Centro de Ciência do Sistema Terrestre

ciência para sustentabilidade

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

SWAT 2013
Toulouse France

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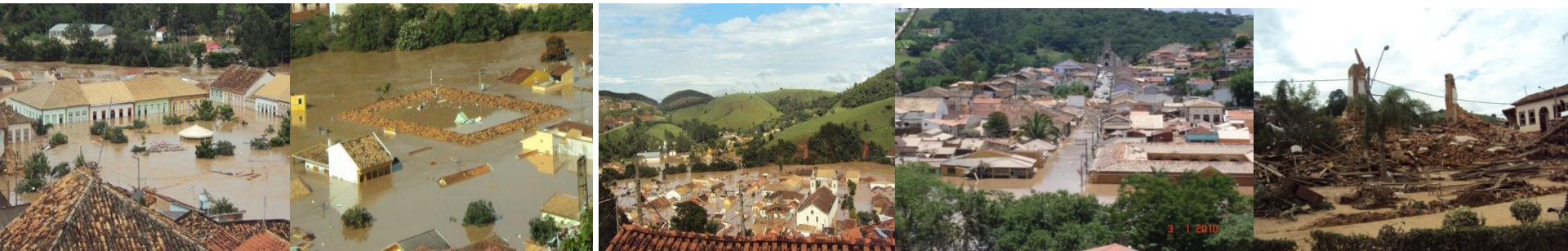


SUMMARY

- 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
Floods
Flooding

29.6%
people
affected

São Paulo state

452
Sudden
Floods

54% of total disasters

Dec
Jan
Feb

INTRODUCTION

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

destruction of the historic center of the city

PhD thesis study

SWAT model

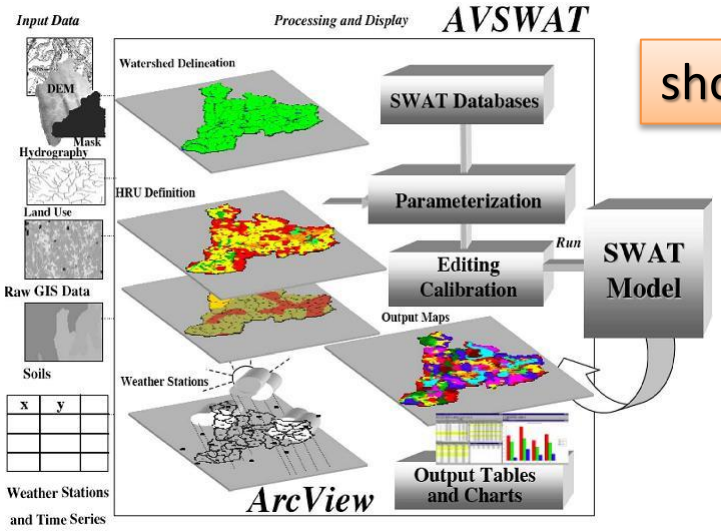
thousands rendered homeless

investigate the causes and short, medium and long-term consequences of extreme flood event

