Pilot project on the extension of the EWS of Durazno city to the cities of Artigas and Treinta y Tres in Uruguay

WEATHER CLIMATE WATER
TEMPS CLIMAT EAU

Third meeting of the FFI Advisory Group
5 to 7 December 2017

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World Meteorological Organization
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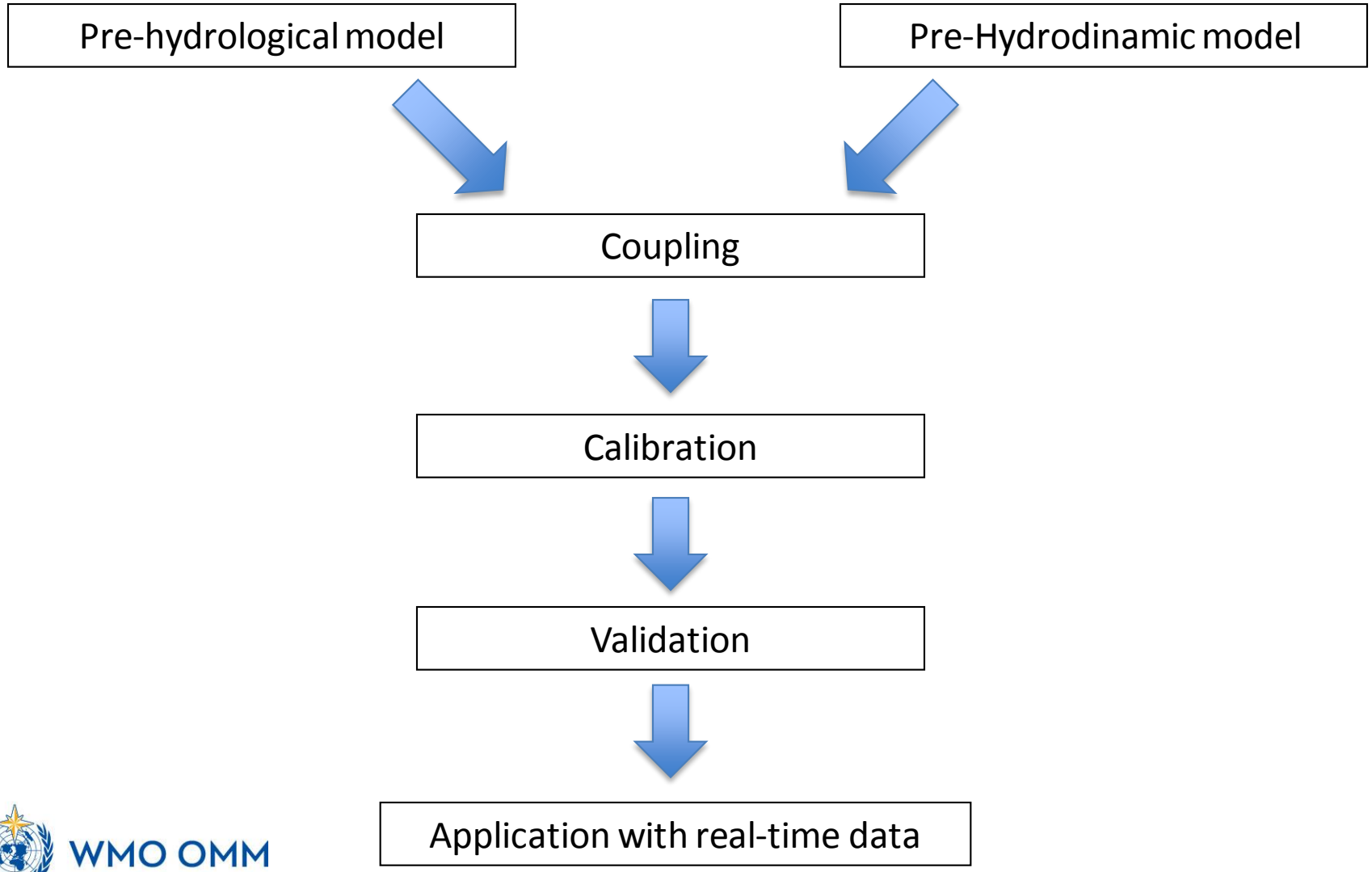
Location of the project

