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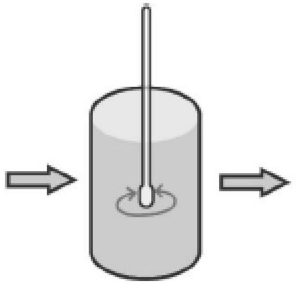
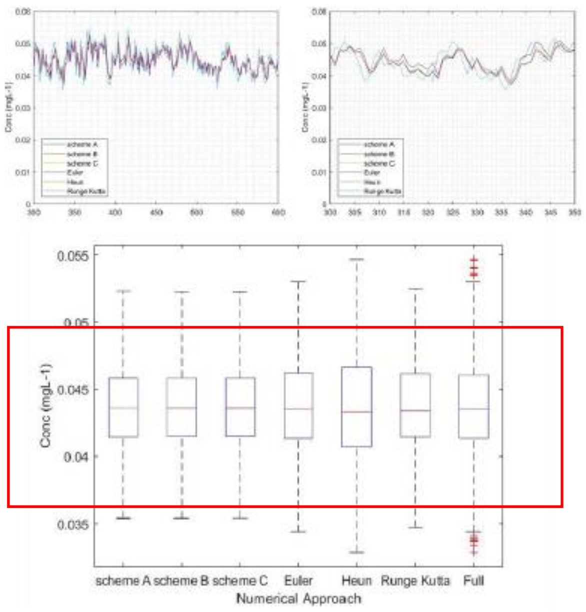


Comparison between numerical and parametrical uncertainty in the application of simplified water quality models

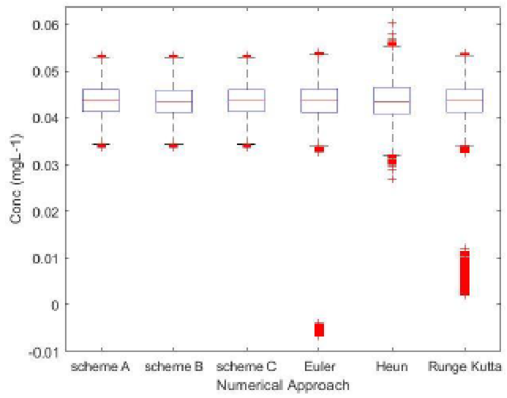
Joana Postal Pasqualini and Fernando Mainardi Fan