INTRODUCTION

SWAT model

Goal PhD thesis

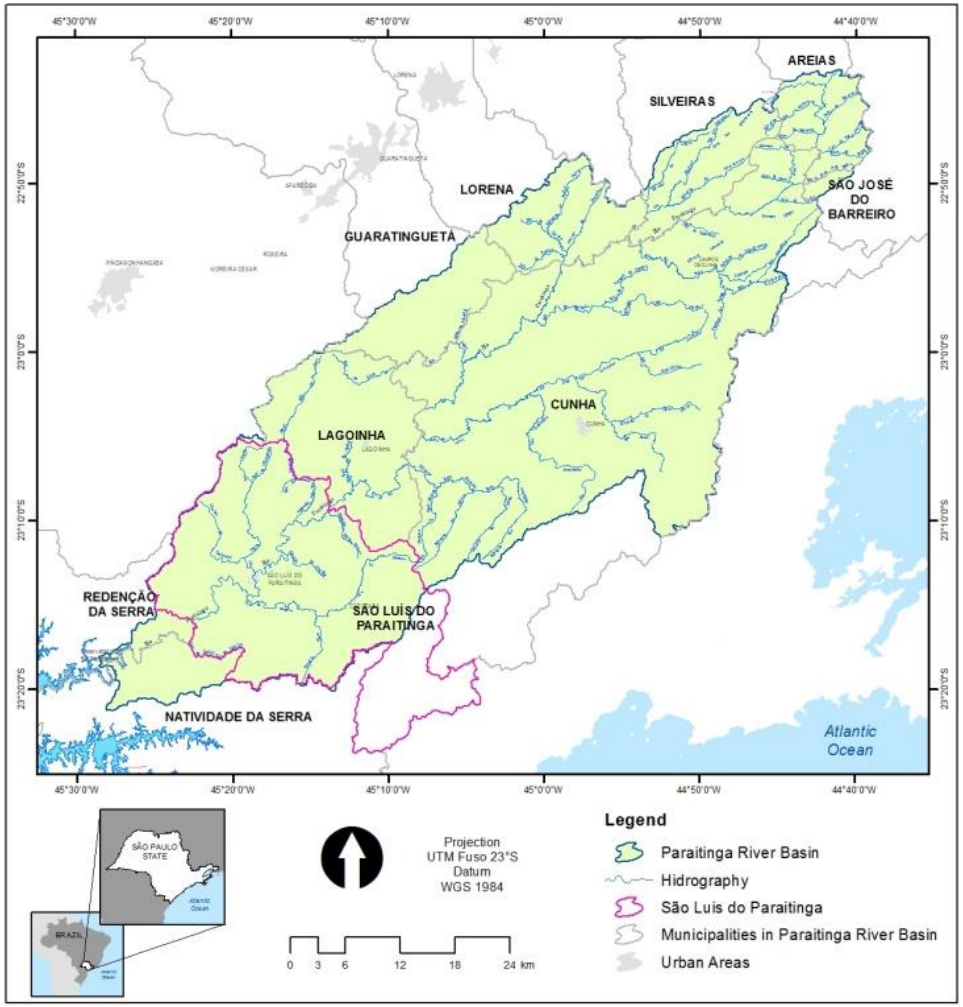


shortage of rainfall data

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 km ²

located in the Paraíba Valley, São Paulo, Brazil

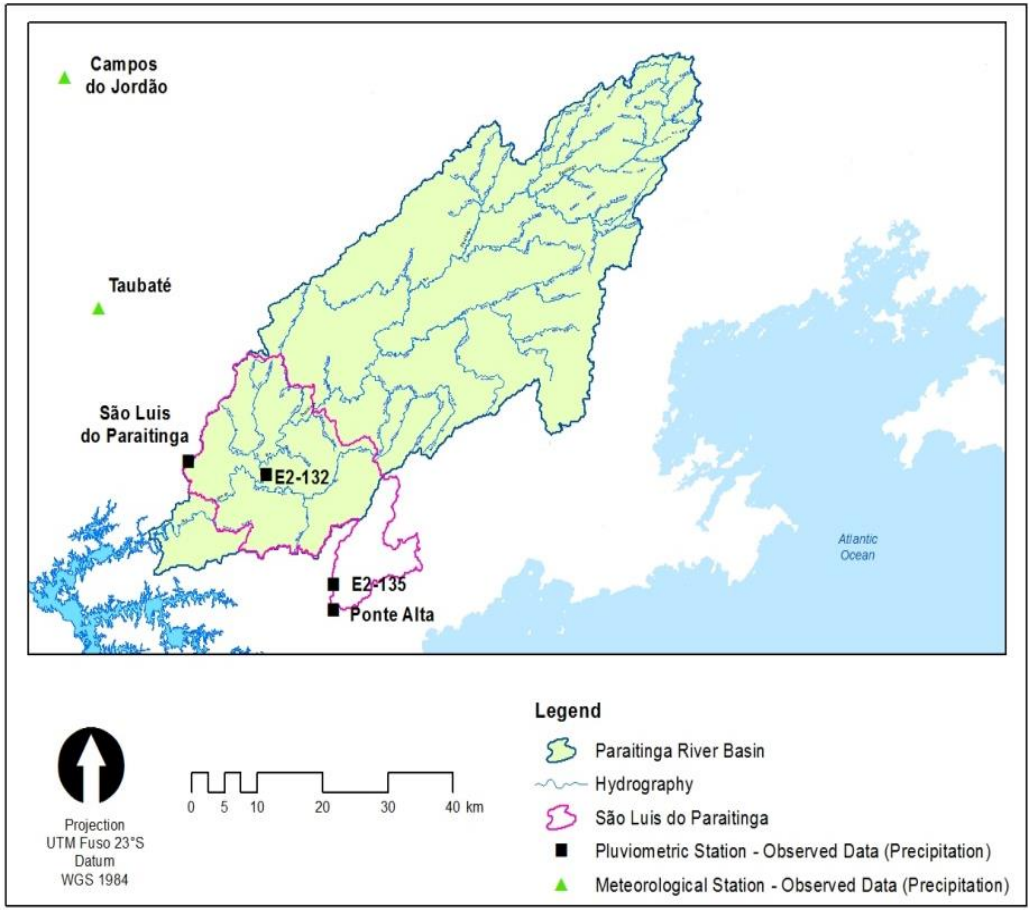
source of the Paraitinga River is located in the Serra do Mar, municipality of Areias (1800 meters altitude)

