The Pina drainage-basin

a study of a highly impacted urban mangrove in the city of Recife (Brazil)

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DAAD

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German Academic Exchange Service

Montevideo, 2016

The city of Recife

- Recife is the sixth-largest metropolitan area in Brazil

- Recife is also the largest metropolitan area of the North/Northeast

- Capital and largest city of the state of Pernambuco.

- The population of the city is about to 1 617 200 (year 2015).
  It means circa of 0.778% of total Brazil population

- It could reach 4 000 000 regarding the entire metropolitan region
  (Olinda, Jaboatão, Paulista, etc.)

The city of Recife

Recife is a huge heat island…

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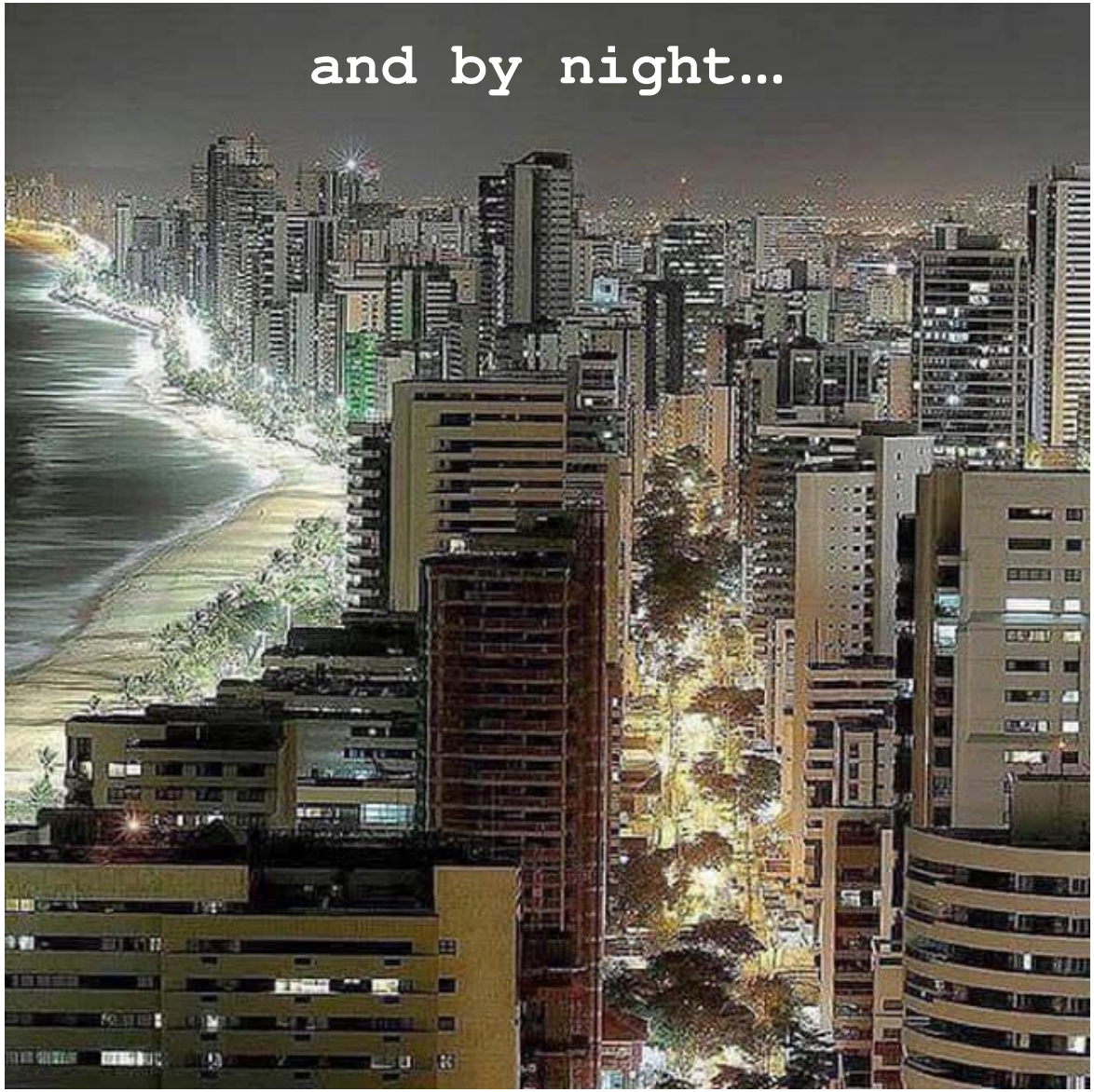
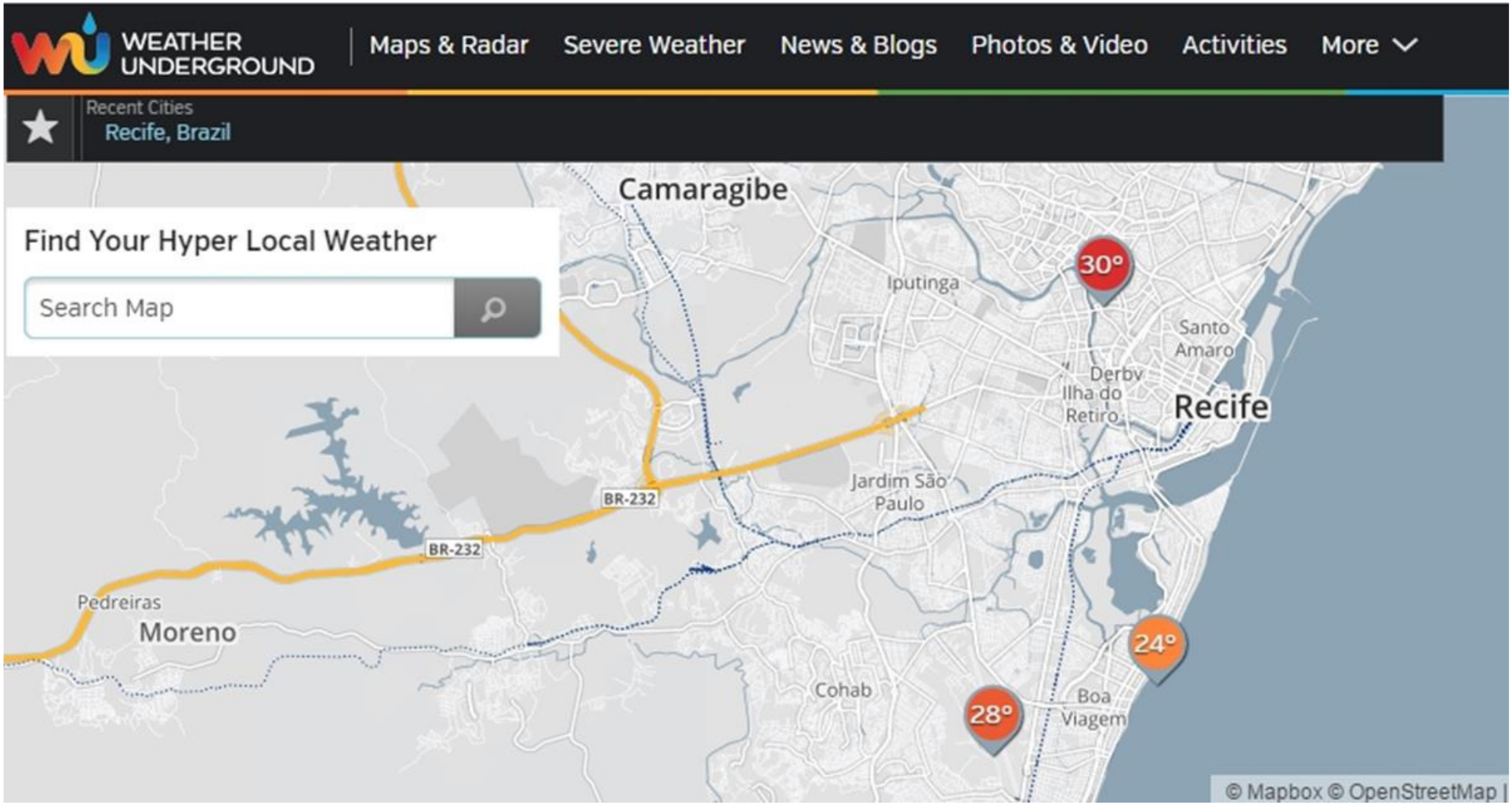
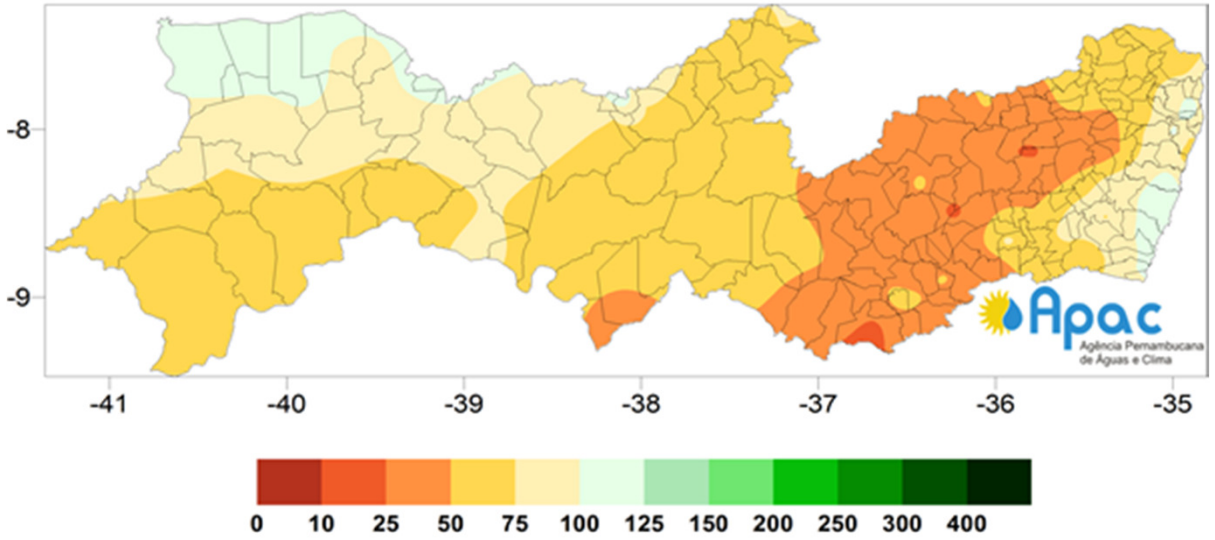


