ABSTRACT

The sedimentological studies of Ganga and Yamuna sediments have practically been untouched. Therefore, an attempt has been made here to study the processes and products of river Ganga and Yamuna. The study area lies between $77^031$ to $78^089$ longitude and $27^043$ to $28^036$ latitude. During investigations seven stations were selected for detailed study.

The present study mainly aims at reconstructing the sedimentation history of the Ganga plain. For this purpose three field sessions were planned and executed in January 2008, 2009, 2010 for detailed measurement of the sections and collection of samples for the follow up laboratory investigation. Forty one lithostratigraphic sections were measured from different localities. Thin sections of sand samples were prepared and used for petrographic study. The textural attributes of the sediments were studied. Bivariant plots were plotted to find out interrelationship of various textural attributes. Detrital mineralogy of the sediments including light and heavy minerals fractions, was studied for the purpose of description and petrographic classification of the studied sediments and interpretation of their provenance. Samples of sediments were chosen for geochemical analysis. Samples were analyzed by XRF and ICP-MS.

The sand grains are medium to fine grained, moderately to well sorted, strongly fine skewed and platykurtic to leptokurtic. The grains are subangular to subrounded. Majority of the grains show low to high sphericity. The interrelationship of various textural parameters appear to be, normal thereby, suggesting that the original texture of the sediments
and by implication, original detrital modes are preserved and have not been affected by diagenetic processes.

The detrital content of the studied sediments is mainly composed of several varieties of quartz followed by rock fragments, feldspar, mica and heavy minerals. All the sediment samples plotted near the Q pole, in the sublitharenite field.

The Qt-F-L plot suggesting contribution from the recycled orogen provenance with metasedimentary and sedimentary rock and continental block provenance with the basement uplift. The Qm-F-Lt plot shows that the samples fall in the recycled orogen and continental block provenance field. The Qp-Lv-Ls plot which is based on rock fragments population reveals the source in rifted continental margin and fold thrust belt. The Qm-P-K plot of the data shows that all the sediment contribution is from the continental block basement uplift provenance and is reflected in mineralogical maturity of the sediments and stability of the source area.

The provenance for the Ganga and Yamuna river sediments is believed to be western, central Himalaya and Siwalik hills, which comprise granite, gneisses, schists and metamorphosed limestone from the horizon of Cambrian and Upper Precambrian age. However, Yamuna river contributed sediments from Himalaya as well as from Aravalli, Bundelkhand terrain path, and from Vindhyan Supergroup.

In the Ganga sediment samples SiO$_2$ is strongly to moderately negatively correlated with other oxides expect Na$_2$O in middle layer sediments. The good to strong positive correlation between Al$_2$O$_3$ and other oxides excluding SiO$_2$ in these sediments indicates clay minerals control on the major element composition of the Ganga sediments. A
positive ratio between Zr and Hf commonly suggests their derivation from felsic rocks. LREE/HREE ratio in the studied sediments indicates that the source area was predominantly felsic similar to granite. SiO$_2$ with other major oxides in Yamuna sediments reflects a decrease in unstable components with an increasing mineralogical maturity. Strong correlation between Al$_2$O$_3$ and other oxides including SiO$_2$ indicates clay minerals control over major element chemistry. Different relationship between elements indicate that minerals like apatite, Titanite, monazite and to certain extent garnet controlled the abundance of heavy REE in Yamuna sediments.

Weathering indices like CIA, PIA and ACNK plots attest low to moderate degree of chemical weathering in the source domain. Projected trend in ACNK diagram suggest a granodiorite source. All the sediment samples fall within active and passive continental margin environment between granitic and TTG composition. Deserninant analysis suggest that the sediment plot in P4 field indicating recycled orogenic terrain and deposited in passive margin regime.