rainfall has an annual variation between 1100mm and 1700mm

METHODOLOGY

Data acquisition

Pluviometric stations	Source	Data Period	Location of the station relative to Paraitinga River Basin
E2-135	DAEE	1972-2010	Out
E2-132	DAEE	2000-2010	Inside
Ponte Alta	ANA	1971-2004	Out
São Luiz do Paraitinga	INMET	2007-2010	Limit
Meteorological Stations			
Campos de Jordão	INMET	1990-2010	Out
Taubaté	INMET	1990-2010	Out

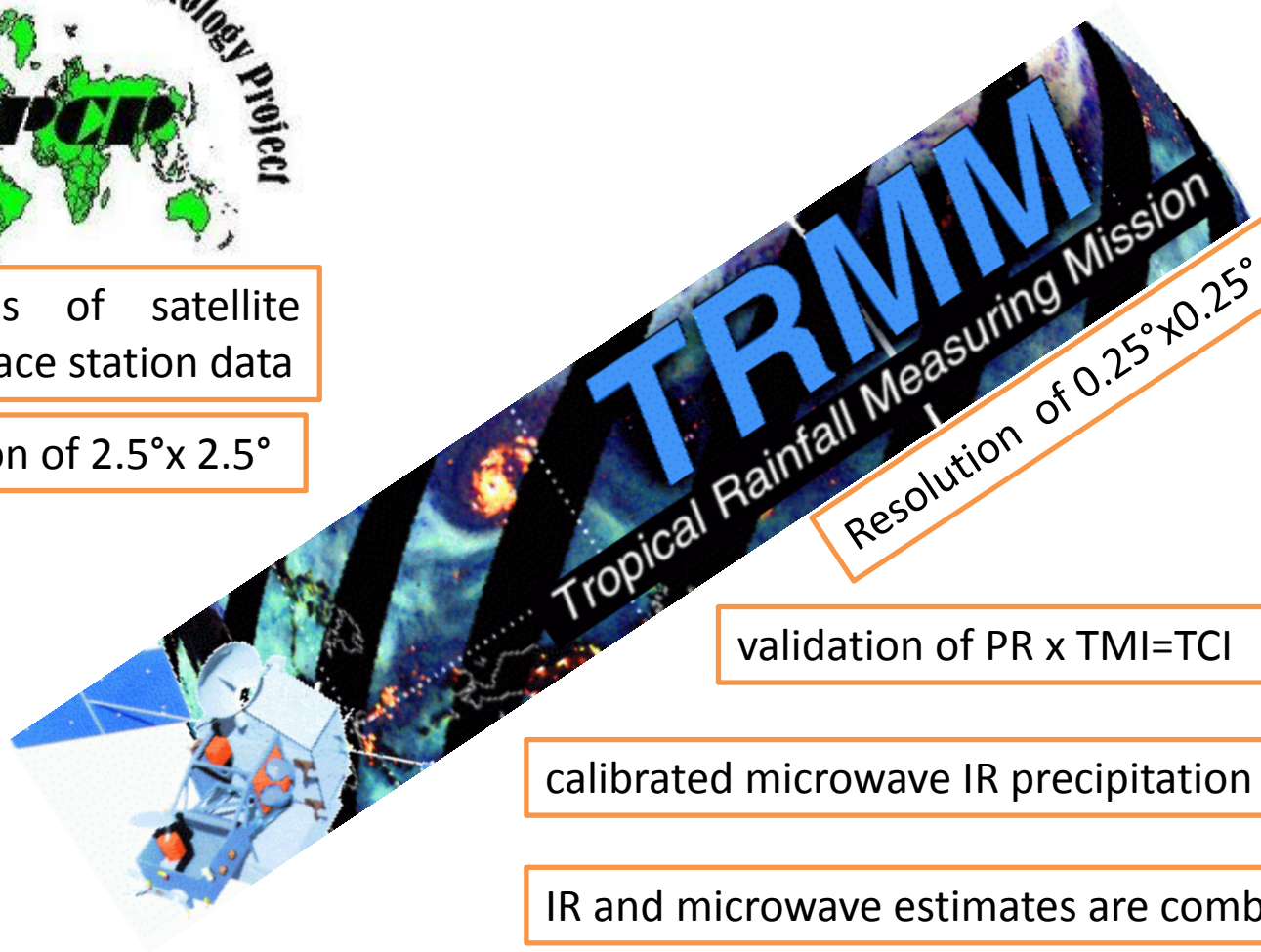


METHODOLOGY

Data acquisition

estimates of satellite and surface station data

resolution of 2.5°x 2.5°



Resolution of 0.25°x0.25°

