Geophysical Research Abstracts
Vol. 12, EGU2010-13832, 2010
EGU General Assembly 2010

Transfer and evolution of sediments in the Gangetic plain

Christian France-Lanord (1), Maarten Lupker (1), and Valier Galy (2)

(1) CRPG-CNRS, Vandoeuvre-les-Nancy, France (cfl@crpg.cnrs-nancy.fr), (2) Woods Hole Oceanographic Institution, MA USA.

A consequence of the Himalayan orogenesis is the development of the Ganga-Brahmaputra drainage basin. At the global scale, this basin is relatively modest in term of discharge or area representing 2.9 and 1% respectively. On the contrary, it's sediment discharge is above 1 billion tons/yr which is more than 10% of the global sediment flux to the oceans. Understanding the processes of transfer and evolution of the sediments in the basin is important for unravelling the history of Himalayan erosion from sedimentary records as well as for scaling the magnitude of bio-geochemical fluxes associated with this basin. Our study is based on chemical and isotopic compositions of suspended and bed-sediments sampled from the major tributaries of the Ganga and Brahmaputra and along their courses, down to the Bangladesh delta. Sampling have been realised along depth profile in order to take into account the chemical differentiation that is generated by particle sorting during transport. This process tends to enrich surface suspended load in fine grained / clay rich particles whereas bed-sediments tend to concentrate in coarser and quartz rich particles. Sorting process exerts a first order control on chemical compositions and is well correlated to simple granulometric parameters or to Al/Si ratio. Provenance of sediment and weathering processes from soils to floodplain exert more discrete chemical variations. It is therefore necessary to decipher both effects in order to quantify one or the other.

On the Ganga, the main provenance is the Himalaya but minor contributions of southern tributaries are highlighted by contrasted compositions in both major and trace elements. This is mainly due to the input of sediments derived from the Deccan traps. Careful monitoring of this contribution is necessary in order to quantify weathering evolution in the basin. Sediment compositions followed from the Himalayan front to the Ganga and the delta show a clear depletion in mobile elements. This corresponds mainly to losses in Na and K due to silicate weathering and in Ca due to carbonate dissolution. Comparison with Himalayan rivers further show that most of weathering occurs in the floodplain rather than in the mountain soils. While weathering in the floodplain normally occurs, the fluxes inferred from sediments appear difficult to reconcile with fluxes derived from dissolved elements in the rivers. It is likely possible that soil erosion in the floodplain could be enhanced by anthropic activities, resulting in an increase of secondary minerals in the river sediments. The presentation will review these different evolutions and present quantitative estimates of the processes and their limits.