Universidade Federal de Santa Catarina

2014 International SWAT Conference
Pernambuco, Brazil

HYDROLOGICAL MODELING OF CUBATÃO DO SUL CATCHMENT USING THE SWAT MODEL – SOIL AND WATER ASSESSEMENT TOOL

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BHRCS – Cubatão do Sul Catchment –

Santa Catarina State - South Brazil

Context: Water Supply

Main

water balance

Specific

- *apply local database*
- *statistical methods response on non-calibrated modelled data*

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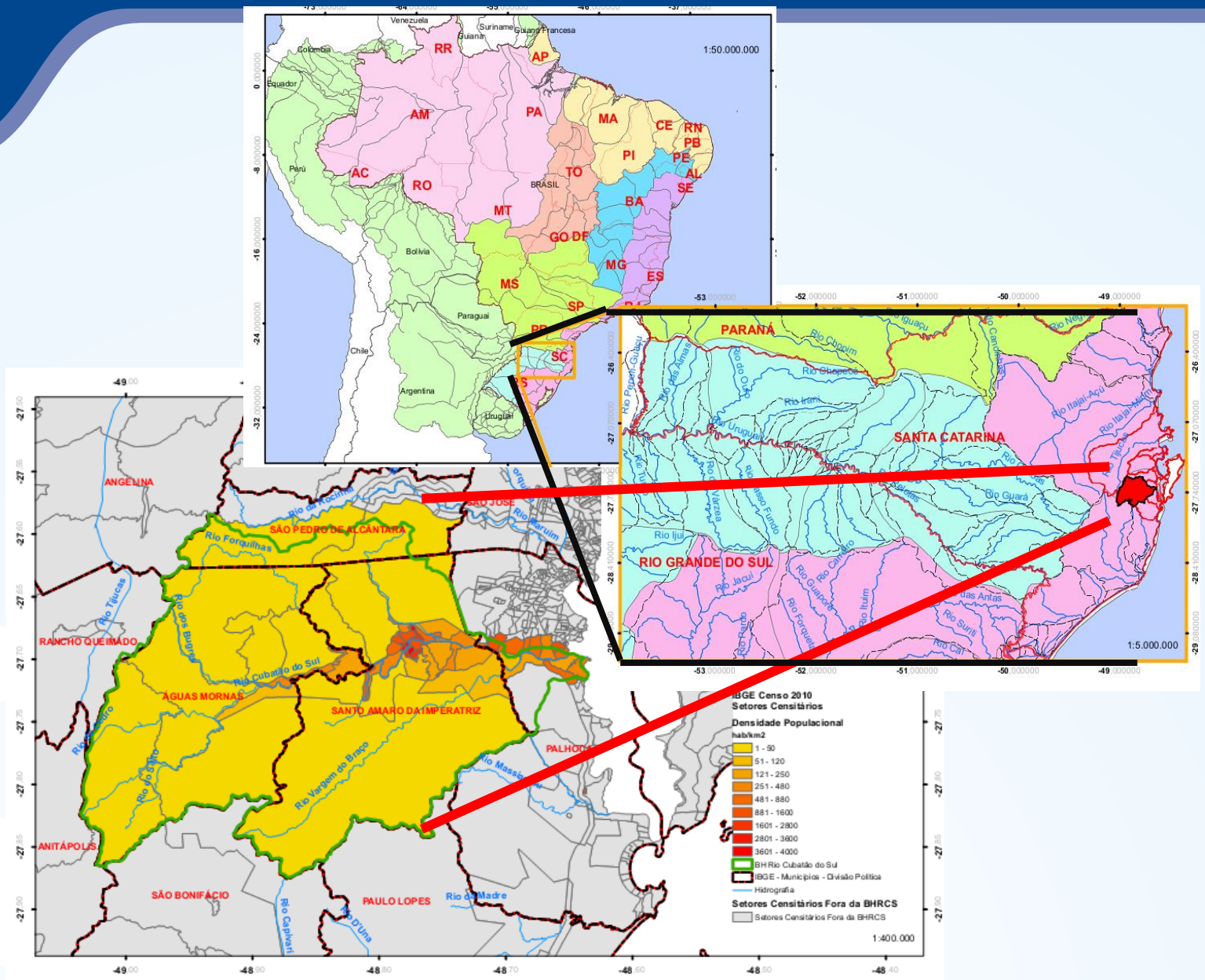

BHRCS

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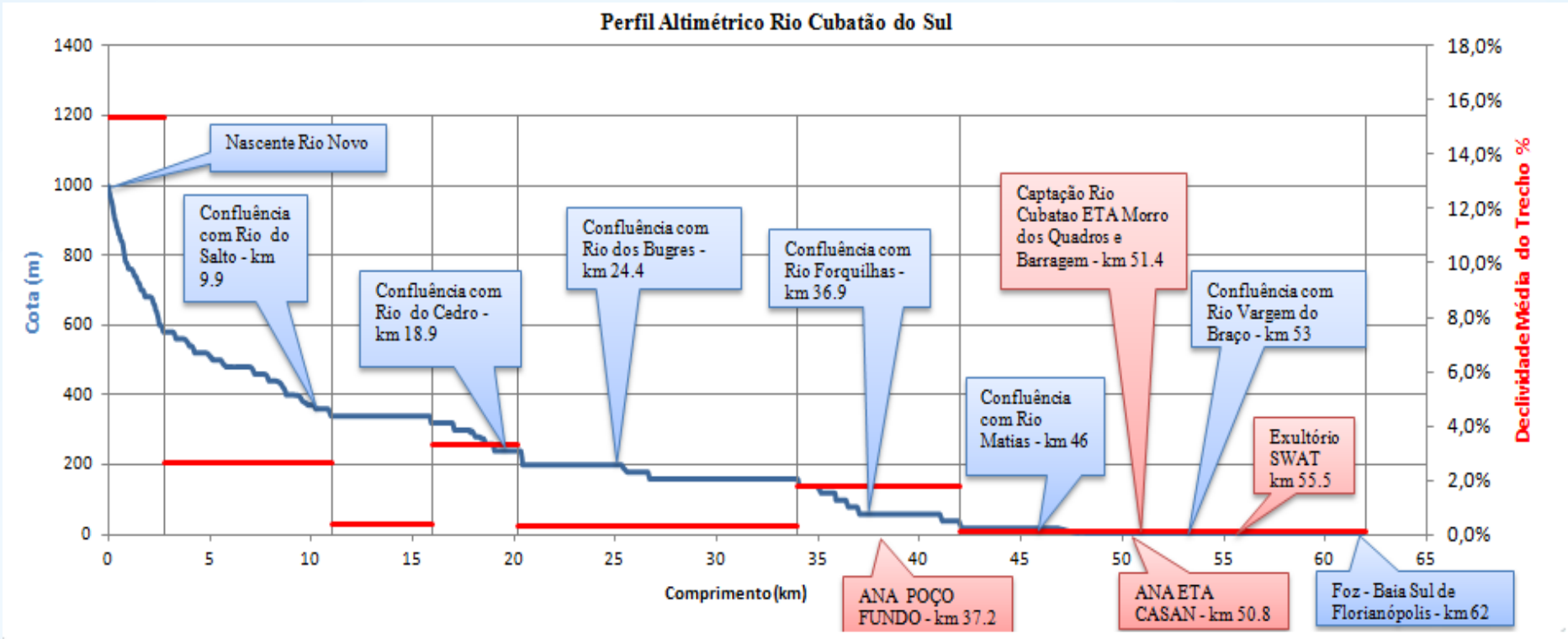

