HYDROLOGICAL MODELLING IN REPRESENTATIVE CATCHMENTS IN BRAZIL USING THE SWAT MODEL: THE EXPERIENCE OF THE **REHIDRO NETWORK**

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[2]- Federal University of Pernambuco State- Brazil

[3]- EMBRAPA Cerrados- Brazil

[4]- Brasília University- Brazil

Summary

* REHIDRO Network- Aims and Groups
* Brazilian semiarid hydrological network;
* Hydrological characteristics of the experimental basins;
* Investments in Instrumentation;
* Experimental measurements- Primary Data;
* Modelling Studies- SWAT applications and developments;
* Conclusions- Next Steps

REHIDRO NETWORK

* Research group funded by the Brazilian Agency **FINEP** foccusing on **instrumentation, experimental measurements, modelling studies** and **teaching, as well as integration of research Groups** involved with experimental and representative basins of Semiarid Caatinga and Cerrado;

* **Institutions:**

Federal Rural University of Pernambuco State;
Federal University of Pernambuco State;
Brasília University;
Embrapa Cerrados;
Embrapa Tabuleiros;
Federal University of Sergipe State;
Federal University of Alagoas State

The Brazilian Network of Experimental and Representative Basins

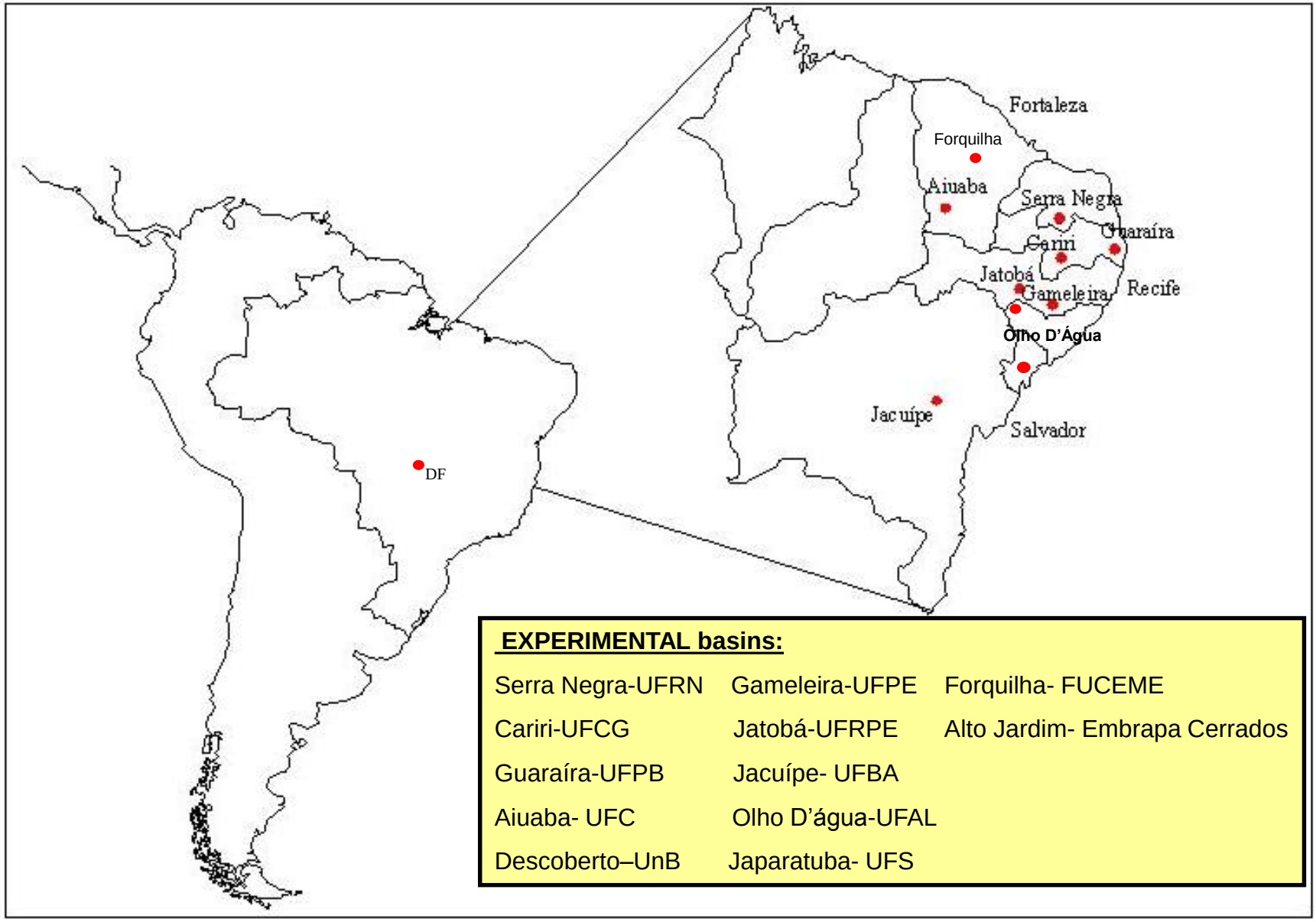
REHIDRO/ REHISA: Consortium of eleven Brazilian Universities and three Research Centers

Approach: Experimental toward Representative Basins

Built upon previous (1960 ~) initiatives on Brazilian hydrology

Progress in PUB implementation
VIIth IAHS Scientific Assembly
Foz do Iguaçu, Brazil, April 2005

REHISA (after REHIDRO, in 2011)



EXPERIMENTAL basins:

Serra Negra-UFRN	Gameleira-UFPE	Forquilha- FUCEME
Cariri-UFCG	Jatobá-UFRPE	Alto Jardim- Embrapa Cerrados
Guaraíra-UFPB	Jacuípe- UFBA	
Aiuaba- UFC	Olho D'água-UFAL	
Descoberto–UnB	Japaratuba- UFS	

Scientific Themes in Experimental and Representative Basins

Monitoring

–Data rescue; **direct and indirect** data acquisition;

–Robust Instrumentation to environmental extremes;