validation of PR x TMI=TCI

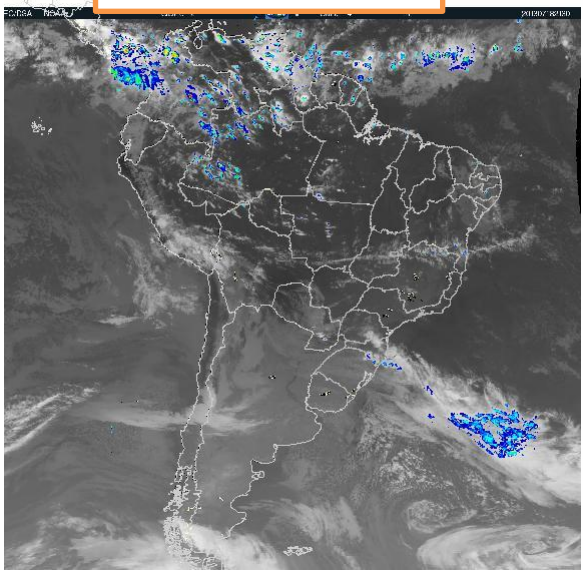
calibrated microwave IR precipitation

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°

REDE CLIMA

INCT

data interpolated

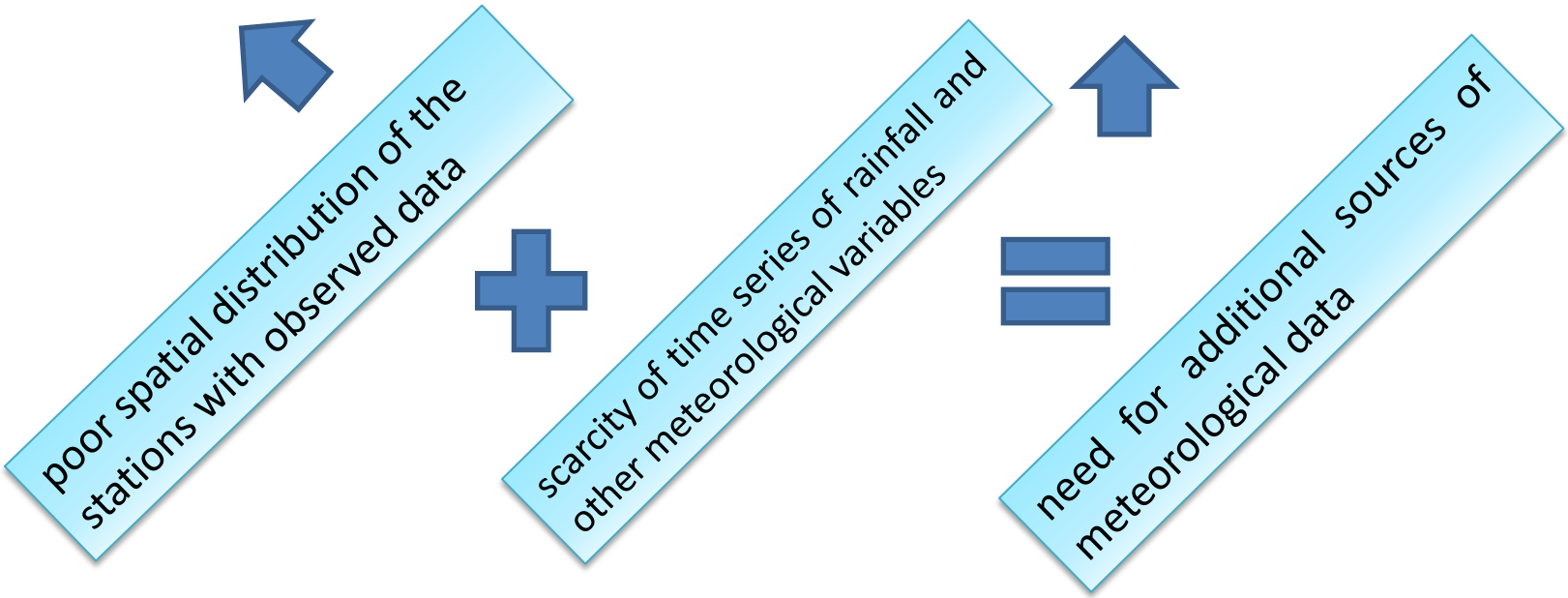
uses available observational data from different stations in Brazil

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

resolution of 0.1°x 0.1°

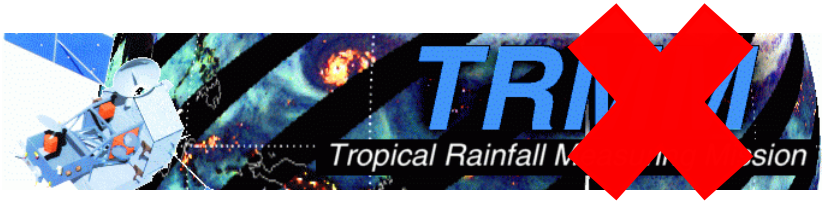
RESULTS

	Maximum daily precipitation (mm)			
Pluviometric stations	**Period 2000-2010**	**Date of occurrence**	**31-01-2009**	**01-01-2010**
