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Mineralogical, Sedimentological and Chemical Relationships of Sediments in Lower Peneplain of the Kelani River

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Abstract

Kelani river is having second largest catchment area and considered as the fourth longest river of the country. The total length of the river is around 145 km with 2292 km² of river basin area. In general, the river carries lot of sediments with important heavy minerals from upper regions and assumed to be deposited at the lower flat terrain and those sediment will reflect overall fluvial process of the river. Identification of mineral sources, weathering grade and geochemistry of sediments are important for a river and sediment characteristics can provide information about source materials and providing information on weathering and transport process. However, many studies are done on contaminations in river water. Conversely, few studies are attempted to analyze sediments of the Kelani river in order to study fluvial process. This study was carried out along the transported sediments deposited in the lower peneplain of the river and the main aim of this study is to investigate mineralogy, sedimentology and chemical relationships of the sediments in the lower Peneplain of the river.

Sieve analysis was done on both sand and flood plain sediments for study particle size distribution of the river. Different fractions of the samples were examined using optical microscope for mineralogy and volumetric percentages were calculated. The mineralogical studies of the river bed sediments reflect quartz, biotite, feldspars, garnet and sapphire rich composition. The most common one is the quartz, however biotite, feldspar and garnet are also present. Mineral biotite and garnet are rich in small particle sizes such as 0.106 mm, 0.053 mm and 0.047 mm. Most of the smaller minerals are sub angular or angular in shape. This may reflect that the fine grained sediments of the river are transported short distance from the origin. Quartz is the most abundant mineral in the river bed and rounded in shape. This concluded that they are transported long distance from the origin. Primary minerals are not dominant in the studied fine grained flood plain sediments which may reflect accumulation of secondary clay minerals. Conversely, river bed sandy sediments are having very limited finer clay fraction. In general, enrichment of weathering resistant minerals such as quartz and biotite, feldspar and garnet in river bed and enrichment of secondary clay minerals in flood plain concluded the strong weathering during transportation.

The flood plain sediments are further tested for physico-chemical parameters such as pH, Oxidized Reduction Potential (ORP) and Total Organic Carbon (TOC). Value of pH is in between 6.0 to 7.0, have positive ORP between 15 to 30 mV and TOC is 16-19 %. This may concluded that the flood plain fine grained sediments are having favorable conditions for accumulation of heavy metals added from possible point-sources. Conversely, river bed sediments are predominantly rich with primary mineral quartz which is having very low possibility for accumulation of heavy metals.

Keywords: Kelani River, Sediment, Mineral