**Houston Flood Inundation Forecasting System**

**Components:**

1. Satellite based precipitation from IMERG (0.1˚)
2. Forecast precip from Global Forecast System (GFS), downscaled using WRF to 0.1˚ resolution
3. Hydrological Modeling – SWAT model (input forcings from IMERG and WRF)
4. HEC RAS 2D Simulation (boundary conditions from SWAT output flow and IMERG+WRF precip)

The workflow of the system is schematically shown below:

A picture containing screenshot

Description automatically generated

Each component is described below.

**1. SWAT Model setup**

***Domain Setup***

A close up of a map

Description automatically generated

*SWAT model domain extending over the catchment for downstream station*

***Calibration of SWAT model***

The SWAT model was calibrated at one of the stations (marked blue in the figure above) where USGS gage streamflow is available over 2001-2014.

*Validation results for SWAT at single station*

R2 = 0.40

The highly flashy response of the basin is leading to some of the missed and overestimated peaks

**2. WRF Setup**

* The namelist configuration files (with WRF domain) are shared on Github in WRF/ folder
* WRF v 4.1.2 was used for simulation
* The automation script, calling WPS and WRF programs is also shared on Github in WRF/ folder

**3. HEC RAS 2D**

* Uses boundary conditions at four locations: 3 stations for upstream inflow, 1 station for downstream outflow and precipitation over the catchment, as shown below.
* Lidar DEM of 1m resolution was used for defining the terrain

A close up of a map

Description automatically generated

*HEC RAS boundary condition location (UBC1, UBC2, UBC3, DBC, and precip over the whole catchment). Hatched area shows RAS domain, while outer boundary is the catchment*

* Shapefiles for boundary conditions (bc1.shp) and RAS domain (flowarea2d\_merged.shp) are shared on Github repository in HEC\_RAS/RAS\_Model/ folder.
* Script automating the SWAT and RAS models along with post-processing the RAS outputs is shared as HEC\_RAS/Automate\_SWAT\_RAS.py