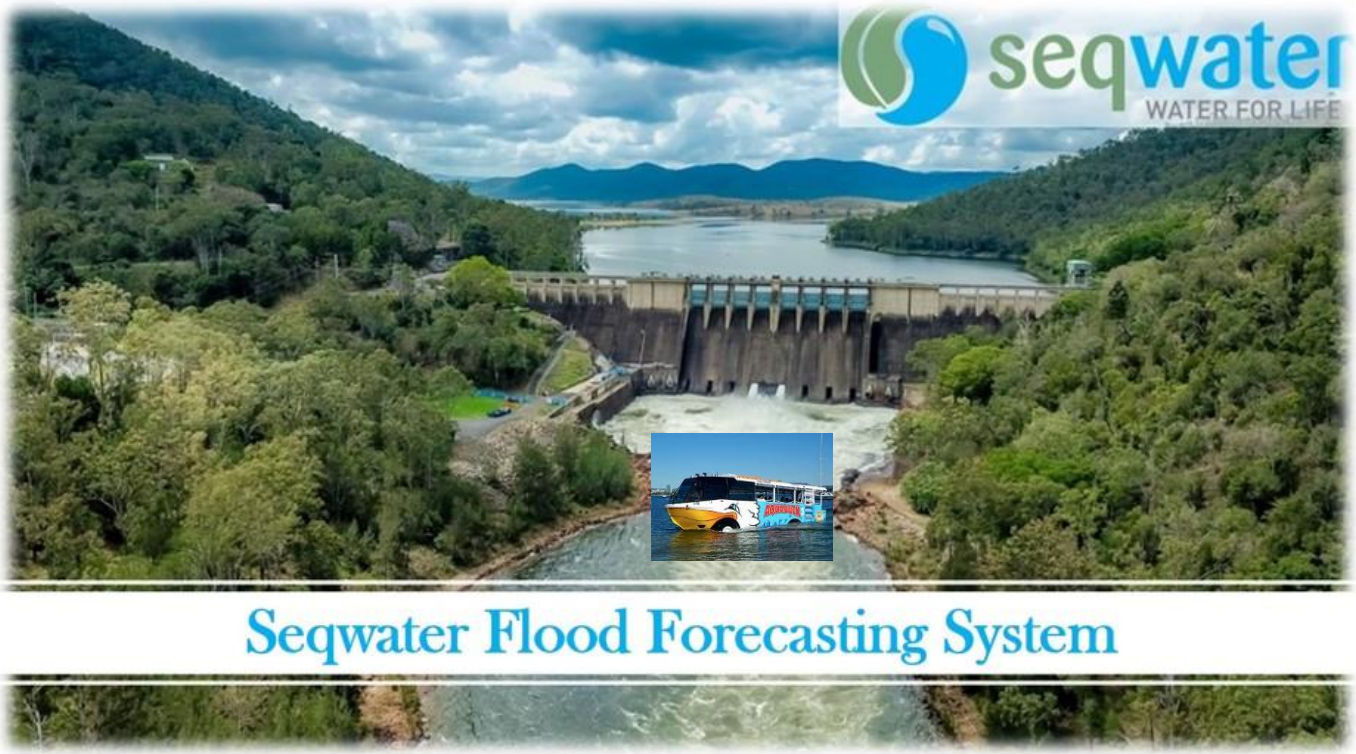
WaterCoach, here and in Australia

2021 Dutch Delft-FEWS User Days

Steve Wang – Seqwater (Brisbane, Australia)



SOURCE STORE SUPPLY

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Credits to

- David Pokarier
- Strom Stickland

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Overview of Seqwater and SeqFEWS

