Changes in mineral composition and depositional environments recorded in the present and past basin-fill sediments of the Kathmandu Valley, central Nepal

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Surface and drill core sediments from the Kathmandu Basin were investigated to decipher their capability to record changes in the mineral composition and depositional environment. Spatial distribution of mineral assemblages in the terrigenous sand and mud reflects different provenance of the past and present basin filled sediments. Bulk mineral assemblages in the modern sediments are controlled by supply of terrigenous detritus from the source rocks in the adjacent surrounding mountains. This suggests the occurrence of granitic and gneiss source in the north and metasediments in the eastern, western and southern part of the Kathmandu Basin.

X-ray diffraction (XRD) experiment was done for the mineralogical study of the present river sediments and RB core sediments. RB core was drilled at Rabhibhawan in the western part of the Kathmandu Basin (Sakai et al. 2001). All samples were prepared on the basis of rule adapted by Kuwahara (2001). XRD measurement were done by Rigaku X-ray Diffractometer RINT 2100V, using CuKα radiation monochromatized by a curve graphite crystal in a step counting time of 2 second. The profile fitting of obtained XRD patterns was performed with an Apple Power Macintosh computer and a scientific graphical analysis program XRD MacDiff (Petschik 2000). The result of the individual minerals obtained from the profile-fitting method was used for quantitative analysis. Relative amount of minerals in the sediments were determined by calibration curve obtained from integrated intensity ratio of the standard mineral to internal standard zincite.

X-ray diffraction (XRD) analysis of greater than 2 mm fraction of the present river sediments from the Kathmandu Basin shows quartz, K-feldspar, plagioclase and mica to be the dominant bulk minerals (accounting over 80%). It shows the presence of low amounts of chlorite and calcite. Chlorite is relatively higher in the northern part than the east, west and south. Based on the study done, the mineral assemblages of the present river sediments within the Kathmandu Valley are divided into two groups. The first group is rich in mica, poor in quartz and has presence of K-feldspar, plagioclase and chlorite in all samples. This group of mineral originated from Shivapuri Lekh of the granite and gneiss complex. The second group is rich in quartz and poor in mica and has presence of plagioclase, K-feldspar and very poor chlorite. This group probably originated from metasediments in the eastern, western and southern part of the Kathmandu Valley. Some samples of this group also contain very low percentage of calcite (less than 5 %).

Mineral assemblages in the RB core sediments from 7 to 40 m depth indicate the same as those encountered in the present river sediments. XRD-analysis of the greater than 2 mm fraction shows the presence of quartz (10-60%), K-feldspar (2-37%), plagioclase (2-8%), mica (4-19%), chlorite (2 -14%) and calcite (0-18%). Relatively high percentages of these minerals are

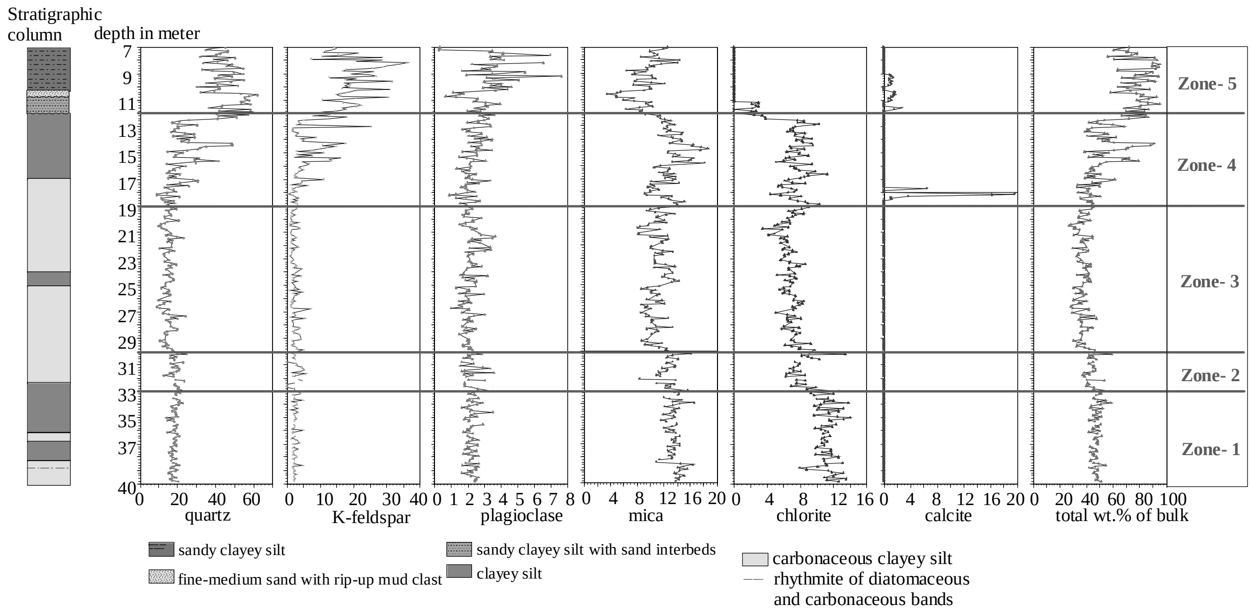

FIGURE 1. Mineralogical variation in the RB core up to 40 m depth

detected above the 13 m depth. The trends in amount between quartz, feldspar and mica are opposite, quartz and feldspar increase when mica decreases. The trend between chlorite and mica is parallel.

On the basis of the variation of these minerals with depth, we divided the RB core sediments into five mineral zones (**Figure 1**). Zone-1 (40-33 m) is rich in chlorite and with quartz and mica higher than in zone-3. Zone-2 (33-30 m) is rich in chlorite with decreased total amount of the minerals. Zone-3 (30-19 m) has the lowest total amount of all minerals poor in quartz and mica. Zone-4 (19-12 m) has increased whole mineral composition. Zone-5 (12-7 m) has increased quartz and feldspar (highest value), with the total amount twice as much as in other zones.

Changes of the mineral composition of the present river sediment with respect to different directions show the provenance of the sediments to be not just one particular direction. Moreover, relatively higher percentage of chlorite in the northern part of the sediments might indicate the source rock contains higher percentage of mica. South, east and west of the Kathmandu Basin contain the carbonate rocks. However, very few percentage of carbonate minerals are detected from this site, which indicate that the carbonate minerals are dissolved within the present river.

RB drill core is located near to the Phulchoki Group of metasediments. The present river sediments flowing from metasediment zones have very low amount of chlorite. However, sediments of the RB core contain chlorite minerals, which are similar to the granitic and gneiss source of the Shivapuri Lekh. Variation of the mineral content in the zone 4 and 5 of RB core above 13m depth are larger than the zone below 13 m depth, particularly, quartz, K-feldspar and mica. Similarly, different amount of mineralogical variation obtained from the drill-well JW-3 in the central part of the Kathmandu Basin (Fujii and Kuwahara 2001). Hence, such mineralogical variation with respect to the depth in the drill core sediments indicates the depositional environmental changes at the time of deposition.

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