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ArcGIS 10 SP4

ArcSWAT 2009

*- Drainage 1:25K **(ADJUSTED)***
- Countour 10 m
- Outlets (ETA CASAN, out of current influence)

-Soil
- Land Use

- Slope Classes
- Sensitivity – 10%

NON-SPATIAL DATA

-WGNMaker4.1

Weather Generator ***Monthly Average***

Soil Database SBCS

ANA, Epagri (Weather DATA)

ArcSWAT

Automatic Delineation

Sub-Basins

HRUs

SWAT DataBase

Daily Modelling

Land phase

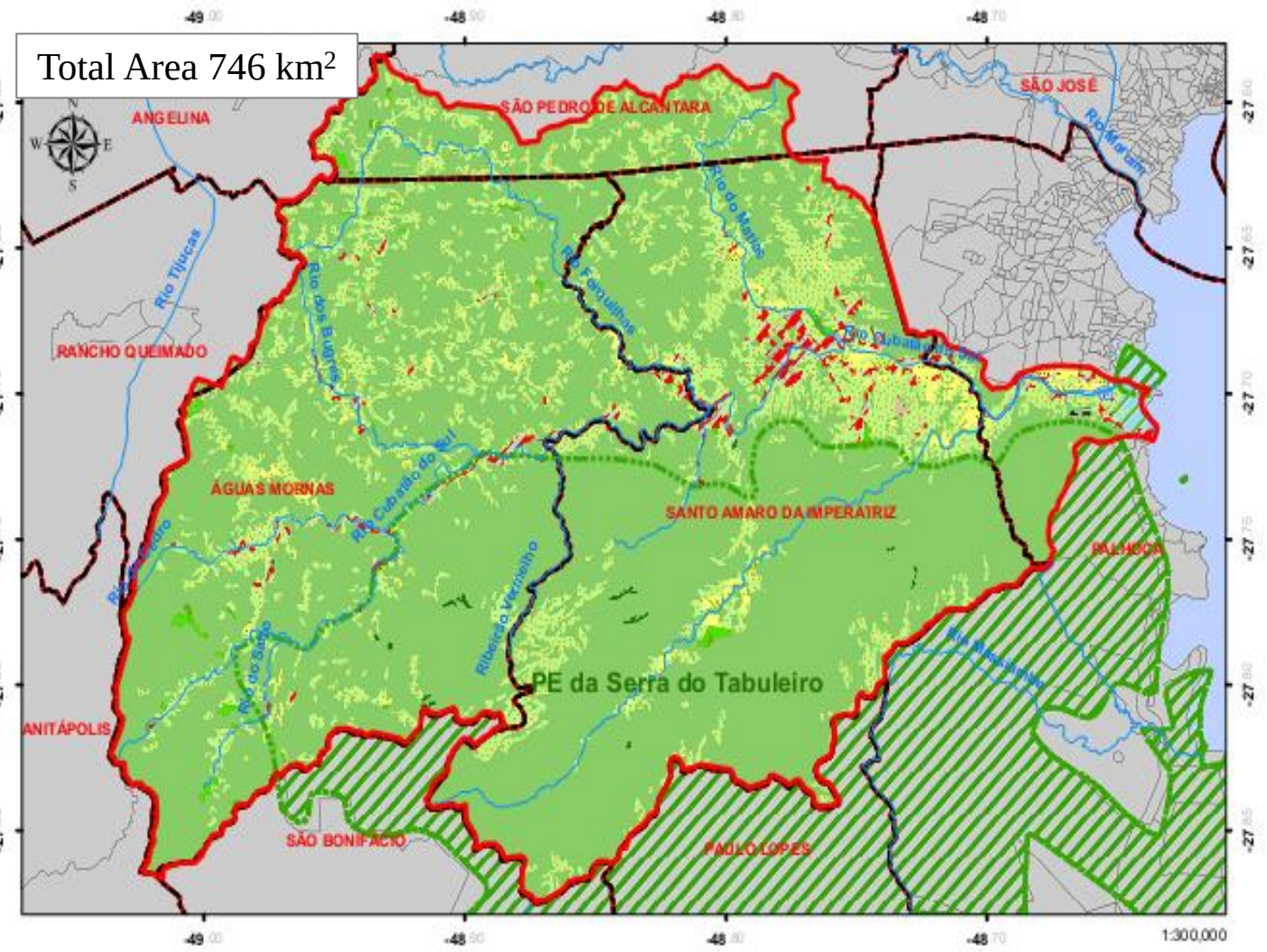
Channel phase

Water Balance

Statistical Analysis

Observed data

LAND USE



AGRICULTURE (AGRL)