Purpose of the agreement with Fundacion Julio Ricaldoni

- Survey of cross-sections in the rivers Cuareim and Olimar
- Pre-hydrological modelling of the two rivers
- Pre-hydrodinamic modelling of the two rivers
- Coupling of the two models
- Incorporation of real-time data in the coupled model
- Training of staff on the operational use of the real-time coupled model
- Provide the Spanish translation of WMO No. 1072 – Manual on Flood Forecasting and Early Warning
- Provide Spanish version of presentation materials based on WMO No. 1072

Structure of the EWS



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Pre-Hydrological Model

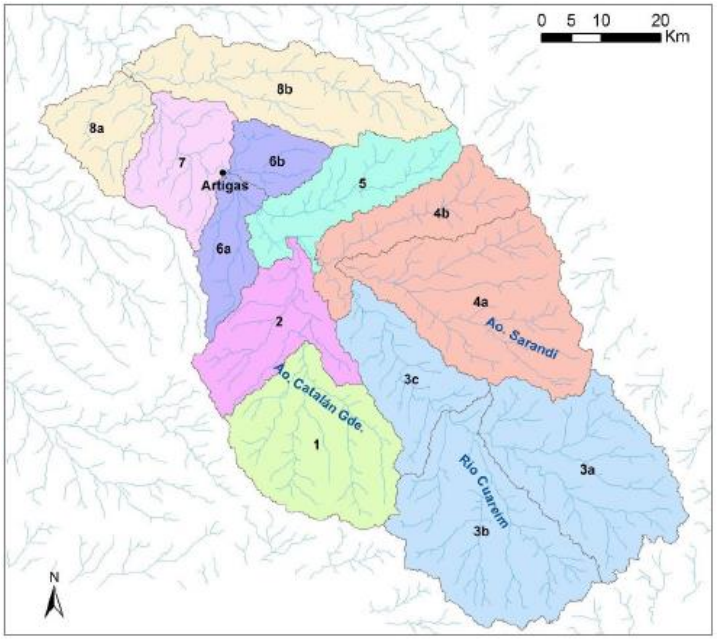
- Daily rainfall data from the period 1982-2016 (Cuareim) and 1980-2015 (Olimar)

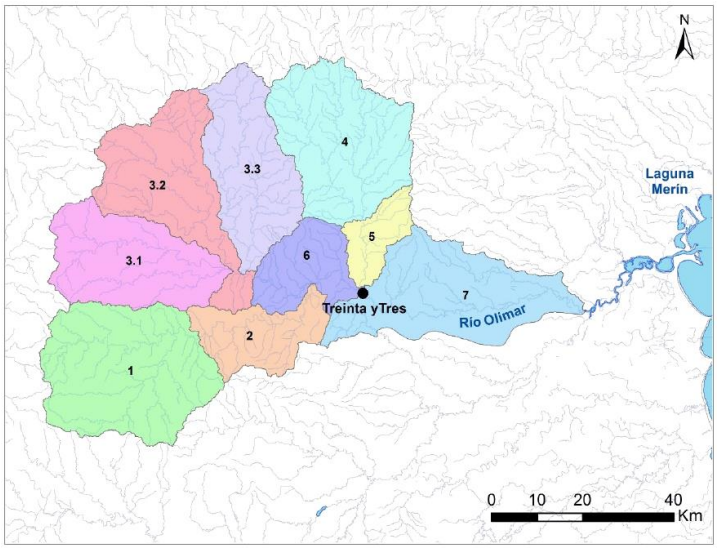
(assumption: no intensity changes during the day)