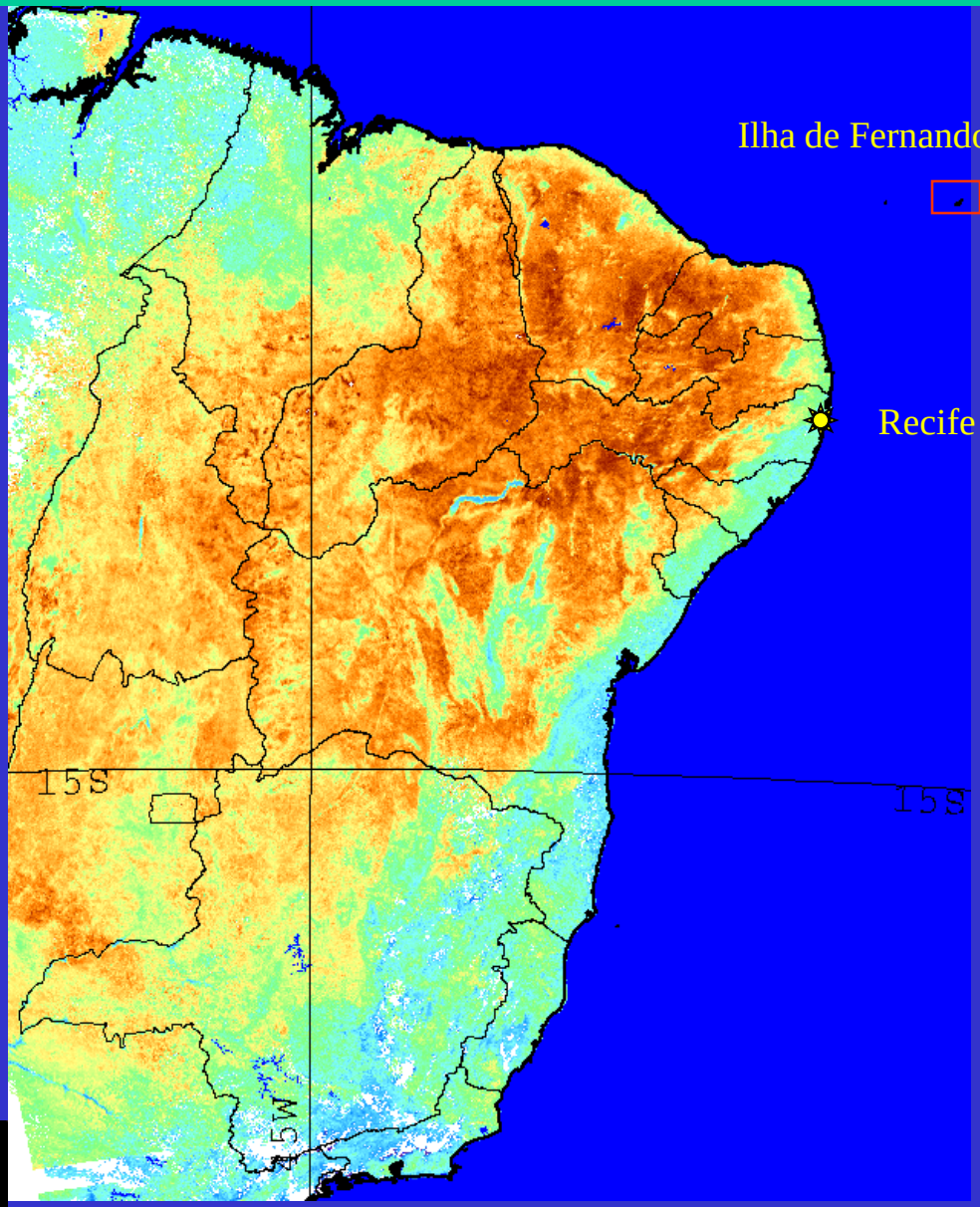
Modelling (scaling)

- Reduction (control) of uncertainties
- SWAT as an integrating effort

Participatory (sustainable) management

- Social impact and inclusion; empowerment (Social Hydrology)