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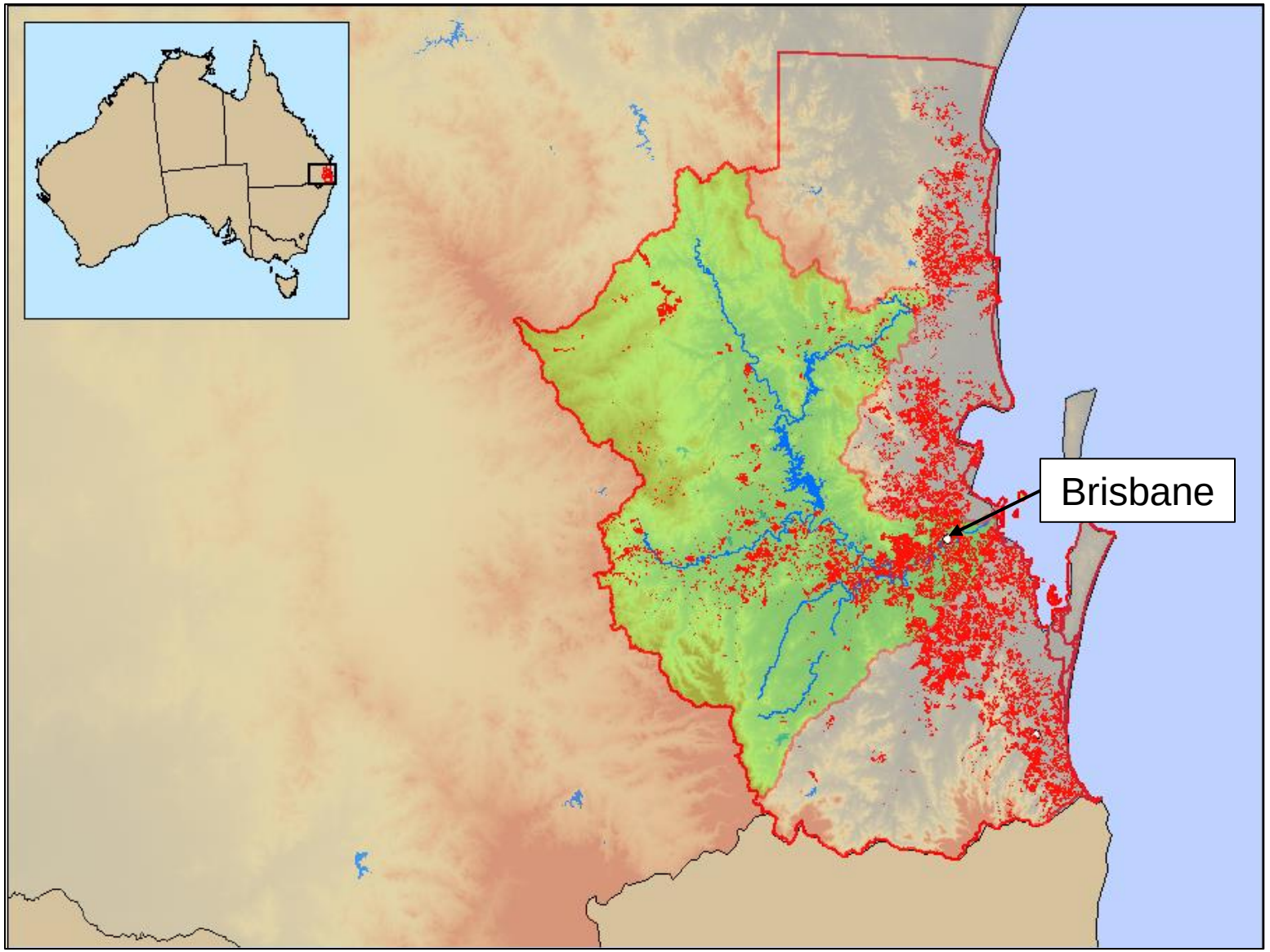
Background of Seqwater



Background of Seqwater

- **Queensland Government Bulk Water Supply Authority**
  - Bulk drinking water supply
  - Irrigation and catchment management
  - Flood mitigation services

