# DISCHARGE SIMULATION OF ABOUREGRAG-MOROCCO WATERSHED USING ChyM MODEL

The Abdus Salam International Centre for Theoretical Physics

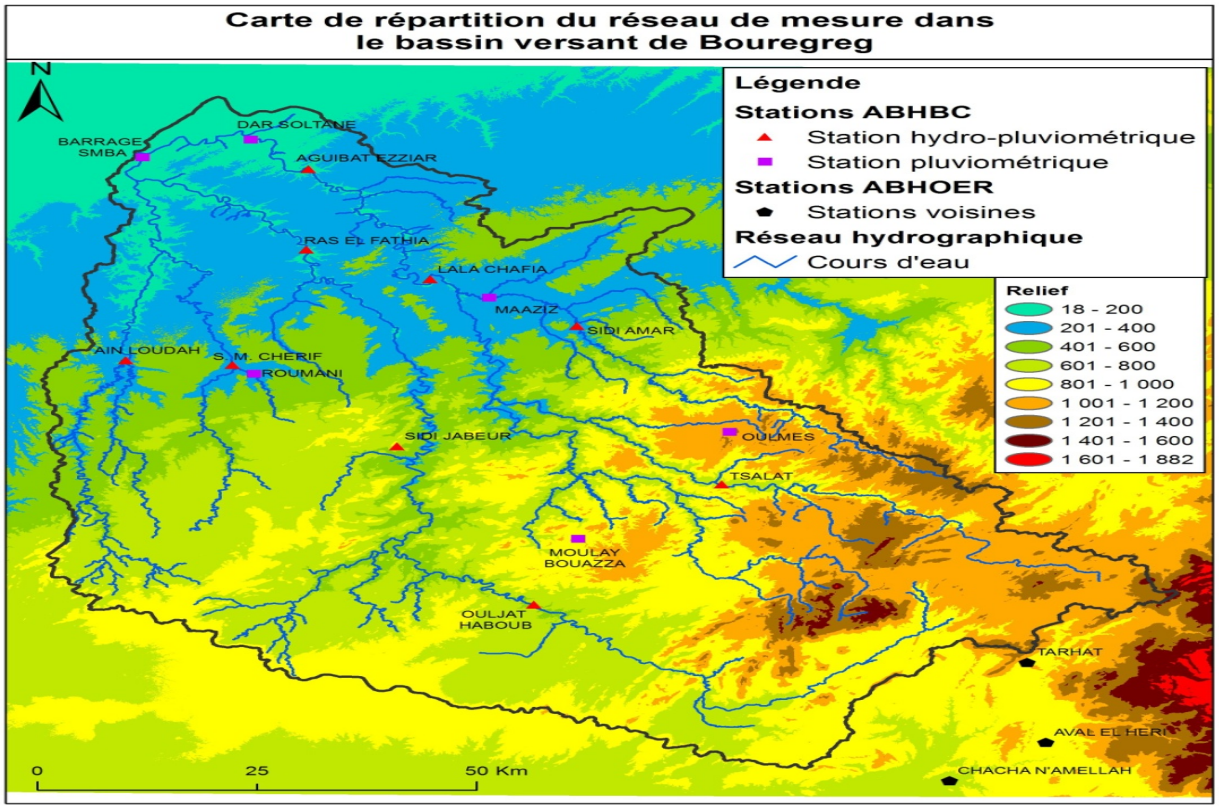
BY:
GADOUALI FOUAD (MOROCCO)
AlAA MOTAR SHAYIA (IRAQ)
KINGSLEY OGBU (NIGERIA)

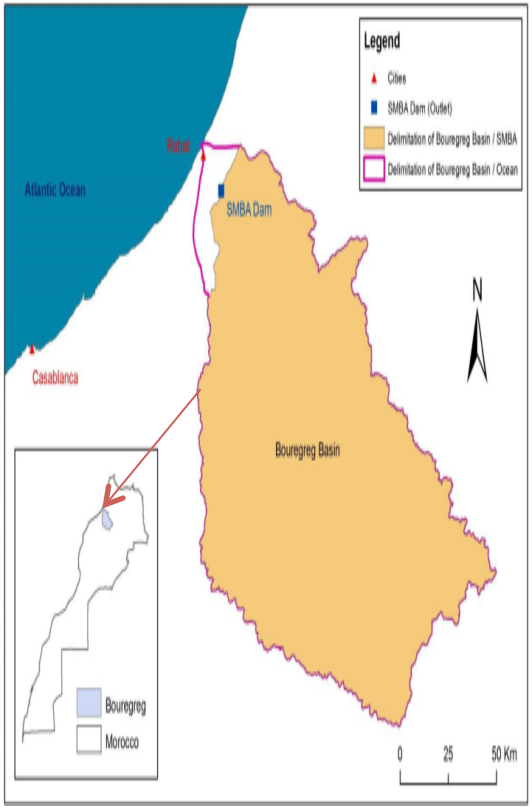
Fourth Workshop on Water Resources in Developing Countries: Hydroclimate Modeling and Analysis Tools 12-23 JUNE 2017

