Short-Range and Nowcasting-Scale Flood Prediction

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IBM Research
Flood Modeling - Big Picture

- Infiltration
- Plant intake of soil water
- Sand and gravel
- Aquifer
- Silty layer
- Sand and gravel aquifer
- Fractured rock aquifer

Water stored underground in cracks and pores
Flood Modeling - Big Picture

Results of dynamic river simulation for a network in North America
Sources of Quantitative Precipitation Estimates (QPEs)

Numerical Weather Prediction
- WRF-ARW, BRAMS, COSMO and others
- Short-Range forecasts (beyond 12 hours and up to 72 hours)

High-Resolution Weather Radars
- Range of a few hundred Kms
- QPE must be estimated from reflectivity
- Very short-range forecasts (up to 12 hours)
- Nowcasting (between 0-2 hours)
High-Resolution Weather Radars

Doppler Radar at Morro da Igreja/SC, Brazil. Image from INPE
Flood Prediction Model

Aims
- To improve an existing 2-D water routing model

Elements
- Weather Radar data source
- Soil model (land/vegetation properties)
  - Can be modeled with a probability distribution
  - Potential to detect landslides
- River flow model
  - Automatic extraction of river streams characteristics
  - Provide detailed information on the river stage
  - Identification of backwaters
Improve the existing 2-D water routing model
Applied Research - Brunei Darussalam

- Has a dual-polarization Doppler weather radar system
  - Ability to provide QPEs in near real time
  - Requires calibration for reliable data acquisition
Flood Prediction Challenges

High Resolution DEMs
- Gaps can exist even with high quality QPEs from radar

Calibration
- How accurate the model is?
- Alternative or proxy data sources need to be identified and evaluated
  - Surveillance systems + image analysis
  - Social networks + text mining
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