1.65%

URBAN LAND (URBN)

1.74%

WATER

0.13%

MIXED FOREST (FRSE)

76,01%

WETLAND

0.23%

PASTURE (PAST)

19.63%

REFLORESTATION (PINE)

0.56%

SOIL (AGRC)

0.06%

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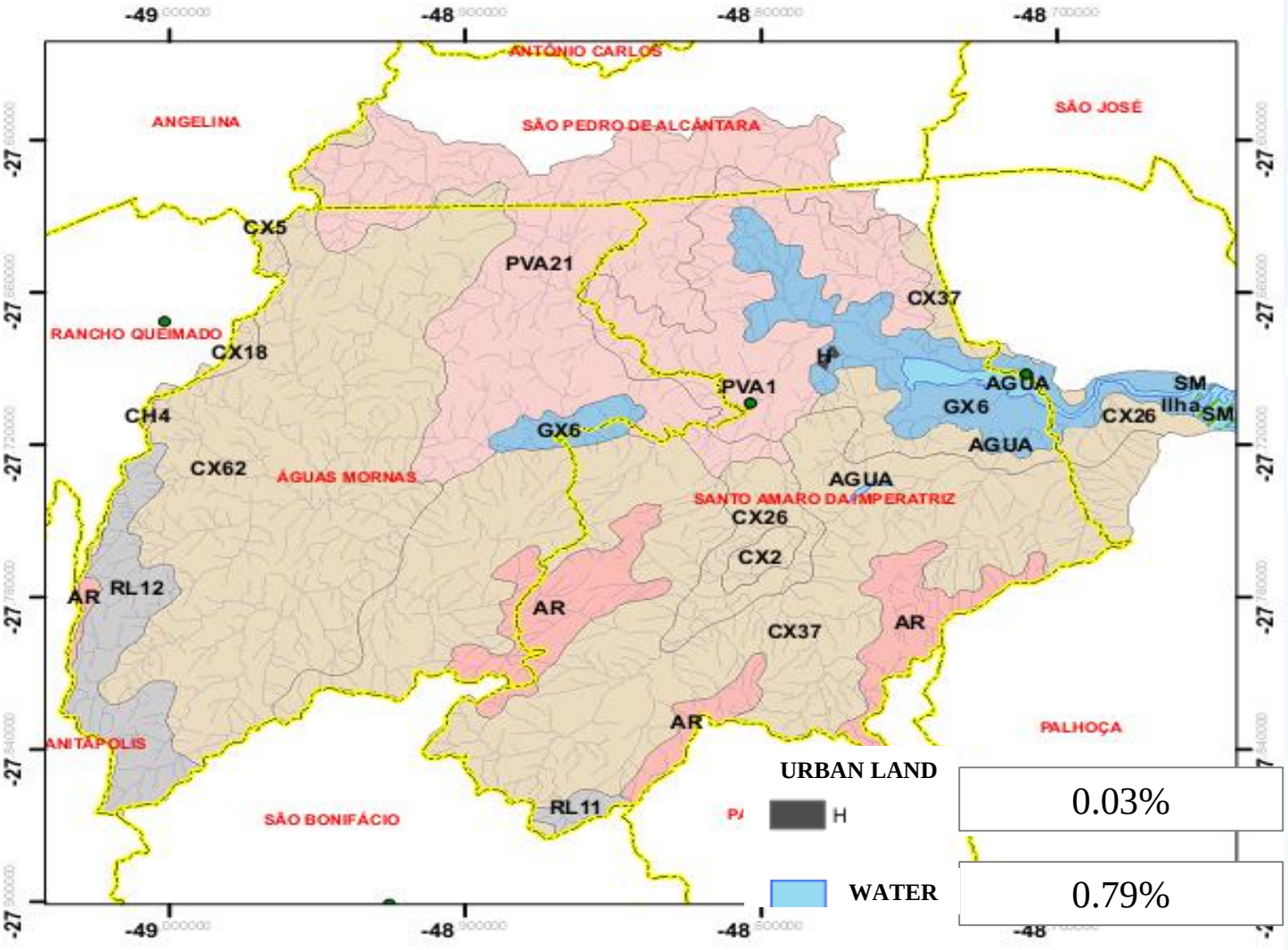
SOIL



WETLAND
SM
0.29%

CAMBISSOLOS HUMICOS
CH4
0.05%

AFLORAMENTO ROCHOSO
AR
SWAT = AF
6.5%

ARGISSOLOS VERMELHO-AMAREL
PVA1
24.8%

CAMBISSOLOS HAPLICO
CX11
56.6%

GLEISSOLO HAPLICO
GX6
6.5%

NEOSSOLOS LITÓLICOS
RL11
4.4%

URBAN LAND
H
0.03%

WATER
0.79%

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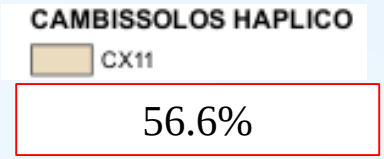
Soil	Cambissolo Háplico			
SNAM	CX			
HYDGRP	C			
NLAYERS	4			
SOL_ZMX	1500			
ANION_EXCL	0.43			
SOL_CRK	0.5*			
Camada SBCS	**A**	**B1**	**B2**	**Cg**
SOL_Z	200	890	1150	1500
SOL_DB	0.98	1.22	1.31	1.19
SOL_AWC	0.1	0.1	0.1	0.1
SOL_K	8.1	8.1	24.3	16.2
SOL_CBN	2	2	2	2
SOL_CLAY	10	6	5	2
SOL_SILT	32	18	12	66
SOL_SAND	59	77	83	31
SOL_ROCK	0	0	0	0
SOL_ALB	0.16	0.16	0.16	0.16
USLE K	0.18	0.18	0.18	0.18



