COMPARISON OF DEPENDABILITY OF THE POROSITY, PERMEABILITY AND DENSITY ON GRAIN TEXTURE OF THE GLACIOFLUVIAL AND GLACIOLACUSTRINE SEDIMENTS, CHANDRA BASIN

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ABSTRACT

Permeability, porosity and density the three factor greatly influence many geological processes. Permeability is one of the important parameter measured to understand the storativity and passage of the water, snow, etc. through the sediments. Although many methods have been developed by geologist, soil scientist and engineers to estimate the permeability of sediment and rock but still there is a lack of adequate understanding. Insufficient data exist for measuring the permeability especially in the glacial environment where poorly sorted sediment are common. The texture of the sediments is an important tool to measure the permeability of sediment. Several studies also measure the permeability of sediment through proxies like grain size, texture etc. Porosity and bulk density greatly affects the permeability of sediments.

Glaciolacustrine and glaciofluvial sediments were studied from Chandra Basin, Himachal Pradesh, India. Chandra–Bhaga is the sub-basin of Chenab basin, lying on the northern ridge of Pir Panjal range of the Himalaya with an elevation range between 2400 m above sea level and 6400 m above mean sea level. This region is important as it falls in the monsoon–arid transition zone and marks the boundary of wet climate to its south and a dry climate to its north. The glaciers of this region are influenced by South Asian monsoons in the summer and westerlies in the winter. The region is composed of metamorphic rocks with their sedimentary cover. The glacial sediments were collected from near the base camp and snout of Chhota Shigri Glacier (western Himalaya, Lahaul-Spiti valley, Himachal Pradesh). The lake sediments were also collected from within the periphery of Chandratal Lake (Lahaul-Spiti valley, Himachal Pradesh). The glaciofluvial and glaciolacustrine sediment is analysed for the statistical and physical parameters i.e. mean, standard deviation, skewness, kurtosis, porosity, permeability and bulk density. Grain size distribution is analysed through the mechanical sieving. The porosity of the sediment is measured through the column saturation method. Correlation among the different parameters tried to explain through the regression analysis. The correlation between permeability and mean grain size shows a good regression coefficient ($R^2 = 0.829$ and $R^2 = 0.581$ for glaciofluvial and glaciolacustrine sediments respectively). Correlation of the density and porosity is also established against mean grain size with a good regression coefficient. Hence the study of sediment grain size and texture were found to be a useful tool to understand the permeability, porosity etc. and movement and mobility of water, snow etc. through the glaciofluvial and glaciolacustrine sediments. The correlation study also shows that the mean grain size could be used as factor for predicting the physioempirical model in that region.

KEYWORDS: Himalayan glaciers, permeability, porosity, bulk density, glaciofluvial, glaciolacustrine, mean, standard deviation, skewness, kurtosis