Thursday, July 31, 2014

SWAT
2014 Conference
Pernambuco, Brazil

9:30 – 10:50 a.m.	**SESSION E1: ENVIRONMENTAL APPLICATIONS** Room: Caboclinhos	**Moderator:** Eduardo Mario Mendiondo *USP-EESC, Brazil*
9:30 – 9:50 a.m.	Bloodless Dzwairo	Application of SWAT to water quality modelling in the Rietspruit sub-basin of South Africa
9:50 – 10:10 a.m.	Antönio Heriberto de Castro Teixeira	Large Scale Energy Balance in the Juazeiro Municipality Brazil
10:10 – 10:30 a.m.	Yaobin Meng	A Model for Heavy Metal Dynamics Coupled with SWAT and Its Application in Liuyang River Upstream Basin in China
10:30 – 10:50 a.m.	Eduardo Mario Mendiondo	On contrasting field evidences of water quality to perform physically-based SWAT simulations in challenging Brazilian biome under change

2014 International SWAT Conference

Hotel Armação, Porto de Galinhas, Ipojuca, Pernambuco, Brazil

On contrasting field evidences of water quality to perform physically-based SWAT simulations in a challenging Brazilian biome under change

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[2] **Professor at University of Sao Paulo, Sao Carlos School of Engineering- EESC/USP, Brazil;**

[3] **Coordinator, National Center of Monitoring & Early Warning of Natural Disasters - CEMADEN, Brazil.**

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Water in the Anthropocene: Challenges for Science & Governance **2013 May 21-24, Bonn, Germany**

Integrating water quantity and quality for environmental regimes based on adaptive water resources management and planning under change

Taffarello, D.[1]; Mendiondo, E.M.[1]; Calijuri, M.C.[1]; Cunha, D.G.F. [1]

Water in the Anthropocene: Challenges for Science & Governance **2013 May 21-24, Bonn**

"A new perspective on environmental flows of Brazilian catchment under change: multidimensional approach of qualiquantitative frequency curves for hydrological ecosystem services assessment"

Taffarello, D.[1]; Mendiondo, E.M.[2]

XX SIMPÓSIO BRASILEIRO DE RECURSOS HÍDRICOS
ÁGUA • DESENVOLVIMENTO ECONÔMICO E SOCIOAMBIENTAL
17 - 22 DE NOVEMBRO DE 2013 - BENTO GONÇALVES / RS

PLANO DE MONITORAMENTO HIDROLÓGICO DO PROJETO PILOTO "PRODUTOR DE ÁGUA" NAS BACIAS PCJ

HIDRÁULICA SANEAMENTO
The Nature Conservancy
Proteger a natureza é preservar a vida.

Taffarello, D. [1]; Lombardi, R[2].; Guimarães, J.[2]; Zaffani, A.G[1].; Calijuri, M.C.[1]; Mendiondo, E.M.[1]*
[1] Depto. de Eng. Hidráulica e Saneamento, EESC/USP - [2] The Nature Conservancy Brasil - taffarellod@gmail.com; emm@sc.usp.br

XX SIMPÓSIO BRASILEIRO DE RECURSOS HÍDRICOS
ÁGUA • DESENVOLVIMENTO ECONÔMICO E SOCIOAMBIENTAL
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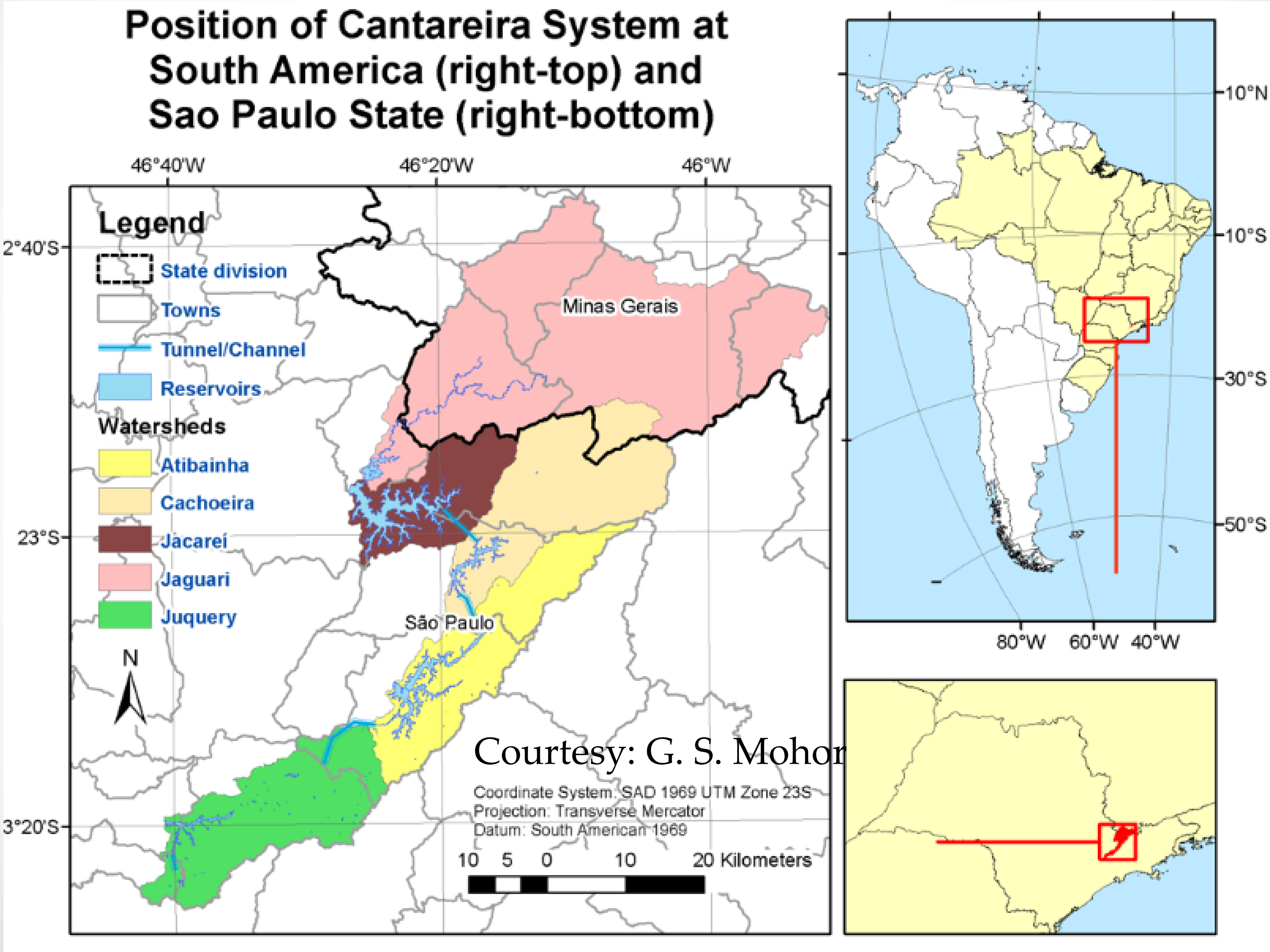
USO DA ECOHIDROLOGIA PARA MONITORAMENTO DO PSA-ÁGUA NO ESTADO DE SÃO PAULO

HIDRÁULICA SANEAMENTO

Carolina Chalella Mazzocato[1]; Denise Taffarello[2] & Eduardo Mario Mendiondo[3]

Brazilian Atlantic Forest is a challenging biome under changing conditions affecting tthe Water-Energy-Food Security nexus at the short-, medium- and long-term



1- How do we address practical yardsticks for modeling*-users and field hydrologists about non-linear behaviors of pollution loads?

