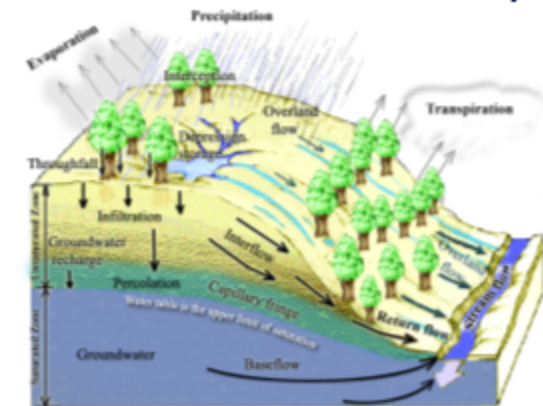


# ISRO-DMS (R&D) early warning project: (2014-2018)

Remote sensing, ground observations and integrated modeling based early warning system for climatic extremes of North West Himalayan region



Extreme weather events has intensified in last 10 years in NWH which requires details hydro-meteorological study and simulations to predict such events to minimize there impacts

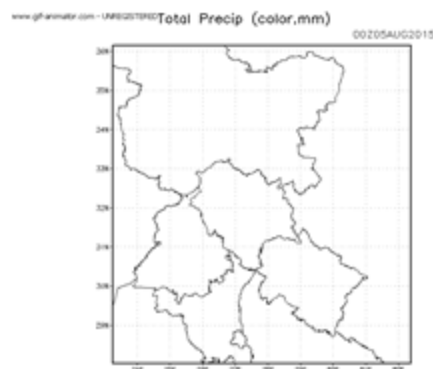
**Objectives:** 1) Use of hydrological and weather parameters derived from remote sensing and ground data in early warning modelling systems 2) Early warning system modelling (basin to watershed scale, with coupling of weather forecasting and hydrological models) at various test basins and watersheds of North west Himalayas. 3) Calibration and validation of early warning results with ground data

**Data used:** High resolution pre and post floods cartosat-1 and LISS-IV FMX data for base line database preparation. In house high resolution WRF-ARW 3 day rainfall forecast along with IMD forecast. DEM for hydrological and river HD parameters extraction.

**Work completed:** Setup and weather forecasting, hydrological and hydrodynamic (HD) models fro upper ganga basin upto Haridwar. Full Near Real Time (NRT) and Short term simulations for 6 events in 2014, and entire monsoon in 2015 at every three days. Validation of WRF results with IMD, TRMM data. Uncoupled hydrological and HD modelling of 2014 (few events) & full 2015 monsoon (every 3 days).

**Validation with INSAT-3D rainfall and ensemble of hydro-models and calibration/validation CWC based river discharge**

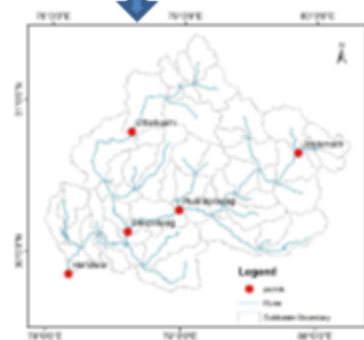
# Overall methodology for flood early warning



1) WRF-3km 3hourly 3-day rainfall forecast + IMD\_GFS daily 5 days ensemble forecast



6) Flood inundation maps NRT & scenarios



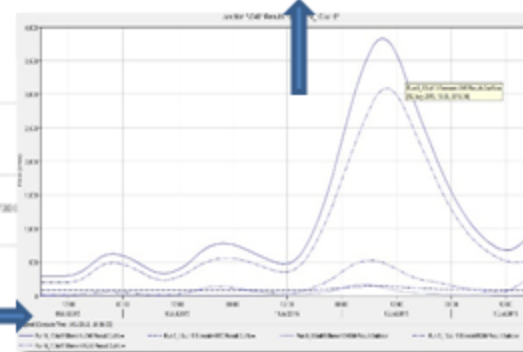
2) Input GIS data for rivers & watersheds with GD sites



5) Hydrodynamic model setup & simulations In DA and flood forecasting



3) Hydrological model setup & simulations



4) Hydrological outputs as input to HD model