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Albedo = 0.069 (Cor Value) – 0,114 *NRCS Soils* (2013)

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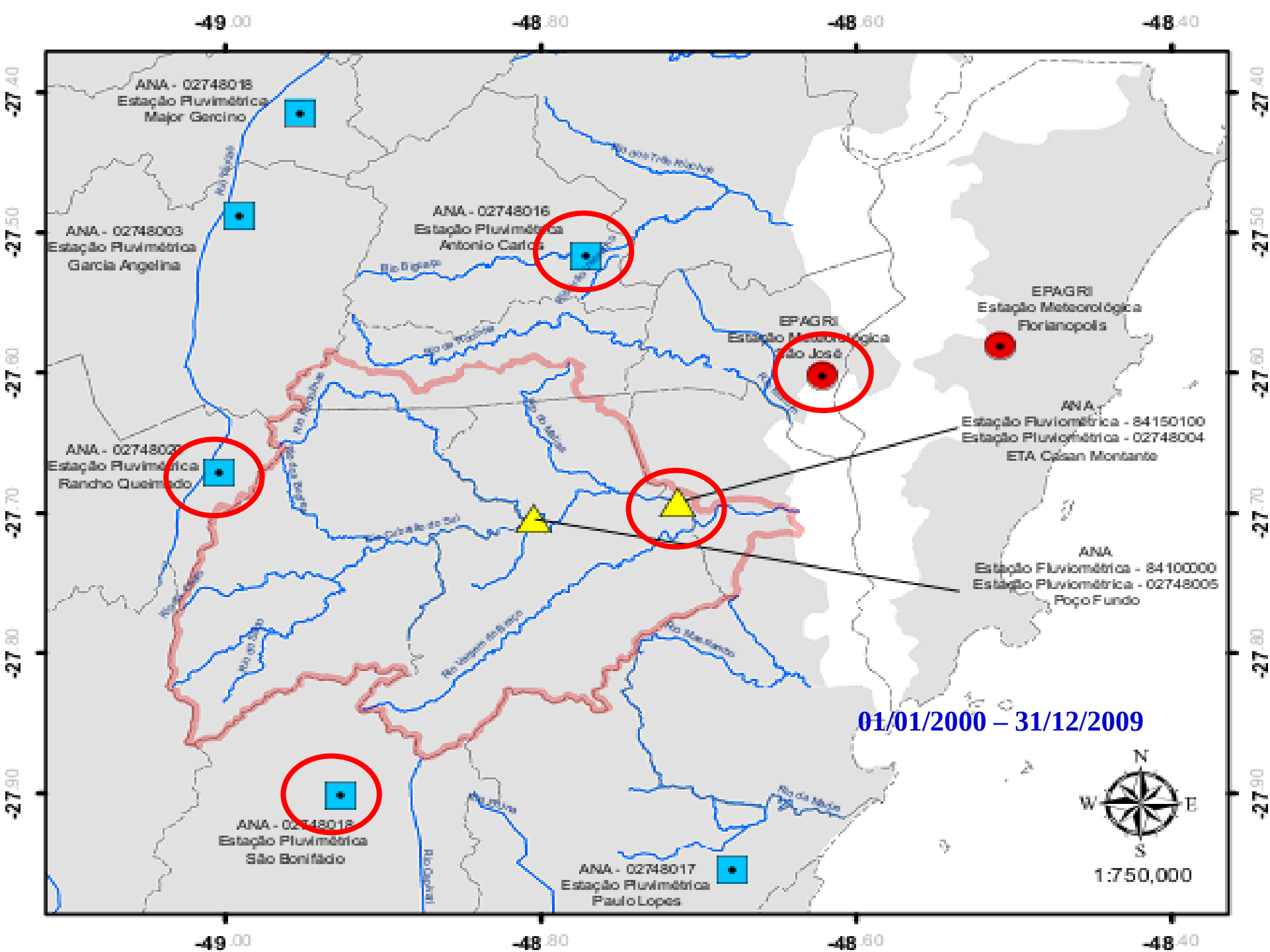
Solo	Argissolo Vermelho-Amarelo				
SNAM	PVA				
HYDGRP	B				
NLAYERS	5				
SOL_ZMX	1500				
ANION_EXCL	0.49				
SOL_CRK	0.5*				
Camada SBCS	**A**	**Bt11**	**Bt12**	**B2**	**B3**
SOL_Z	130	430	700	1050	1500
SOL_DB	1.07	1.27	1.24	1.1[illegible]	1.15
SOL_AWC	0.07	0.07	0.07	0.07	0.07
SOL_K	542	[illegible]00	130	60	58
SOL_CBN	2	2	2	2	2
SOL_CLAY	31	42	52	63	62
SOL_SILT	17	16	14	14	16
SOL SAND	52	42	34	23	22
SOL_ROCK	0	0	0	0	0
SOL_ALB	0.16	0.16	0.16	0.16	0.16
USLE K	0.18	0.18	0.18	0.18	0.18

24.8%

Soil & Water Assessment Tool SWAT

Albedo = 0.069 (Cor Value) – 0,114 *NRCS Soils* (2013)


-49.00
-48.80
-48.60
-48.40
-27.40
-27.50
-27.60
-27.70
-27.80
-27.90
ANA - 02748018
Estação Pluviométrica
Major Gercino
ANA - 02748003
Estação Pluviométrica
Garcia Angelina
ANA - 02748016
Estação Pluviométrica
Antonio Carlos
EPAGRI
Estação Meteorológica
São José
EPAGRI
Estação Meteorológica
Florianopolis
ANA
Estação Pluviométrica - 84150100
Estação Pluviométrica - 02748004
ETA Casan Montante
ANA - 02748035
Estação Pluviométrica
Rancho Queimado
ANA
Estação Pluviométrica - 84100000
Estação Pluviométrica - 02748005
Poço Fundo
01/01/2000 – 31/12/2009
ANA - 02748019
Estação Pluviométrica
São Bonifácio
ANA - 02748017
Estação Pluviométrica
Paulo Lopes
N
W
E
S
1:750,000