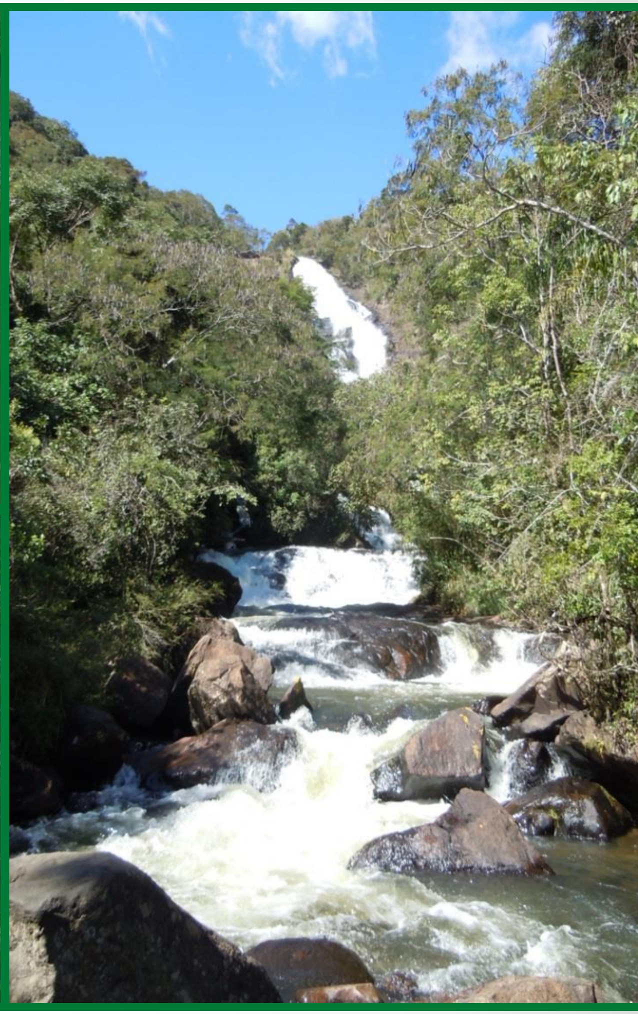
2- How could experimental water quality data help predicting uncertainty in model* set-ups & outputs?

3- In what manner runoff evidences in field could help on optimizing novel monitoring & early warning strategies of hydrological cycle?

- Outline contrasting field water quality data to perform further physically-based modeling* at biomes under change
- Integrate short-term evidences at headwaters to optimize long-term monitoring & early warning strategies at strategic river basins
- Explore empirical variability of datasets which bound inherent hydrological uncertainty related to W-E-F security programs

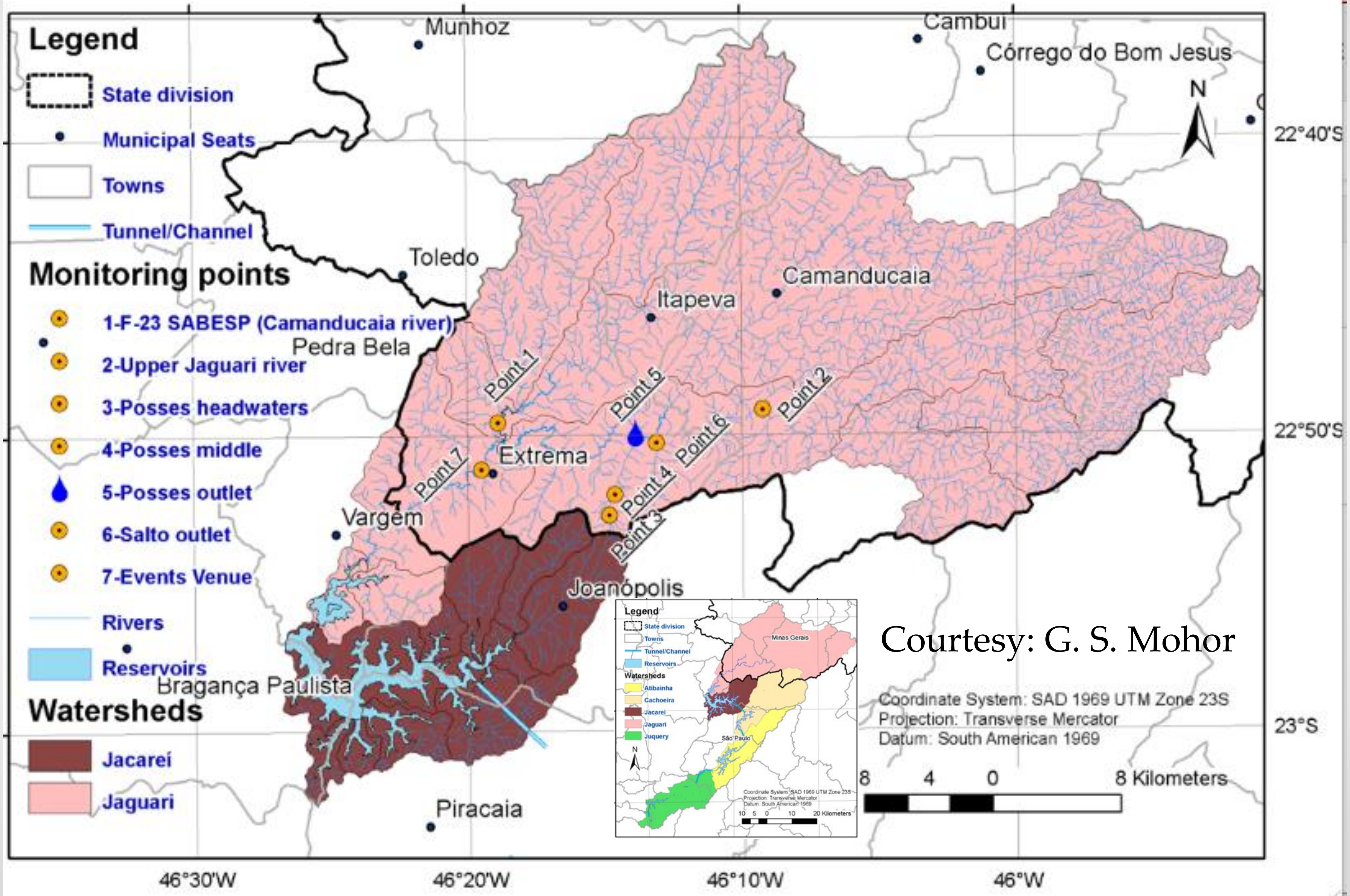

ESTAÇÃO FLUVIOMÉTRICA
F30


Aqui nasce o
Rio Piracicaba
Prefeitura Municipal da
Estância Turística de Joanópolis