- Average Rainfall for each sub-basin obtained through Thiessen polygons
- Runoff → Curve Number method
  f (soil, land use, Antecedent Moisture Condition - AMC)
- Concentration time → Tucci formula

$$Tc = \frac{3.42}{60} L^{0.8} \left(\frac{1000}{NC} - 9 \right)^{0.7} S^{-0.5}$$

- Rainfall-runoff → Triangular Unit Hydrograph (NRCS)





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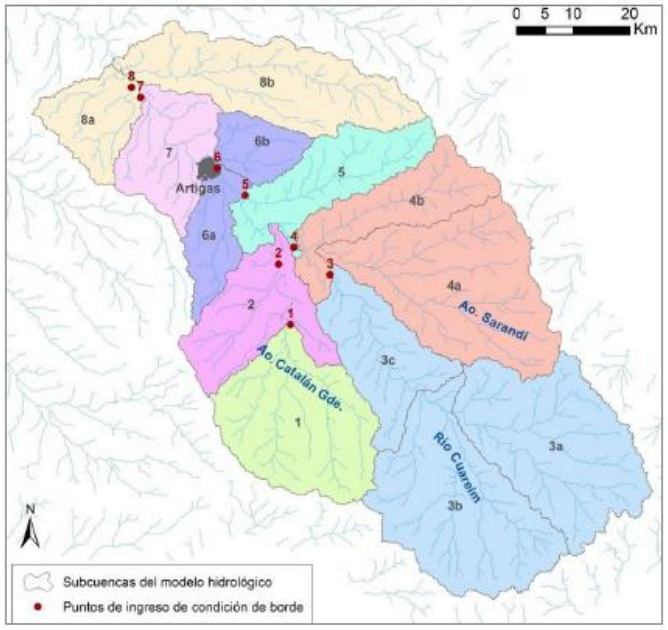
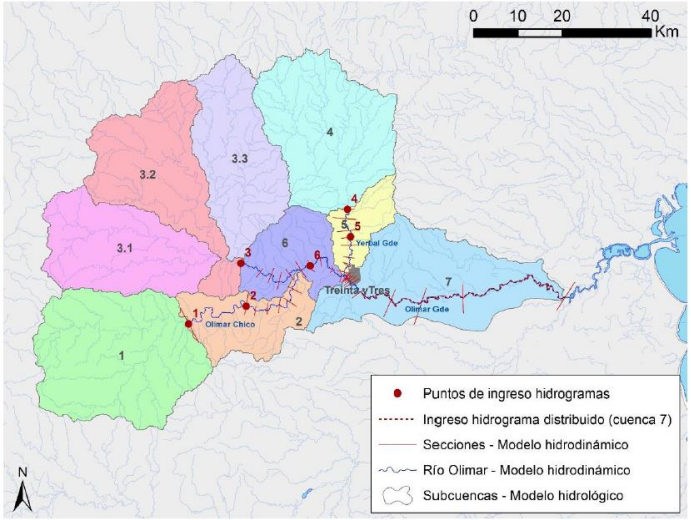
Pre-Hydrodinamic Model

- HEC-RAS 4.1.0
- 32+16+6 sections (Cuareim) and 16+6+9 (Olimar)
- Boundary conditions
  - Downstream: steady flow
  - Upstream and lateral flows (red points): UH from the pre-hydrological modelling of each sub-basin
  - Initial condition: 5 m_3/s
- Manning coefficient (for riverbed and for floodplain)