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Missing Data – Weather Generator

- **Dew Point**
(temp max - min, umid) ⟶ WGN_Maker ⟶ USERWGN.dbf

- **Max 30 min Rainfall**
RAINHHMAX

Rainfall desagregation (DAEE-CETESB, 1980)	
Period	(FCP) *1,13 (T=10 years)
12 hs	0.85
10 hs	0.82
8 hs	0.78
6 hs	0.72
1 hs	0.42
30 min	0.74

$$q_{peak} = \frac{\alpha_{tc} \cdot Q_{surf} \cdot Area}{3.6 \cdot t_{conc}}$$

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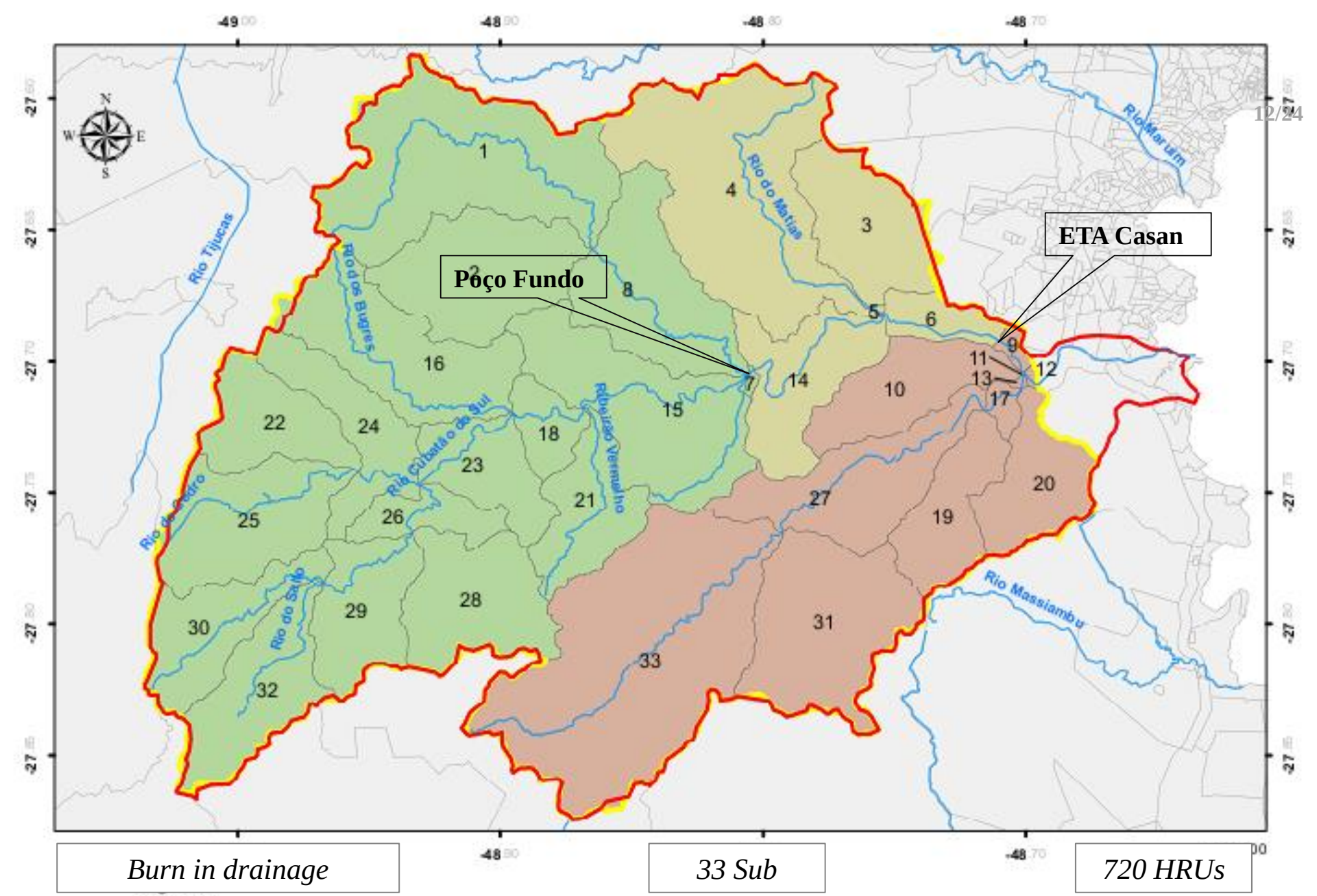
$RAINHHMAX = 0{,}35\ R_{avg,\ monthly}$

$$\alpha_{tc} = 1 - \exp\left[2 \cdot t_{conc} \cdot \ln(1 - \alpha_{0.5})\right]$$