E2-135	205,5	26-01-2005	81,2	104,5
E2-132	90,0	12-02-2006	No data	No data
Ponte Alta	67,9	02-01-2001	No data	No data
São Luiz do Paraitinga	64,9	21-12-2008	11,0	56,0
Meteorological Stations				
Campos de Jordão	108,4	25-05-2005	44,4	45,4
Taubaté	121,2	24-11-2004	10,4	56,8



RESULTS

resolution of 2.5ºx2.5º (~250km), cover an area larger than the interest area

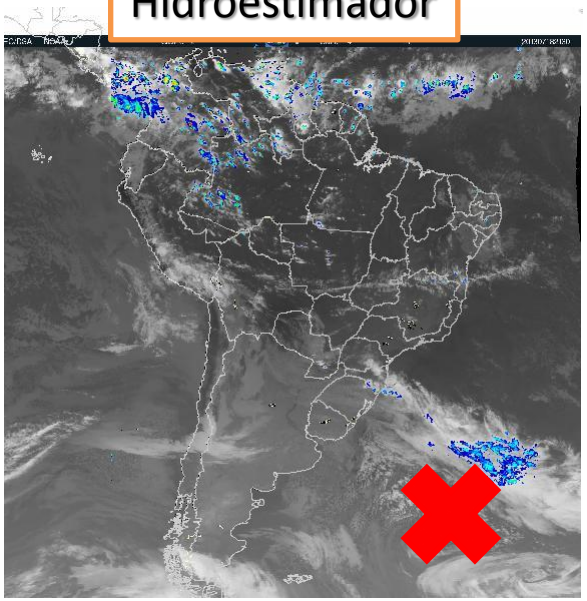


resolution of 0.25ºx0.25º (~25km), despite being finer than the resolution of GPCP, is still not sufficiently refined to the space scale of interest in the present study