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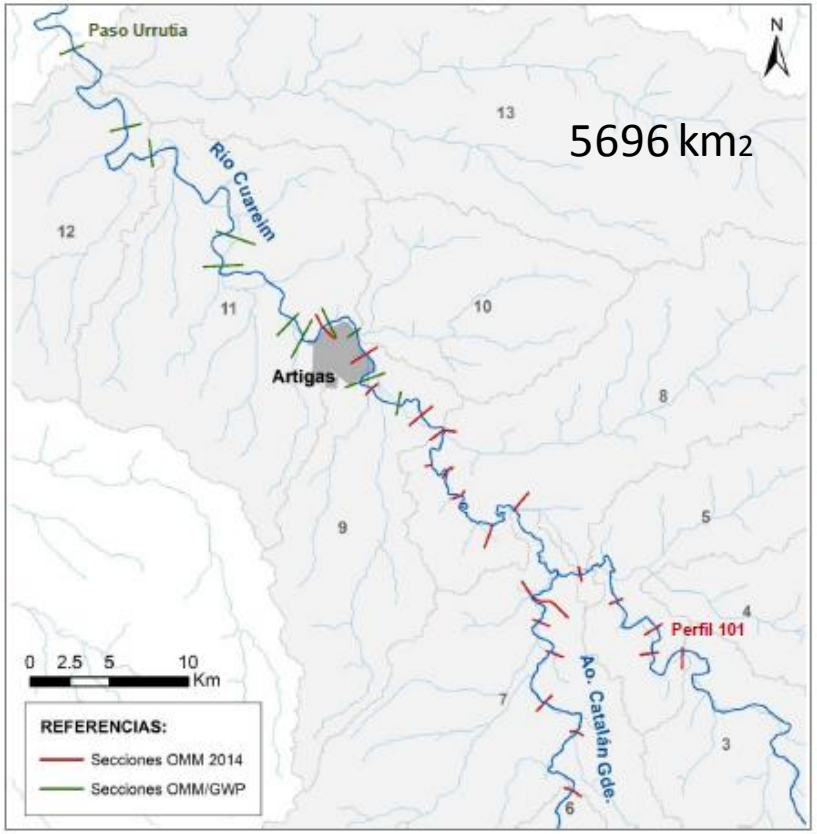
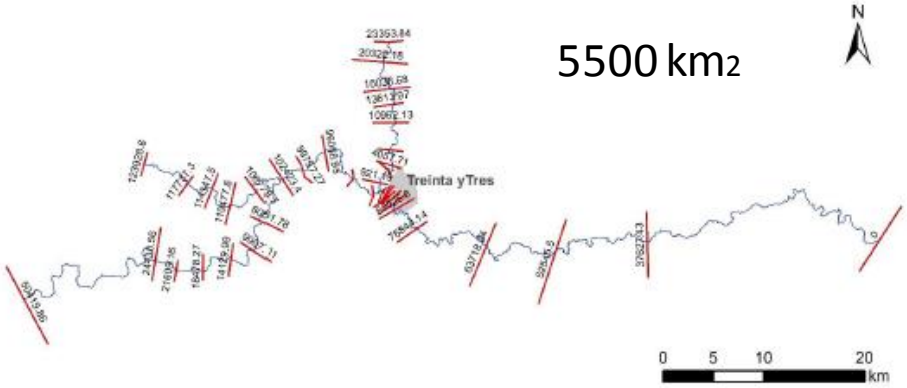
Cross-sections surveyed



Rio Cuareim and arroyo Catalan
16+6 new sections (2014)
32 sections from APFM project (2003)



Rio Olimar (Grande and Chico) and arroyo Yerbal Grande
24+6+9 new sections (2014)