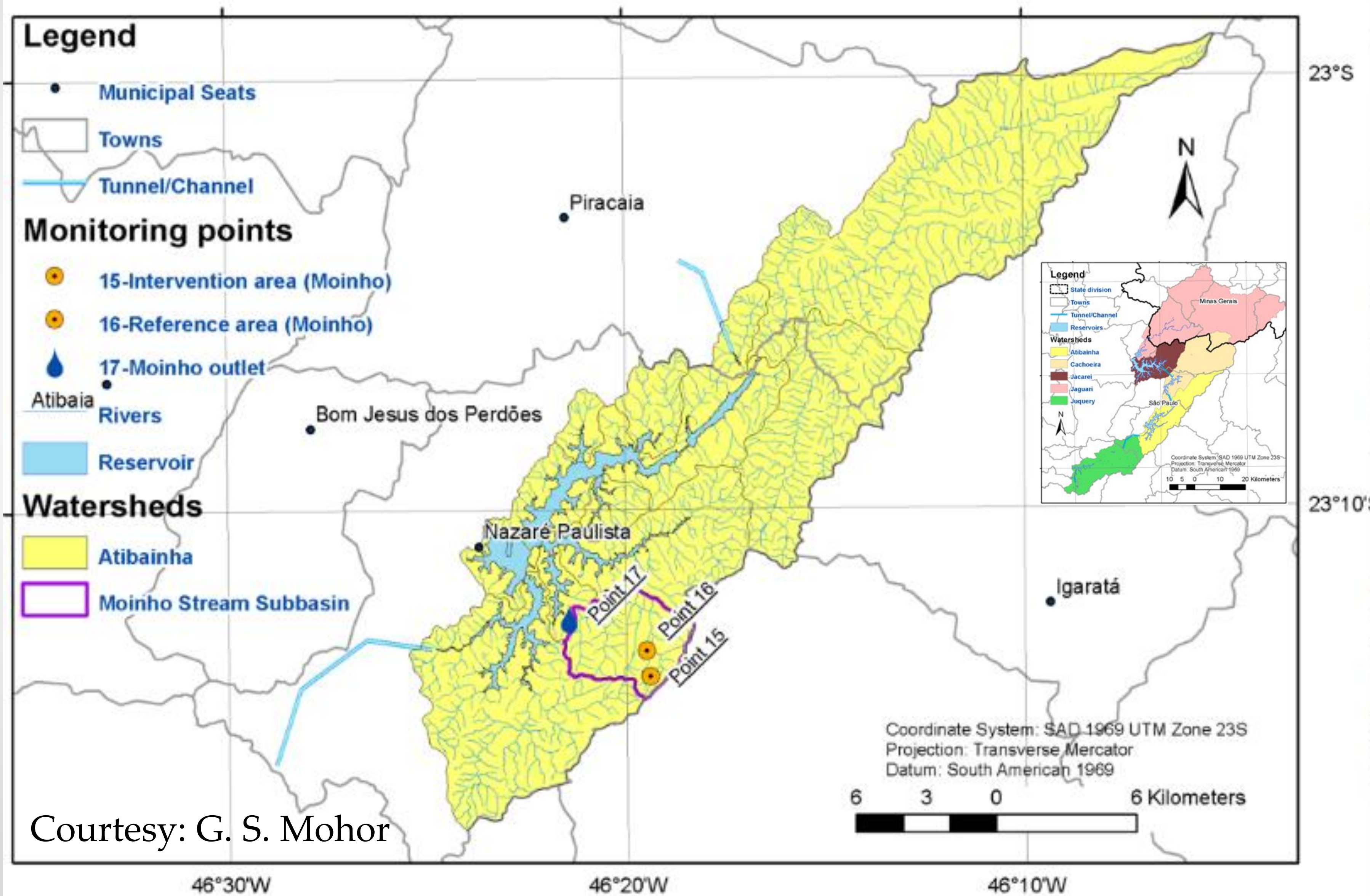
- Selected experiments at Southeastern Brazilian Atlantic Forest
- Sites at transboundary PCJ's headwaters (States of MG & SP)
- Altitudes 900-1350 m.a.m.s.l., $<P> = 1400\text{-}1750$mm, ETP/P = 1.2-2.3
- Collecting field & experimental water quality data through a Nested catchment Experiment (NCE) approach at 17 strategic model nodes.
- Bi-monthly field NCE campaigns: September 2013 until May 2014
- Experimental NCE drainage areas from 12 to 130 km^2.
- Characterization of inherent variability of nutrient loads, e.g. Total Phosphorous (TP), Phosphates (PO4), Nitrates ($N\text{-}NO_3$), *E. coli*, etc.
- Experimental variability of water quality and discharges at NCE points
- Seasonal variability of field water quality-and-discharge data
- Specific pollution load = "concentration x flow / drainage area", outline non-linear behaviors throughout spatiotemporal scales
- Regional field relationships to help spatiotemporal model set-ups