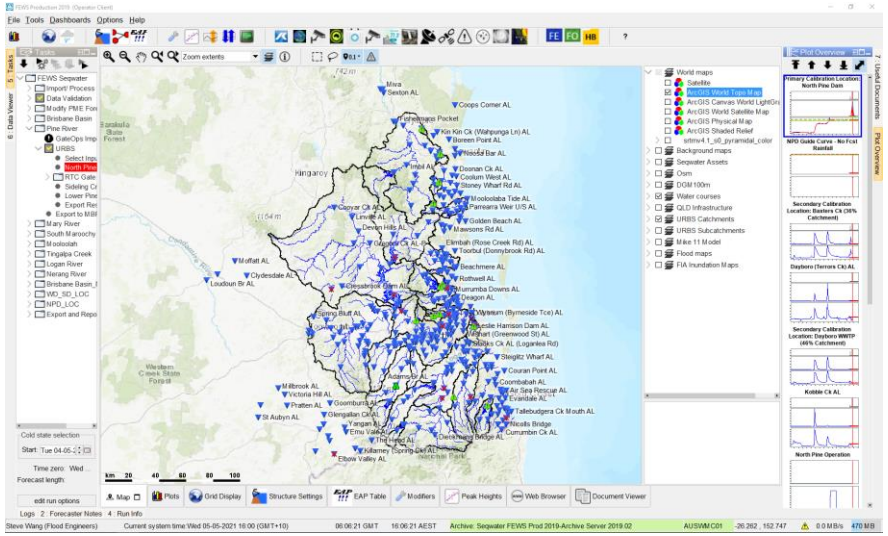
Delft-FEWS 2019.02

- **Assets**
  - 25 referable dams
  - 51 weirs
  - 36 water treatment plants
  - 3 purified recycled water treatment plants
  - 1 desalination plant
  - 28 bulk water reservoirs
  - 22 pump stations
  - 600 km+ of bulk water supply pipelines

Overview of SeqFEWS

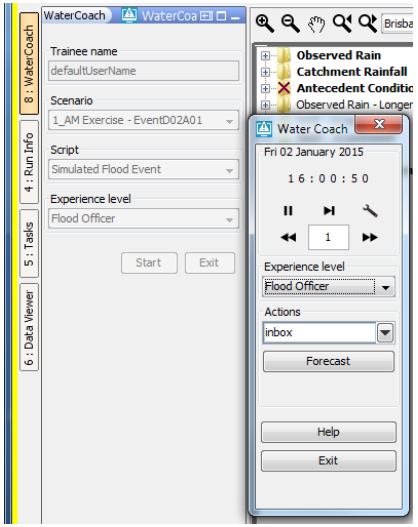
SeqFEWS

- Implementation started in 2010.
- Operational in 2013.
- Currently version is based on Delft-FEWS 2019.02.
- **Observed Data**
  - Automated water level & rainfall
  - Manual readings from sites
- **Forecast data**
  - Meteorological forecasts
  - Soil moisture estimates
  - Streamflow forecasts
- **Models**
  - 30 hydrologic models
  - 1 hydraulic model
  - 9 RTC Tools V1 models
- **Multiple HTML reports**
- **Event based email notification**
- **Open Archive**



Use of Water Coach

- Start using Water Coach in 2015
- Primary objective: **create a comprehensive training package for Flood Engineers**:
  - ✓ simulates a “real” flood event,
  - ✓ can be readily deployed,
  - ✓ provides a consistent output for assessment.



Why training & limitation in the previous training system

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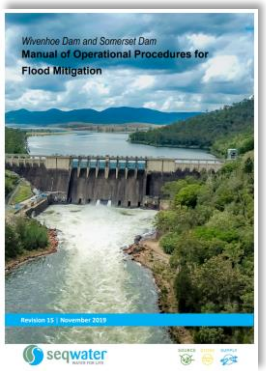
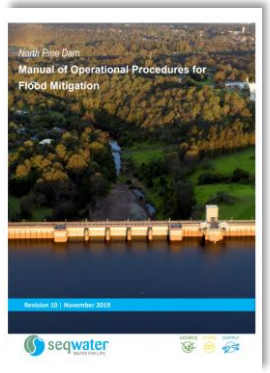
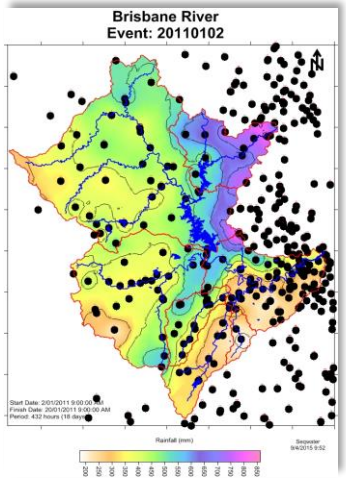
Why training & limitation in the previous training system

