



Geomorphological and sedimentological evidences of palaeo-outburst flood events from TanglangLa-Gya catchment of River Indus, Ladakh, India

Debarati Nag^a, Binita Phartiyal ^a, Pankaj Kumar ^b, Priyanka Joshi^a and Randheer Singh^a

^aBirbal Sahni Institute of Palaeosciences, 53-University Road, Lucknow, India; ^bInter University Accelerator Centre, Aruna Asaf Ali Marg, New Delhi, India

ABSTRACT

Gya river, one of the main tributary of Indus, hosts several scattered palaeoflood deposits. The chronology, genesis and spatiotemporal relationships of these scattered deposits can throw light to the regional and global climatic fluctuations and their implications for the evolution of the valley. The valley structure of the Gya river consists of a broad middle reach alternating with narrow valleys and gorges in the upper and lower reaches which can be blocked by the slightest of sediment discharge damming the entire valley. The geomorphological, sedimentological and chronological study in this valley reveals multiple short-lived lake phases at 21–19.9 ka, 13 ka and 4.5 ka in the broader reach of the river during the transition periods when climate rapidly fluctuates between cold-dry and warm-wet. The damming in the valley is the result of the glacial lake outbursts in the head waters of the Gya catchment blocking the narrow lower reaches of the main channel by massive sediment. These lakes that are formed by valley damming contains $\sim 10^8$ m³ of water which subsequently breach out causing significant geomorphic changes on reach scale along the Gya river channel.

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Ladakh; climate; palaeodams; outburst flood; quaternary

Introduction

Topographic, geomorphic and climatic setup of the Himalayan region make it vulnerable to various types of natural disaster. Among other hazards, outburst floods that include Glacial Lake Outburst Floods (GLOFs), Landslide Lake Outburst Floods (LLOFs), flash floods caused by cloud bursts and rapid snow melt, monsoonal floods, natural dam breach floods are considered to be most destructive (Veh et al., 2020) and these events are more frequent in the arid and cold, Trans Himalayan region (Bookhagen, 2010). Historical records of such catastrophic events are increasingly reported from the Ladakh region of, Trans Himalayan. In 1926, a GLOF caused by Shyok glacier destroyed Abudan village; a GLOF at Nyoma in the Changthang area in eastern Ladakh in 1971 caused 13 to 16 fatalities (Schmidt et al., 2020) and in 2003 at Domkhar, Ladakh that destroyed farmland and infrastructure (Ikeda et al., 2016); 2010 cloud burst followed by