Hydrological condition A: low storage oscillation

Numerical

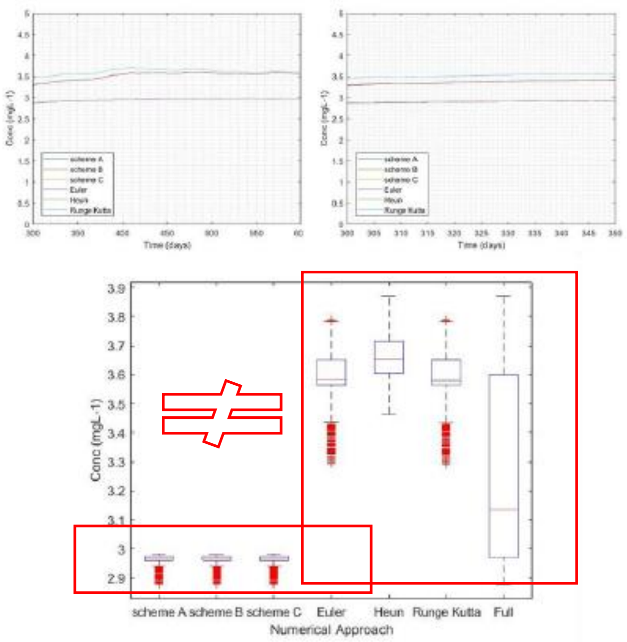


Parametrical

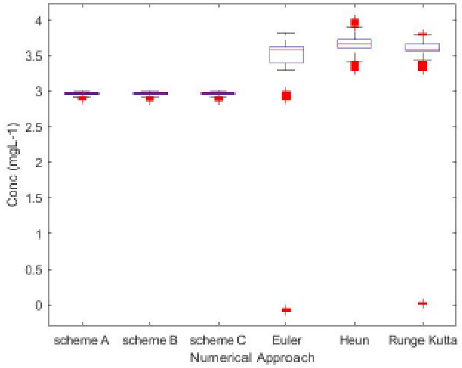


Hydrological condition B: constant storage oscillation

Numerical



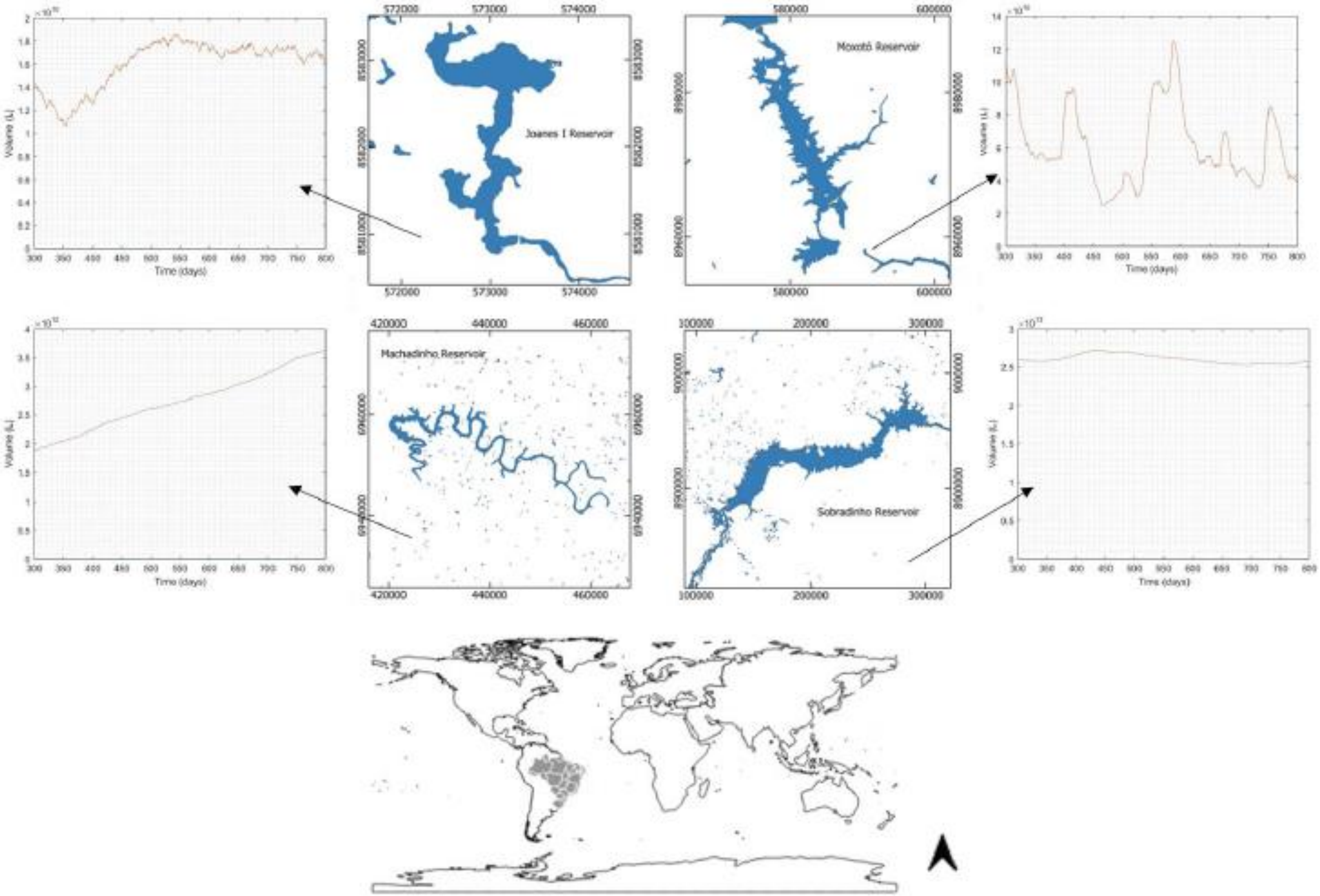
Parametrical

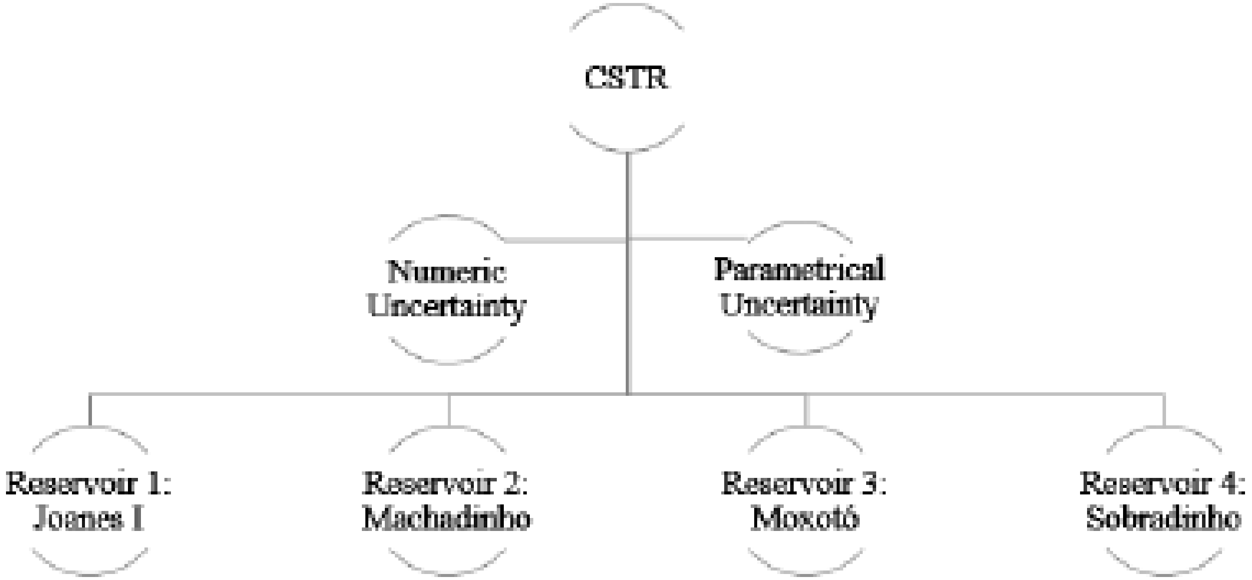


Uncertainties should be considered for better decision-making

Probabilistic

Deterministic


Joanes I Reservoir
Moxotó Reservoir
Machadinho Reservoir
Sobradinho Reservoir
Volume (L)
Time (days)
572000
573000
574000
580000
600000
420000
440000
460000
100000
200000
300000

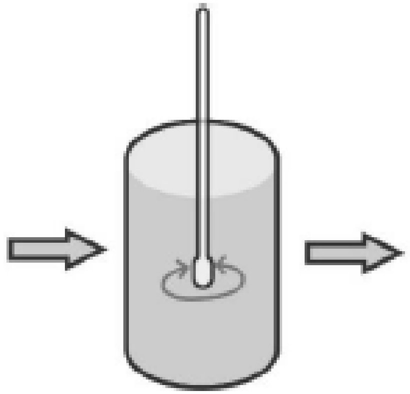


Storage (hm³)	1.90E+01	1.0E+03	1.28E+03	3.41E+04
Inflow (m³/s)	292.4	778.4	1185.94	1,219.59
Residence time (years)	2.50	1.66	6.47	101.78

Data	Type	Source	Collection frequency
Flow	Variable	Embasa, National Water and Sanitation Agency (ANA)	Daily
Inflow concentrations	Variable	Embasa, Institute for the Environment and Water Resources, São Francisco Hydroelectric Company, National Water and Sanitation Agency (ANA)	Monthly and bimonthly
Reservoir capacity	Variable	Embasa, National Water and Sanitation Agency (ANA)	Daily
Production rate	Parameter	*	-
Consumption rate	Parameter	*	-

*estimated according to the residence time of each reservoir (Salas and Martino, 1991)

$$Mass\ accumulation = Mass\ in - Mass\ out + Sources - Sinks$$



$$\frac{d(C.V)}{dt} = Q_{in} \times C_{in} - Q_{out} \times C_{out} + r_p \times V - r_c \times V$$

I – Numeric Ensemble

Numerical Uncertainty consisted on the test of six different numerical approaches in solving the same CSTR problem

II – Parametrical Ensemble