# DISCHARGE SIMULATION OF ABOUREGRAG-MOROCCO WATERSHED USING ChyM MODEL

## *STUDY AREA*

ABOUREGRAG BASIN AREA IS 9566 Km²

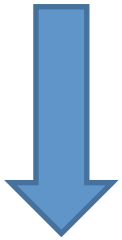


# DISCHARGE SIMULATION OF ABOUREGRAG-MOROCCO WATERSHED USING ChyM MODEL

## PROJECT OBJECTIVE:

1-Discharge simulation using the Chym for 1 year
2-Evaluation of Chym in flooding case study (29-11-2014 Morocco)



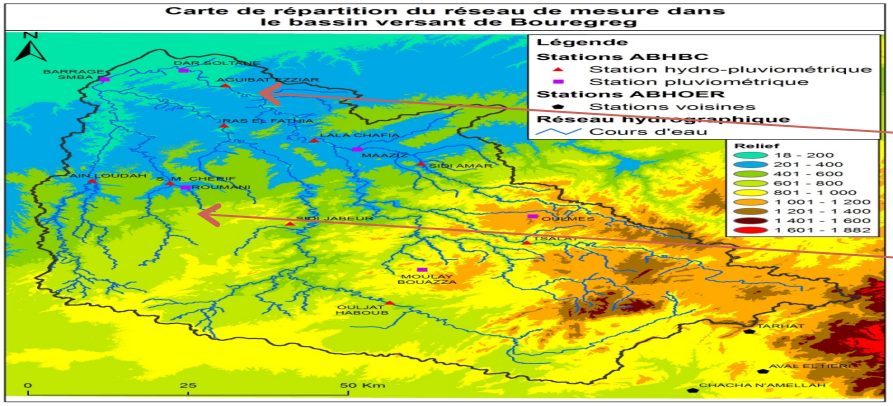
Input rainfall fields TRMM and PERSIANN
were not ready to use for 2000-2005
After many simulations we decide to run the model
for 1 year period (2002)

# DISCHARGE SIMULATION OF ABOUREGRAG-MOROCCO WATERSHED USING ChyM MODEL

## *DATASET*

-Observed data:

Daily flow discharge and precipitation from 2 rain gauges




Aguibat azziar

Ras elfatiha

-Simulated data:

Chym model resolution: spatial 1km-temporal 1hour

Static fields: DEM, drainage area

Dynamic fields:

Daily flow discharge, water available for run-off …

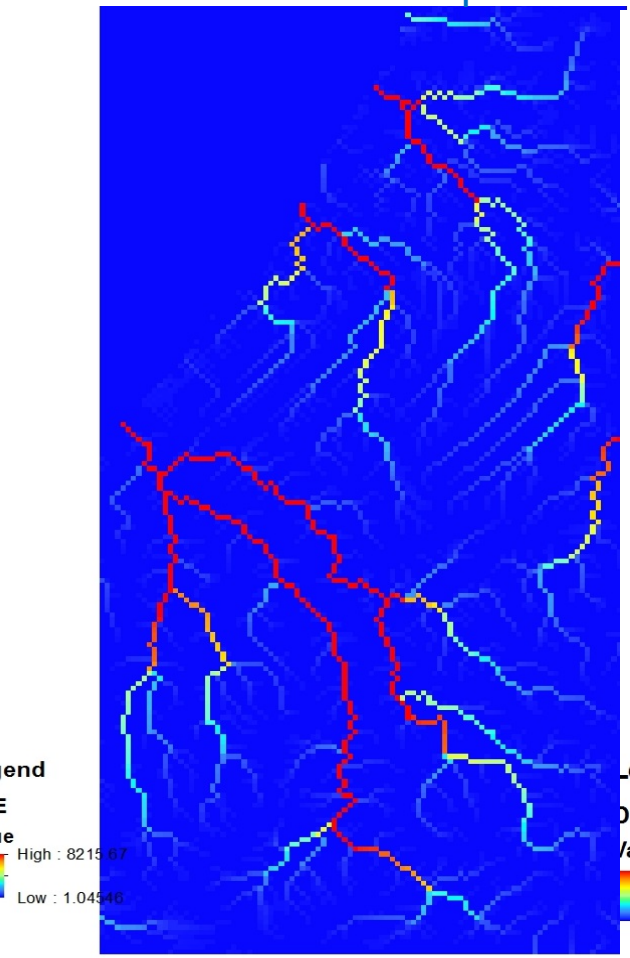
# DISCHARGE SIMULATION OF ABOUREGRAG-MOROCCO WATERSHED USING ChyM MODEL

