Integrating Hydrological Ensemble Forecasts into Decision Support Tools for Operation of the Electric System in Uruguay

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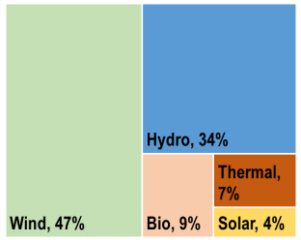
1. OBJECTIVE

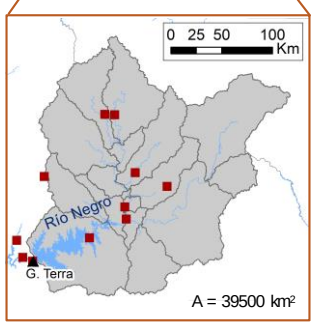
Development of a methodology for the generation and processing of a hydrological ensemble forecast for the largest hydroelectric reservoir of the Uruguayan integrated electric system, based on a **coupled hydrological and electric system modelling approach**.

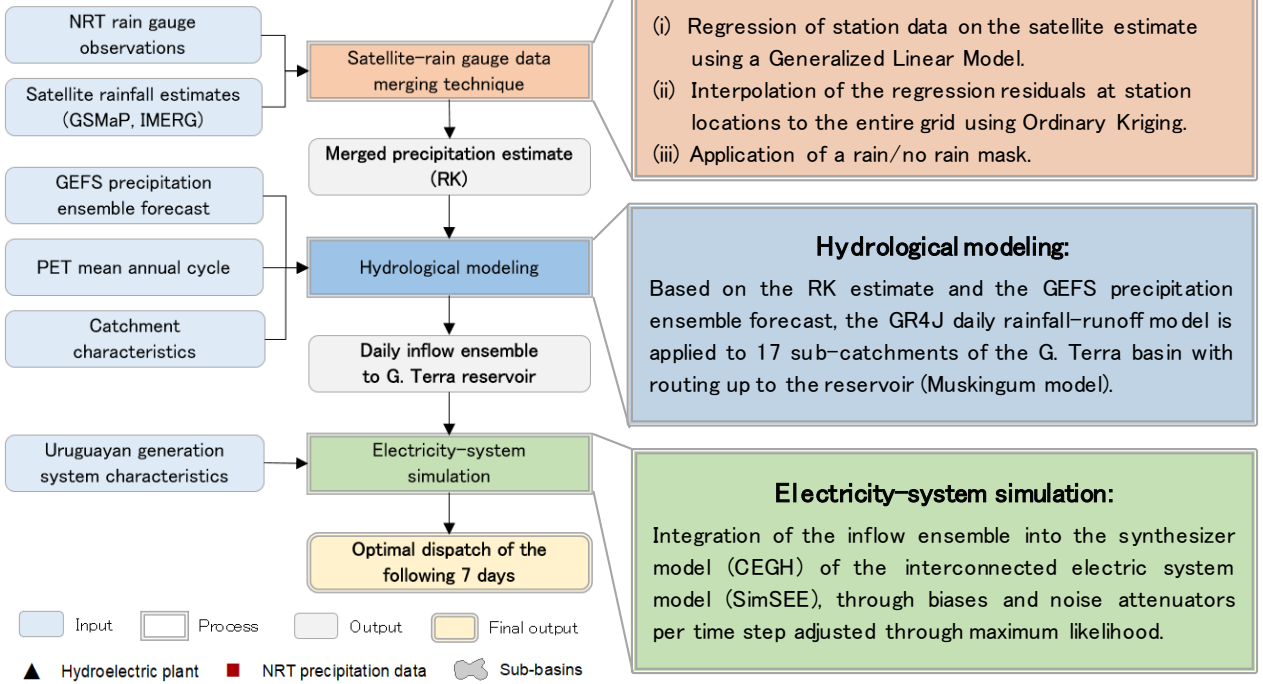


Generation mix in 2020

2. MATERIALS AND METHODS

G. Terra plant in the upper Rio Negro basin (Uruguay).





Satellite–rain gauge data merging technique:

(i) Regression of station data on the satellite estimate using a Generalized Linear Model.
(ii) Interpolation of the regression residuals at station locations to the entire grid using Ordinary Kriging.
(iii) Application of a rain/no rain mask.

Hydrological modeling:

Based on the RK estimate and the GEFS precipitation ensemble forecast, the GR4J daily rainfall–runoff model is applied to 17 sub-catchments of the G. Terra basin with routing up to the reservoir (Muskingum model).

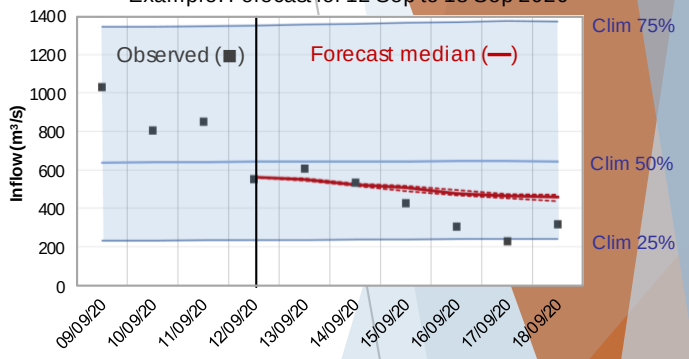
Electricity–system simulation:

Integration of the inflow ensemble into the synthesizer model (CEGH) of the interconnected electric system model (SimSEE), through biases and noise attenuators per time step adjusted through maximum likelihood.

3. RESULTS

The model was integrated into the **operational version** of SimSEE at ADME[2] in June 2020, it updates and executes on a daily basis in order to obtain the **dispatch of the following seven days** (https://www.adme.com.uy/)

Example: Forecast for 12 Sep to 18 Sep 2020



4. FUTURE WORK

Evaluation of the ability of the precipitation and hydrological ensemble forecasts.

Assimilation of observed streamflow data: nudging of the state variables of the hydrological model.

Evaluation of a methodology for the selection of a sub-ensemble of GEFS forecasts (based on the performance in the immediately preceding period) in order to improve local predictability.

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