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Seismic Facies and Growth History of Miocene Carbonate Platforms, Wonocolo Formation, North Madura Area, East Java Basin, Indonesia

The Miocene Wonocolo Formation in the North Madura area, East Java Basin, contains numerous isolated carbonate platforms that are broadly distributed across an ~ 3000 sq km area of the Indonesian back-arc region. The Wonocolo platforms provide an interesting test for comparing the different growth histories of closely spaced individual platforms, where eustatic history was the same for all the platforms, but where subtle differences in other extrinsic factors influenced their growth. A grid of 2-D seismic data and information from several wells across the region were used to map all Wonocolo platforms across the study area. Five growth phases are recognizable in the platforms, based on seismic facies analysis and internal seismic-stratigraphic relationships. Platforms from the western part of the study area are larger in plan view than age-equivalent platforms to the east and record a complex history of platform initiation, backstepping, progradation, coalescence into larger composite platforms, and termination. Although all five growth phases are also recognizable in some Wonocolo platforms from the eastern part of the study area, the eastern platforms are different in that they: 1) are much smaller in plan view, 2) are spaced farther apart, 3) tend to have steeper platform margins, 4) have largely aggradational stratal geometries, 5) are slightly thicker overall than the western platforms, and 6) the tops of the platforms are at greater burial depths than the tops of the western platforms. Most of these differences in platform morphology and growth history can be attributed to slightly faster subsidence rates in the eastern part of the study area. Faster subsidence rates in the eastern part of the study area from 12.2-6 Ma (the age range for the Wonocolo platforms) are probably related to differential surface loading by the Indonesian volcanic arc.