COPING WITH WATER SCARCITY AND UNCERTAINTIES



LST

Land Surface Temperature

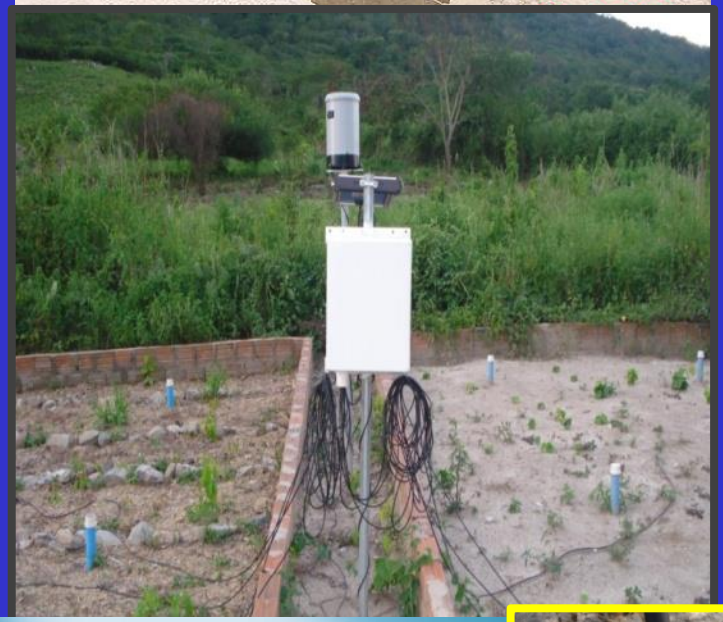
NOAA AVHRR Day time

Aquisition September 2002

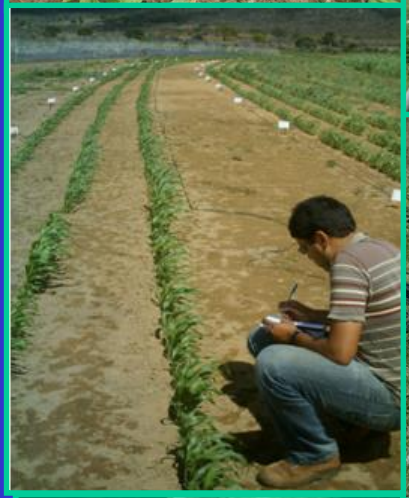
COOPERAÇÃO
REPÚBLICA FEDERATIVA DO BRASIL
REPÚBLICA FEDERAL DA ALEMANHA

DLR

Hydrological characteristics- Caatinga; Cerrado; Semiarid zone



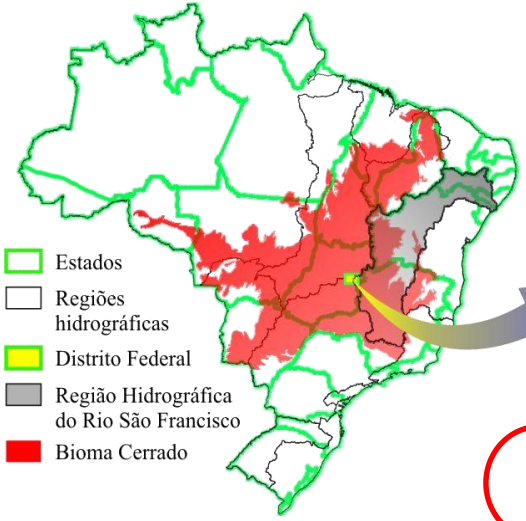
Jorge Werneck (2013)

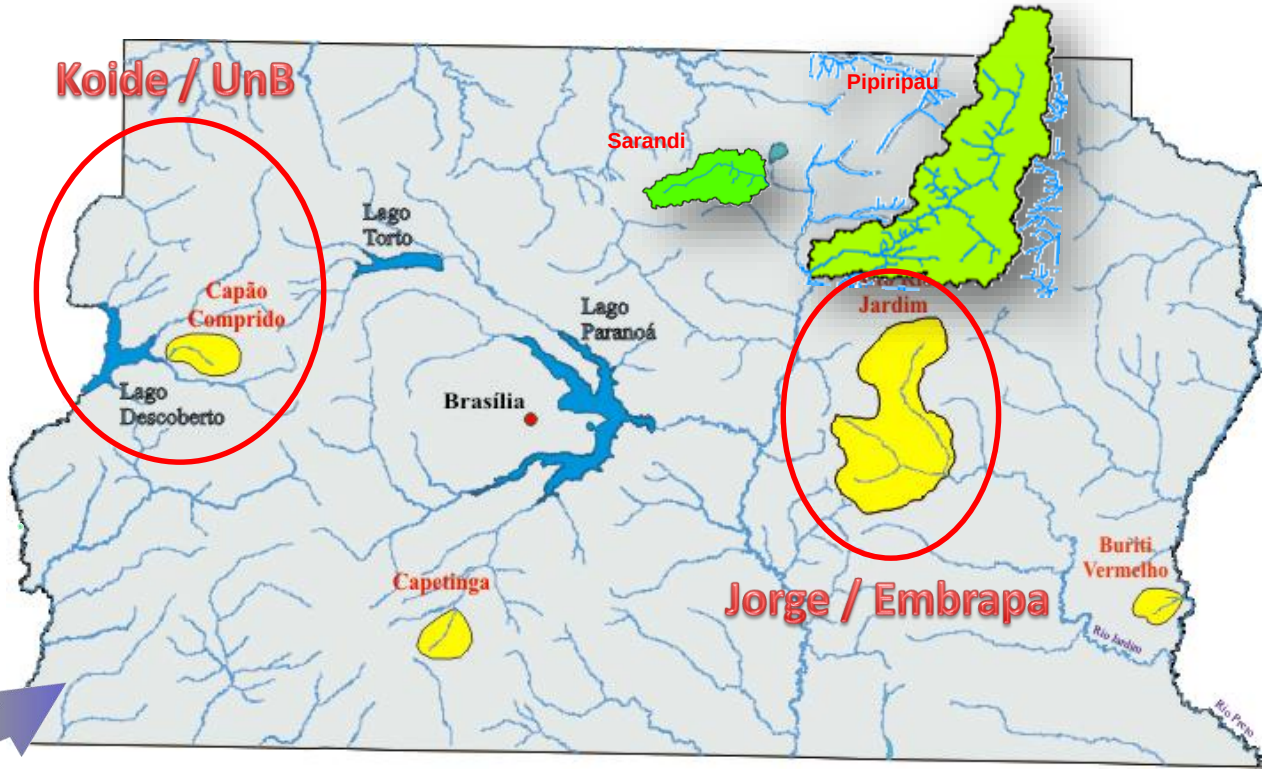


PARTICIPATORY APPROACH and TEACHING

Experimental Basins in DF

- Alto Jardim
- Capão Comprido
- Buriti Vermelho
- Capetinga
- Pipiripau
- Sarandi