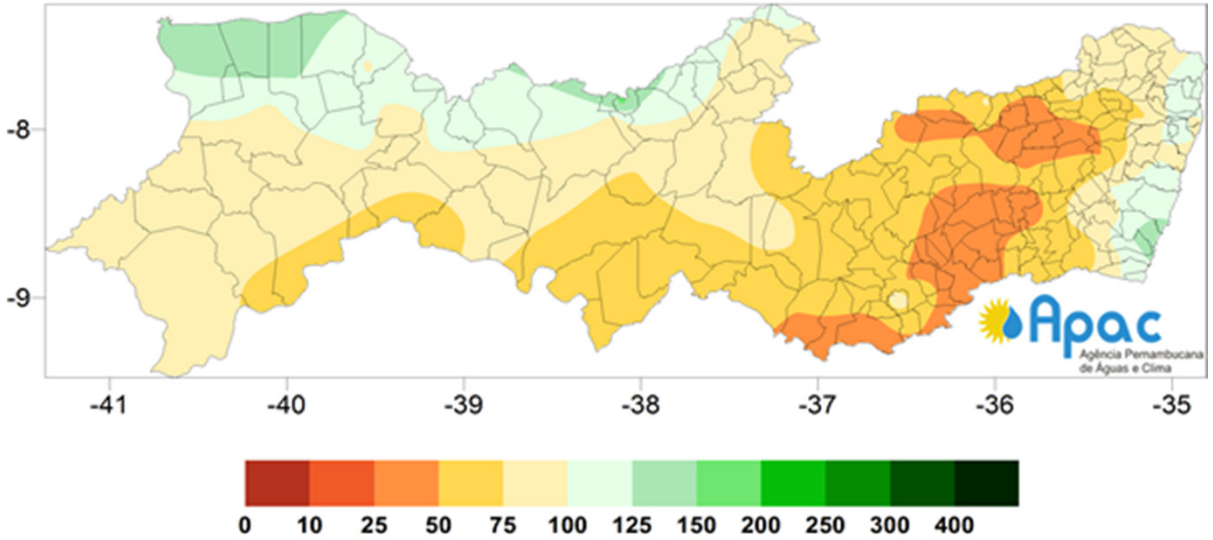
Recife is a huge heat island…



Climatologia da precipitação mensal (mm) Janeiro



Climatologia da precipitação mensal (mm) Fevereiro



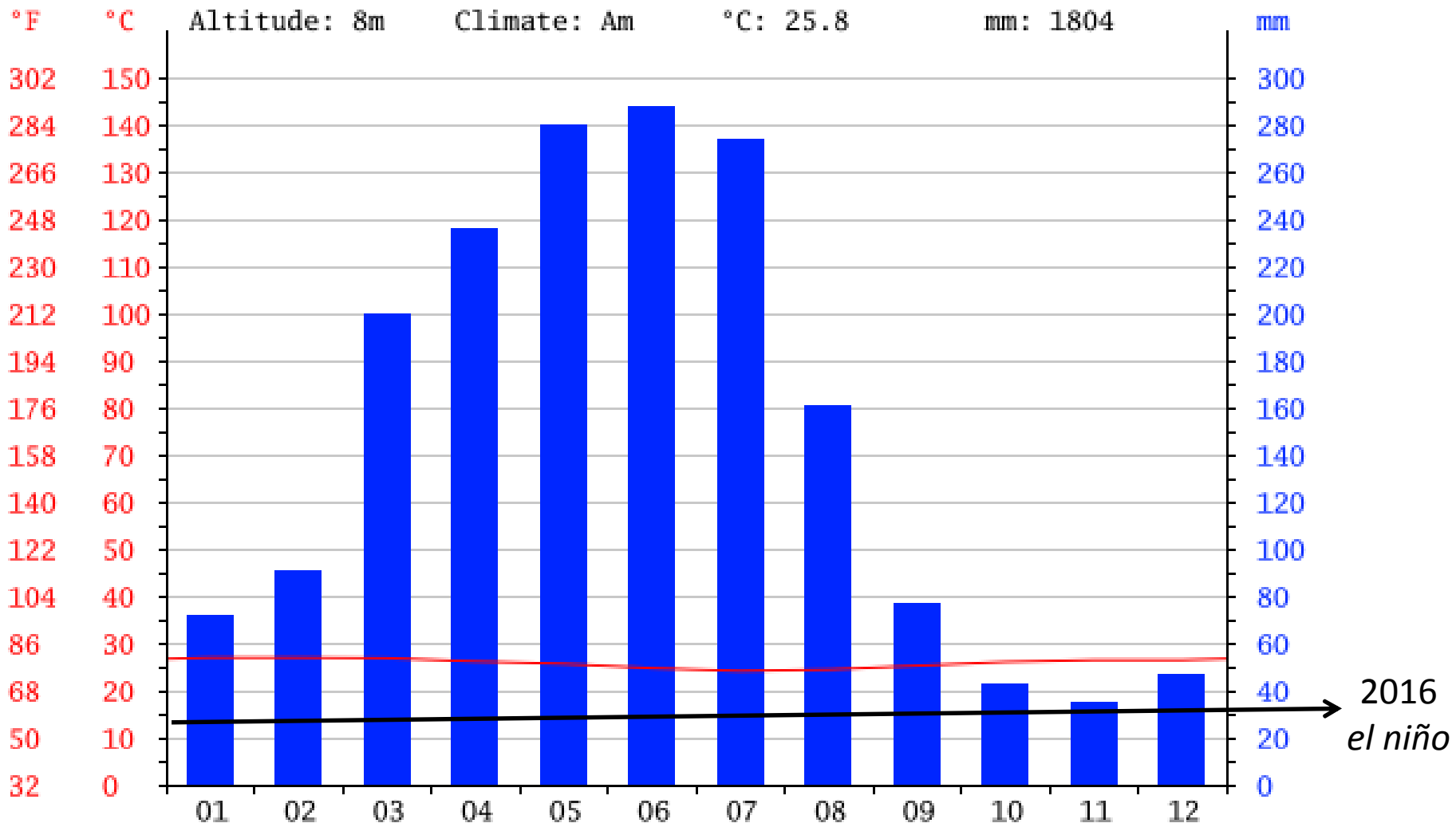
2010 – 2014

the seasons of the year in **Recife:**