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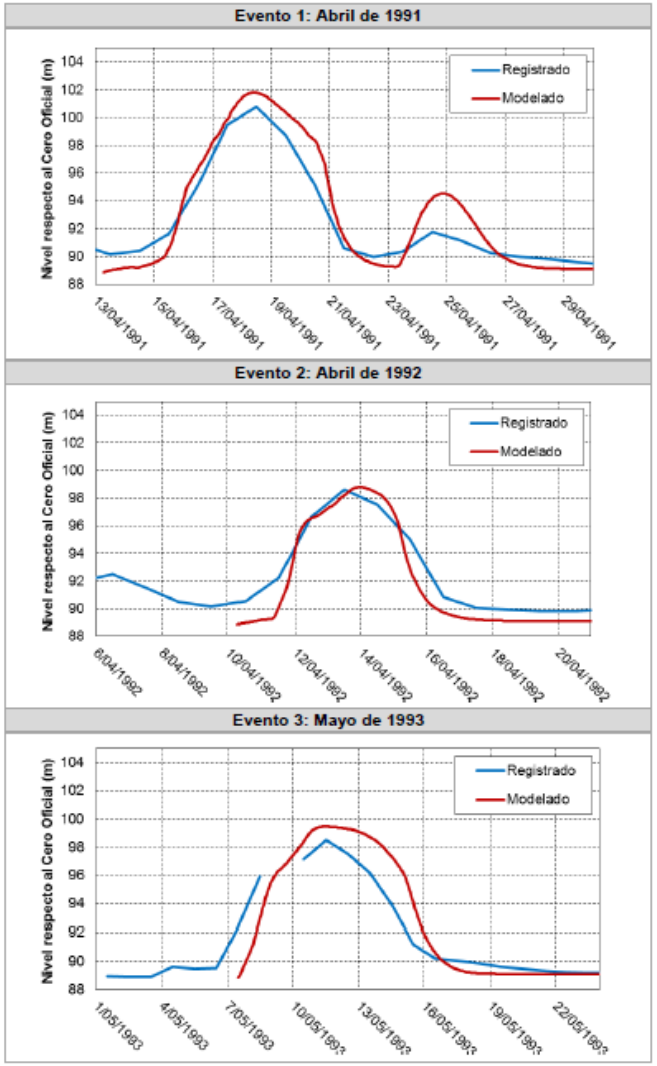
Coupling hydrological and hydrodinamic models and calibration

- Programmed in Matlab R2013
- Coupling done imposing the UH for each sub-basin from the hydrological model as boundary conditions in the hydrodinamic model
- When the points where the UH is imposed group more than a sub-basin, the UH are summed up
- Calibration done with 3 (or 6 for Olimar) observed events to adjust the parameters in the CN and Tc



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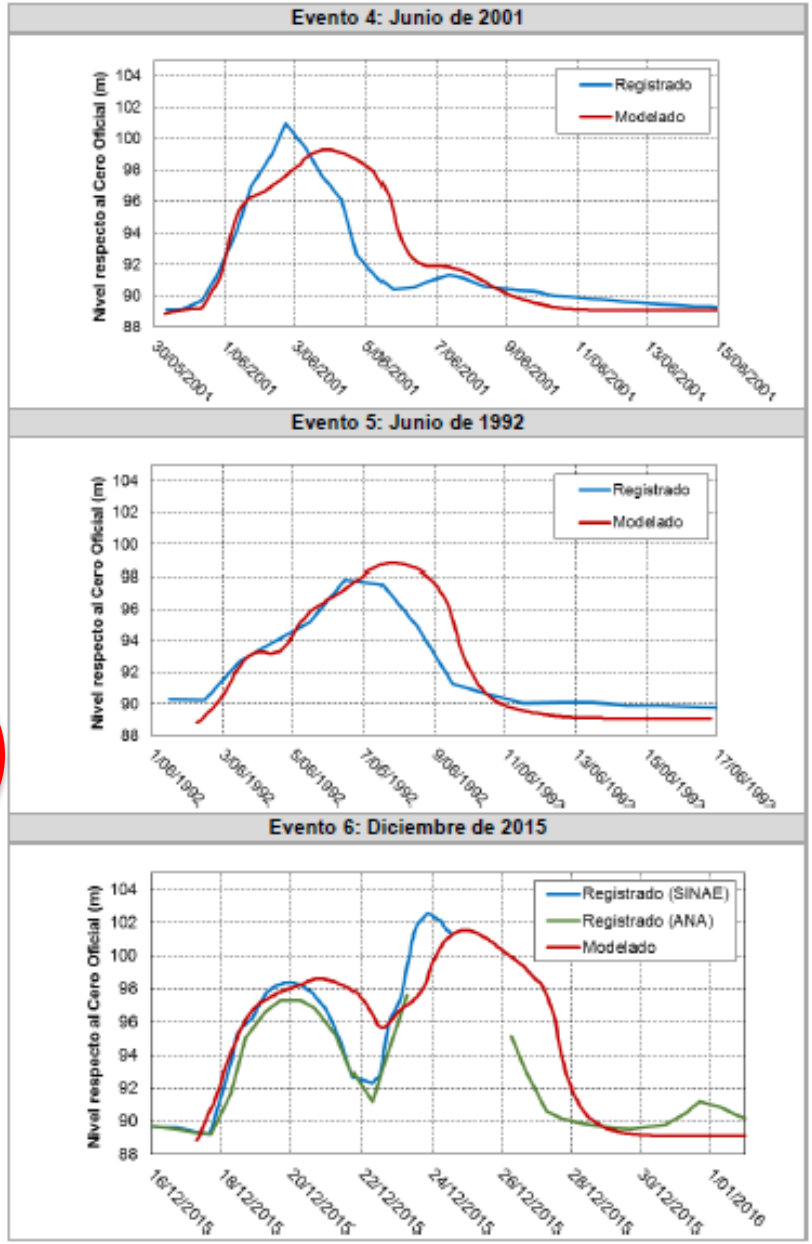
Validation of the model - Cuaraim