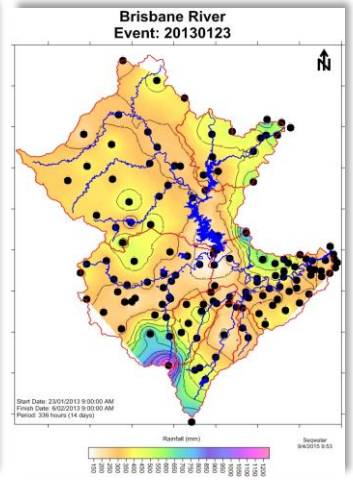
- **Why train?**
  - **Compliance**
    - Compliance with Flood Mitigation Manuals.
  - **Re-familiarisation**
    - Refresh knowledge and skills in flood operations and modelling.
    - Revisit manuals, protocols, procedures and Emergency Action Plans.
    - Build confidence in extreme flood events or unlikely emergency events.
  - **Teamwork**





- **Limitations in the previous training system.**
  - Standalone application (data is not shared across the team).
  - Unable to simulate a “live” flood event.
  - Based on historical events (limited dataset).
  - No system feedback from change in dam operations.





Step 1: Increase the flood dataset for training

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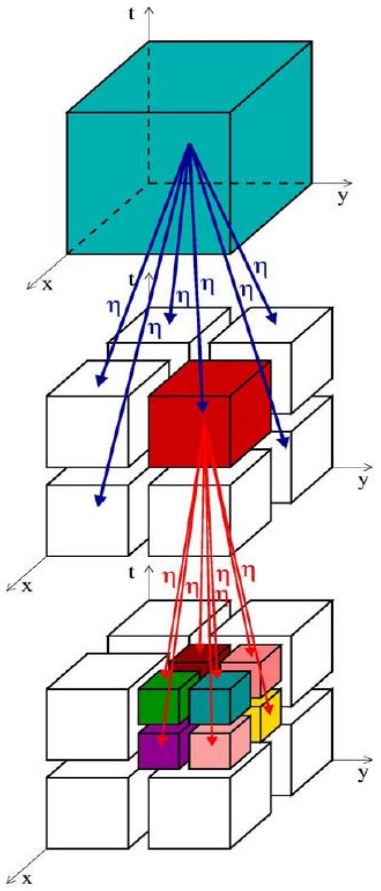
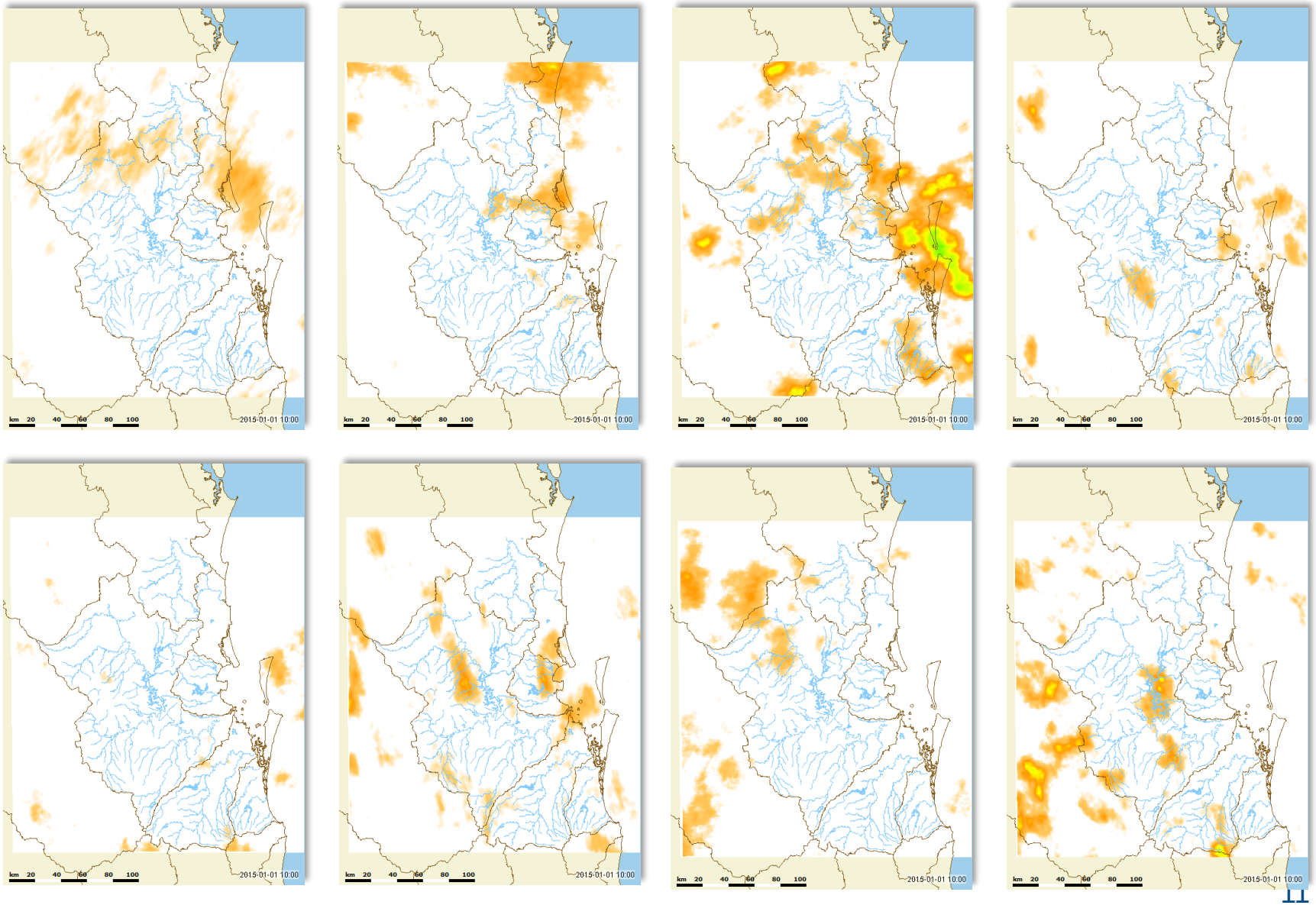
Investigated space time rain patterns

As part of **Wivenhoe and Somerset Dams Optimisation Study (WSDOS)**, space time rainfall patterns for Brisbane River Basin were analysed.

- Multiplicative random cascade model
  - Specialist Dr. Alan Seed (BOM)
  - Space-time statistical structure of rainfall
  - Calibrated to rainfall inferred from radar data, validation against rain gauge data
  - Refer paper Jordan et al