Jaguari-Jacareí Subbasins



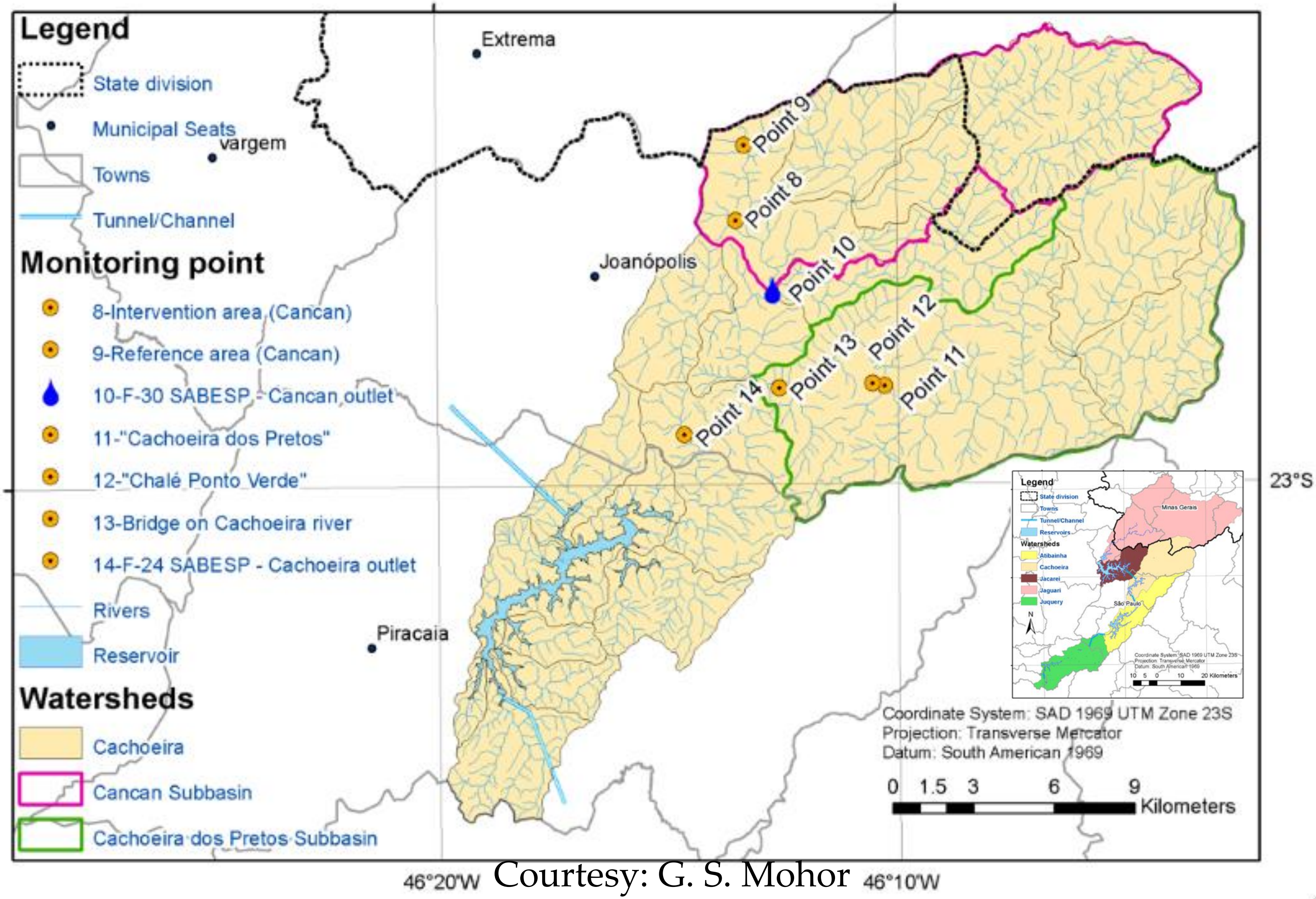
Courtesy: G. S. Mohor

Atibainha Subbasin



Courtesy: G. S. Mohor

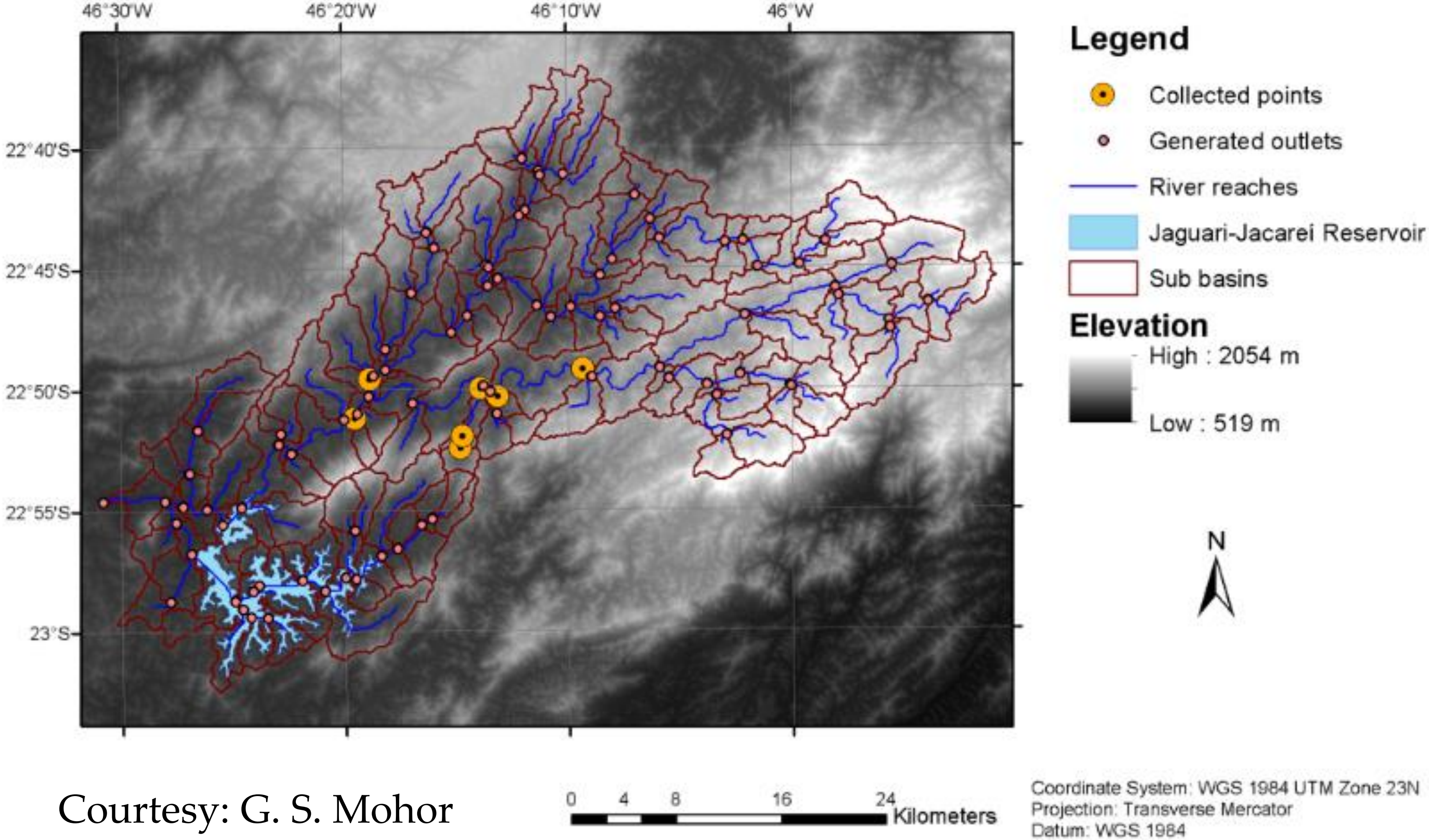
Cachoeira Subbasin



Courtesy: G. S. Mohor

Field Campaign	NCE-Type	Goal	Number of samples	Period	API (15d) (mm)
1	Exploratory	Determination of local of monitoring	12	DEC 10-12, 2012	75.1
2	Explortatory	Determination of monitoring points	3	SEP 11 , 2013	13.2
3	Sistematic	Qualitative and quantitative measures	19	OCT 23-25, 2013	99.6
4	Sistematic	Qualitative and quantitative measures	17	DEC 09-10, 2013	126.7
5	Sistematic	Qualitative and quantitative measures	17	MAR 21-23, 2014	76.7
6	Sistematic	Qualitative and quantitative measures	17	MAI 23-25, 2014	23.4

Initial delimitation of Jaguari Watershed within ArcSWAT



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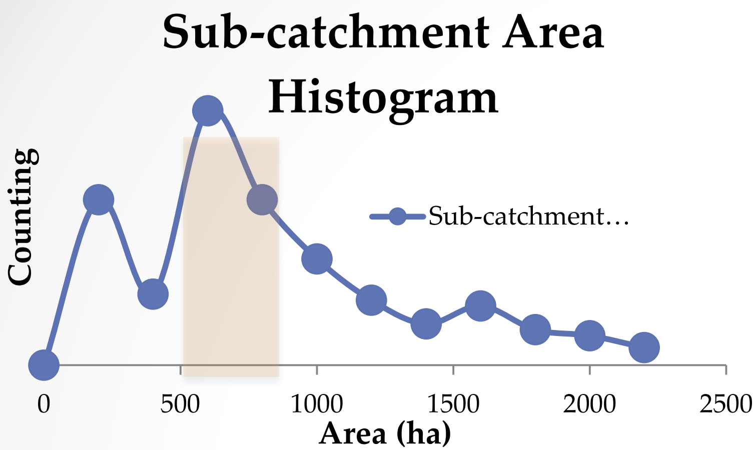
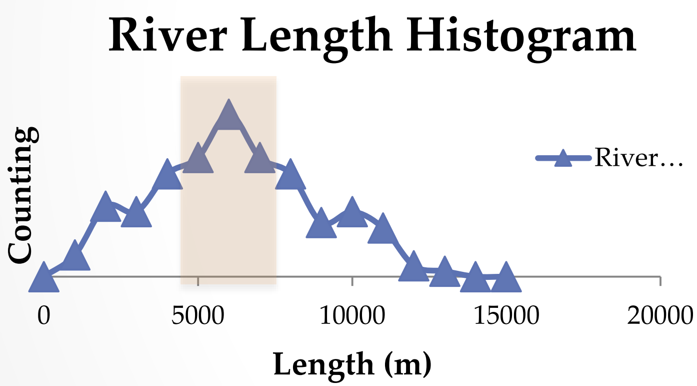
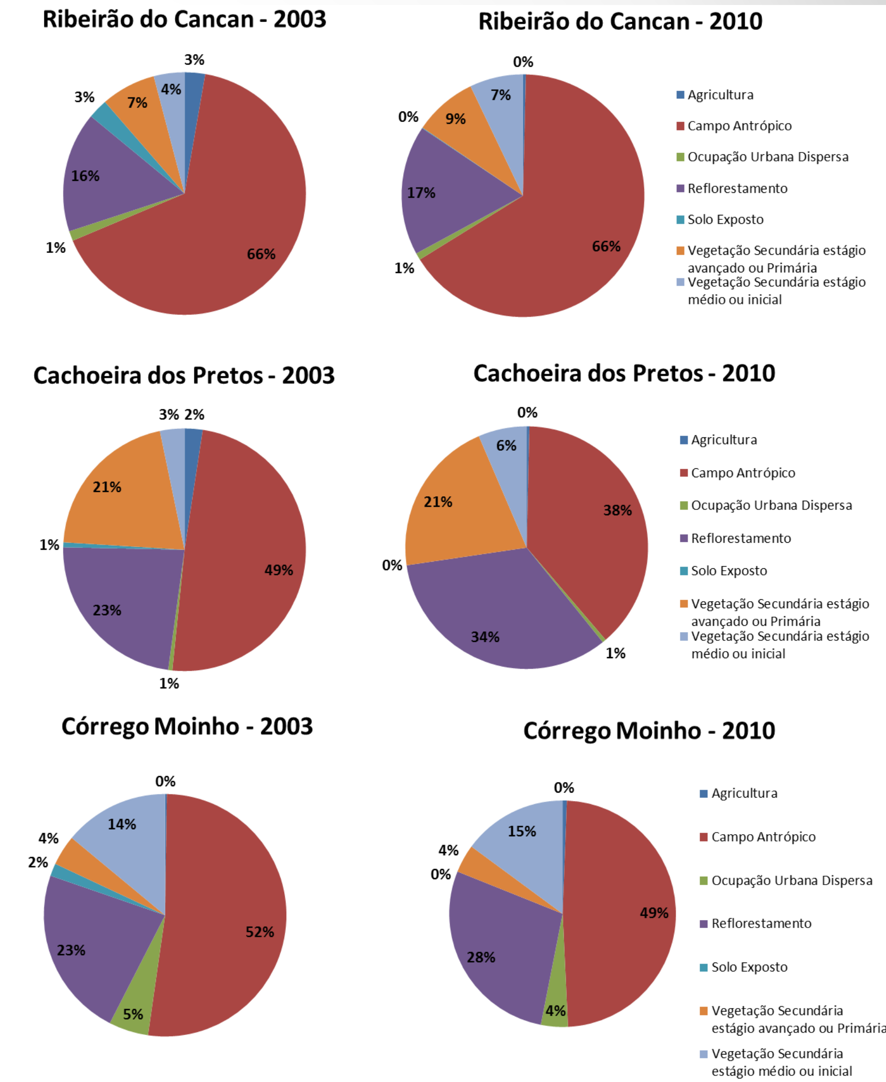
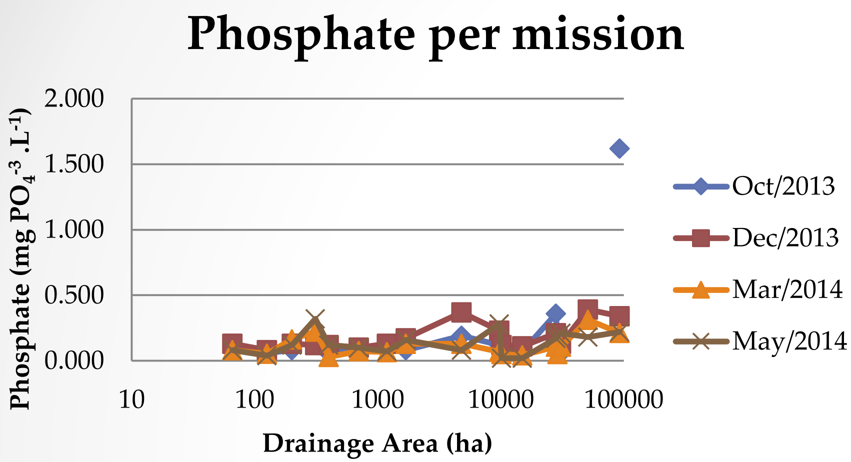


