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Application of Entropy theory to estimate the sediment transport

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Abstract: Sediment transport is a natural process where sediment particles can be deposited downstream and exacerbate flooding. The movement of sediments can be observed in flows through rivers, canals, and coastal areas which include suspended load transport and bed-load transport. Bed-load transport occurs in the area close to the riverbed, which is of particular importance in shaping the riverbed. The present research aims to investigate the sediment transport process by applying the Entropy concept as a theoretical approach to the activities of the project 'Probabilistic floods and sediment transport forecasting in the Himalayas during extreme events', funded in the context of the Italy-India joint science and technology cooperation program.

Specifically, based on collected field data through the Alaknanda River at Srinagar in India by current meter, first, the Entropy theory was applied to obtain the cross-sectional distribution of the velocity (based on recent developments of Entropy theory in Bahmanpouri et al., 2022a, b). The calculated mean velocity and discharge were compared with the observed data collected by the Central Water Commission (CWC). Next, shear velocity was calculated for different cross-sections based on different flow conditions. Further, shear stress was calculated based on two terms induced by skin friction and bedforms, respectively. Finally, the shield parameter was obtained based on shear velocity distribution to find out if sediment particles have the potential to be transported or not. Overall, the findings of the current research highlighted the potential of the theoretical method of Entropy to calculate sediment transport in developing countries.

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