Numerous synthetic rainfall patterns



Step 2: Make the flood event more realistic

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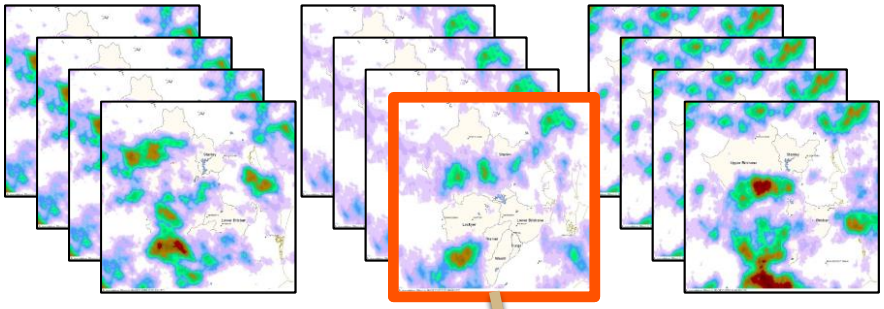
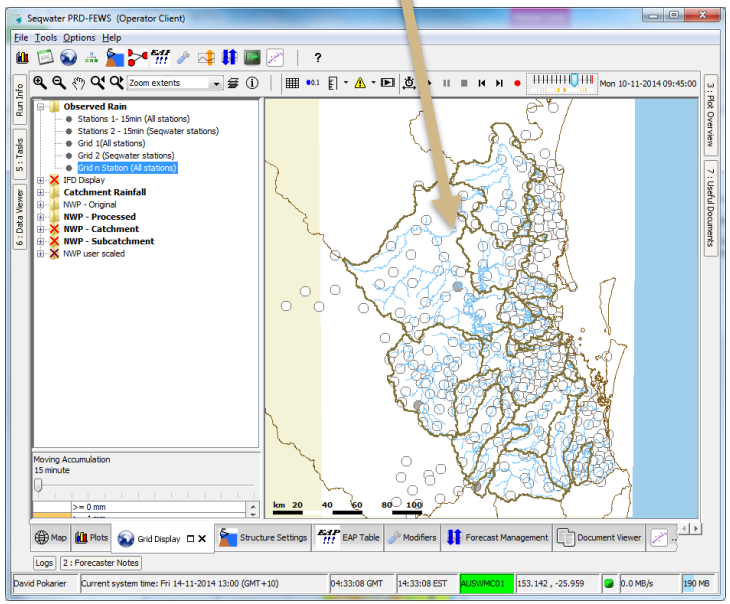
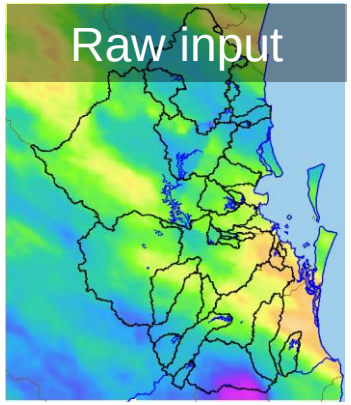
How to make the flood event more realistic ?!

1. **Every flood is different**
   - 50 synthetic rainfall events

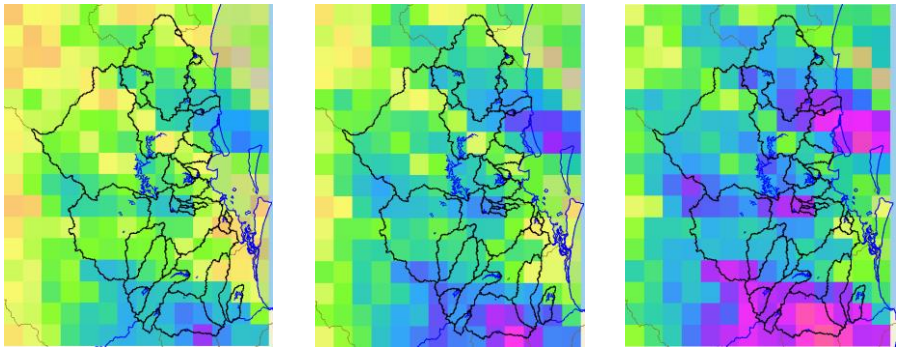




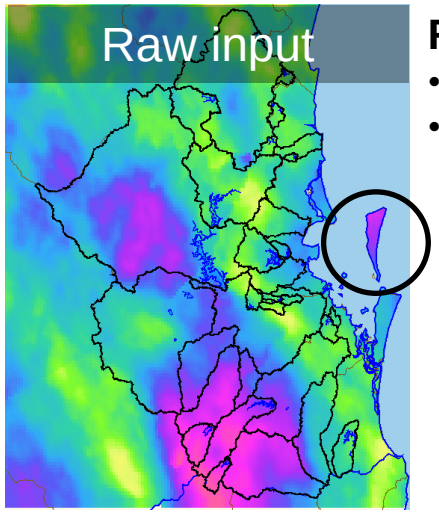
2. **Apply scale factors to modify the magnitude of the event**



