# Modern Carbonate Sediments and Systems as Analogues for Subsurface Reservoirs

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## Abstract

Carbonate reservoirs are renowned for their heterogeneity at all scales and modern deposits may provide key analogues to better understand this subsurface variably. This grain- to system-scale evaluation of modern carbonate heterogeneity utilises a range of techniques from MicroCT, petrology, laser granulometry, XRD, satellite imagery, as well as ground truthing of modern carbonate environments and deposits. On grain-scales, these studies provide insight into the primary pore system characteristics of modern carbonate deposits, their diagenetic potential for alteration, and a 'birth to burial' pathway for pore system evolution. Key to upscaling on local- to system- or regional scales is better understanding of local environmental and intra- to inter-platform variability, the distributions and links between environmental facies and sediment characteristics together with understanding of their controlling influences.

The grains, or the solid parts of carbonate sediments have been extensively studied because information on grain types, depositional textures, sedimentary structures and mineralogies are utilised in the interpretation of depositional environments, facies relationships and the diagenetic alteration of carbonate rocks. However, the pore networks, or the voids in carbonate sediments that may constitute between 40-80% of the bulk volume of the sediment remain understudied. In particular, an understanding of pore networks in skeletal or bioclastic carbonate sediments remains at best rudimentary, perhaps in part due to their perceived complexity. Yet in many regions such as the equatorial tropics or the temperature regions, carbonate sediments may be almost exclusively skeletal in their primary origins. This study investigates the primary porosity characteristics of bioclastic reefal and non-reefal sediments from a range of local environments. The pore and sediment characteristics and their mineralogy are mapped to local environments, and across a range of carbonate systems. Systems studied include carbonates fringing land areas, build-ups, large and small-scale atolls. The local and regional environmental conditions affecting these pore-controlling factors are investigated. Further insight is gained into pore system evolution through integration of data from diagenetically modified depositional systems comparable to the modern examples studied.