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PRELIMINARY ANALYSIS OF SUBTIDAL CARBONATES, MODERN RED SEA BUILDUPS, OFFSHORE YANBU, SAUDI ARABIA

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ABSTRACT

EXPEC ARC collected 43 samples for thin-section and grain-size analysis along three rift-margin buildups in the Red Sea that include, from distal to proximal, (1) Abu Galawa, surrounded by water hundreds of meters deep; (2) Marker 29, surrounded by water tens of meters deep; and (3) Marker 27, surrounded by water < 50 meters deep. Point counts made on 75 thin-sections have estimated intrinsic errors ranging from about 1.5% to 2.5 %, relative, for 13, kilogram-sized samples and 2.5% to 4% for 30, gram-sized samples. Relationships between 24 point- counted allochems, water-depth, grain-sizes, and sample locations were explored with cross-plots, histograms, and other techniques. As expected from the published literature, abundance of some allochems, including coral, benthic foraminifera, and red and green-algae can meaningfully be characterized by water-depth. Similarly, other allochems, including gastropods, echinoderms, and peloids show little or no correlation to water-depth. Some expected relationships are also apparent in allochem contents versus distal to proximal sites. For example, red algae content is highest at the distal Abu Galawa site. Some unexpected relationships are also apparent. For example, bivalve, intraclast, and peloid contents are highest at Abu Galawa. Regardless of water depth, >80% by volume of grains from all samples are in the sand fraction. Gravels, always <15% by volume, are the next most common grain-size, and mud-sized grains are the least prevalent fraction with a maximum occurrence of <5%. Lack of relationship in grain-size with depth is important as sequence stratigraphy is founded on the principle that changes in relative sea-level are recorded in the rock record by sediment accumulation with relative water depth-dependent attributes. Our results, demonstrate this principle to be an oversimplification, as a direct link between palaeo-water depth and depositional grain-size is not always observed in subtidal lithofacies. Our findings support recent studies and emphasize caution must be applied when inferring palaeo-water depths from depositional fabrics. Such insight is relevant to interpretation of meter-scale, subtidal carbonate cycles in the geological record. As reservoir analogues, EXPEC ARC will use these modern examples to constrain geologic models and to indicate dimensions, trends, and interrelationships of reservoir and non-reservoir distributions.