc of the Barisan Mountains Range. To the northwest it is bounded by Padang High, to the northest by Barisan Mountains (Sumatra Fault Zone) to the southwest by Mentawai Fault Zone and to the southeast by Semangko High/ Sunda Strait. The stratigraphic succession and tectonic development can be broadly divided into four stage/ periods, i.e Late Jurassic- Early Cretaceous, Late Eocene-Early Oligocene, Late Oligocene-Early Miocene, Middle Miocene-Late Miocene and Pliocene-Plistocene, which are mainly controlled by the development of subduction activities. The Pre Tertiary Basement consist of sedimentary and shallow water limestone, calcareous mudstone, cherts and tholeiitic volcanic rocks, with Late Jurassic to Early Cretaceous in age. The sedimentation in this basin is depend on the relief of the Pre Tertiary Basement (Woyla Terrane) and occured into two stages, i.e. transgressive stage during the Latest Oligocene-Early Middle Miocene Seblat Formation, and the regressive stage during the Latest Middle Miocene-Pleistocene (Lemau, Simpangaur and Bintunan Formations). The Pre-Tertiary Faults were more intensive than the overlying cover, The Tertiary Rocks. There are two main fault trends can be distinguished, Northwest–Southwest Faults and Northeast-Southwest Faults. The NW-SE fault (Ketaun) are commonly laterally persistent, are interpreted to the part of Sumatran Fault Systems. They commonly form the boundaries to the Pre Tertiary basement highs and therefore are one of the faults elements controlling the geometry and development of the Tertiary sedimentary basins.The Northeast-Southwest faults was formed a conjugate set to the Northwest–Southeast Faults. In the earliest Tertiary and reactivated during the Plio-Pleistocene in a compressive mode with subsequent dextral displacement. The Block Faulting accross these two sets of faults related to approximate North–South compression in Paleogene time and produced a series of elongate basins separated by basement highs in the backarc and forearc region. The Bengkulu basin is interpreted having evolved from pull apart feature in the area southwest of the main Sumatra Fault System related to NW-SE trending in dextral shear.Based on Pyrolysis Yield (PY) vs Total Organic Carbon (TOC) diagram show that Seblat and Lemau Formation belongs to oil and Gas Prone with the quality of the source rocks includes into excellent and good (Lemau Formation), Fair and Poor (Seblat Formation). The fine-grained carbonaceous sediment of the Seblat dan Lemau Formations as source rocks, the coarse grained and carbonate sediments of the Seblat and Lemau Formations as reservoir rocks, claystone bed in Seblat and Lemau Formation as caprock. The source rocks maturation are late immature to early mature, with kerogen type II and III (Seblat Formation), and late immature to post mature with kerogen type I and III (Lemau Formation). The burial history show to 2500 m in depthh with paleo temperature reached 80oC. Trapping mechanism occur during Oligo–Miocene and Middle Miocene, mainly in block faulting system.

Keywords : fore arc, bengkulu, sumatra, sundaland, hydrocarbon, trapping mechanism
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