HELLCIFE

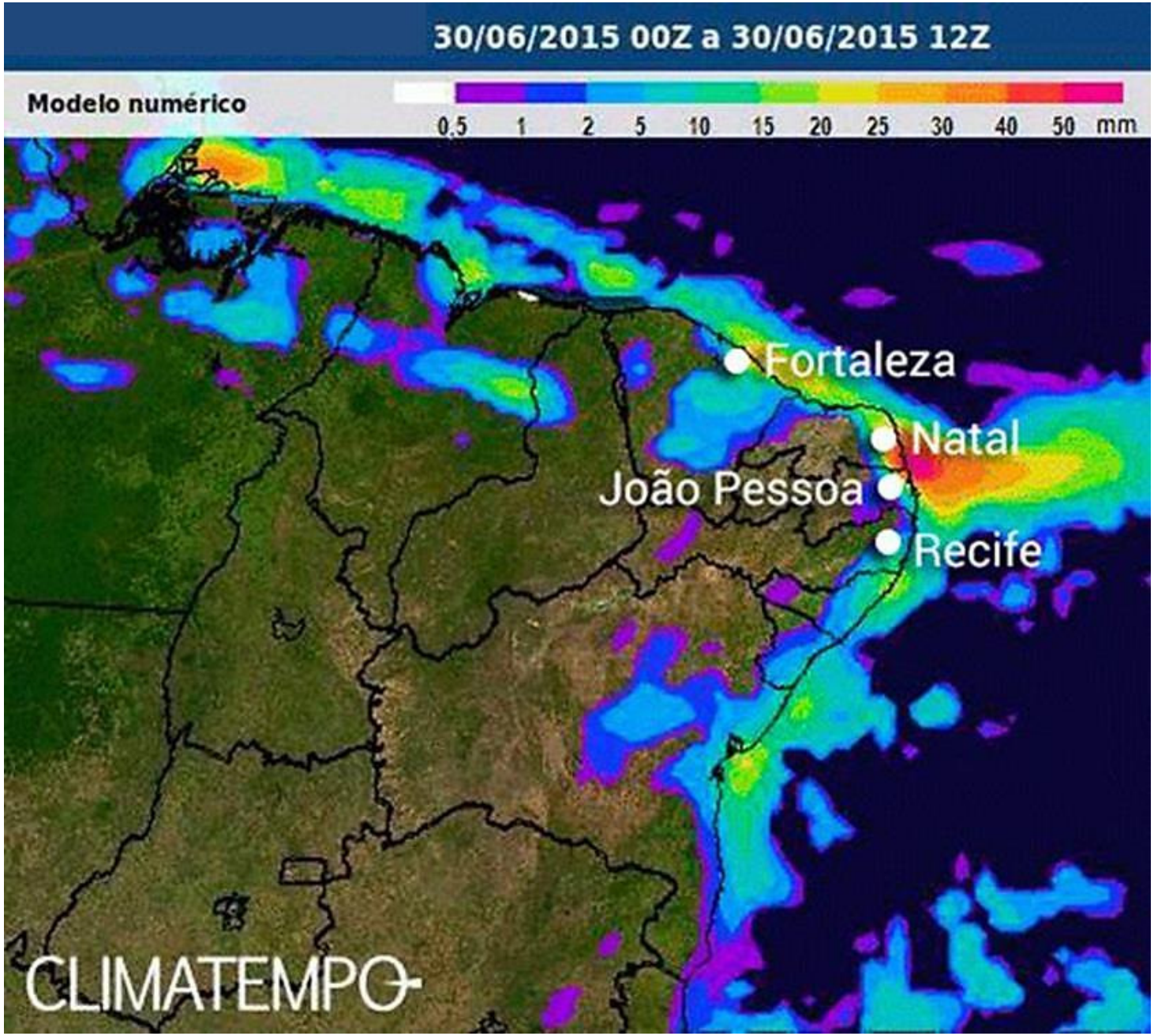
RAINCIFE

Recife: rainfall

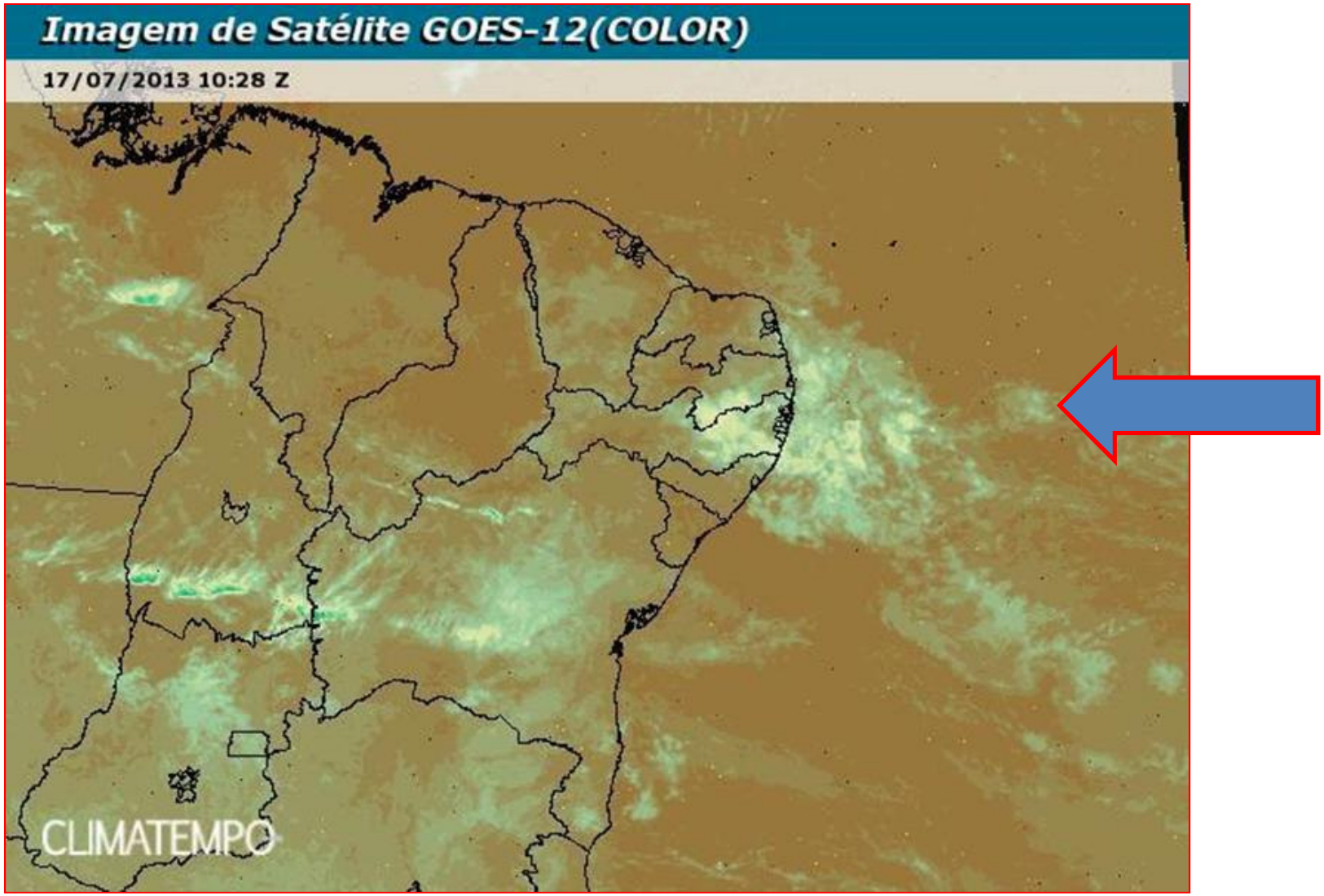


Recife: climate

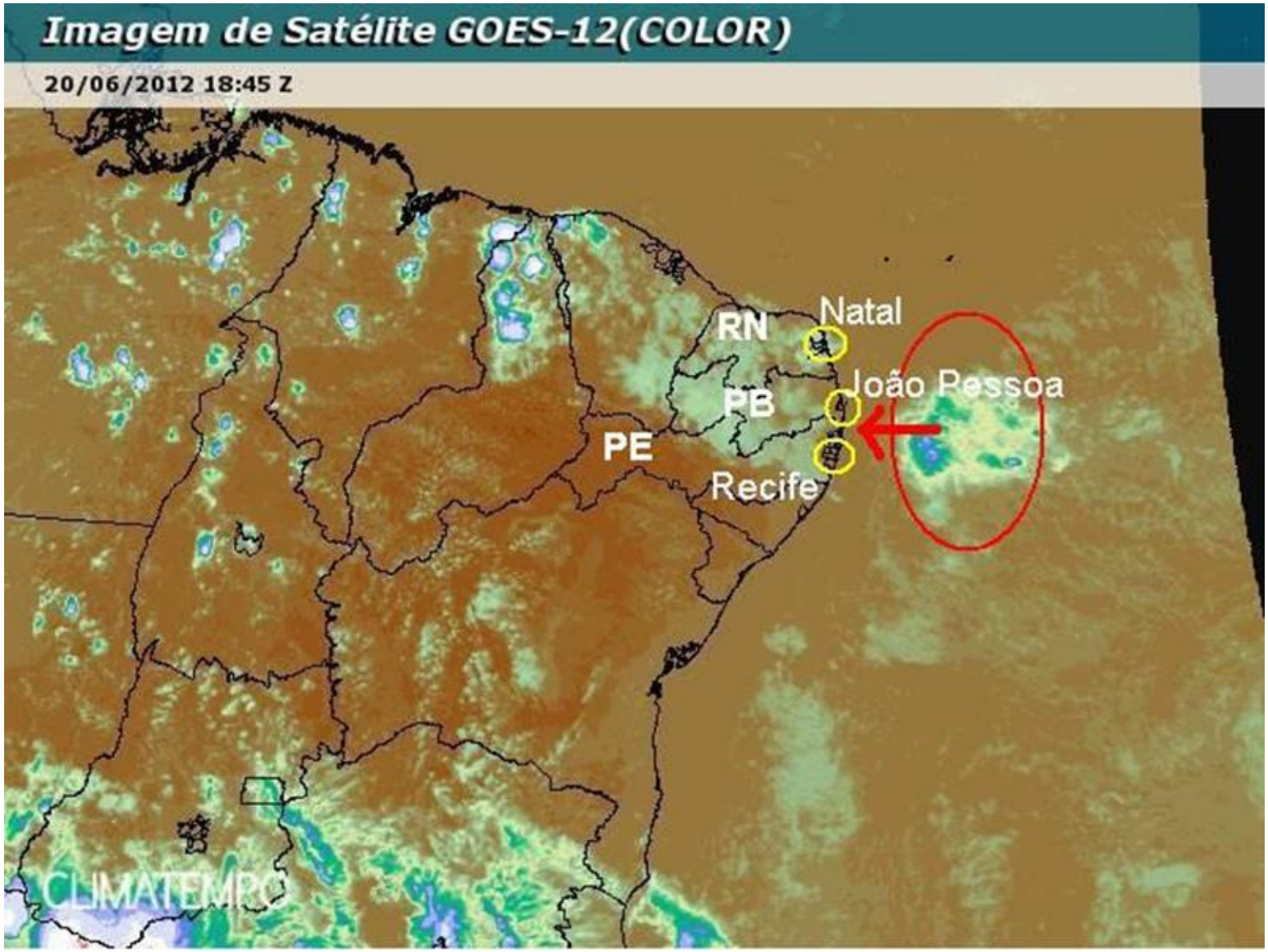
month	1	2	3	4	5	6	7	8	9	10	11	12
mm	72	91	200	236	280	288	274	161	77	43	35	47
°C	26.9	26.9	26.8	26.1	25.6	24.7	24.1	24.4	25.2	26.0	26.4	26.4
°C (min)	23.8	23.8	23.6	23.0	22.5	21.9	21.2	21.2	22.0	22.8	23.2	23.4
°C (max)	30.1	30.1	30.0	29.3	28.7	27.6	27.1	27.6	28.4	29.3	29.7	29.5
°F	80.4	80.4	80.2	79.0	78.1	76.5	75.4	75.9	77.4	78.8	79.5	79.5
°F (min)	74.8	74.8	74.5	73.4	72.5	71.4	70.2	70.2	71.6	73.0	73.8	74.1
°F (max)	86.2	86.2	86.0	84.7	83.7	81.7	80.8	81.7	83.1	84.7	85.5	85.1


30/06/2015 00Z a 30/06/2015 12Z
Modelo numérico
0,5 1 2 5 10 15 20 25 30 40 50 mm
Fortaleza
Natal
João Pessoa
Recife
CLIMATEMPO

“*EAST FRONTS*” (frentes de leste)