Burn in drainage

33 Sub

720 HRUs

Epagri - Hidrografia

Epagri - BH Rio Cubatão do Sul

Limite Bacia SWAT

Exutório 6 - ETA Casan Montante SWAT - Vazão Simulada apenas

Exutório 7 - Poço Fundo

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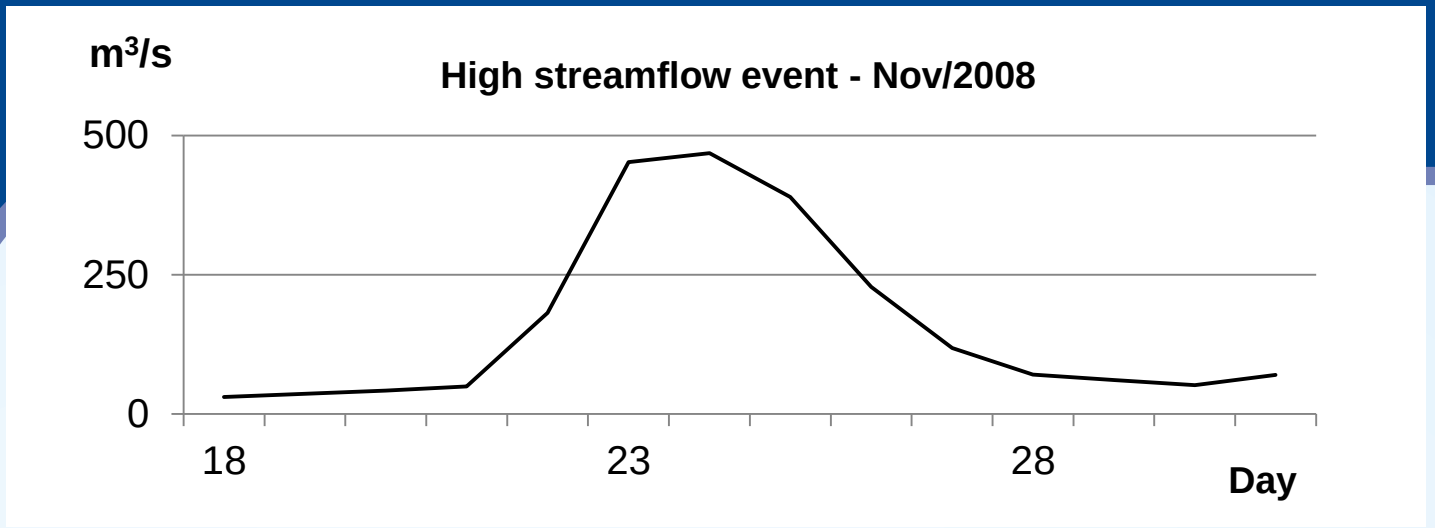
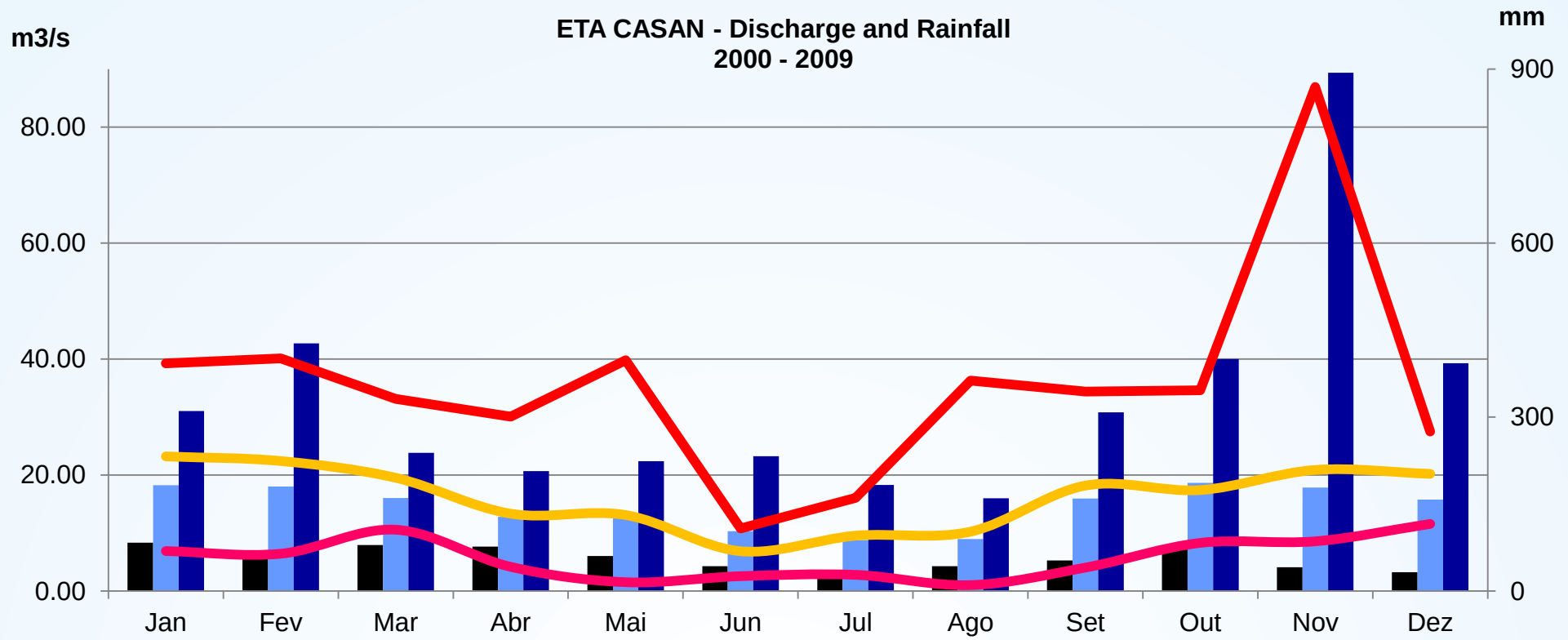
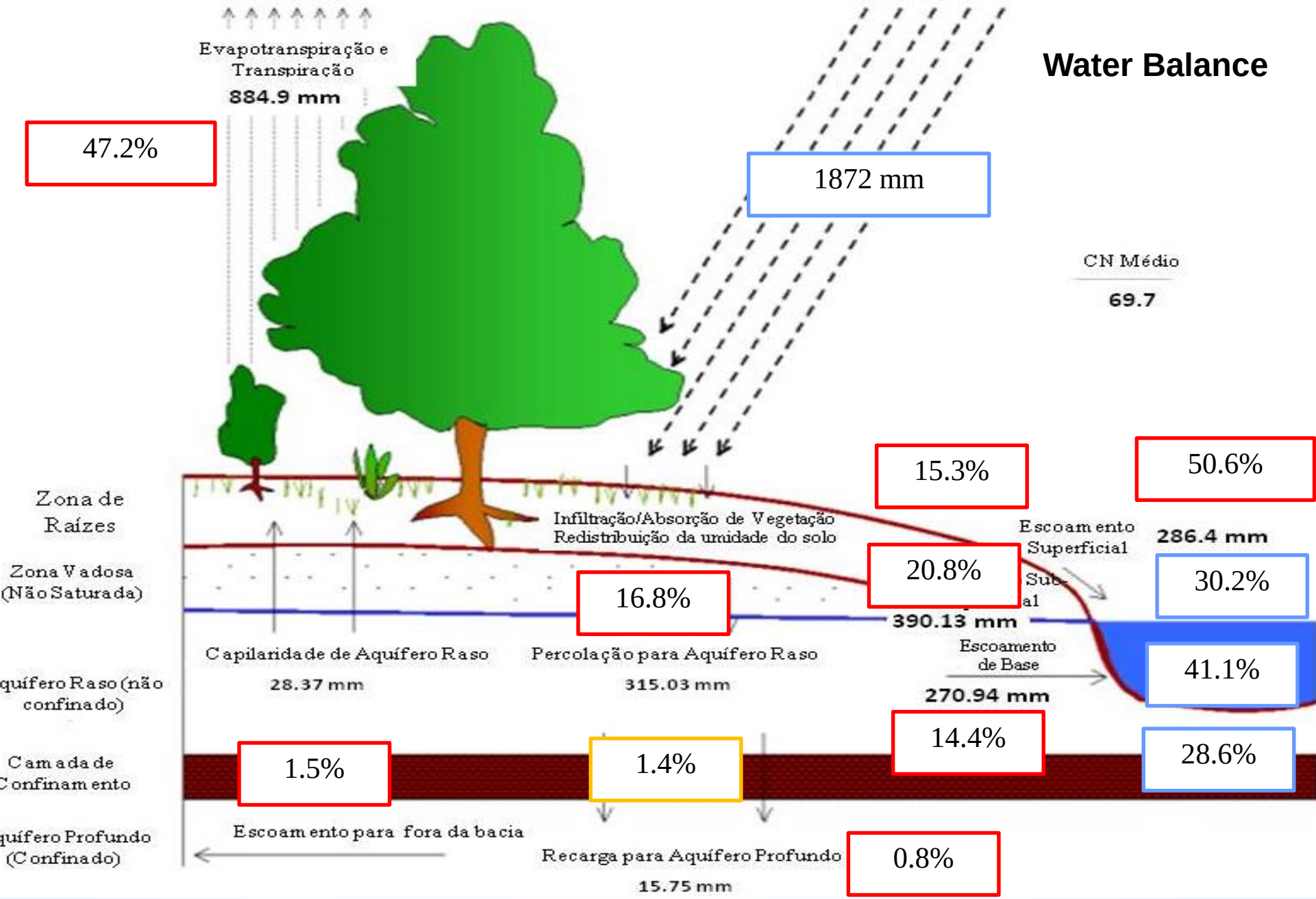




