EARLY WARNING SYSTEMS FOR FLOOD FORECASTING IN DURAZNO CITY IN URUGUAY

INTERNATIONAL CONFERENCE CLIMATE SERVICES 4
Building & delivering EWS session

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BACKGROUND

- Population: 33,576 inhabitants
- Basin area: 8.750 km²
- $T_c = 54$ hs
BACKGROUND

Storms of May 2007 and February 2010:

5,500 to 6,000 inhabitants evacuated

(about 20% of the population)
COMPONENTS of EWS-Durazno

- **Input Data Acquisition**
- **Hydrologic – Hydrodynamic Modelling**
- **Social and Land Management Model**
EWS-Durazno: Acquisition of Input Data

• Rainfall:
  
  **Weather Forecast:**
  WRF Model from Uruguay’s Meteorological Board (INUMET), INMET/CPTEC (Brazil), IMFIA School of Engineering, etc.

  **Real Time measured rainfall:**
  Telemetric network UTE, Raingauges INUMET

• Wind
  • Forecast (IMFIA)
  • Measurements (INUMET)

• Basin data:
  • Topography, soils, geology, land use.
EWS Durazno: Hydrologic-hydrodinamic model

Simulated water surface levels in Durazno city

Precipitacao Acumulada (6h)

EWS Durazno: Hydrologic-hydrodinamic model
The hydrologic-hydrodynamatic model based on observed and predicted rainfall provides quantitative information about the future evolution of water surface levels to forecast flooded areas and its permanence in time.

A hydrologic model computes for each sub-basin the input flow hydrograph to Yi River. The input data is observed and forecasted rainfall.

**Hydrologic model:** The curve number (CN) model developed by the Natural Resources Conservation Service (NRCS, 1997).
Simulation of the dynamics of water flow in motion to estimate the water level in Durazno city at each time step.
EWS Durazno: Storm occurred in Jan-Feb 2014

DURAZNO

- **Monday 01/27/2014 Green level**
- **Tuesday 01/28/2014 Yellow level:**
  - Predicted peak (New bridge): 9.24 m.
  - Predicted peak (Old bridge): 8.21 m.
  - Expected dates for the predicted peak: 02/03 to 02/05/2014
  - Recorded and forecasted rainfall: 127mm
EWS Durazno: Storm occurred in Jan-Feb 2014

DURAZNO

- **Wednesday 01/29/2014 Red level:**
  - Predicted peak (New bridge): 10.61 m.
  - Predicted peak (Old bridge): 9.48 m.
  - Expected dates for the predicted peak: 02/05 to 02/07/2014
  - Recorded and forecasted rainfall: 204mm
DURAZNO, Sunday 02/02/2014 Red level:
Predicted peak (New bridge): 13.85 m.
Predicted peak (Old bridge): 12.51 m.
Expected dates for the predicted peak: 02/09 to 02/11/2014
Recorded and forecasted rainfall: 505mm
EWS Durazno: Storm occurred in Jan-Feb 2014

- **DURAZNO, Thursday 02/06/2014 Red level**
  
  Predicted peak (New bridge): 12.06 m.
  
  Predicted peak (Old bridge): 10.83 m.
  
  Expected dates for the predicted peak: 02/08 to 02/10/2014
  
  Recorded and forecasted rainfall: 366 mm

  Recorded maximum water level (New bridge): 11.23 m (-0.83 m)
  
  Total recorded rainfall: 362 mm
  
  Evacuees: 2290 inhabitants
EWS Durazno: Storm occurred in Jan-Feb 2014

The EWS allowed to manage the storm that took place between 01/21 to 11/02/2014.

"Before there was chaos. People were evacuated without knowing which was the water level that would reach the river. People were evacuated 24 hours a day. Now we can manage the actions, using less trucks, with more time before the flood, more safely," said Jesus Mario Rodríguez, director of the Durazno Emergency Coordination Center, The Observer 02/08/2014.
EWS Durazno: Real-time operation

1.- Statistical Model ("White Helmets" OAS).
2.- Combined Statistical Model and Hydrological model Sdel Yí.
3.- Hydrologic-Hydrodynamic model.

Success in the maximum value of H

<table>
<thead>
<tr>
<th>Storm</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>Observed</th>
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</thead>
<tbody>
<tr>
<td>24-25 May 2011</td>
<td>7.58 m</td>
<td>6.67-6.99 m</td>
<td>6.64 m</td>
<td>6.20 m</td>
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<tr>
<td>16-19 June 2011</td>
<td>8.46 m</td>
<td>6.43-6.95 m</td>
<td>6.42 m</td>
<td>6.74 m</td>
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<tr>
<td>15-16 July 2011</td>
<td>7.26 m</td>
<td>7.35-7.53 m</td>
<td>8.30 m</td>
<td>8.62 m</td>
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Accuracy of the peak time

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</thead>
<tbody>
<tr>
<td>24-25 May 2011</td>
<td>---</td>
<td>---</td>
<td>28 May 5:00</td>
<td>27 May 13:00</td>
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<tr>
<td>16-19 June 2011</td>
<td>---</td>
<td>---</td>
<td>21 June 18:00</td>
<td>21 June 18:00</td>
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<tr>
<td>15-16 July 2011</td>
<td>---</td>
<td>---</td>
<td>20 Jul 10:00</td>
<td>20 July 10:00</td>
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THANK YOU!!