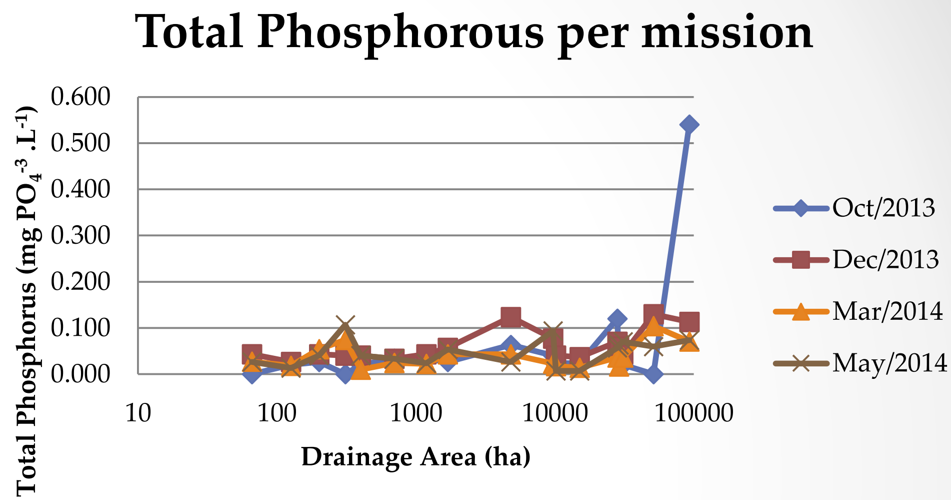


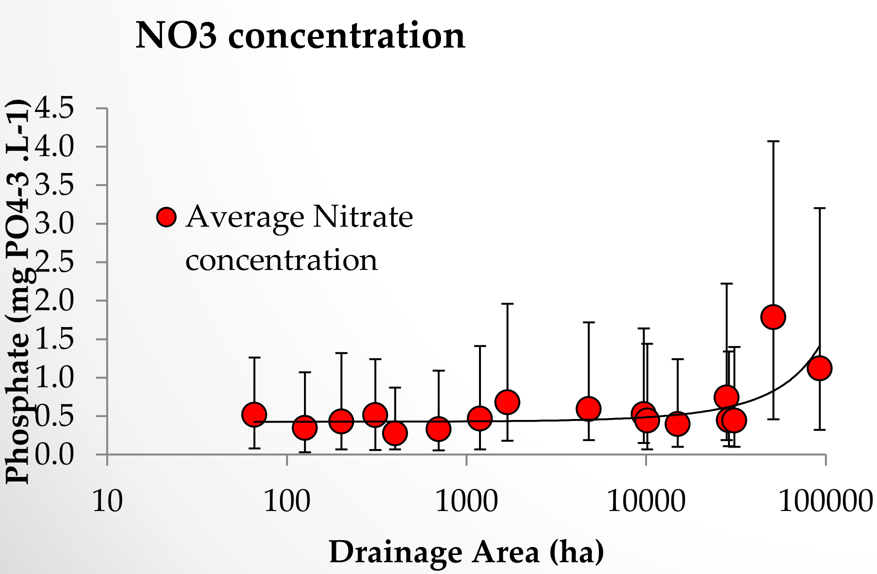


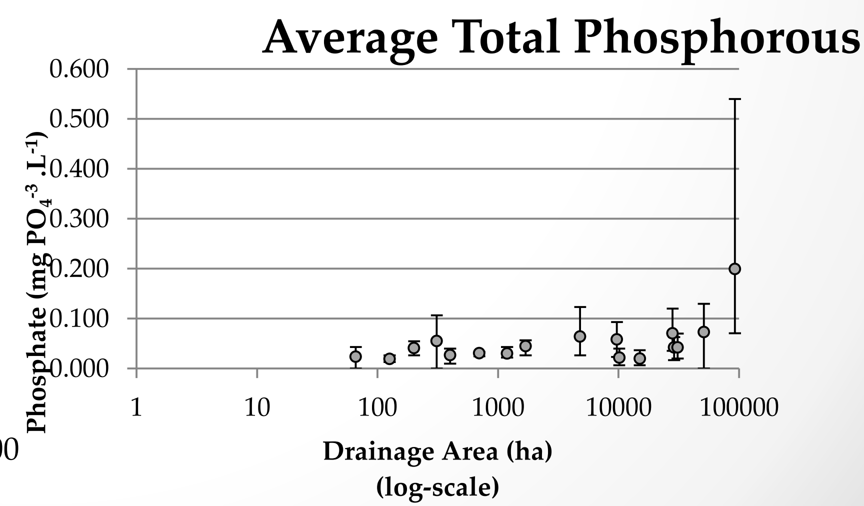
Modeling discretization of setup Cantareira System headwaters

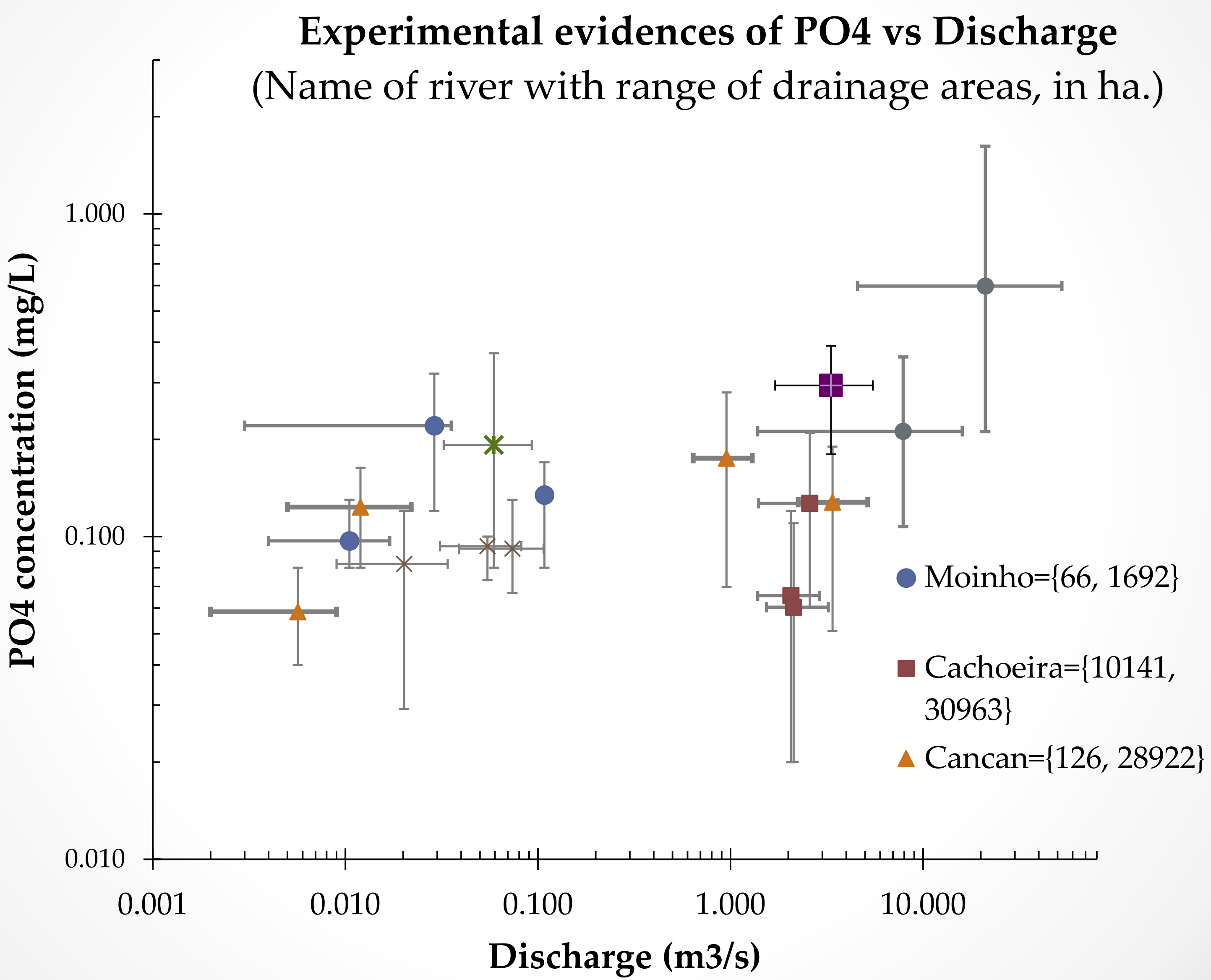
Statistics	Catchment area (ha)	Slope (%)	River Lengtl (m)
Mean	775 ± 582	25 ± 6	5,771 ± 2,754
Minimum	2	5	380
Maximum	2949	36	15,436

