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Identifying Flash Flood-Prone Subbasins in India Using Geomorphological and Meteorological Parameters

Nandana Dilip K¹, Urmin Vegad², and Vimal Mishra^{3,4}

¹IIT Gandhinagar, Civil Engineering, India (nandanadilipk@iitgn.ac.in)

²IIT Gandhinagar, Civil Engineering, India (vegad_urmin@iitgn.ac.in)

³IIT Gandhinagar, Civil Engineering, India (vmishra@iitgn.ac.in)

⁴IIT Gandhinagar, Earth Science, India (vmishra@iitgn.ac.in)

Flash Floods are one of the crucial disasters in India which causes high mortality and damage due to its sudden onset and devastating impact. These events are projected to increase in India due to the warming climate and increasing unplanned urbanization. However, India still lacks a robust analysis on flash flood susceptibility at a subbasin scale. In our study, we have considered meteorological and geomorphological factors to improve the susceptibility mapping, as flash floods are the result of high intensity rainfall in a short period of time and the geomorphology of the basin. We analyzed 17 different geomorphological factors of drainage, relief and areal aspects. Further, we calculated the flashiness index for all the subbasins within India using the model simulated streamflow. We forced a hydrodynamic routing model with reanalysis data to simulate streamflow at the subbasin outlets. We prepared subbasin-level flash flood susceptibility maps based on geomorphology, flashiness index and a combination of both. The integrated use of geomorphology and meteorology will provide a more robust framework for identifying the flash flood prone subbasins in India. This will help the authorities in focusing on the probable regions to plan mitigation strategies.