IMPROVING FLOOD FORECAST SKILL USING REMOTE SENSING DATA – *hydraulic component*

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ACCURATE FLOOD FORECAST IS ESSENTIAL TO SAVE LIVES AND REDUCE DAMAGES. HOW FAR CAN WE GET USING REMOTE SENSING DATA TO CALIBRATE AND CONSTRAIN IN REAL TIME A COUPLED HYDROLOGIC - HYDRAULIC MODEL?

Floods are the most common natural disaster worldwide. An accurate flood forecast in real time is essential to reducing mortality and damages.

This project investigates the use of remote sensing (RS) data to improve the forecast skill of a coupled hydrologic-hydraulic model. The hydraulic component is presented here.

OBJECTIVES AND METHODS

RS derived data of flood extent/water levels can be used for calibration and real time constraint of the hydraulic model. A hydraulic model is being implemented in Australian catchments for historical flood events to answer three questions :

- To what extent can the uncertainty in the hydraulic model be reduced?
- When and how frequent do RS data need to be acquired and assimilated?
- What is the required accuracy of RS data?

PROGRESS TO DATE

- Selection of the study sites.
- Selection of the hydraulic model.
- First application of the hydraulic model.

STUDY SITES AND DATA

The Clarence and the Condamine-Culgoa- Balonne (Fig.1) have been selected based on:

- the relevance, frequency and characteristic of historical flood events;
- the availability of RS data of flood extent/water levels.

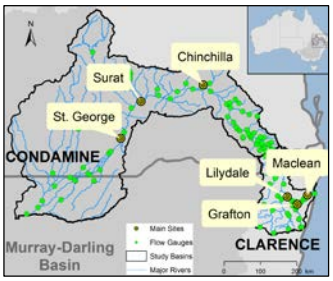

Fig. 1: Study sites

Clarence Catchment

- Area: 20.730 km^2
- Very quick flood events

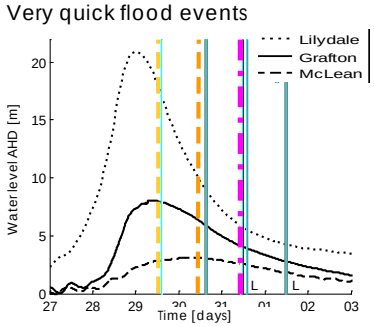

Fig. 2: Clarence catchment, measured water levels in January 2013 and RS data availability (each vertical line represents a RS image)

Condamine-Culgoa-Balonne Catchment

- Area: 147.817 km^2
- Slow flood events

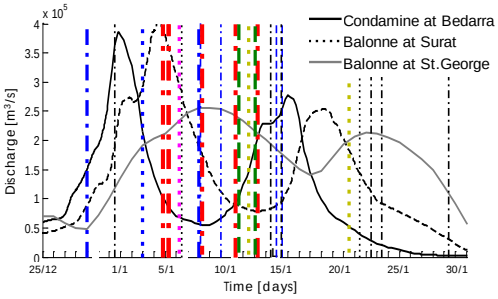

Fig. 3: Condamine-Culgoa-Balonne, measured discharge hydrographs in January 2011 and RS data availability (each vertical line represents a RS image)

HYDRAULIC MODEL

LISFLOOD-FP solves the inertial approximation of the shallow water equations.

FIRST APPLICATION OF THE MODEL

Flood event in January 2013 in the Clarence catchment.

- Partial implementation: the data collection is still in progress. The black line in Fig.4 shows the temporary input point (due to the lack of measurements, we estimated the input hydrograph).
- The model has not been calibrated yet.

The preliminary results are presented in Fig.4 and Fig.5.

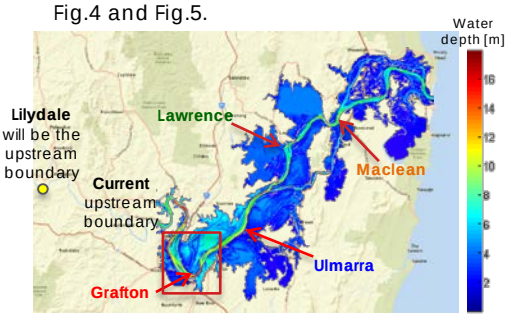

Fig. 4: Clarence catchment, modelled flooded area on Jan 29th 2013 at 12pm.

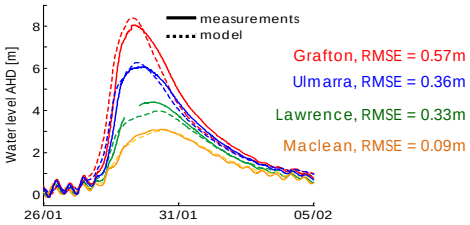

Fig. 5: Clarence catchment, modelled and measured water levels at 4 gauging stations.

Fig. 6: Grafton, airborne image (LPI – NSW), Jan 29th 2013, 10am-2pm and modelled flooded area (blue lines) on Jan 29th 2013 at 12pm.

A rather satisfactory agreement between modelled and measured water levels was achieved at local level. However, the numerical model mispredicted the flooding of Grafton, as demonstrated by the analysis of RS data and historical evidence(Fig.6).

DISCUSSION AND FUTURE WORK

Despite the model's accuracy at the local level, a simple visual comparison with a RS image (Fig. 6) shows significant errors in the modelled flood extent.

These errors will be corrected:

- **completing the implementation** of the model (e.g., river bathymetry; use of a measured input hydrograph);
- **calibrating the model using a combination of field and RS data**.