## RESULTS:

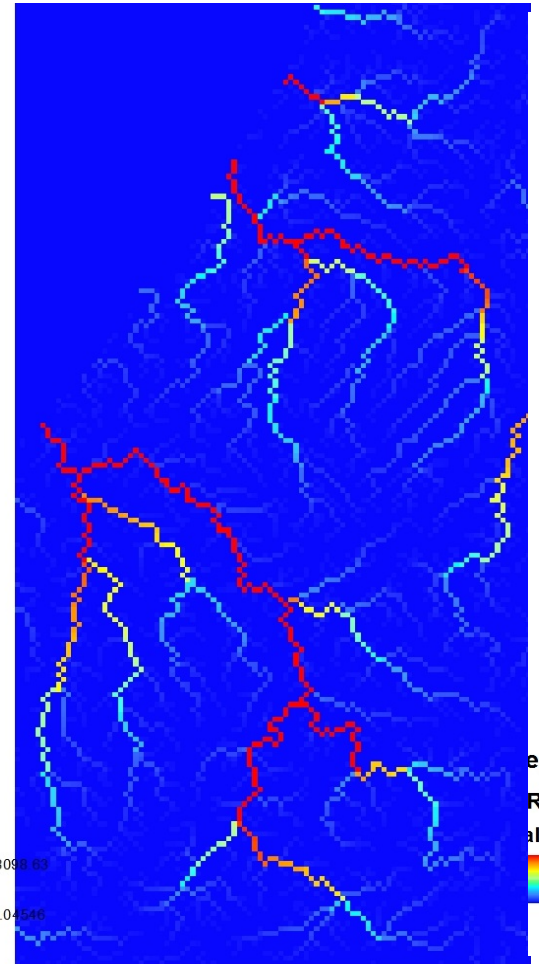
### Static fields:

DEM:world90m

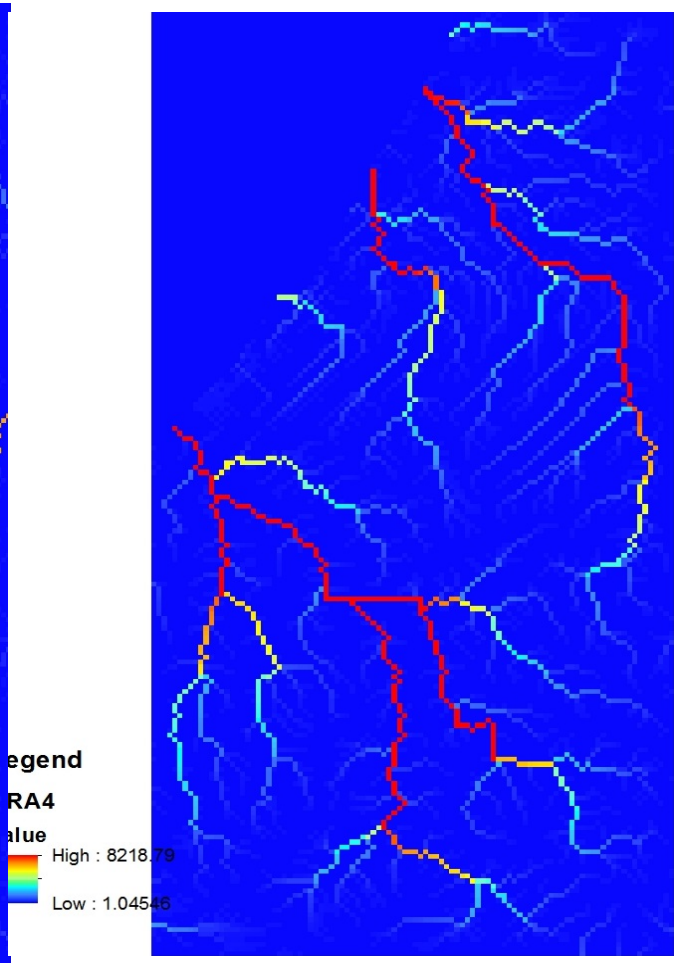
The best representation




DEM:1km

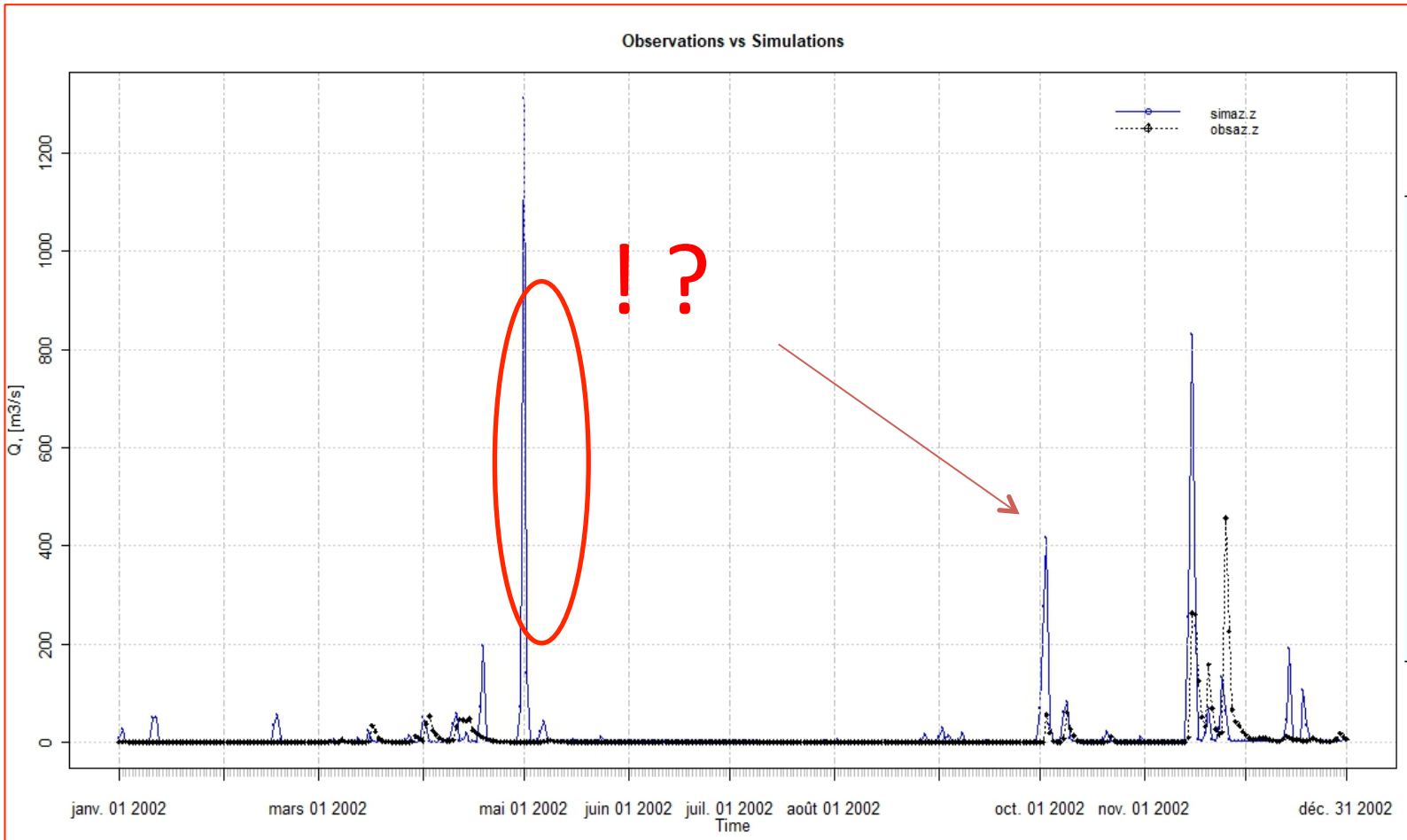



DEM:Italy 90m



# DISCHARGE SIMULATION OF ABOUREGRAG-MOROCCO WATERSHED USING ChyM MODEL

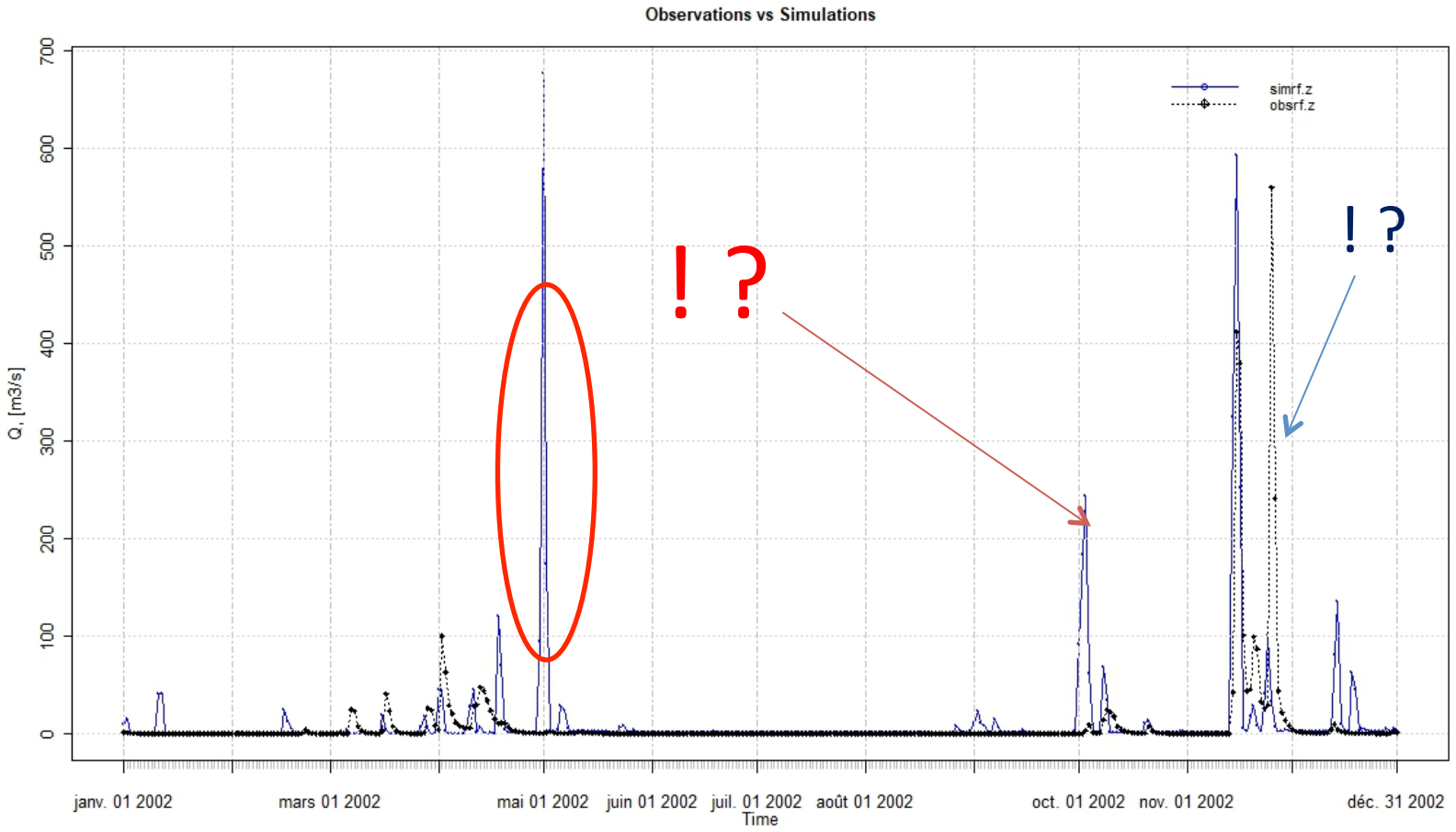
## Dynamic fields:




GoF's:

ME = 8.52
MAE = 17.69
RMSE = 86.14
NRMSE = 242
PBIAS = 106.1
RSR = 2.42
rSD = 2.49
NSE = -4.87
mNSE = -0.42
rNSE = -1590.02
d = 0.34
md = 0.44
rd = -178.43
r = 0.28
R2 = 0.08
bR2 = 0.06
KGE = -0.97
VE = -1.2

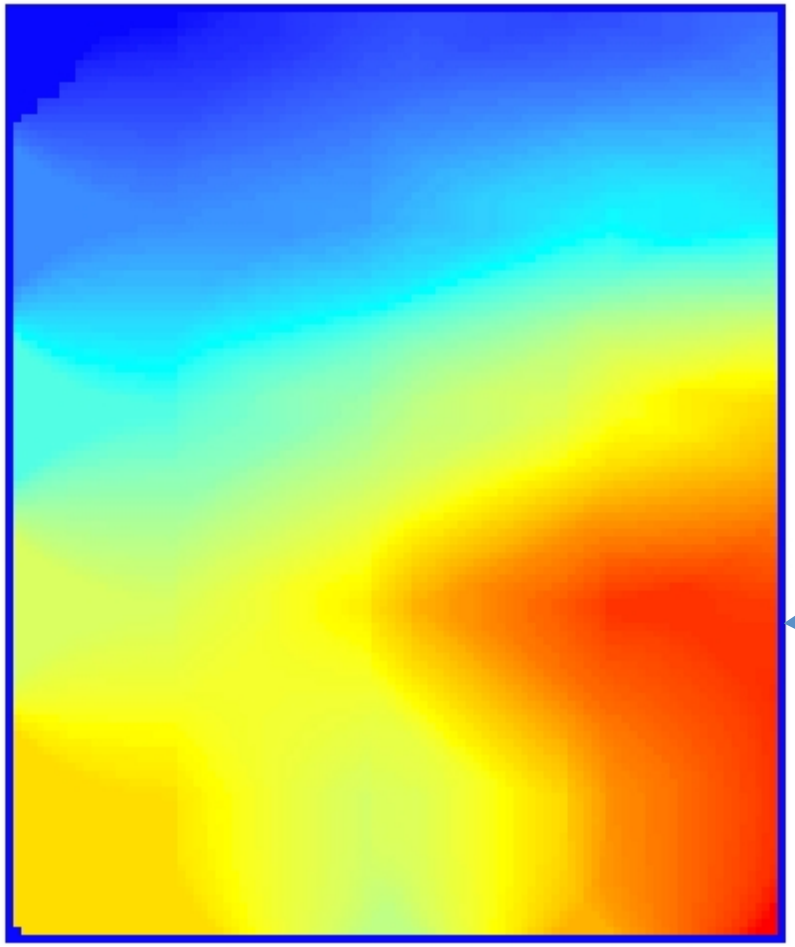
# DISCHARGE SIMULATION OF ABOUREGRAG-MOROCCO WATERSHED USING ChyM MODEL




GoF's:

ME = 3.92
MAE = 14.5
RMSE = 56.54
NRMSE = 126.4
PBIAS = 45.6
RSR = 1.26
rSD = 1.26
NSE = -0.6
mNSE = -0.04
rNSE = -Inf
d = 0.56
md = 0.52
rd = -Inf
r = 0.39
R2 = 0.15
bR2 = 0.08
KGE = 0.2
VE = -0.68