REHIDRO Project - Cerrado

Universidade de Brasília UnB

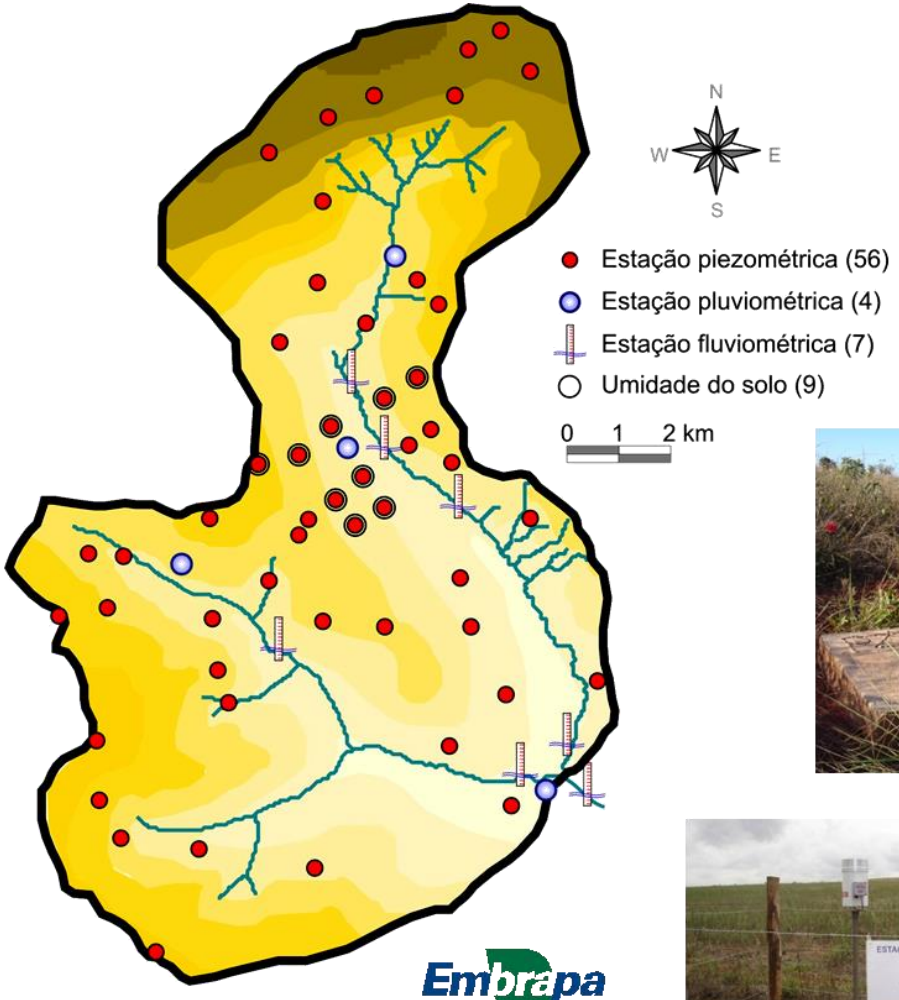
Embrapa Cerrados

Monitoring

Bacia do Alto Rio Jardim

Processos Hidrológicos?
Métodos?

Lima et al., 2007



Embrapa
Cerrados

Development of a soil database for applying SWAT model in a catchment of the Brazilian Savanna

Jorge Enoch Furquim Werneck Lima

Euzebio Medrado da Silva

Michael Strauch

Carsten Lorz

Embrapa Cerrados

Embrapa Cerrados

HELMHOLTZ ZENTRUM FÜR UMWELTFORSCHUNG UFZ

Hochschule Weihenstephan-Triesdorf

SWAT 2013
Toulouse France

Aplicabilidade do modelo SWAT na simulação da vazão em bacia experimental agrícola do Bioma Cerrado

Kássia Batista de Castro[(1)], Henrique Llacer Roig[(1)] e Jorge Enoch Furquim Werneck Lima[(2)]

Uso do modelo SWAT na estimativa da vazão e da produção de sedimentos em bacia agrícola do Cerrado Brasileiro

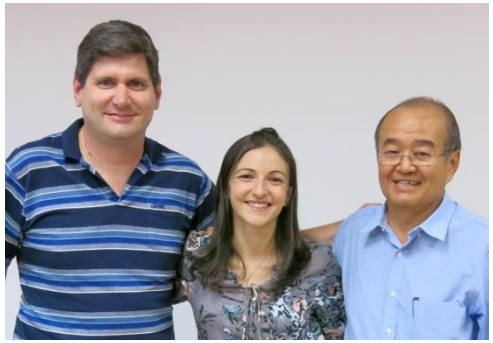
Flávio Hermínio de Carvalho, Marilusa Pinto Coelho Lacerda, Jorge Enoch Furquim Werneck Lima

Em relação à análise de sensibilidade dos parâmetros, CN2 e SOL_K tiveram comportamento amplamente dominante no processo. O parâmetro ESCO teve pequena influência, enquanto alterações nos demais parâmetros produziram pouca ou nenhuma resposta no modelo.

Impacts of a specific soil database on streamflow simulation with SWAT in an experimental rural catchment of the Brazilian savanna

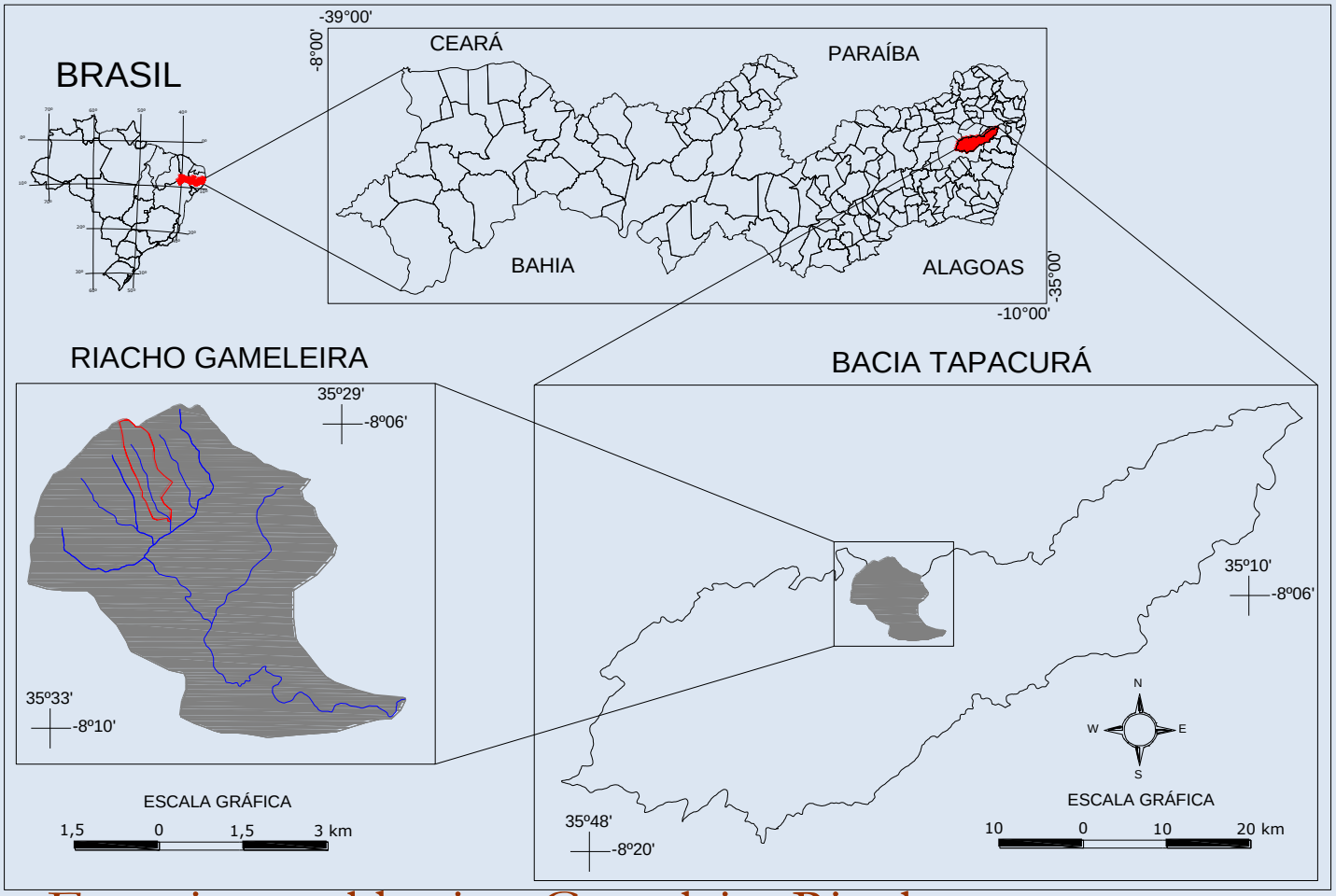
Kássia Batista de Castro[(1)], Henrique Llacer Roig[(1)] e Jorge Enoch Furquim Werneck Lima[(2)]

