Records of Massive Aggradation in Himalayan River Valleys

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The Bhagirathi-Alaknanda river system (BARS) constitutes the headwater reaches of the Ganga river system. BARS traverses from all the major litho-tectonic units of the Himalaya and interestingly this area also shows diverse climatic regime where precipitation varies from ~3000mm/year at mountain front of the Higher Himalaya to 1200 mm/year at the foothills. Thus this river system has the potential to study the climate–tectonic interaction for the generation of fluvial landforms generated in the Late Pleistocene-Holocene. The fluvial terrace deposits that are ubiquitous in these valleys are the archives from which important information about the climatic perturbations and the tectonic pulsations are studied. These deposits are located primarily in between the tectonic boundaries of the Main central Thrust (MCT) and the Main Boundary Thrust (MBT) i.e. in the Lesser Himalayan region. Sedimentologically these deposits are composed of clast supported massive gravel (Gcm), matrix supported gravel (Gmg), Clast supported horizontally stratified gravel (Gh) and horizontally stratified sand (Sh). These deposits are formed because of (a) the aggrading channel bars, (b) episodic flash floods and (c) by the local landslides. The luminescence chronology shows that in the BARS the aggradational events are in two major phases; first from 49-25 ka and secondly from 18-11 ka. These phases are in coherence with the global climatic phases. The Aggradation in these valleys is focused at Marine Isotope Stage III (MIS-III) and during the transition phase of MIS-II and MIS-I. Glaciation-deglaciation processes in the upper catchment produced copious sediment during 63-11 ka, which was transferred by these rivers in several cycles of erosion and deposition and lead to extensive aggradation. The climatic changes at ~11 ka and then the completion of deglaciation process lead to increased fluvial discharge and decreased sediment supply, a condition favorable for incision of alluvial fills. Hence in BARS aggradational cycle is soon followed by the incision phase in time and space.

Keywords: Himalaya; Bhagirathi-Alaknanda river system; aggradation; incision; luminescence dating; paleoclimate.