- Model run with data related to three historical events and compared to the observed hydrographs

Etapa	Fecha	Nivel máximo observado (m)	Nivel máximo modelado (m)	Diferencia (m)	Desfasaje del pico (hs)
Evento 4	Junio 2001	100.95	99.27	-1.68	26.00
Evento 5	Junio 1992	97.87	98.83	0.96	31.00
Evento 6	Dic. 2015	102.20	101.55	-0.65	25.00



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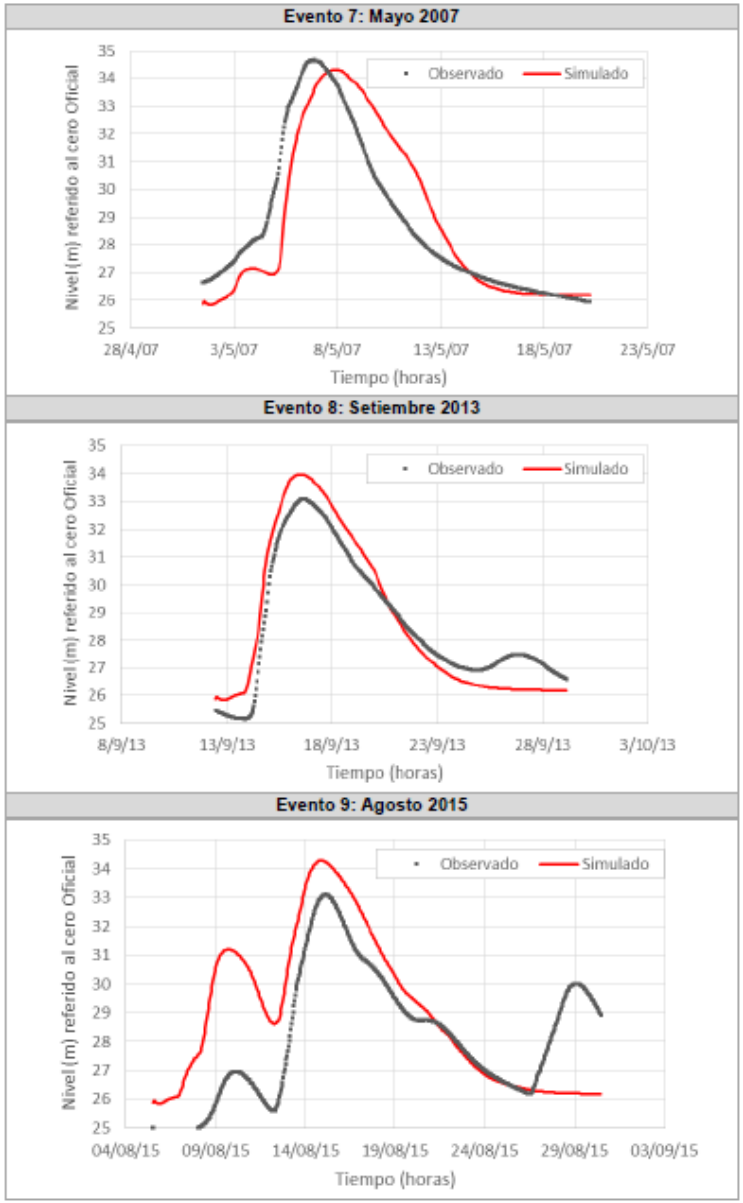
Validation of the model - Olimar