Publications- UnB - Brasília



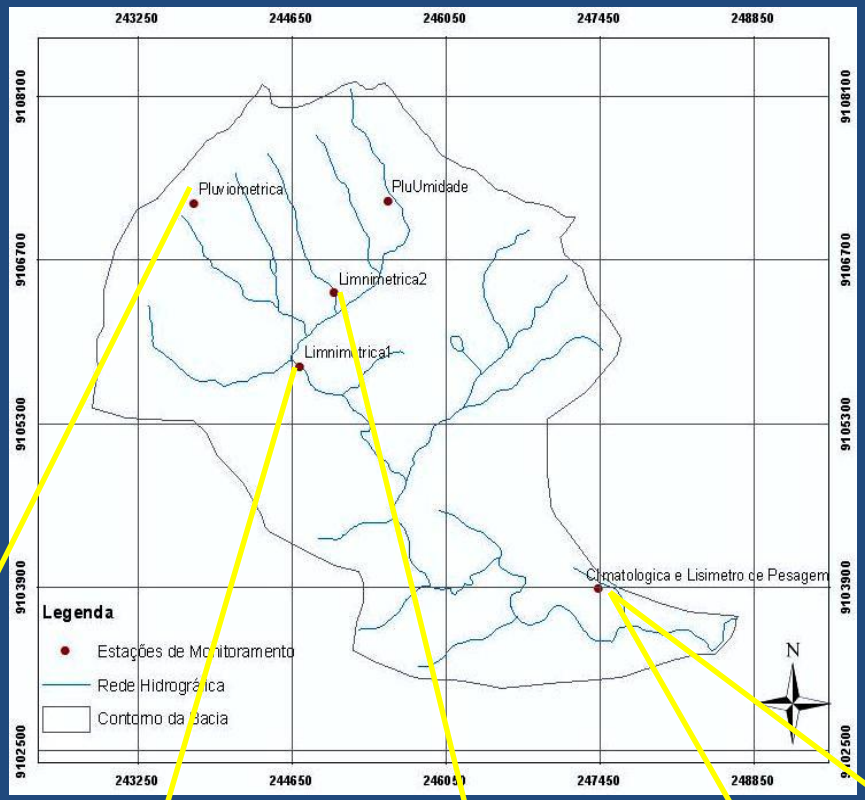
- Ferrigo, S.; Minoti, R.T.; Koide, S. **USING THE SWAT MODEL TO ESTIMATE SEDIMENT PRODUCTION OF DIFFERENT LAND USE IN THE CAPÃO COMPRIDO SUB-BASIN (BRASÍLIA - DF)** – 2011.
- Ferrigo, S.; Minoti, R.T.; Roig, H.L.; Koide, S. **SEDIMENT LOAD ESTIMATION WITH SWAT MODEL ANALYSIS IN A SMALL RURAL WATERSHED CALIBRATED ONLY FOR STREAMFLOW** – 2012.
- Ferrigo, S.; Minoti, R.T.; Roig, H.L.; Koide, S. **EVALUATION OF THE USE OF DIFFERENT METHODS IN AUTOMATIC CALIBRATION OF SWAT MODEL**– 2013.
- Ferrigo, S. **ANALYSIS OF CONSISTENCY OF SWAT MODEL PARAMETERS OBTAINED BY AUTOMATIC CALIBRATION - CASE STUDY OF DESCOBERTO LAKE CATCHMENT – DF** - 2014.
- Ferrigo, S.; Minoti, R.T.; Roig, H.L.; Koide, S. **ASSESSMENT OF THE APPLICABILITY OF THE SWAT MODEL TO SIMULATE THE STREAMFLOW IN A RURAL CATCHMENT IN THE FEDERAL DISTRICT (BRAZIL)** – 2014.

