Meteorological data set as input for the SWAT model to simulate the extreme flood event occurred in the municipality of São Luiz do Paraitinga, São Paulo, Brazil, between 2009/2010.
SUMMARY

• Introduction
• Methodology
  ✓ Study area
  ✓ Data acquisition
• Results
• Conclusions
INTRODUCTION

Brasil > frequency and intensity of damages caused by Naturais Disasters

2000-2010
31,909 disasters

21% Sudden Flooding

29.6% people affected

54% of total disasters

São Paulo state

452 Sudden Floods

Dec Jan Feb
A typical case of Sudden Flood occurred in São Luiz do Paraitinga (São Paulo state)

- Thousands rendered homeless
- Destruction of the historic center of the city
- PhD thesis study
- SWAT model
- Investigate the causes and short, medium and long-term consequences of extreme flood event
The present study aims to describe the diverse datasets available for the study area, such as *in situ* stations, satellite data, reanalysis products and interpolation of data, as a source of complementary meteorological data suitable for input to the SWAT model.
METHODOLOGY

Study Area

Paraitinga River Basin

2413 km²

located in the Paraíba Valley, São Paulo, Brazil

source of the Paraitinga River is located in the Serra do Mar, municipality of Areias (1800 meters altitude)

rainfall has an annual variation between 1100mm and 1700mm
### METHODOLOGY

#### Data acquisition

<table>
<thead>
<tr>
<th>Pluviometric stations</th>
<th>Source</th>
<th>Data Period</th>
<th>Location of the station relative to Paraitinga River Basin</th>
</tr>
</thead>
<tbody>
<tr>
<td>E2-135</td>
<td>DAEE</td>
<td>1972-2010</td>
<td>Out</td>
</tr>
<tr>
<td>E2-132</td>
<td>DAEE</td>
<td>2000-2010</td>
<td>Inside</td>
</tr>
<tr>
<td>Ponte Alta</td>
<td>ANA</td>
<td>1971-2004</td>
<td>Out</td>
</tr>
<tr>
<td>São Luiz do Paraitinga</td>
<td>INMET</td>
<td>2007-2010</td>
<td>Limit</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Meteorological Stations</th>
<th>Source</th>
<th>Data Period</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Campos de Jordão</td>
<td>INMET</td>
<td>1990-2010</td>
<td>Out</td>
</tr>
<tr>
<td>Taubaté</td>
<td>INMET</td>
<td>1990-2010</td>
<td>Out</td>
</tr>
</tbody>
</table>

Legend:
- Paraitinga River Basin
- Hydrography
- São Luiz do Paraitinga
- Pluviometric Station - Observed Data (Precipitation)
- Meteorological Station - Observed Data (Precipitation)
METHODOLOGY

Data acquisition

estimates of satellite and surface station data
resolution of 2.5° x 2.5°

validation of PR x TMI = TCI

calibrated microwave IR precipitation

IR and microwave estimates are combined
METHODOLOGY

Data acquisition

Hidroestimador

precipitation (estimated by radar) and the brightness temperature of the cloud tops generating precipitation rates in real time

resolution of 0.1° x 0.1°

data interpolated

uses available observational data from different stations in Brazil

interpolated by means of the inverse distance squared method, considering the effects of latitude and topography

resolution of 0.1° x 0.1°
### RESULTS

<table>
<thead>
<tr>
<th>Maximum daily precipitation (mm)</th>
<th>Pluviometric stations</th>
<th>Period 2000-2010</th>
<th>Date of occurrence</th>
<th>31-01-2009</th>
<th>01-01-2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>E2-135</td>
<td>205,5</td>
<td>26-01-2005</td>
<td>81,2</td>
<td>104,5</td>
<td></td>
</tr>
<tr>
<td>E2-132</td>
<td>90,0</td>
<td>12-02-2006</td>
<td>No data</td>
<td>No data</td>
<td>No data</td>
</tr>
<tr>
<td>Ponte Alta</td>
<td>67,9</td>
<td>02-01-2001</td>
<td>No data</td>
<td>No data</td>
<td>No data</td>
</tr>
<tr>
<td>São Luiz do Paraitinga</td>
<td>64,9</td>
<td>21-12-2008</td>
<td>11,0</td>
<td>56,0</td>
<td></td>
</tr>
</tbody>
</table>

**Meteorological Stations**

| Campos de Jordão                 | 108,4                 | 25-05-2005       | 44,4              | 45,4       |
| Taubaté                          | 121,2                 | 24-11-2004       | 10,4              | 56,8       |

The poor spatial distribution of the stations with observed data, scarcity of time series of rainfall and other meteorological variables, and need for additional sources of meteorological data.
resolution of 2.5°x2.5° (~250km), cover an area larger than the interest area.

resolution of 0.25°x0.25° (~25km), despite being finer than the resolution of GPCP, is still not sufficiently refined to the space scale of interest in the present study.
resolution could be refined to a distance of 1 km, would attend the needs of this study

formation of orographic precipitation, which generally has very high precipitation rates and clouds with hot tops, making it impossible to estimate rainfall with the methodology applied in the Hidroestimador algorithm
RESULTS

results were based on the interpolation data from a greater number of available stations, allowing more cohesive rainfall input for the SWAT model.
RESULTS

Figure 5 - Precipitation data obtained from in situ stations for the period of 15/12/2009 to 15/01/2010.

Figure 6 - Data availability of interpolated precipitation.
RESULTS

The same will is being done to the other meteorological data, such as temperature, radiation, humidity, wind speed, etc.

we are going to validate the interpolated rainfall values with the values obtained from in situ stations.
CONCLUSION

This paper describes a part of a PhD research that aims to simulate the extreme flood event occurred in the city of São Luiz do Paraitinga, São Paulo, Brazil, in early January 2010.

The shortage of meteorological stations in the study area to compose an input database for the SWAT model drove the evaluation of some possible weather data sources to supplement the precipitation database.

However, the improper spatial resolution of the GPCP and TRMM data limit their use in the study area. Besides, the operating principle used for the Hidroestimador algorithm is not suitable to simulate orographic precipitations, which are the common type of precipitation which occurs at the Paraitinga River Basin.
Acknowledgement

Thank you! See you in Brazil for the next conference ... soon!

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