HYDROLOGIC MODELLING (GR MODELS)

Model comparison
The following three variants of GR (Génie Rural) models were initially investigated:

- GR4H with a bulk soil moisture (SM) layer;
- GRHUM with a bulk SM layer and a surface layer embedded;
- GRKAL with separated surface and root-zone SM layers.

Due to the relatively good performance and ability to accept RS data, the GRKAL model has been chosen.

Joint calibration
A semi-distributed forecasting system based on GRKAL and linear Muskingum routing is calibrated using either only discharge or both discharge and RS-SM in Clarence. The results indicate:

- RS-SM can improve flow prediction in forecasting period (Fig. below);
- RS-SM has stronger impact in ungauged areas (Table below).

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

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

Floods are among the most common natural disasters in Australia, and cost the economy on average $377M per year. 1859 people have died in floods between 1900 and 2015 (Haynes et al., 2016). In early June 2016, floods in East Australia and Tasmania claimed the lives of 5 people.

Flood forecasting models are an essential tool in managing floods. They consist of a hydrologic model, forecasting the flow volume in the river system, and a hydraulic model, converting this flow volume into water levels and flood extents.

Forecast inaccuracies are mainly due to errors and uncertainties in the rainfall data and the model structure and parameters.

Satellite remote sensing (RS) can provide excellent data sets that should be used to constrain these models.

In this project, RS soil moisture values will be used to constrain the hydrologic model; RS water levels and flood extents will be used to constrain the hydraulic model.

Condamine-Balonne catchment
A field campaign was organized to measure the bathymetry of river reaches in strategic locations (13km in total).

IN PROGRESS
Analysis of critical features:
- Low accuracy of the DEM
- Lack of bathymetric data
- Levee breaches (yellow arrow in the Fig. on the right)