3. **Coarse sampling and noise added to produce three forecasting rainfall grids**

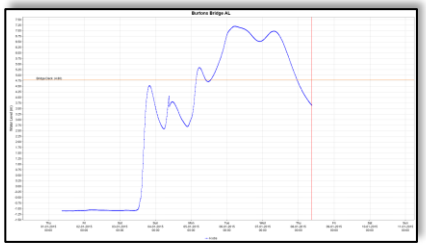


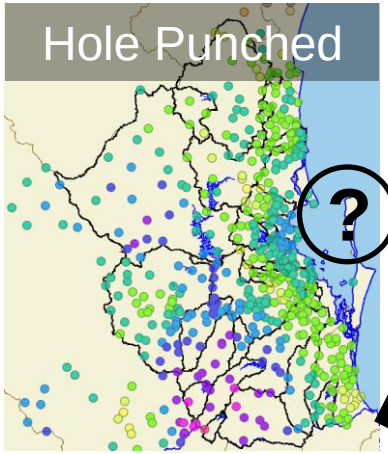
How to make the flood event more realistic ?!



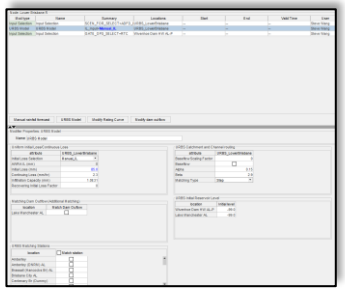
Raw input storm
- Complete storm.
- Point of truth.

Synthetic obs water level
- Resampled into 3 hourly time steps.
- Constantly updates with dam operations.





What do users see:
- Limited to network observation
- Additional noises added to simulate gauge failure



Step 3: Setup of the training system

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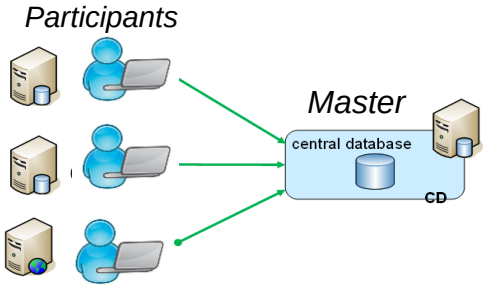
Step 3: Setup of the training system

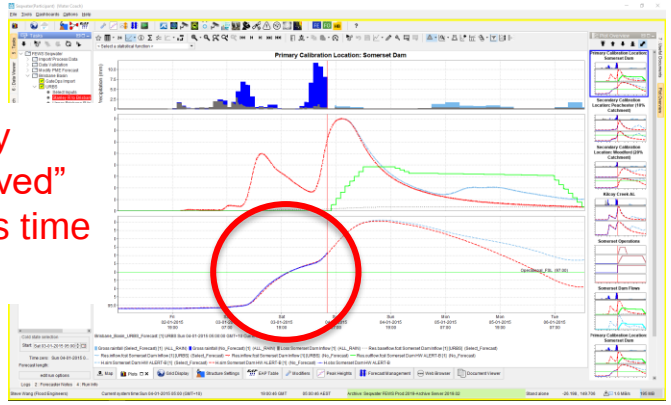
- **Based on the operational flood forecasting system – SeqFEWS**

- **Data is networked using a Master and Participant concept. (no ICT involvement)**