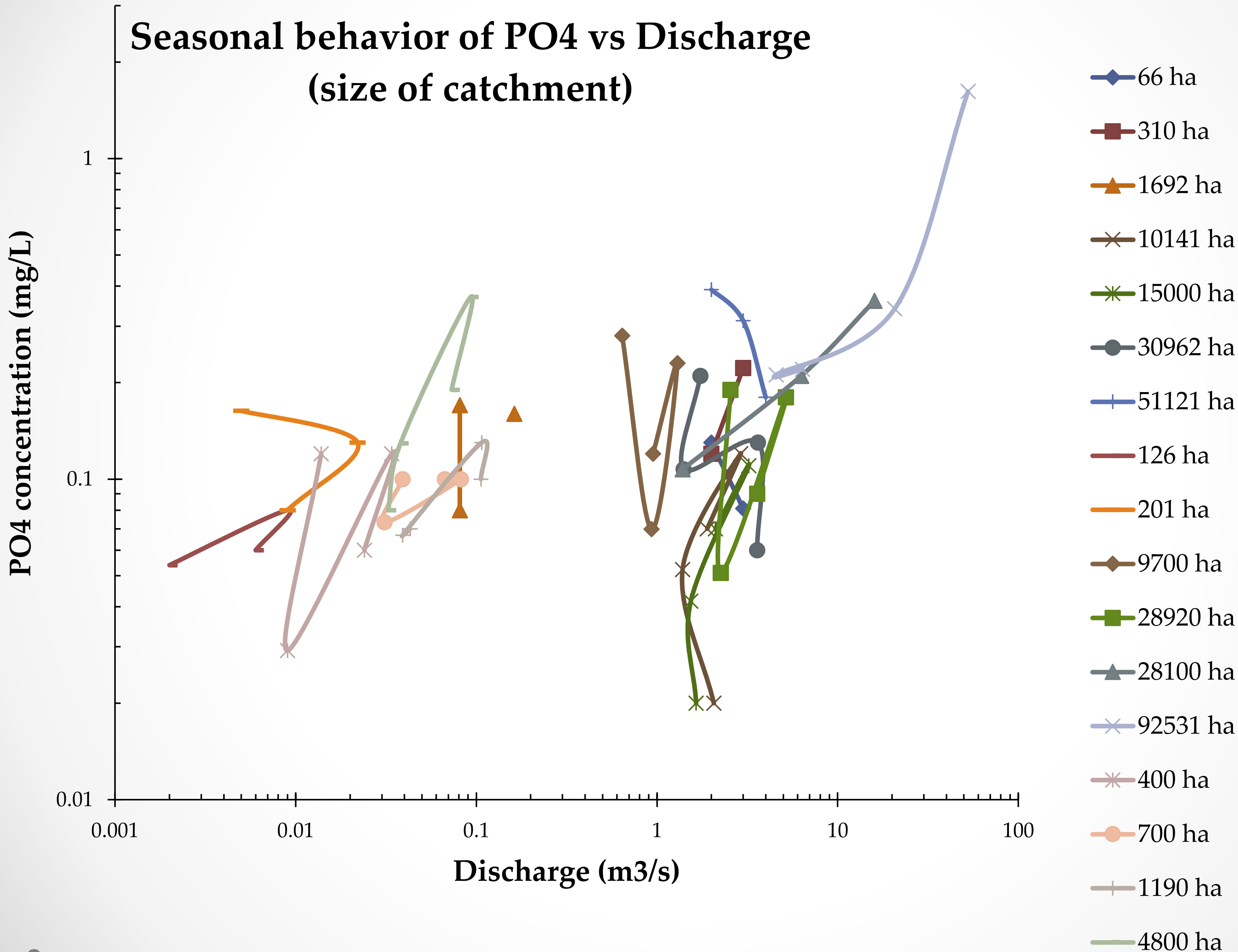

Phosphate per mission
Phosphate (mg PO_4^{-3} .L^{-1})
2.000
1.500
1.000
0.500
0.000
10
100
1000
10000
100000
Drainage Area (ha)
Oct/2013
Dec/2013
Mar/2014
May/2014