Evento	Fecha	Nivel máximo observado (m)	Nivel máximo modelado (m)	Diferencia (m)	Desfasaje del pico (hs)
Evento 7	Mayo de 2007	34,67	34,32	-0,35	-24
Evento 8	Setiembre de 2013	33,10	33,97	0,87	-3
Evento 9	Agosto de 2015	33,11	34,32	1,21	-8

Significant difference between the height but especially the lag time modelled and observed



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Incorporation of real-time data

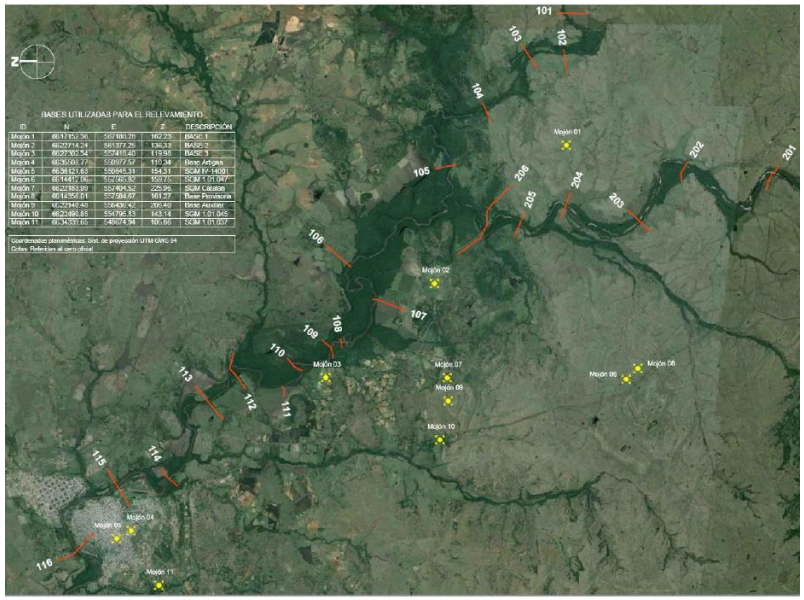
Two rainfall recording stations with telemetric transmission (hourly) installed in the Cuareim basin (5 in the Olimar)

New EWS based on running the coupled model every 6 hours based on last 24 hours recorded precipitation

Comparison of the observed hydrograph with the model results

Emergency room established, staff of the NHS trained.

At the time of the final report (December 2016) still little feedback on the operational use of the EWS



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Conclusions

The coupled model might still be improved in terms of accuracy (maximum peak and lag time)

Better than no EWS at all (but potential issues related to false alarm and public perception)

Not enough feedback on its operational use at the time of reporting

Might benefit from a post-implementation evaluation one year later, to assess its results and shortcomings/lessons learnt from its operational use

Article on the launch of the project published on [República.com.uy]

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Thank you
Merci

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