Lithological properties on diagenesis process of Miocene carbonate rocks in northeast Java basin, Indonesia

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Currently Northeast Java Basin contains the sixth largest oil reserve in Indonesia, but the complexity and heterogeneity of carbonate reservoir increasing the exploration risk. Sedimentology and diagenesis process are the most fundamental aspects for appropriate exploration. Accurate knowledge of these parameters for hydrocarbon reservoir is required for increasing performance of the oil and gas field. Thus, sedimentology as well as diagenesis aspect must be studied as detail as possible. This should be done along with microfacies analyses and stable isotope analyses.
The Miocene carbonate rocks of 283m thick were deposited in a high energy shallow marine settings in a rifting basin. The carbonate succession can be divided into 3 main units from base to top: fine grain limestone, dolostone, and coarse grain limestone. Fine grain limestone, wackestone and mudstone, was interpreted as fore-mound carbonate likely derived from pre-existing limestone, characterized by the abundances of intraclasts. Dolostone unit was a diagenetic product from marine dolomitization process. The planar structure with polymodal fabric of dolostone suggest that dolomitization process was worked on single nucleation from homogenous parental rocks under uniform growth at low temperature (Sibley and Greg, 1987). While coarse grain limestone, packestone and grainstone, is interpreted as terrigenous carbonate in which its fossil components show different responses to fluctuation of silisiclastic influx. Negative values both of $\delta^{13}C$ and $\delta^{18}O$ on limestone and dolostone unit suggest a marine diagenesis process followed by an intensive meteoric diagenesis that was likely related with tectonic uplift activity. In detail, the dolostone unit showed higher $\delta^{18}O$ value than limestone unit, most likely associated with different fractionation factors between dolomite and calcite. Between two limestone units also showed different values both $\delta^{13}C$ and $\delta^{18}O$. The coarse grain limestone unit showed lower both $\delta^{13}C$ and $\delta^{18}O$ values than fine grain limestone. This suggests that meteoric diagenesis works very effectively on coarse-grained and permeable limestone in which meteoric water easily go through into the rocks, then change its constituents.

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