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The correspondence of the coastal grain size distribution to the offshore bathymetry- sympathetic for sustainable coastal management

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Grain size distribution (GSD) of beach sediments helps to understand the morphological changes take place along the coastal environment. Thus, giving insights to the coastal sediments will be beneficial for the maintenance and the sustainable development in potential coasts. Particularly, the eastern coast of Sri Lanka is mostly undeveloped and has good future economic potential with China's Belt and Road Initiative (BRI). Therefore, it is noteworthy to assess the sedimentary environment of this undeveloped coast with respect to the present natural settings. There was lack of studies to understand the probable factors that affect the grain size distributions along the said coast. During this study we aimed to find a relationship between GSD of beach and the offshore hydrodynamics precisely on bathymetry. The coast includes main morphological components naming Vendalose bay, Kalkhudah bay, Valachchenai lagoon and Batticaloa lagoon with in-between linear coastlines. Surface sediment samples were collected from three different levels of the beach profile at 35 stations and granulometric analysis was done following the standards. The GSD data and statistical parameters were compared with hydrodynamic data obtained from relevant agencies. Within the 20 to 25 km distance from the beach, the marine depth reaches about 1000 m whereas, for about 45 km distances it reaches about 3500 m depth. The study area shows parallel isobaths to the coastline for about 3 km distance with an average depth of 20 m. A narrow canyon (reaches 100 m depths within 5 km distance) is noted at the edge of the Punnakuda point which outspreads perpendicular to the beach. However, the sediment grain sizes do not show any significant change except the river load dumping sites. The mean grain size is medium sands with a unimodal GSD pattern indicating unique depositional environment for the studied coastline. The wave hindcast data and tidal data suggested the northeast monsoon driven longshore sedimentation upheld with the local river dumping is the governing factor for the sediment distribution. Remarkably, no influence was observed for the GSDs by the presence of a shallow marine canyon along the study beach. Further studies are reasonable to identify whether the canyon is ingesting the coarse fractions of the littoral drift or narrow continental shelf controls the sediment sizes by winnowing processes and yielding the coarse fractions.

Keywords: Canyon, offshore bathymetry, sediment grain size

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