Water Balance



Kobyiama e Chaffe (2008), 62% Total Disc and 44% EVAP – HYCYMODEL 77-94

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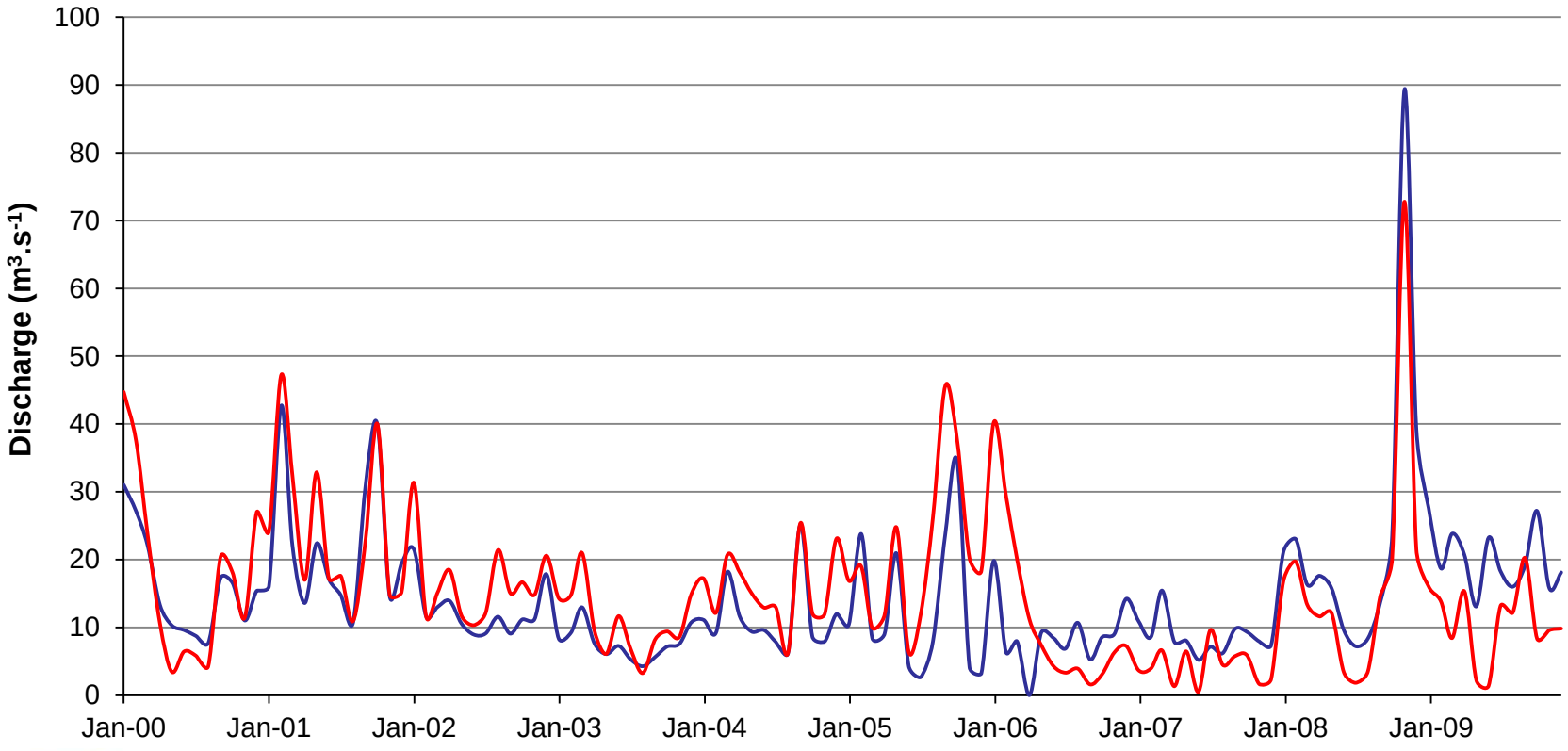