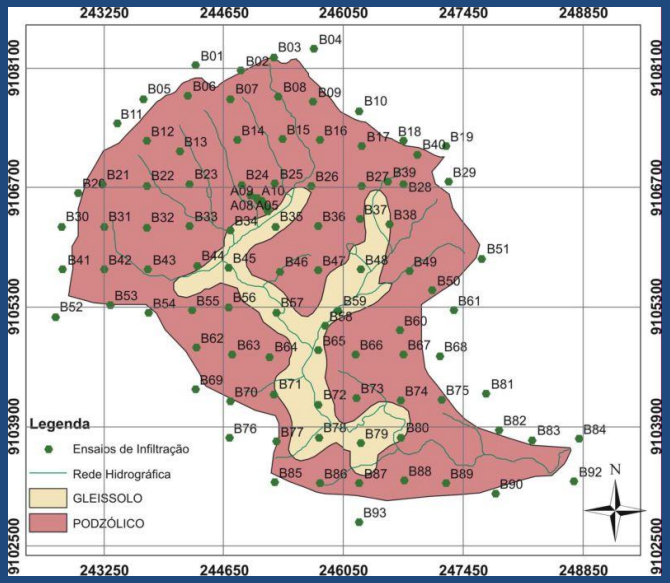
Study Area- UFPE



Experimental basin: Gameleira Rivulet

Gameleira Experimental Basin





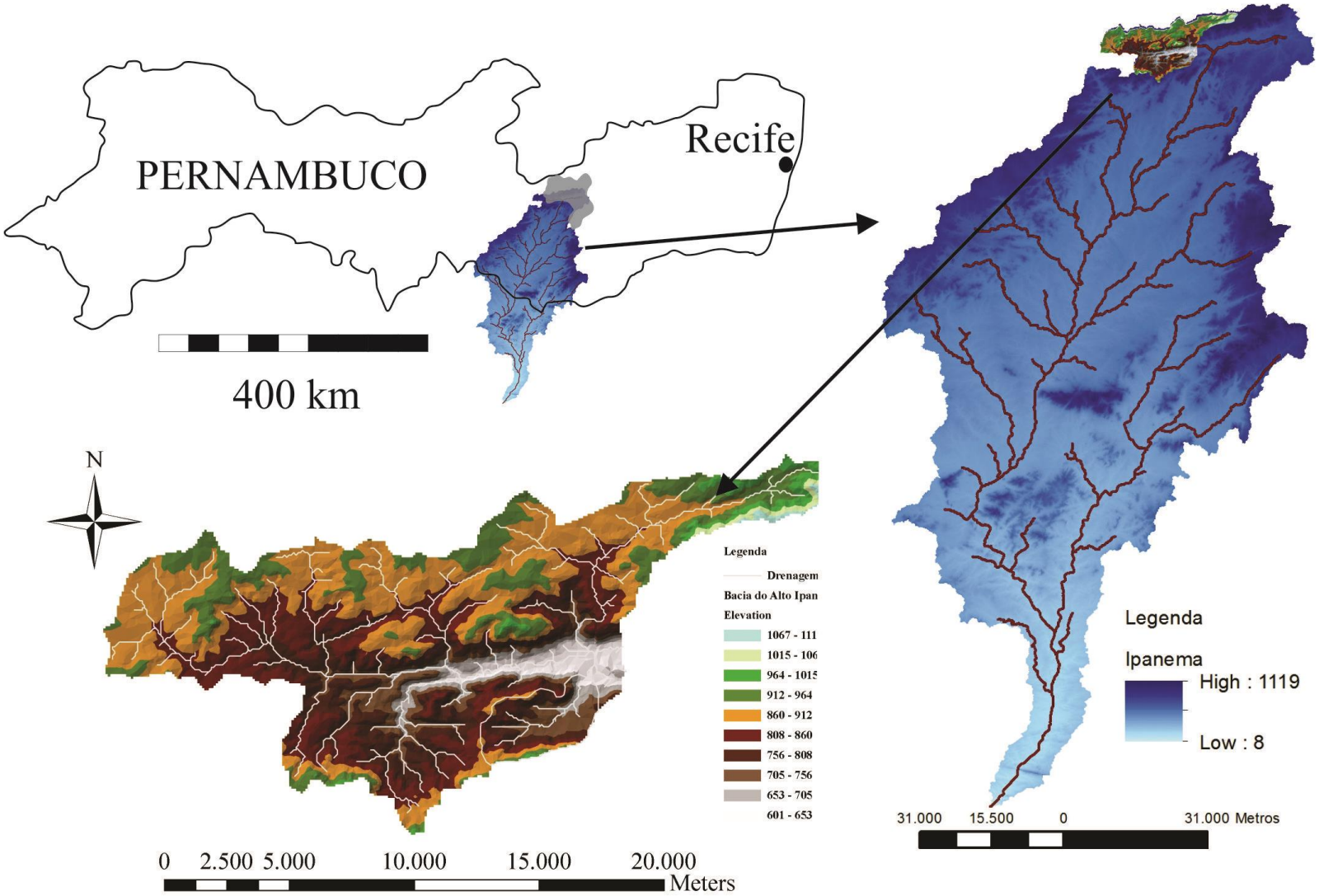
Infiltration experiments- Berkan Method

Publications - UFPE

Santos et al. 2014.