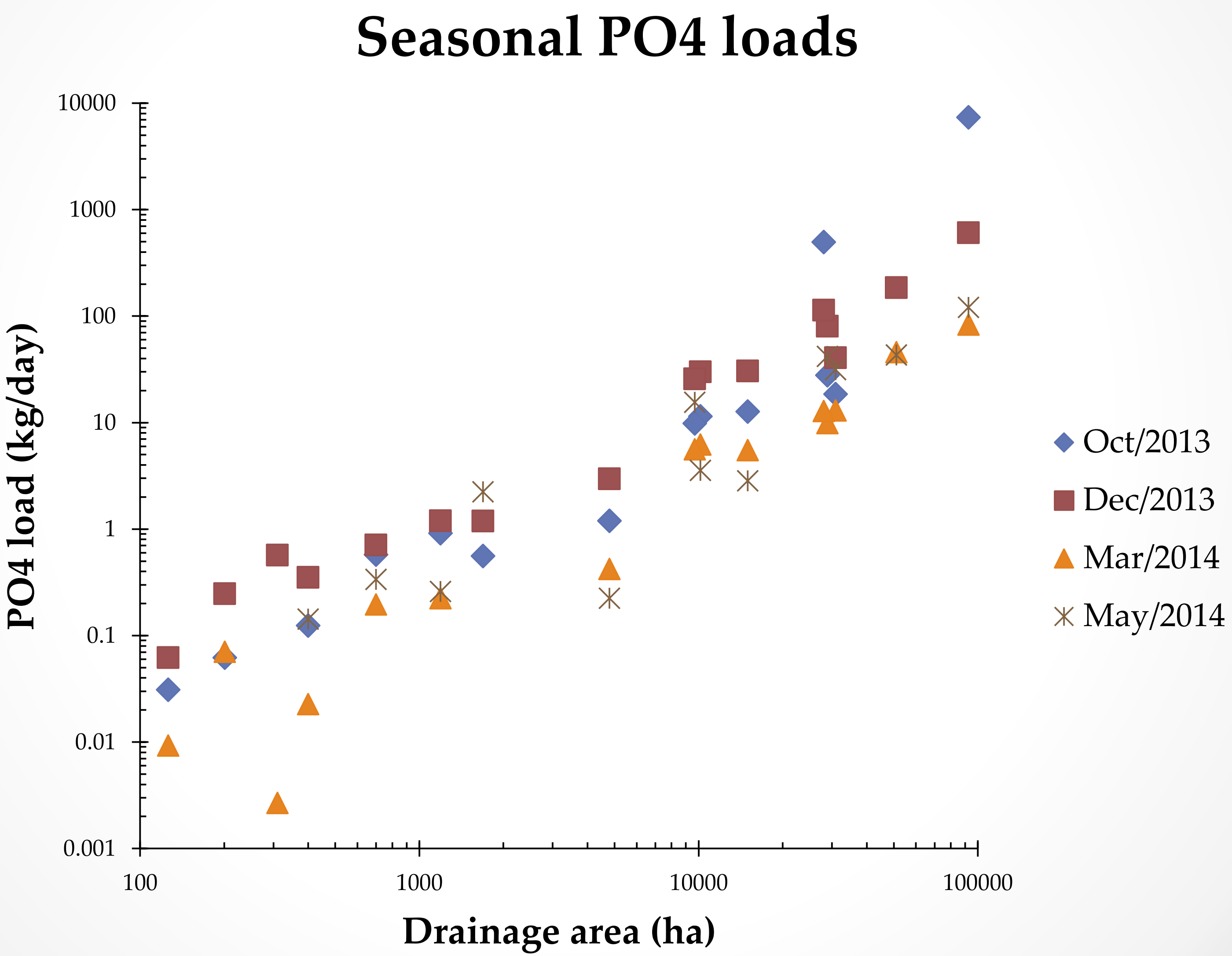

Total Phosphorous per mission
Total Phosphorus (mg PO_4^{-3} .L^{-1})
0.600
0.500
0.400
0.300
0.200
0.100
0.000
10
100
1000
10000
100000
Drainage Area (ha)
Oct/2013
Dec/2013
Mar/2014
May/2014


NO3 concentration
Phosphate (mg PO4-3 .L-1)
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Average Nitrate concentration
10
100
1000
10000
100000
Drainage Area (ha)


Average Total Phosphorous
Phosphate (mg PO_4^{-3} .L^{-1})
0.600
0.500
0.400
0.300
0.200
0.100
0.000
1
10
100
1000
10000
100000
Drainage Area (ha)
(log-scale)


Experimental evidences of PO4 vs Discharge
(Name of river with range of drainage areas, in ha.)
PO4 concentration (mg/L)
1.000
0.100
0.010
0.001
0.010
0.100
1.000
10.000
Discharge (m3/s)
Moinho={66, 1692}
Cachoeira={10141, 30963}
Cancan={126, 28922}

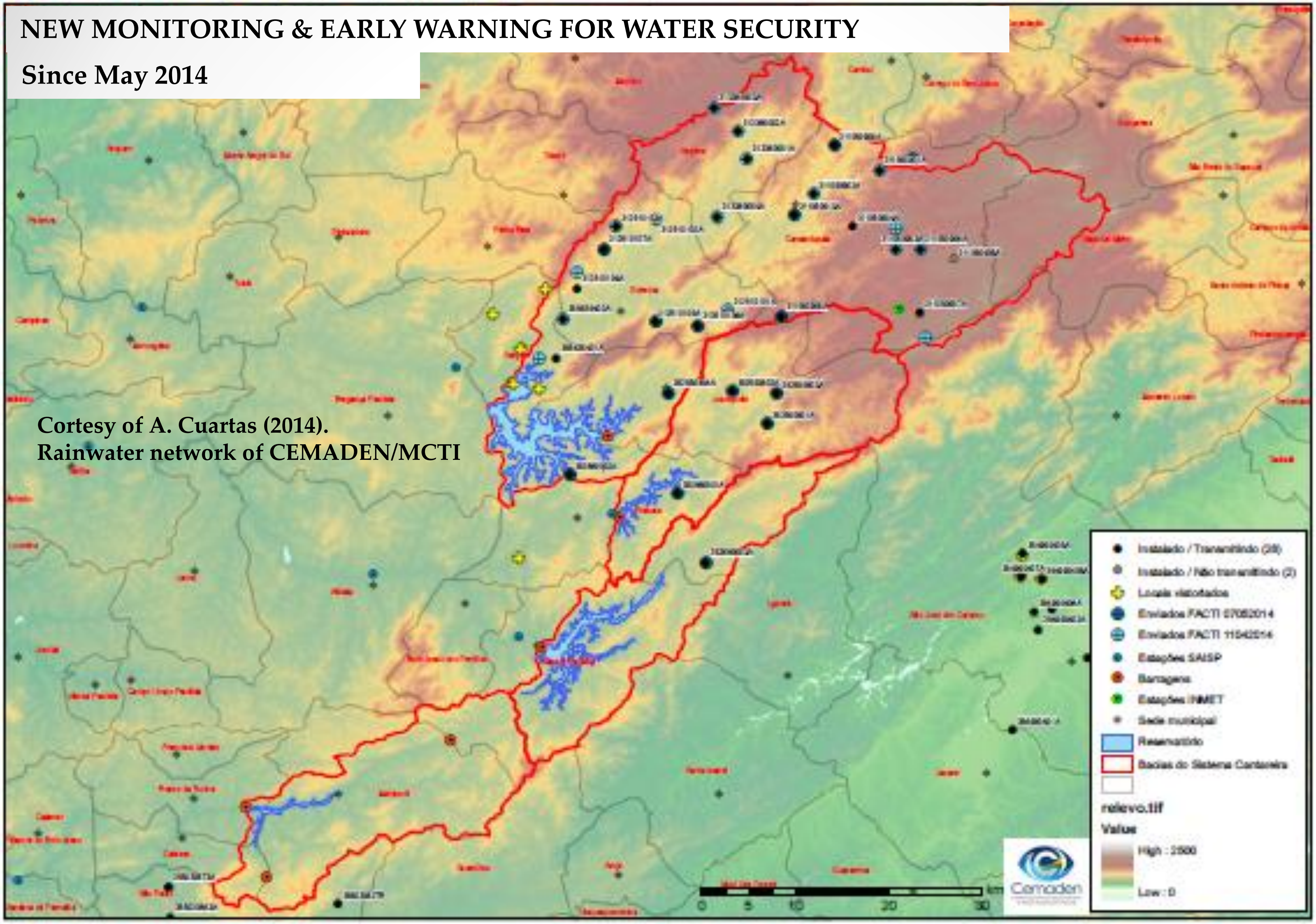

Seasonal behavior of PO4 vs Discharge
(size of catchment)
PO4 concentration (mg/L)
1
0.1
0.01
0.001
0.01
0.1
1
10
100
Discharge (m3/s)
66 ha
310 ha
1692 ha
10141 ha
15000 ha
30962 ha
51121 ha
126 ha
201 ha
9700 ha
28920 ha
28100 ha
92531 ha
400 ha
700 ha
1190 ha
4800 ha


Seasonal PO4 loads
PO4 load (kg/day)
10000
1000
100
10
1
0.1
0.01
0.001
100
1000
10000
100000
Drainage area (ha)
Oct/2013
Dec/2013
Mar/2014
May/2014