RESULTS

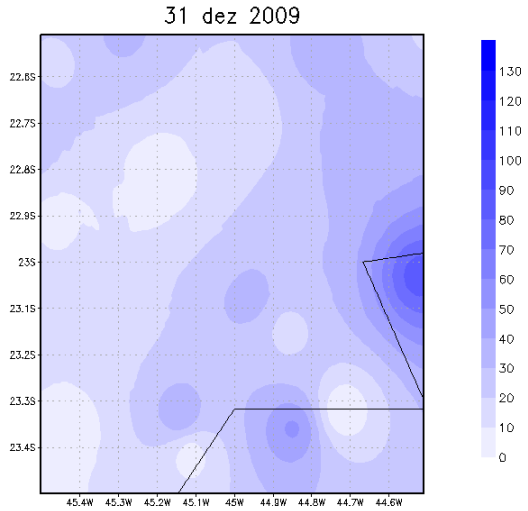
resolution could be refined to a distance of 1 km, would attend the needs of this study

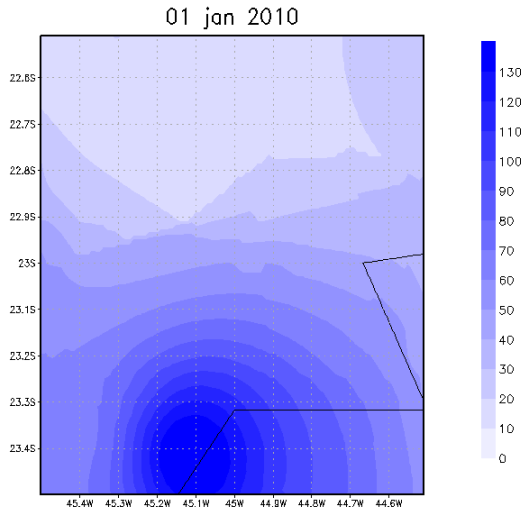
Hidroestimador

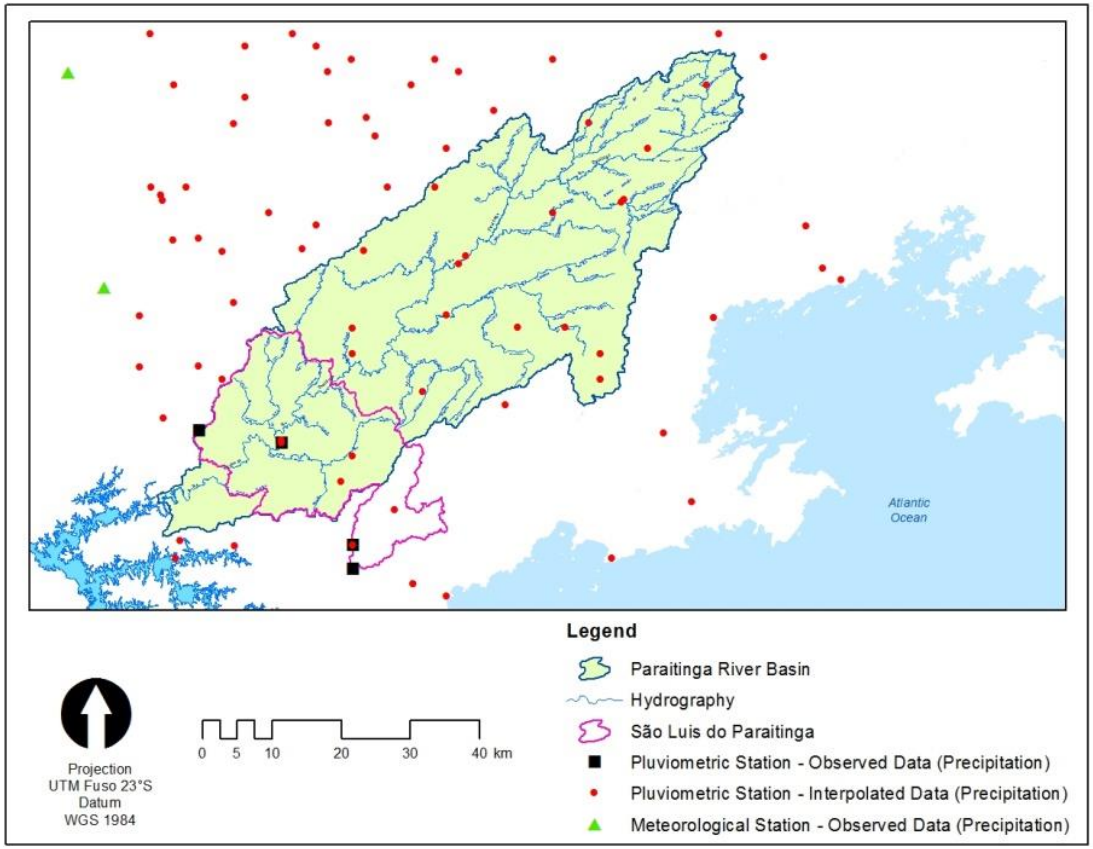


formation of orographic precipitation, which generally has very high precipitation rates and