Granulometric Study of Mixed Siliciclastic-Carbonate Sediments Distribution along a 100km Transect of Modern Carbonate Depositional Environment (Arabian Gulf)

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ABSTRACT

This study examined granulometric and statistical relationships of marine sediments collected along a 100 km transect in northwestern Arabian Gulf. The marine sediments in general are texturally characterized by allochthonous terrigenous detritus and coarse autochthonous calcareous sediments rich in bioclast sourced from submerged reefs, lime rock, shelled organisms and fluvial process. Forty sediment samples were collected along a linear transect from northwestern Arabian Gulf to deeper parts of the basin using a grab sampler. Univariate and multivariate statistical parameters were used to understand the nature of the depositional environment, establish subtle changes and relationships among the stations. A synergy of software was used to generate the 3D facies distribution map. The sediments were subdivided into seven textural classes, namely gravelly muddy sand, gravelly sand, sandy gravel, slightly gravelly muddy sand, slightly gravelly sand, slightly gravelly sandy mud based on a mosaic of ten size fractions. The mean grain size ranged between 0.28–8.93 phi, with a pronounced gradational basin-ward (West-East) change from sandy to clayey sediment. Poorly sorted sand is generally dominant followed by moderate sorted sand while most stations have bimodal distributions. The sediments components are mainly quartz grains, foraminifera, ooids, reef debris, and mollusk shell fragments. Three clusters where identified (A, B and C), sediments in cluster A are characterized by the shallowest water depths of 1 - 9m, stations nearest to shore, moderate to poorly sorted and having slightly gravelly sand to gravelly muddy sand texture. Cluster B contains sediments that are mainly gravelly muddy sand within water depths of 16 – 45 m, and characterized by very abundant bioclasts. Cluster C sediments are poorly to very poorly sorted and are characterized as regions with submarine highs and high sedimentation rates. This includes stations that are very poorly sorted, belonging to textural groups that correspond to the deepest water depths along the transect 47 – 50 m, and are predominantly slightly gravelly to gravelly muddy sand. These grain-size parameters are reliable and effective sources of information for interpreting depositional processes, as such, this study provides a useful baseline data, insight into a greater fluvial and shallow marine processes in the Gulf sedimentation and a better understanding of the non-linear sediment distribution in the Arabian Gulf.