We examine the utility of a modeling framework with requisite simplicity – to paraphrase Einstein ‘simple, but not simpler’ that relying on flow persistence, aggregated upstream rainfall and travel time – to provide reliable flood forecasts comparable to relatively more complex methods for up to 10-days lead time for the Ganges, Brahmaputra, and Meghna (GBM) Rivers inside Bangladesh.

Our results show comparable or better forecasting accuracy with respect to existing operational hydrologic, hybrid models or satellite altimetry-based forecast methods for these river basins.

The proposed framework is of particular importance for large rivers, where access to upstream data are limited.

### A Flood Forecasting Scheme for Large Rivers with Requisite Simplicity

#### Objective
- Provide improved streamflow and water level forecasts of the GBM basins at their most downstream gauging locations (i.e., Hardinge Bridge, Bahurubad, and Armanshid, respectively) inside Bangladesh.
- Building on the notion of requisite simplicity, we aim to introduce a linear regression-based forecasting model for the GBM basins for 1-10 days lead time. We named it requisite simplicity (RS) flood forecast model or RS model.

### Methods
- Applied regression-based linear model by employing river flow persistence and upstream aggregated rainfall over broadly divided basin domains with runoff travel time lag adjustment.
- Generate isochrones (runoff travel time map) and divide basin into four large domains.
- Calculate domain (spatial) and domain’s max & min runoff travel time (temporal) average TRMM rainfall to general four domain daily rainfall for the regression.
- Origin of forecast day and one day before measured streamflow or water level data provides flow or water level component of the regression.

### Results
- The MAE and $R^2$ of the Ganges 10-days water level forecasts are 0.37 m and 0.8, respectively during flood season for 2007-2015. The corresponding values for the Brahmaputra are 0.37 m and 0.83, respectively.
- The forecast performance for the Meghna is limited to 5 or 7-days lead time with average MAE and $R^2$ is less than 1.0 m and over 0.75, respectively.

### Abstract
- The forecast performance for the Brahmaputra is comparable to relatively more complex methods for up to 10 days lead time. We named it requisite simplicity (RS) flood forecast model or RS model. This model will have greater application in those basins where availability and access to upstream ground data are limited and detail hydrological modeling are expensive, resource intensive and operationally prohibitive.
- Easy to develop, implement and institutionalize for early flood warning operation.