clouds with hot tops, making it impossible to estimate rainfall with the methodology applied in the Hidroestimador algorithm

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

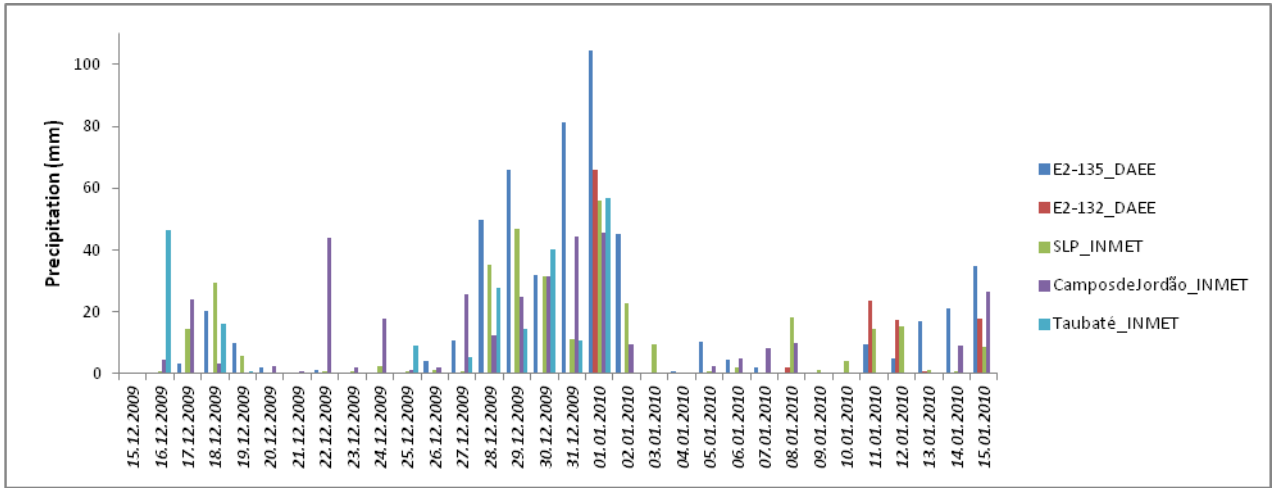


Figure 5 – Precipitation data obtained from in situ stations for the period of 15/12/2009 to 15/01/2010