# DISCHARGE SIMULATION OF ABOUREGRAG-MOROCCO WATERSHED USING ChyM MODEL

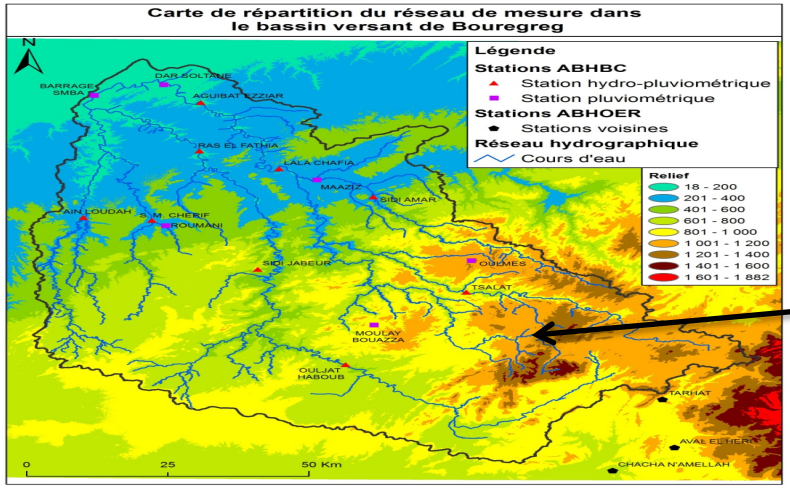


PERSIANN
Precipitation
30-04-2002

Mountains

# DISCHARGE SIMULATION OF ABOUREGRAG-MOROCCO WATERSHED USING ChyM MODEL

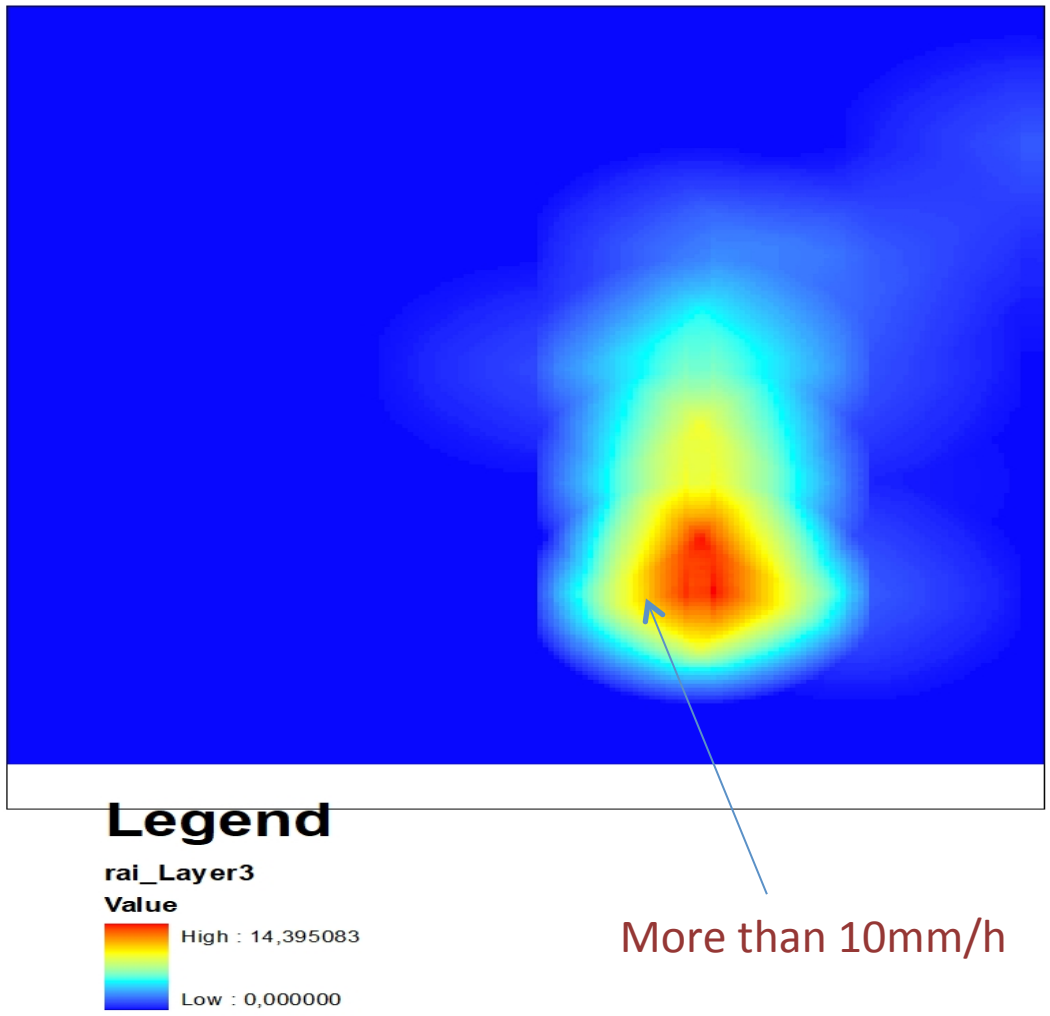
| Date | OH | SJ | RF | TS | LC | AZ | SMC | AL | SMBA |
|---|---|---|---|---|---|---|---|---|---|
| 26/04/2002 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 27/04/2002 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 28/04/2002 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 29/04/2002 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30/04/2002 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 |
| 01/05/2002 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 02/05/2002 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |




Satellite products TRMM, PERSIANN exhibit lower performance over and nearby mountains