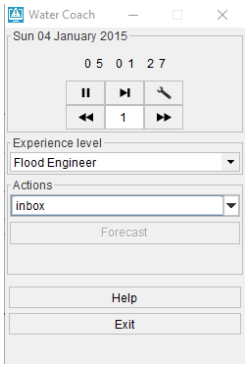


- **Water Coach Mode**

Display "observed" data as time goes



- **Control Panel and event script**



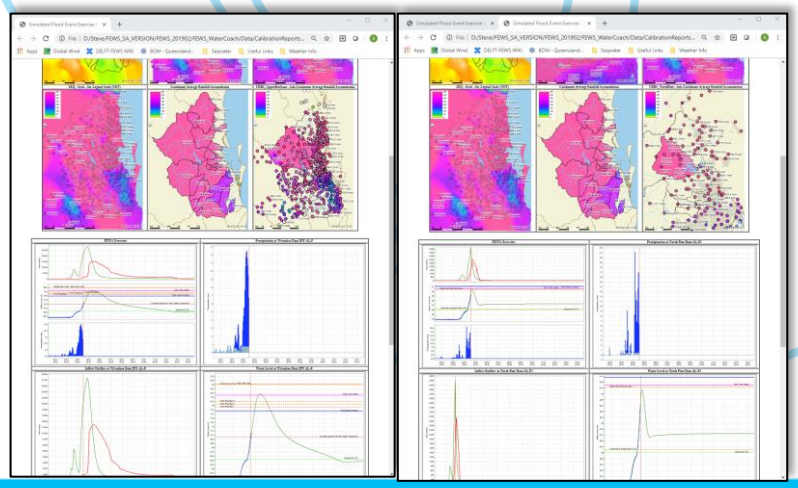
Other highlights of the Water Coach training system

1. **Can be readily deployed**
   - Template approach to minimise configuration changes.
   - Define training model parameters and initial conditions using a csv file.
   - Train alone or in a team.

2. **Can be scripted for different objectives**
   - Competency assessment.
   - Model calibration training.
   - Testing new operation rules.
   - Familiarisation of the procedures and protocols.
   - Stress testing the engineers.


Image courtesy of FreeDigitalPhotos.net

3. **Produce consistent outputs for assessment and review**
   - Calibration reports generated as event progresses.
   - Provide feedbacks and identity deficiencies and misunderstandings.
   - Single local datastore for reviewing and archiving.



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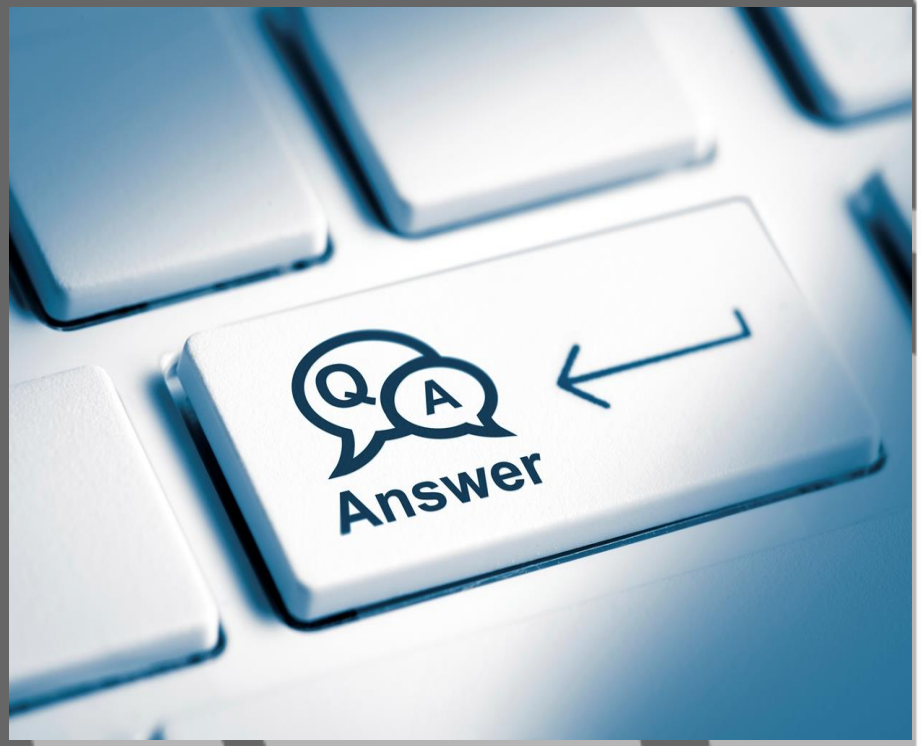

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