Geomorphology, Sedimentology and its implication for Climate change, Gangotri Glacier, Garhwal Himalaya, India

Gangotri glacier is one of the longest and well studied glaciers known Internationally for its rapid rate of retreat. It is located in Uttarkashi district of Kumaun and Garhwal Himalaya. It has been observed that the glacial landforms and landscapes are modified by the paraglacial processes which evolve as soon as the glacier vacates its valley. The paraglacial processes, though secondary in origin in a glaciated terrain, are very active and control the landscape evolution of a glaciated region. The important paraglacial processes are: mass movement, fluvial, lacustrine landslide lake outburst flooding and glacial lake outburst flooding. These paraglacial processes modify the landforms and so create problems in identification of original landforms. The sedimentary facies are important tool to differentiate between various types of landforms. However, little attention has been given to the sedimentary facies of a glaciated terrain.

The study explains the sedimentary facies that describe the physical characteristics of the sediments and associated surface processes for the evolution of geomorphic features and depositional environments of the glacial and paraglacial landforms in the Gangotri Glacier region. The glacial events have resulted in the evolution of lateral moraine (LM), recessional moraine (RM) and outwash plain (OWP), while the paraglacial processes are responsible for the formation of debris cone (DC), pillar structures (PS), fluvial deposits (FD), lacustrine deposits (LD) and the flash flood deposits (FFD). The sedimentary facies for all the geomorphic features have been described for the first time from the Gangotri Glacier region which could be used as a model to interpret the ancient glacial sequences and landforms in other regions.

The results indicate that the Gangotri Glacier region exhibits complex and varied geomorphic features evolved by glacial and paraglacial sedimentary environments. The glacial and paraglacial sedimentary environments are characterised by a distinctive set of processes and sedimentary facies. It has been concluded that apart from glacial the lacustrine, mass movement, fluvial and flash flood processes are very active and important sedimentary environments in a glaciated region.