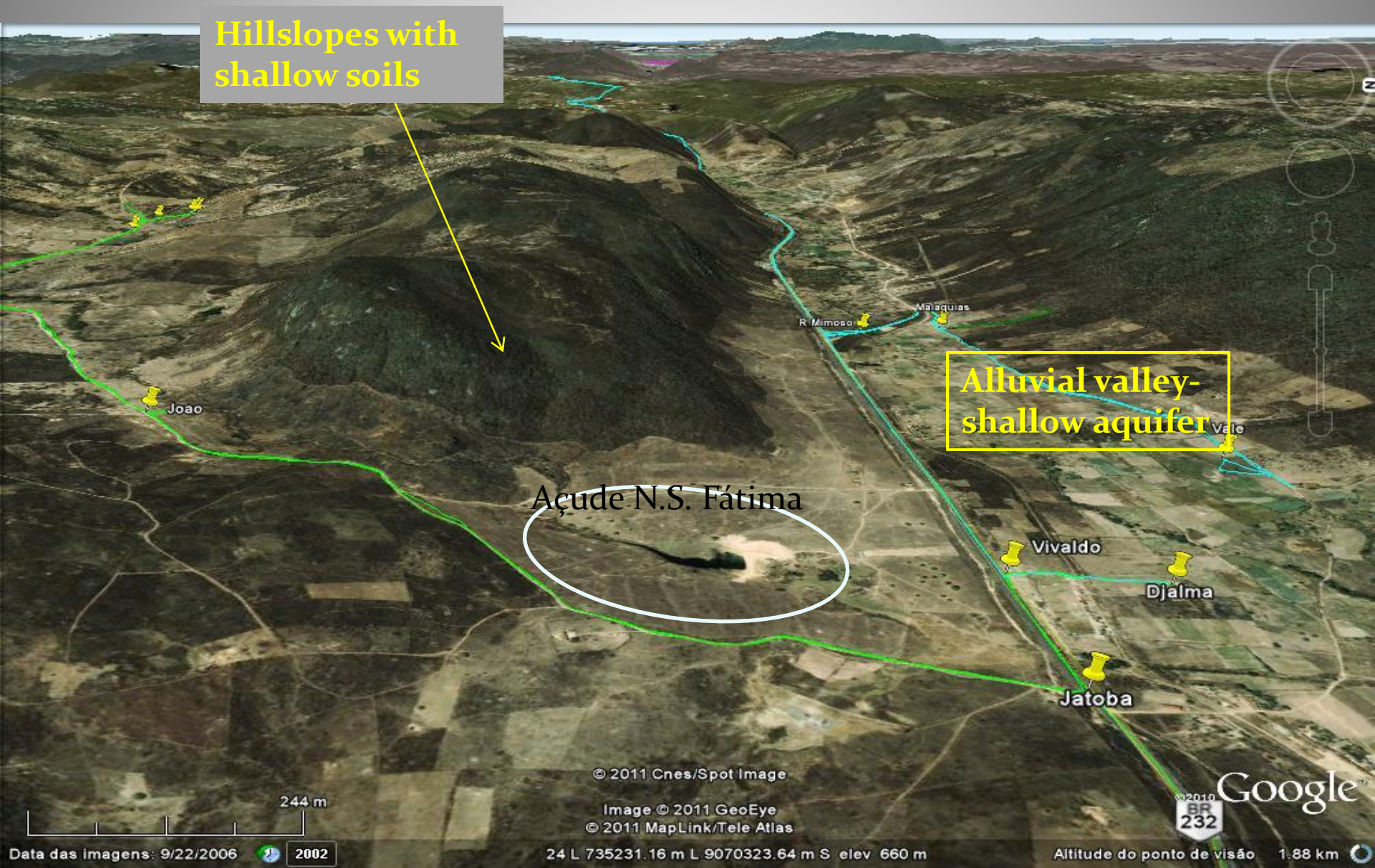
Assessment of runoff in the Tapacurá River Basin (Pernambuco state, Brazil) using SWAT model. SWAT 2014 Conference Porto de Galinha, PE, Brazil.

Ipanema Representative Basin- UFRPE



Location Alto Ipanema Basin in Ipanema Basin in the state of Pernambuco

Alto Ipanema- Mimoso Catchments

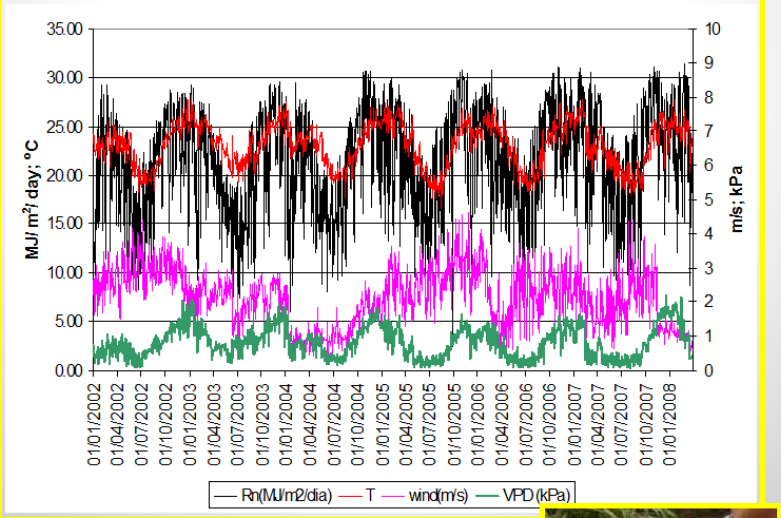


EX SEMINE SEGES

09/2008 19:36

6880 Bracket
3/4" x 1"
NU-RAIL
Connect
p/n 1049
arm
SR50

2013/07/18 12:07


MJ/ m2 day; °C
m/s; kPa
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
10
9
8
7
6
5
4
3
2
1
0
01/01/2002
01/04/2002
01/07/2002
01/10/2002
01/01/2003
01/04/2003
01/07/2003
01/10/2003
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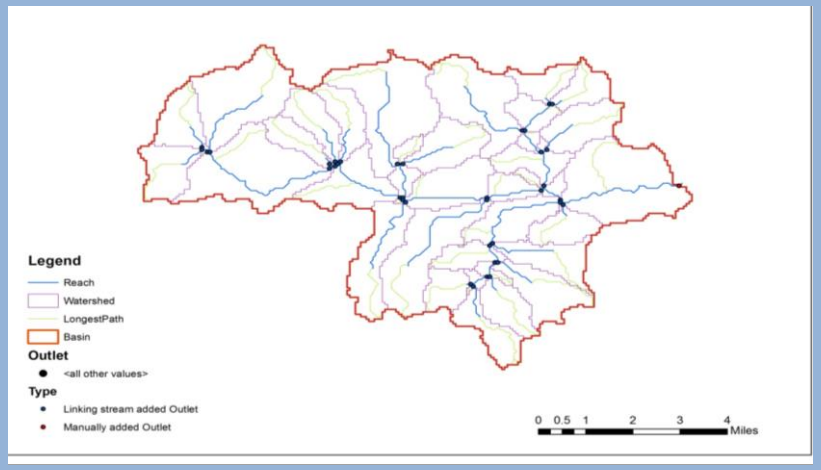
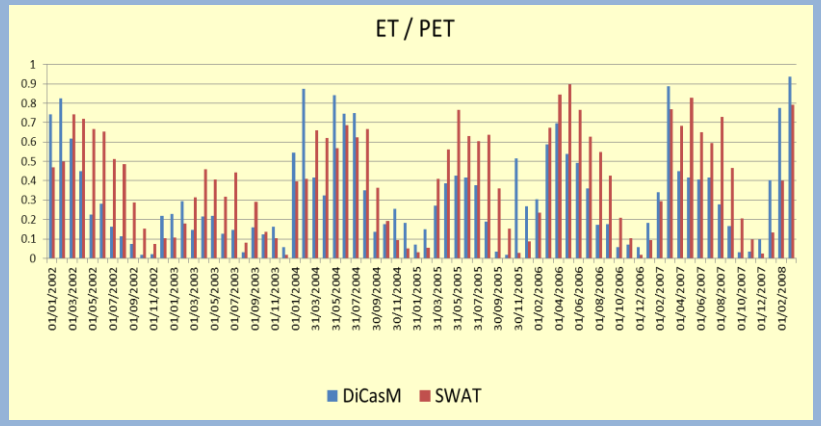
01/04/2007
01/07/2007
01/10/2007
01/01/2008
Rn(MJ/m2/dia)
T
wind(m/s)
VPD (kPa)

