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The identification of the orographic barrier in Chenab River Basin and its role in the slope stability condition

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The tectonics of the actively deforming collisional mountain ranges are influenced by climate [1] and vice-versa which affects the erosion rate and sediment yield by affecting the stability of the slopes. The structures act as an orographic barrier and causes heavy precipitation in its front which in turn increases the erosion and sediment yield in the downstream reaches. This complex association between the climate-erosion-tectonics has been investigated in various parts of the world such as Andes [2] and Himalayas [3][4].

In the present study, the Chenab River Basin, situated in the Western Himalayas, is investigated to identify the orographic barrier using the erosion and sediment data to synthesise the complex relationship between the tectonics and the climate and their pooled effect on the stability of the slopes.

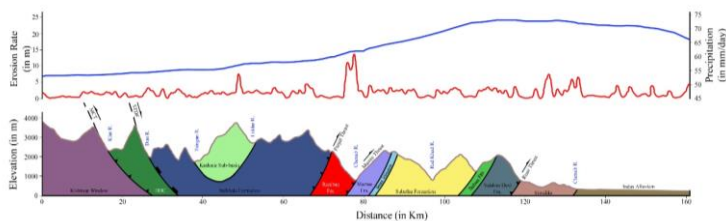


Figure 1: Precipitation and erosion rate plotted along a line traversing different lithologies in the basin.

The assimilation of the parameters such as precipitation (TRMM) and erosion rate (both observed and calculated using RUSLE) has been carried out with relation to each other and the tectonics in the basin. Both these data plotted over the longitudinal profile of the Chenab River (Figure 1) displayed prominent peak in front of the Panjal Thrust (~MCTII). The trend of precipitation in area, reveals

that it is governed by the tectonic structures as high values are observed in front of the Panjal Thrust. It also highlights the association of these two variables with each other. The erosion rate and sediment loads also increases and follows the trend of precipitation, but there are some anomalies present in the

form of crest and trough. These anomalies can be explained on the basis of lithological variations and tectonic setting which serve as important factors in determining the erosion rate and the related outputs.

The present research suggest that the orographic barrier in the Chenab River Basin can be traced along the Panjal Thrust, where the highest SL value is observed, suggesting that the climate of the area is controlled

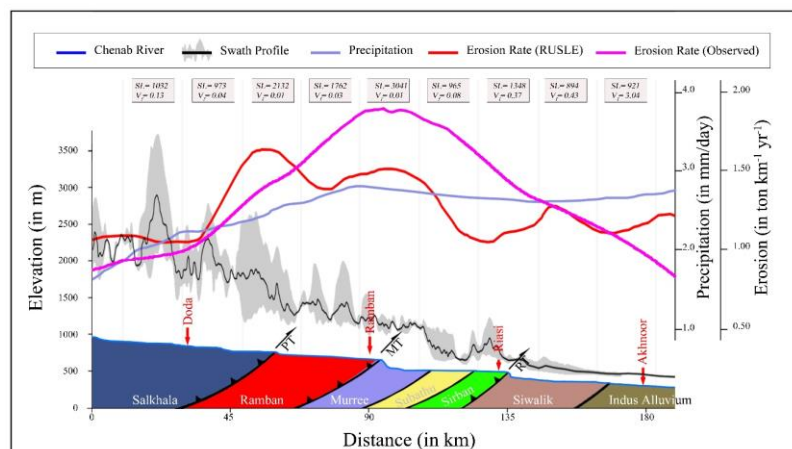


Figure 2: Precipitation, Erosion rate and SL number plotted over the longitudinal profile of the Chenab River.

by the tectonic structure (Figure 2) and vice-versa. The high values of SL, precipitation, erosion rate and sediment yield in the vicinity of the active tectonic structures point towards the complex coupling between the climate and the tectonic in the Chenab River basin.

References:

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