

TEXTURAL CHARACTERISTICS OF SAND GRAINS IN RED EARTH DEPOSIT IN NORTH AND NORTHWESTERN SRI LANKA: IMPLICATIONS ON ORIGIN

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Red Earth (RE) deposit in Northwestern Sri Lanka is a distinctive sedimentary formation that belongs to the Quaternary Period. The deposit extends from Puttalam to Mullaitivu District, parallel to the North and Northwestern coastal belt. Although some hypotheses already exist on the formation of the RE deposit, a detailed study on quantitative textural characterization can provide useful information on its mode of origin. The aim of the present study was to analyze the size and shape of sand size particles of the RE deposit quantitatively to understand its provenance. Undisturbed RE samples were collected from four different locations of the deposit *viz.* Puttalam (southern part of the deposit), Mannar (mid part of the deposit), Kilinochchi (Northwestern northwestern part of the deposit) and Mullaitivu (Northeastern part of the deposit). The sand fraction (250 - 500  $\mu\text{m}$  size) separated by dry sieving was rinsed with deionized water and observed through a stereo microscope. Monochromatic photomicrographs (15 $\times$ ) were taken for all the samples (>100 grains from each location), and post processed for the digital segmentation using "FIJI-ImageJ" open source software (Life-Line version) tool. Segmented and scaled images were analyzed with the same software tool to obtain two dimensional (2D) parameters such as area ( $A$ ), perimeter ( $P$ ), major and minor axes of best-fit ellipse ( $a$  and  $b$ , respectively), Freet's length ( $L$ ) and Freet's width ( $S$ ) of each grain. These parameters were used to calculate the grain size and shape indexes such as diameter of equal area circle ( $D_{\text{equ}} = 2\sqrt{A/\pi}$ ), aspect ratio ( $R = a/b$ ), solidity ( $A/A_{\text{convex hull}}$ ), shape factor 1 ( $\text{SF}_1$ ) or smoothness ( $P/P_{\text{equ}}$ ;  $P_{\text{equ}} = \pi * D_{\text{equ}}$ ) and shape factor 2 ( $\text{SF}_2$ ) ( $A/A_{\text{equ}}$ ;  $A_{\text{equ}} = \pi * (D_{\text{equ}}/2)^2$ ). Sieve analysis data showed a uni-modal grain distribution pattern in all the locations. The highest and the lowest degrees of sorting were observed in samples from Puttalam ( $\sigma = 0.8$ ) and Mannar ( $\sigma = 1.3$ ), respectively. The average aspect ratio of grains of all four locations showed similar values ( $\sim 1.5$ ), indicating more spherical grains. However, the high standard deviation of Puttalam samples may indicate the variation in grain shape locally. The average  $\text{SF}_1$  and  $\text{SF}_2$  were similar for all the locations implying comparable smoothness and circularity of grains. No statistically significant difference was observed in any of the particle parameters obtained for sands from studied locations. This potentially indicates the influence of similar depositional or post-depositional environmental conditions in all regions of the RE deposit. A similar analysis should be performed for other size fractions of the deposit to confirm the above statement.

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