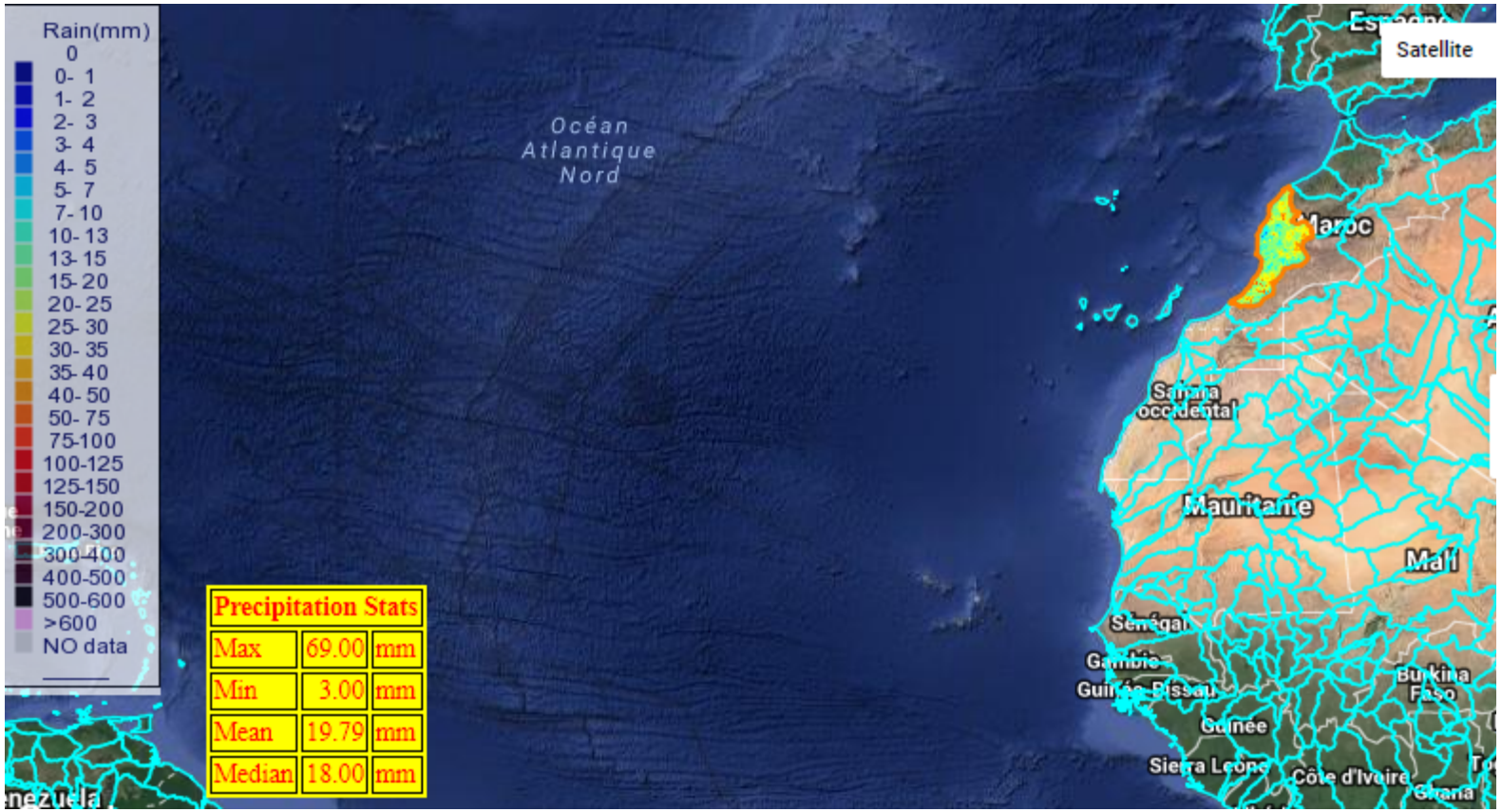
# DISCHARGE SIMULATION OF ABOUREGRAG-MOROCCO WATERSHED USING ChyM MODEL