10
20
30
40
50

Brazil
2014 International SWAT Conference
July 28 - 29 - Workshops in Recife • July 30 - August 1 - Conference in Porto de Galinhas


Legend
Reach
Watershed
LongestPath
Basin
Outlet
<all other values>
Type
Linking stream added Outlet
Manually added Outlet
0 0.5 1 2 3 4
Miles


ET / PET
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
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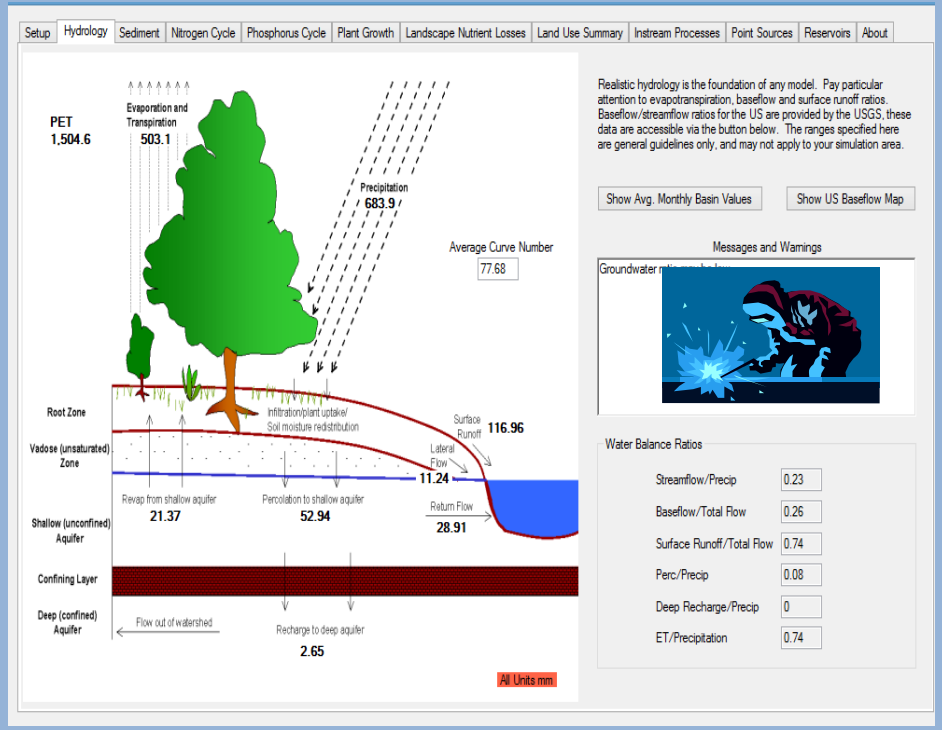
01/12/2007
01/02/2008
DiCasM
SWAT


Setup
Hydrology
Sediment
Nitrogen Cycle
Phosphorus Cycle
Plant Growth
Landscape Nutrient Losses
Land Use Summary
Instream Processes
Point Sources
Reservoirs
About
PET
1,504.6
Evaporation and Transpiration
503.1
Precipitation
683.9
Average Curve Number
77.68
Root Zone
Vadose (unsaturated) Zone
Shallow (unconfined) Aquifer
Confining Layer
Deep (confined) Aquifer
Infiltration/plant uptake/ Soil moisture redistribution
Surface Runoff
116.96
Lateral Flow
11.24
Revap from shallow aquifer
21.37
Percolation to shallow aquifer
52.94
Return Flow
28.91
Flow out of watershed
Recharge to deep aquifer
2.65
All Units mm
Realistic hydrology is the foundation of any model. Pay particular attention to evapotranspiration, baseflow and surface runoff ratios. Baseflow/streamflow ratios for the US are provided by the USGS, these data are accessible via the button below. The ranges specified here are general guidelines only, and may not apply to your simulation area.
Show Avg. Monthly Basin Values
Show US Baseflow Map
Messages and Warnings
Water Balance Ratios
Streamflow/Precip 0.23
Baseflow/Total Flow 0.26
Surface Runoff/Total Flow 0.74
Perc/Precip 0.08
Deep Recharge/Precip 0
ET/Precipitation 0.74

Impact of Land Use changes on Runoff in a Representative Basin in the Semiarid of Pernambuco State Using the SWAT Model

R.V. FONTES JÚNIOR & A.A. MONTENEGRO

Experimental and simulated runoff by the curve number model for cassava cropping under different agricultural practices

LIMA, C. A.; MONTENEGRO, A. A. A.; SANTOS, T. E. M.; MONTEIRO, A. L. N.; PEREIRA, E. G.

Conclusions- Next Steps of REHIDRO

- Improve simulations using SWAT;
- Evaluate possible new developments in the model;
- Expand field measurements;
- Carry out a more integrated approach in REHIDRO;
- Adopt the SWAT model as a tool for **comparative Hydrology** studies in REHIDRO

Acknowledgments

CT BRASIL
Ministério da Ciência e Tecnologia
cgee FINEP CNPq
CT Hidro
FUNDO SETORIAL DE RECURSOS HÍDRICOS

FINEP
FINANCIADORA DE ESTUDOS E PROJETOS
MINISTÉRIO DA CIÊNCIA E TECNOLOGIA

FACEPE

CISA
Cooperação Internacional
do Semi-Árido

CNPq
Conselho Nacional de Desenvolvimento
Científico e Tecnológico

Thank you

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