Chronology of Late Quaternary Glaciation and Landform Evolution in the Pindar Valley, Kumaun Himalaya

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The timing and the palaeoglacial extent of various episodes of Late Quaternary period is not very well documented in the central Indian Himalayan region. Systematic field investigations in the upper reaches of Pindar glacial valley has helped in identifying a number of glacially sculptured landforms. During the present work, periglacial geomorphic features have been systematically studied, recorded and mapped to reconstruct the pattern of Late Quaternary glaciation. After carefully examining and dating some of glacial deposits, an attempt has been made to build up moraine stratigraphy along the Pindar valley.

Remnants of the recessional moraines near Khati (2925 m asl), about 22 km downstream of the present day snout, suggests that the Pindari trunk glacier during **Stage I** had probably extended upto Khati (Khati Stage), sometimes during the Middle to Late Quaternary. The LGM in the area seems to have occurred during the early part of last glacial cycle i.e. MIS-3 (23-58 Ka BP). The valley cross section upstream of Khati suggests the presence of a broad U- shaped valley which has subsequently been modified into a narrow one, along the valley floor. During the **Stage II (25 ka BP,** Phurkia Stage), the glacier again advanced upto about 7 kms downstream of the present snout. The extent of Stage II advance is marked by the well developed and preserved terminal moraine observed along the right valley wall before Phurkia. During its recessional journey that continued upto around 7.0 Ka BP., the glacial snout reached almost upto the altitude of the present day snout. This is clearly evidenced by the presence and dating of a set of recessional moraines in the shadow of rock knob locally named as Kupi Dhura. Thereafter, there was a sudden and sporadic advance of the trunk glacier during **Stage III (6.0 – 1.0 ka BP)**. Due to sudden advance and presence of rock knob, the Stage III advance did not cover the entire width of the valley. The left lateral moraine of the Stage III advance of trunk glacier is found well preserved as a morainic ridge in almost centre of the trunk valley. A number of crescent shaped recessional moraines disposed along the present day valley floor represent the **Stage IV** glacial advancement, coinciding with the global Little Ice age.

By observing the morphotectonic disposition of landforms and carrying out Anisotropy of magnetic susceptibility (AMS) fabric analysis, it is inferred that active tectonics has been responsible for the glacio-geomorphic diversity of the area. There has been a major phase of rejuvenation prior to 25 ka that inhibited the downstream advancement of

Pindari trunk glacier as well as another phase post 3 ka that modified the orientation of glacio-lacustrine deposit present within the Left lateral moraines of the Third phase.

Keywords: Late Quaternary glacial chronology; Pindari glacier; Moraine stratigraphy; Geomorphic evolution