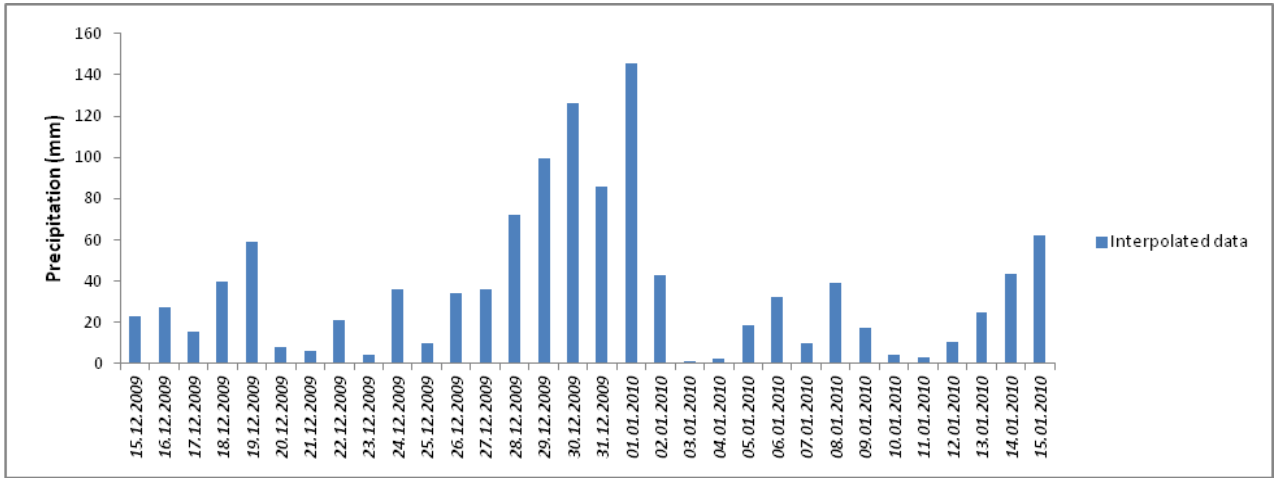


Figure 6 - Data availability of interpolated precipitation.

RESULTS

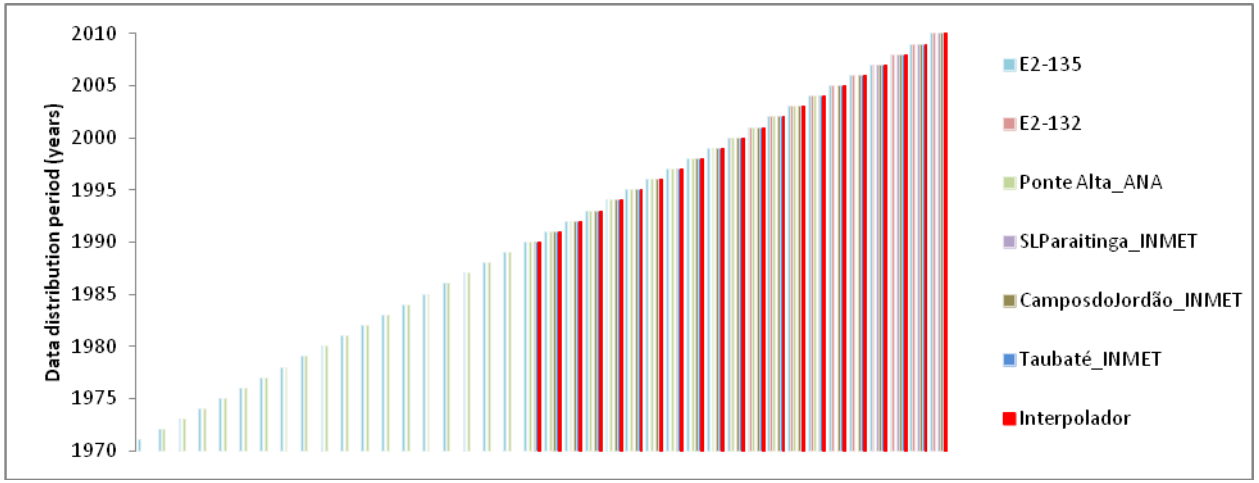


Figure 7 - Temporal distribution of stations with observed and interpolated data.

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.

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Acknowledgement

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

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