Controls on Fracturing in a Structurally Complex Carbonate Platform Setting (Rajamandala Limestone); Western Java, Indonesia

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Preliminary investigation of joints and faults in Rajamandala platform carbonates outcropping in western Java, Indonesia suggests distinct differences in fracture style and intensity related to stratigraphic position. These differences are expected to impart stratigraphy-related but structurally-controlled permeability heterogeneity and anisotropy commonly observed in the subsurface. The Rajamandala limestone is Late Oligocene (Chattian) in age and is exposed along two N-directed thrust sheets that are cut by NNW-SSE tear faults. The study centers on two windows; Cikamuning on the northern thrust in a platform margin position, and Gunung Guha on the southern thrust in a backstepping platform setting. The Rajamandala carbonates are age and facies analogs for reservoirs in east Java, and can be used to constrain their geologic models.

Both outcrops show strike-slip and normal faulting (5-10m offsets), two sets of stylolites dipping parallel (early) and normal (late) to bedding, and two main fracture sets dipping at high angle to bedding and striking generally perpendicular and parallel to beds. The small-scale deformation mirrors larger scale structures, although modified by the stratigraphic setting and lithology. The Cikamuning outcrop also shows reverse faults not present at the Gunung Guha section.

In Cikamuning two main facies associations are exposed; massively bedded margin and well bedded slope units. The massive beds contain a range of joint sizes, including prominent joint clusters with inferred good vertical connectivity. Joints in the more bedded slope facies have mean spacing related to bed thickness. Some joints subsequently slipped, forming small-offset faults. In the massive margin rocks, small-faults may have developed as primary shearing mode structures. The Gunung Guha outcrop consists of well-bedded platform facies showing a close relationship between fracture style and intensity related to stratigraphic position and distance from larger-scale faults. In both outcrops faults and joint clusters can provide vertical conduits across what would otherwise be isolated fractured beds. Calcite cementation along joints and small faults due to paleo-fluid flow is common in the margin facies but sparser along faults in slope and platform facies. The results demonstrate the need to incorporate stratigraphic and regional structural data in modeling fractures and joints in carbonates.