**Case study 29-11-2014: from 25-11-2014 to 29-11-2014**



# DISCHARGE SIMULATION OF ABOUREGRAG-MOROCCO WATERSHED USING ChyM MODEL

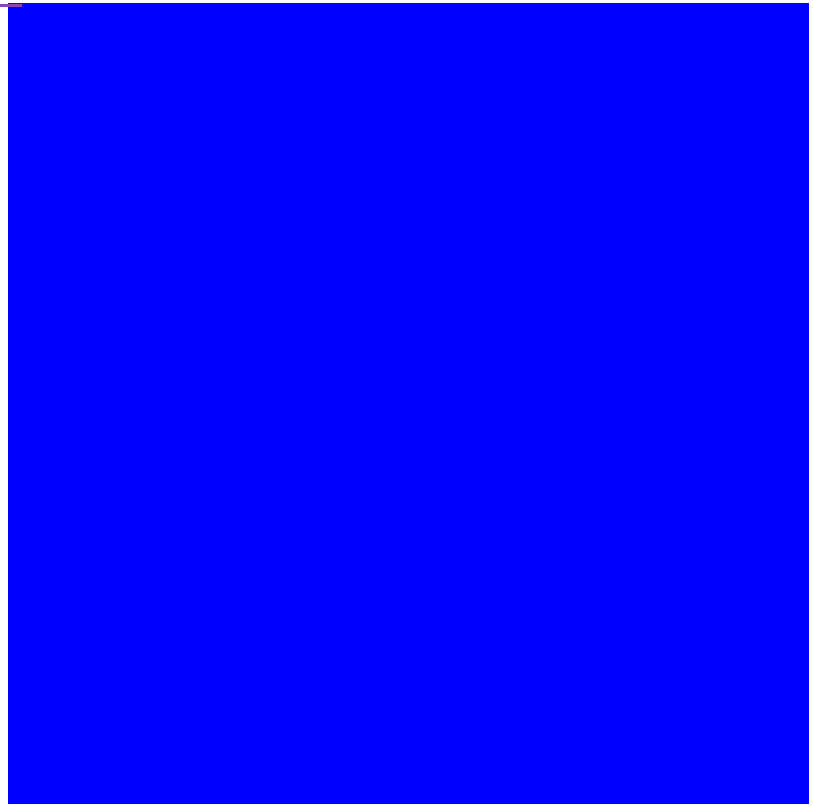
## Case study 29-11-2014




Daily PERSIANN-CCS 28-11-2014

# DISCHARGE SIMULATION OF ABOUREGRAG-MOROCCO WATERSHED USING ChyM MODEL

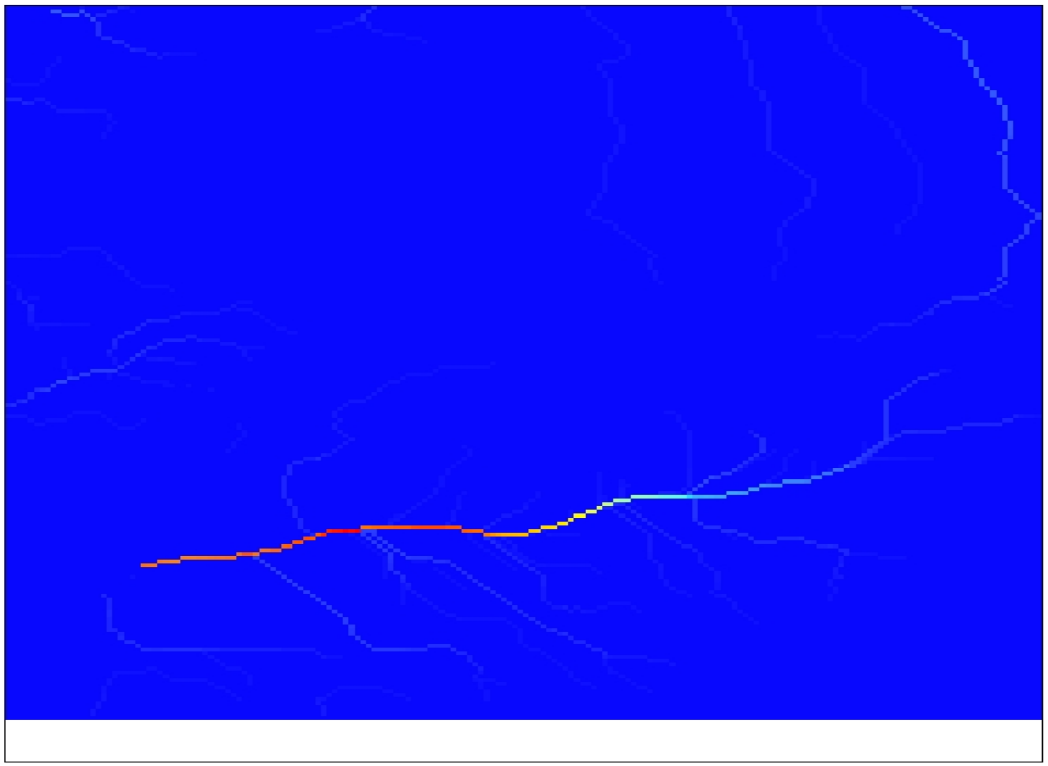
**Case study 29-11-2014**



Animation of the simulated flow discharge
From 25-11-2014 to 29-11-2014

# DISCHARGE SIMULATION OF ABOUREGRAG-MOROCCO WATERSHED USING ChyM MODEL

**Case study 29-11-2014**




More than 8000m3/s

# DISCHARGE SIMULATION OF ABOUREGRAG-MOROCCO WATERSHED USING ChyM MODEL

## Conclusion and perspective

-Chym was able to reproduce the intra-annuel variability of the flow discharge over the basin,

-The overestimation of the flow discharge exhibited by Chym was due to non accurate precipitation input

-The most appropriate DEM for the ABOUREGRAG watershed was the world 90m DEM

-

-the flood event case study was well reproduced by the Chym model

-The Chym model need to be run by accurate observations and to be calibrated for the basin proprieties

# DISCHARGE SIMULATION OF ABOUREGRAG-MOROCCO WATERSHED USING ChyM MODEL


Thank you for your attention

Special thanks to Fabian and Adriano