

Sedimentation and Thermal Stratification During Floods: A Case Study on Hail Haor of North-East Bangladesh

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ABSTRACT

The presence of numerous haors (seasonal lakes), and the occurrence of flash floods and sedimentation are among the dominant physical and hydro-climatic features of North-East Bangladesh. These features for one of the haors (Hail Haor) in the region are studied using a conceptual hydrological model and a hydraulic routine. The hydrologic model used for daily runoff estimation from rainfall and evaporation information is the widely used tank model. Both soil-moisture movement and stream-flow routing are considered in the developed model. The tank runoff is used as an input to a hydraulic routine for estimation of stream water temperatures and suspended sediment load. Based on the stream sediment concentration, sedimentation in a downstream lake (Hail Haor) is estimated and it is found to be about 25 mm per annum. The relationship between monsoonal flooding and thermal response of the haor is investigated with one-year measured data of haor temperatures and water level. Different heat fluxes and thermal stability parameters are also estimated. The advection flux and the Richardson number are found to be sensitive to flooding in the haor. The unique feature of the Hail Haor found in the context of lake ecology is that thermal stratification occurs during sunny days under calm weather and complete mixing occurs in the event of large flash floods.

Keywords: tank model, suspended sediment, water temperature, thermal stratification, buoyancy flux, Richardson number, and haor.
