Western Water Centre

RESEARCH THEME

- Water Resources
  - ~$14M in funding
  - Current HQP: 5 PhDs, 5 MESc, 2 PDFs
  - 3 state-of-the-art laboratories and research groups
3. Water Resources

FOCUS

- Climate change and green infrastructure
- Natural hazards including floods and droughts
- Systems modeling
- Risk and resilience analysis
- Water resources and environmental systems analysis
- Computer-based decision support systems development
- Integrated water resources management

OVERVIEW

- Number of degrees conferred: 22 PhDs, 46 MSc, 19 PDFs
- Number of candidates currently supervised: 5 PhDs, 5 MSc, 2 PDFs
- Publications: 256 JP, 32 BM, 125 TR, ~300 C
- Funding: ~$14.4 M
- Advanced programming and HPC capabilities
- Laboratories and research groups
  - Hydraulics lab, Facility for Intelligent Decision Support, Multi-hazard, risk and resilience
3. Water Resources

COLLABORATION/TRAINING AND PROFESSIONAL DEVELOPMENT

- Environment and Climate Change Canada
- BC Hydro
- Ministry of Environment, Conservation and Parks
- Conservation Authorities
- Municipal Govt
- Chaucer Reinsurance
- China Institute for Water and Hydropower Research
- Wuhan University
- First Nations etc

Training:
- Erosion and Sediment Control
- Stormwater management
- Low Impact Development
- Hydrologic and hydraulic modelling
- BC Forestry
- CAPES School of Advanced Studies of Water & Societies under Change
- USP São Carlos, Brazil; and APEG BC

Slobodan Simonovic
Imtiaz Shah
Reza Najafi
3. Water Resources

SYSTEMS ANALYSIS

- Addressing complexity
- The systems of interest are social systems of:
  - Individuals
  - Organizations
  - Societies and
  - Environment.
- Flows connecting the subsystems:
  - Resource, and
  - Information.
- Information is used to determine resource use by subsystems.
- Values provide meaning to information flows.
3. Water Resources

RISK AND RESILIENCE

- Addressing uncertainty
  - Risk (static)
  - Resilience (dynamic)
- Risk management as adaptation to global change
- Resilience as a criterion for decision making
3. Water Resources

PROJECTED IMPACTS OF CLIMATE CHANGE ON EXTREME EVENTS
3. Water Resources

COMPOUND FLOODING

Contributing Factors to Flooding

Marine Processes

Waves

High Sea Levels

Coastal Flooding

Storm Tides (combination of astronomical tide and storm surge)

Hydrologic Processes

River Flows

Overbank Flooding

Direct Runoff

Inland Areas

Coastal areas saturated by high sea levels

Weather-related Extreme Events (such as tropical storms and hurricanes)
3. Water Resources

COMPOUND FLOODING
3. Water Resources

REMTOTELY-SENSED QUANTITATIVE PRECIPITATION ESTIMATIONS
3. Water Resources

REMOTELY-SENSED QUANTITATIVE PRECIPITATION ESTIMATIONS

Definition of different types of precipitation events

Extracting different precipitation events from different sources (satellite, radar, and rain gauges)

Evaluation of remotely sensed QPEs for each individual type of precipitation

Computation of probability of exceeding precipitation return periods

Extraction of extreme characteristics (Intensity and duration) from QPEs

Joint simulation of extreme precipitation characteristics

GOAL: Comprehensive evaluation and bias correction of satellite (IMERGV06B) and radar (MRMS) data in estimating extreme precipitation events over southern Canada

Classification of extreme precipitation patterns

Validation of bias corrected EQPEs for different observed extreme events

Bias correction of both Radar and Satellite

Probabilistic simulation of extreme QPEs (EQPEs)

Downscaling Satellite EQPEs to be matched with MRMS

Developing a high spatio-temporal unified network of quantitative estimates of extreme precipitation

Definition of extreme events based on observed and historical data analysis