Parametrical Uncertainty consisted on the probabilistic test according to Monte Carlo methodology, with a parameters variation of 20% and 50% among normal distribution for each numeric method, in each study area.

Question 1

Do different numerical approaches result in statistically different results in a deterministic approach?

Yes, it is possible to obtain statically different results especially in case studies with distinct volumetric ascension or recession.

Question 2

Which numerical meth
less sensitive to param

No different sensibility for situations
gradual volumetric oscillation over t

Heun : most sensitive method for the
greater volumetric oscillation.

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3

Is it the uncertainty of the parameters or is the uncertainty of the numerical methods that generate the greatest range of possibilities?

Question 4

Which uncertainty source confers greatest proportion of possibilities?

Input Data.

40% - 70%.

etric oscillation: equivalent in proportion. 15%

anges: numerical uncertainty exceeds the parametrical 30%

(RADWAN; WILL
BERLAMONT, 20
WILLEMS, P., 20

Question 5

Is it possible to dissociate the structural uncertainty into numerical and parametrical for a simple application?

No.

we can have an idea of its estimate/proportion

Question 6

What is the benefit of kno
considering probabilistic r
simple application? Are th
for which there are more b

Considering the probability of deviatio
from the deterministic result.

And collaborating for risk management
engineering problem in question.

Main References

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THANK YOU!

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