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Satellite and Field Based Facies Mapping of Isolated Carbonate Platforms from the Kepulauan Seribu Complex, Indonesia

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Cenozoic shallow-marine tropical carbonates form major hydrocarbon reservoirs in various parts of the world.; e.g. ∼2/3 of all hydrocarbon reservoirs in SE Asia are located in drowned carbonate platforms. Quantitative facies models from modern systems are essential for the interpretation of their fossil counterparts. Kepulauan Seribu consists of many atoll-like island with nearly continuous reef belt exposed to bidirectional monsoon wind. Statistical analysis based on texture and composition reveal that there are four sedimentary facies; coral grainstone, coral packstone/grainstone, coral-mollusk packstone, and mollusk wackestone. The occurrence of mollusk wackestone in the lagoon is controlled by water depth, while the sand apron and reef front environment do not show significant facies separation with water depth. The co-occurrence of these different facies in the same depth window is contrary to the common thought that changes in bathymetry should be reflected in facies changes. Understanding of where and how carbonate sediments are produced and accumulated has evolved from rather simple concept of direct productivity-depth relations to a recognition that carbonate depositional environments are influenced to some degree by depth but also by a complex suite of autogenic factors which leads to a facies mosaic especially in the shallow water where carbonate elements are not systematically stratified by water depth but instead migrate and super-impose one another on short scales as a result of subtle environmental changes. Satellite derived environmental facies map generated by an image analysis algorithm called the unsupervised classification indicate that environmental facies distribution in this area is mainly controlled by water depth, density of sea grass cover and coral abundance. In the lagoon, satellite derived environmental facies directly correlates with sedimentary facies. However, there is no direct correlation for environmental facies and sedimentary facies for the sand apron due to heterogeneity and complexity of the environment. This study is aiming to: 1. contribute towards a better understanding of modern equatorial SE Asian carbonate systems, 2. delineate modern carbonate facies based on sediment texture and composition with the aid of multivariate statistical analysis combined with statistic based satellite mapping, and 3. give insights regarding the correlation between depositional facies and water depth.