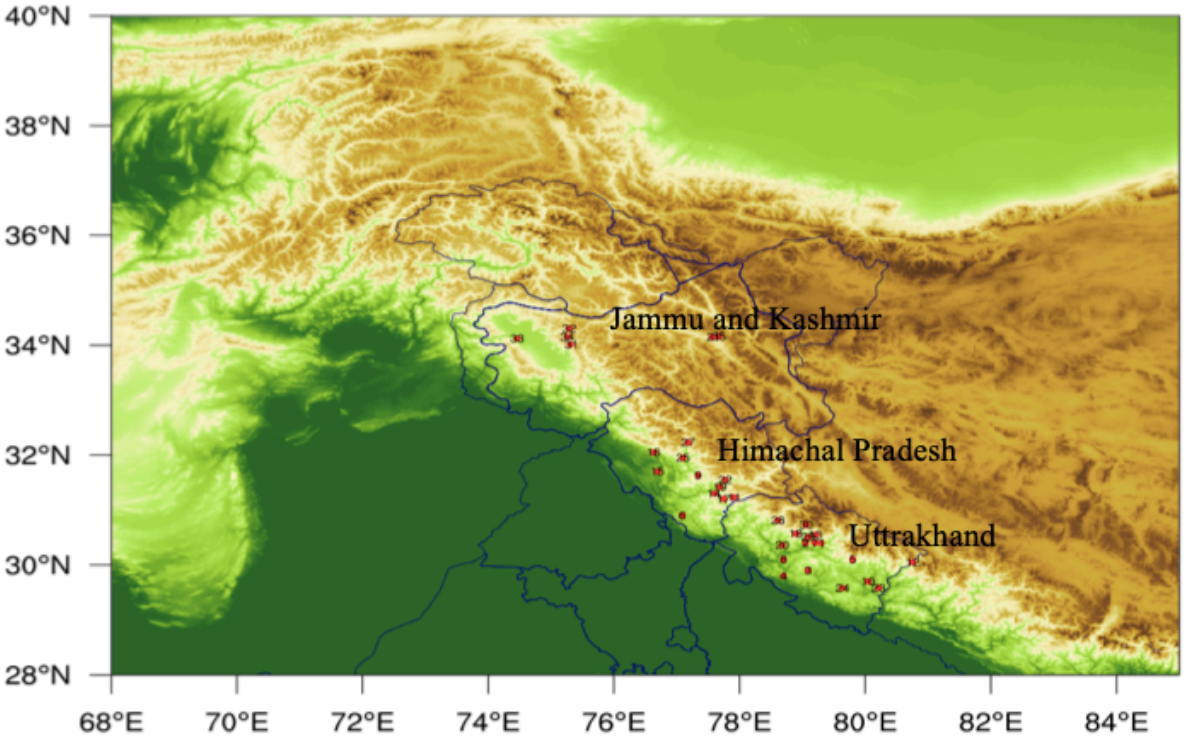
Flashfloods and landslides along the foothills of the Himalayas: their precursors, dynamics and thermodynamics

*Anu Gupta[1], Jun Matsumoto[1]

1. Tokyo Metropolitan University, Tokyo

In the past three decades, the total number of extreme precipitation events during summer monsoon season over north India has increased, which majorly caused flooding and landslides over the Himalayan foothills and north Indian region. Among those extreme precipitation events, some are reported as cloudburst events. In this article, those extreme precipitation events over north India are studied by employing satellite and gauge merged high-resolution precipitation CHIRPS (Climate Hazards Group InfraRed Precipitation with Station data) dataset for the period 1981-2015. Using ERA-Interim reanalysis dataset, cloudburst (CB) events are classified into five major classes C1, C2, C3, C4 and C5 based on the large-scale weather systems observed in the lower, middle and upper troposphere. Analysis shows that cloudburst events of classes C1, C2, and C3 occurs during active monsoon season, whereas, class C4 and C5 cloudburst events develop in the monsoon hiatus/break period. Classes C1, C2 and C3 cloudburst events associated with lower atmosphere cyclonic circulation over the head Bay of Bengal, cyclonic circulation centered over Central India, and East-West oriented low-pressure conveyor system over central India respectively. Further, thermodynamic analysis of each class revealed that class C1, C2, and C3 cloudbursts are associated with the moist instability of the local atmosphere during the cloudburst events, where orographic forcing created potential instability and made them intense and overwhelming. A detailed schematic of each class is presented to understand the overall processes during the cloudburst. This kind of careful knowledge about schematics of extreme precipitation events is very useful in comparing process-based model simulations and monitoring.

Keywords: Cloudburst events, Orographic forcing



In figure brown color represents the high mountains of the Himalayas in the northern part of India which includes Jammu and Kashmir, Himachal Pradesh and Uttrakhand states, and red dots represents the location of cloudburst events.