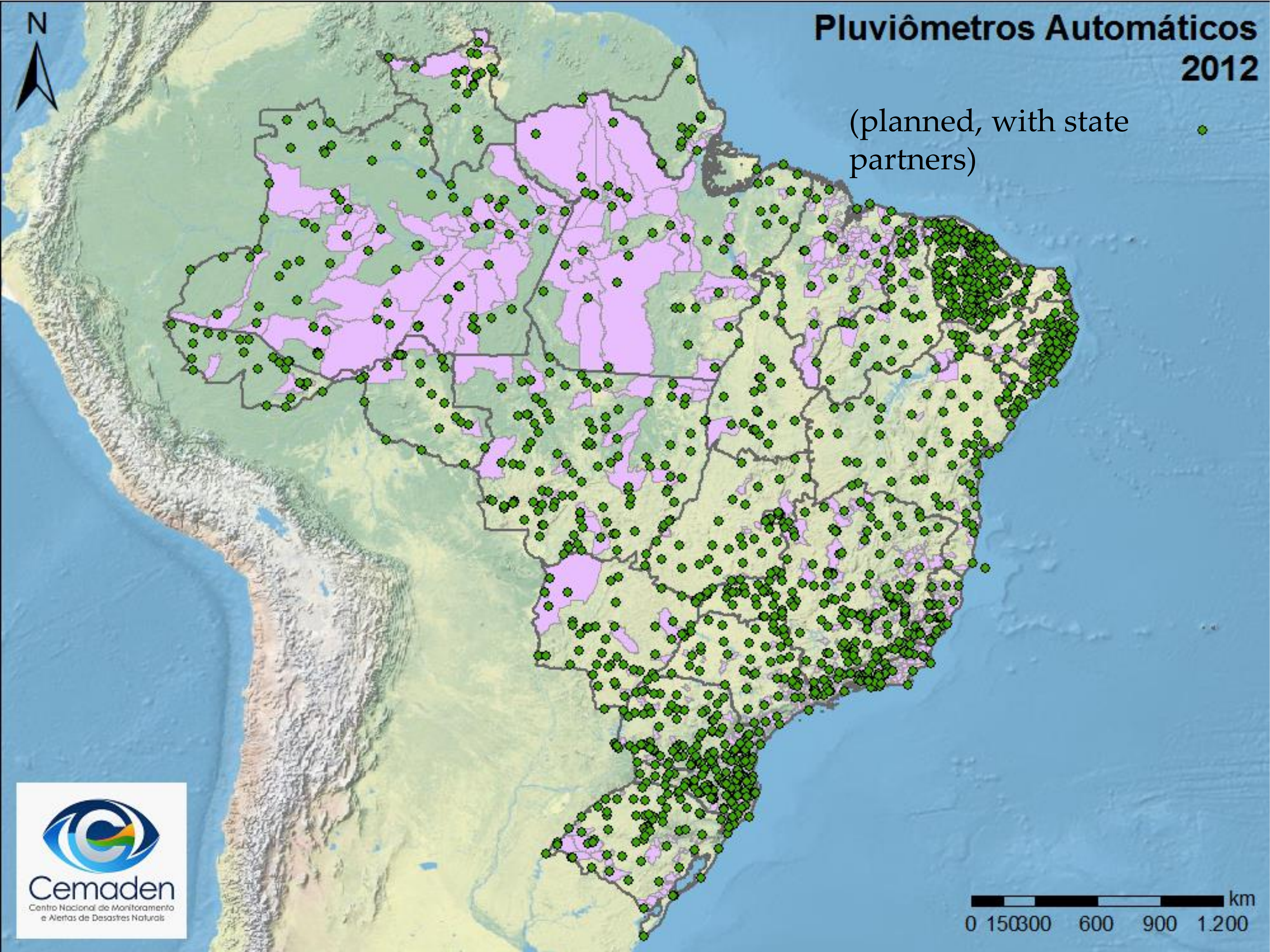
Local partnerships

NEW MONITORING & EARLY WARNING FOR WATER SECURITY

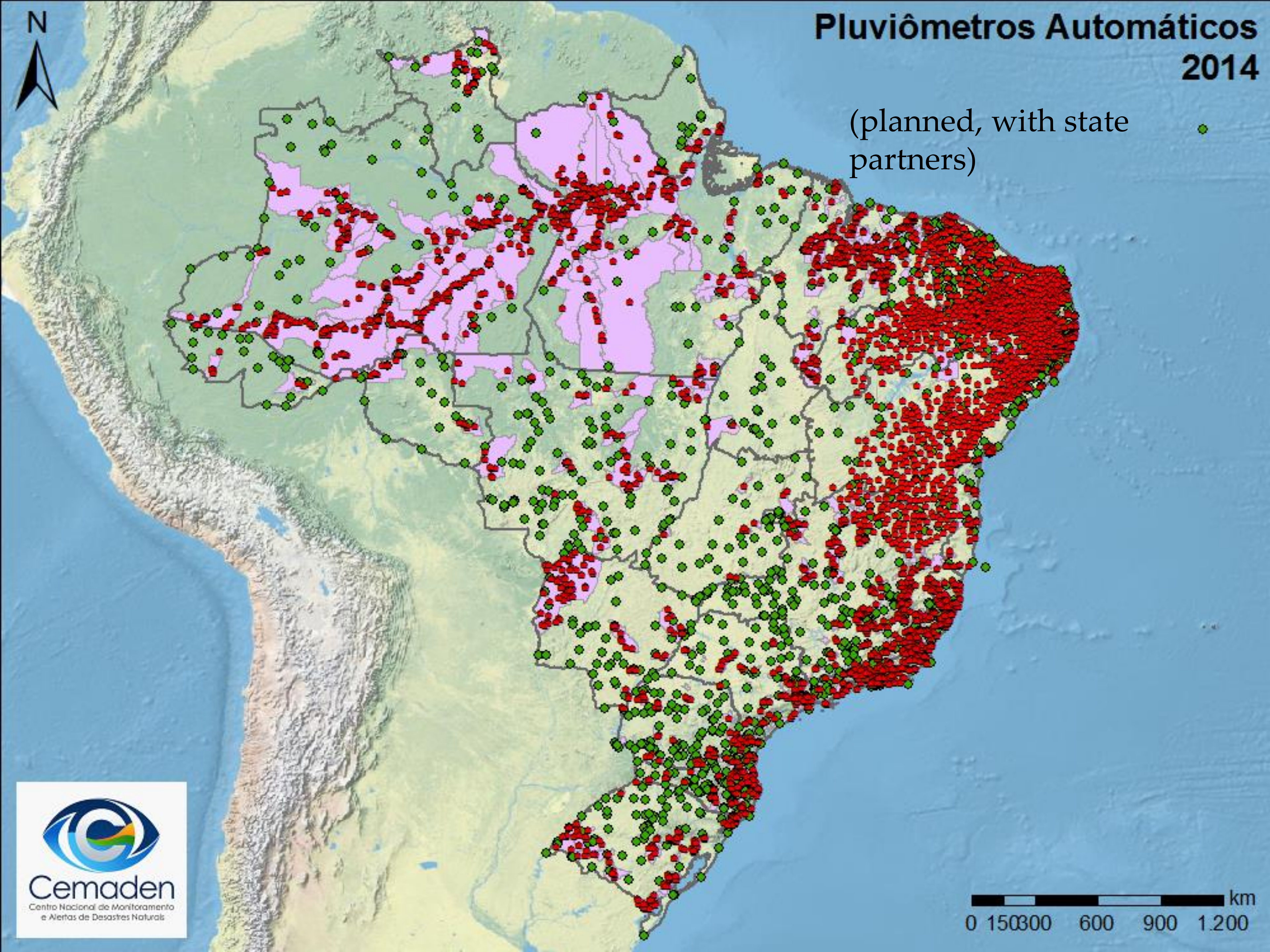
Since May 2014



Cortesy of A. Cuartas (2014).
Rainwater network of CEMADEN/MCTI



Pluviômetros Automáticos
2012
(planned, with state partners)
N
km
0 150300 600 900 1.200
Cemaden
Centro Nacional de Monitoramento e Alertas de Desastres Naturais



Pluviômetros Automáticos
2014
(planned, with state partners)
N
Cemaden
Centro Nacional de Monitoramento e Alertas de Desastres Naturais
km
0 150300 600 900 1.200

- Results depict heavy non-linearities of water quality and quantity of runoff at headwater which provoke a deep reflection on further modeling setups
- Variability intervals permit future calibration, validation and sensitivity analyses under a physically-based framework under non-stationary conditions and land-use change
- Experiments during a quasi-continuously recession period delineate alternative modeling setups at headwaters with strong uncertain hydrology
- High-impact conflicts of 9 million people from water-supply of the “Cantareira System” at Metropolitan Region of Sao Paulo call for a pact of new governance strategies of integrated water resources management under change
- New monitoring and early warning approaches proposed to cope with water scarcity under changing conditions
- Water scarcity scenarios consolidated alliances through public-private partnerships: Consórcio PCJ, USP, TNC, WWF, CBRH/SP, CPRM, ANA, CEMADEN, Municipalities, EMBRAPA, TAMU-AgriLife, INPE, and more…at local, state, national and international levels.

ACKNOWLEDGEMENTS

Núcleo Integrado de Bacias Hidrográficas

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MUITO OBRIGADO!

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