Geophysical Research Abstracts
Vol. 19, EGU2017-13758, 2017
EGU General Assembly 2017

Hydrological simulation of the Brahmaputra basin using global datasets

Biswa Bhattacharya, Crystal Conway, Joanne Craven, Ilyas Masih, Maurizio Mazzolini, Shreedeepy Shrestha, Reyne Ugay, and Schalk Jan van Andel

UNESCO-IHE, Integrated Water Systems and Governance, Delft, Netherlands (b.bhattacharya@unesco-ihe.org)

Brahmaputra River flows through China, India and Bangladesh to the Bay of Bengal and is one of the largest rivers of the world with a catchment size of ∼580K km2. The catchment is largely hilly and/or forested with sparse population and with limited urbanisation and economic activities. The catchment experiences heavy monsoon rainfall leading to very high flood discharges. Large inter-annual variation of discharge leading to flooding, erosion and morphological changes are among the major challenges. The catchment is largely ungauged; moreover, limited availability of hydro-meteorological data limits the possibility of carrying out evidence based research, which could provide trustworthy information for managing and when needed, controlling, the basin processes by the riparian countries for overall basin development.

The paper presents initial results of a current research project on Brahmaputra basin. A set of hydrological and hydraulic models (SWAT, HMS, RAS) are developed by employing publicly available datasets of DEM, land use and soil and simulated using satellite based rainfall products, evapotranspiration and temperature estimates. Remotely sensed data are compared with sporadically available ground data. The set of models are able to produce catchment wide hydrological information that potentially can be used in the future in managing the basin's water resources. The model predications should be used with caution due to high level of uncertainty because the semi-calibrated models are developed with uncertain physical representation (e.g. cross-section) and simulated with global meteorological forcing (e.g. TRMM) with limited validation.

Major scientific challenges are seen in producing robust information that can be reliably used in managing the basin. The information generated by the models are uncertain and as a result, instead of using them per se, they are used in improving the understanding of the catchment, and by running several scenarios with varying catchment conditions the catchment dynamics is explored. Objectives are set that suit the data availability. For example, patterns (e.g., variation of rainfall in the lower basin) and aggregates/averages (seasonal averages) are preferred over point information. Instead of simulating instantaneous flood propagation flood extent corresponding to a frequency is followed. As satellite rainfall products may be erroneous so a variety of satellite based products are used as ensemble input. Satellite rainfall estimates are corrected for bias and different rainfall products are aggregated in a data fusion framework. Finally, the linkages between catchment erosion, hydrology and morphological changes are investigated and validated with remote sensing imageries.

Keywords: Brahmaputra, hydrology, TRMM, data fusion, ungauged basin.