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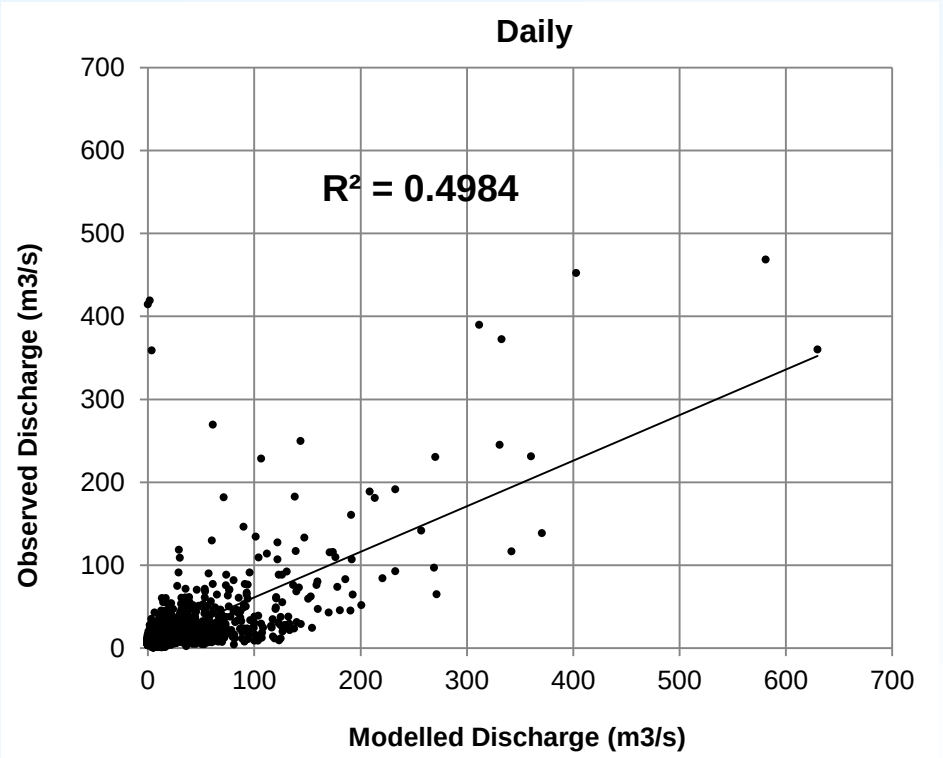
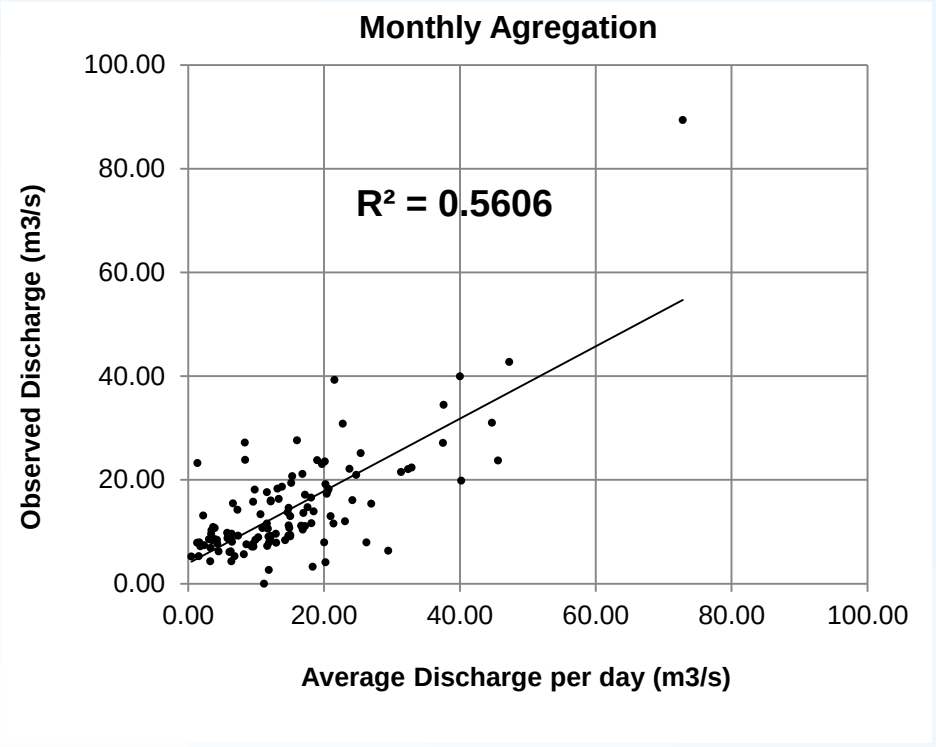
Statistical Method	Daily	Monthly	Moriasi *et al* (2000) Monthly
R^2	0.49	0.56	$R^2 > 0{,}5$ *(acceptable)*
NSE	0.16	0.78	NSE ≤ 0.75 (very good)
PBIAS	-4.9	15.75	±10 ≤ PBIAS <±15 (good)
RSR	0.91	0.46	RSR ≤ 0.5 very good





Conclusions and Recommendationc

- The BHRCS has been already modelled and this study has shown similar results - discharge bigger than evapotranspiration

- Statiscal methods have shown satisfactory results for non-calibrated data

- RainFall distribuction (Topography), consistency analysis, Detailled soil database, Slope Classes

- Sensitive Analisys, Calibration and Validation

Acknowledgements

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LAHIMAR/UFSC

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