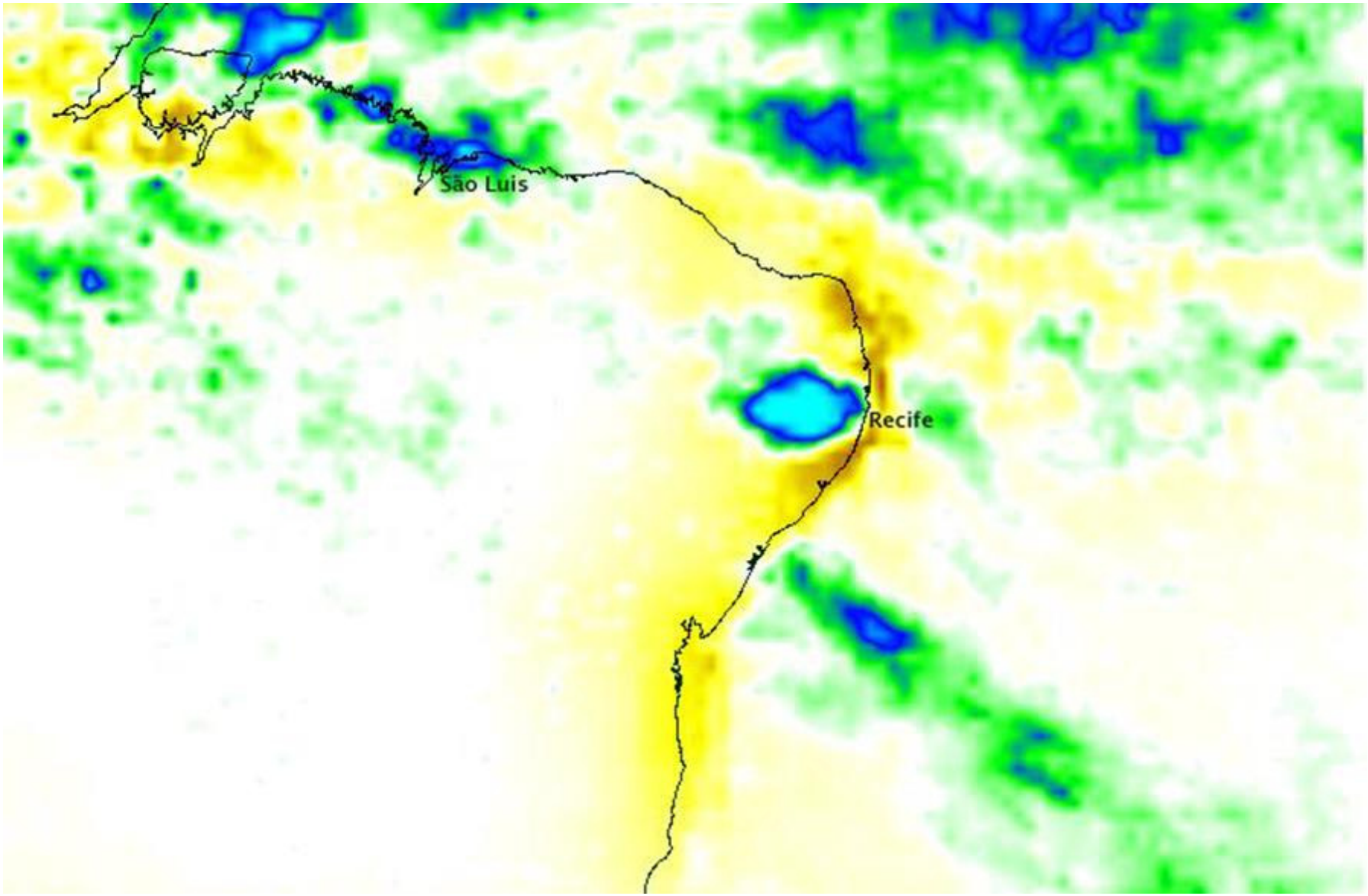
Rainfall anomaly



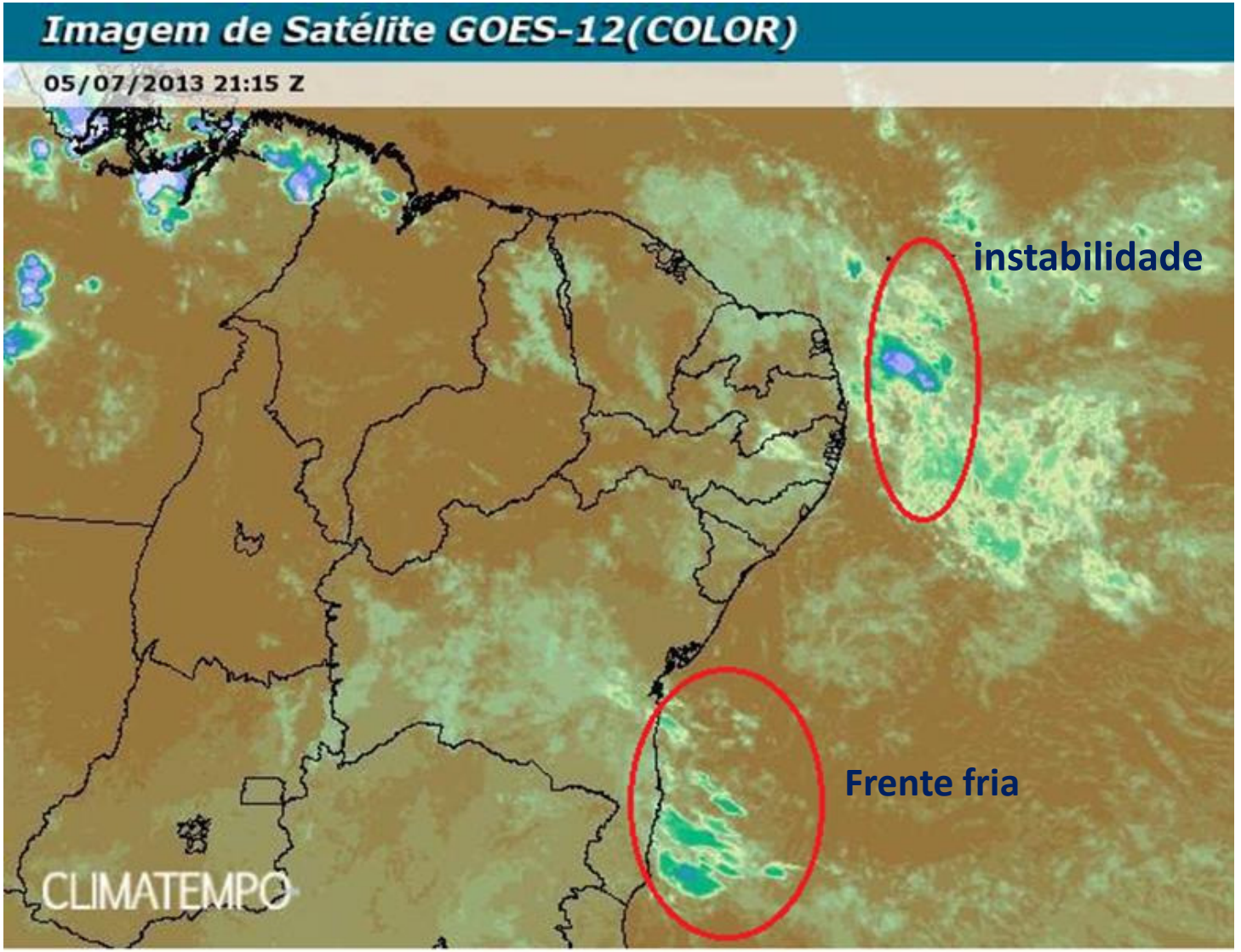
29.000 homeless

28 deads

Rainfall anomaly Brazil June-2010



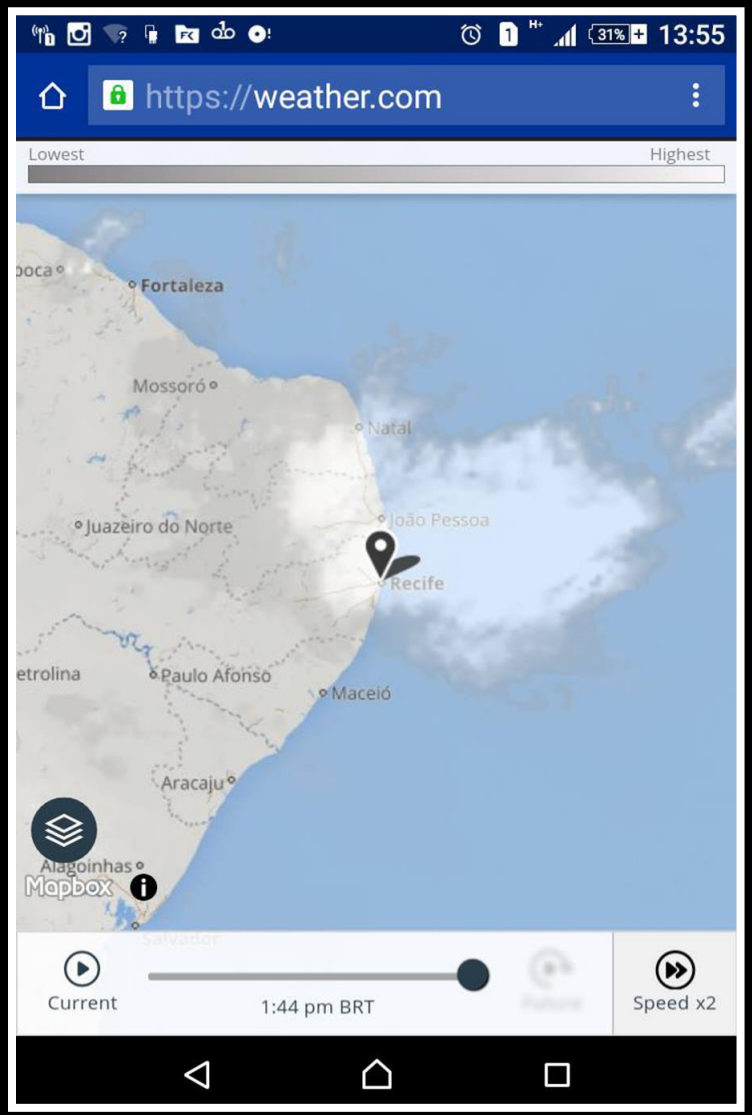
“Instability areas” in ocean



cold front


Imagem de Satélite GOES-12(COLOR)
02/07/2012 11:28 Z
MA
RN
PE
BA
nuvens carregadas
que provocam muita
chuva em Recife
CLIMATEMPO

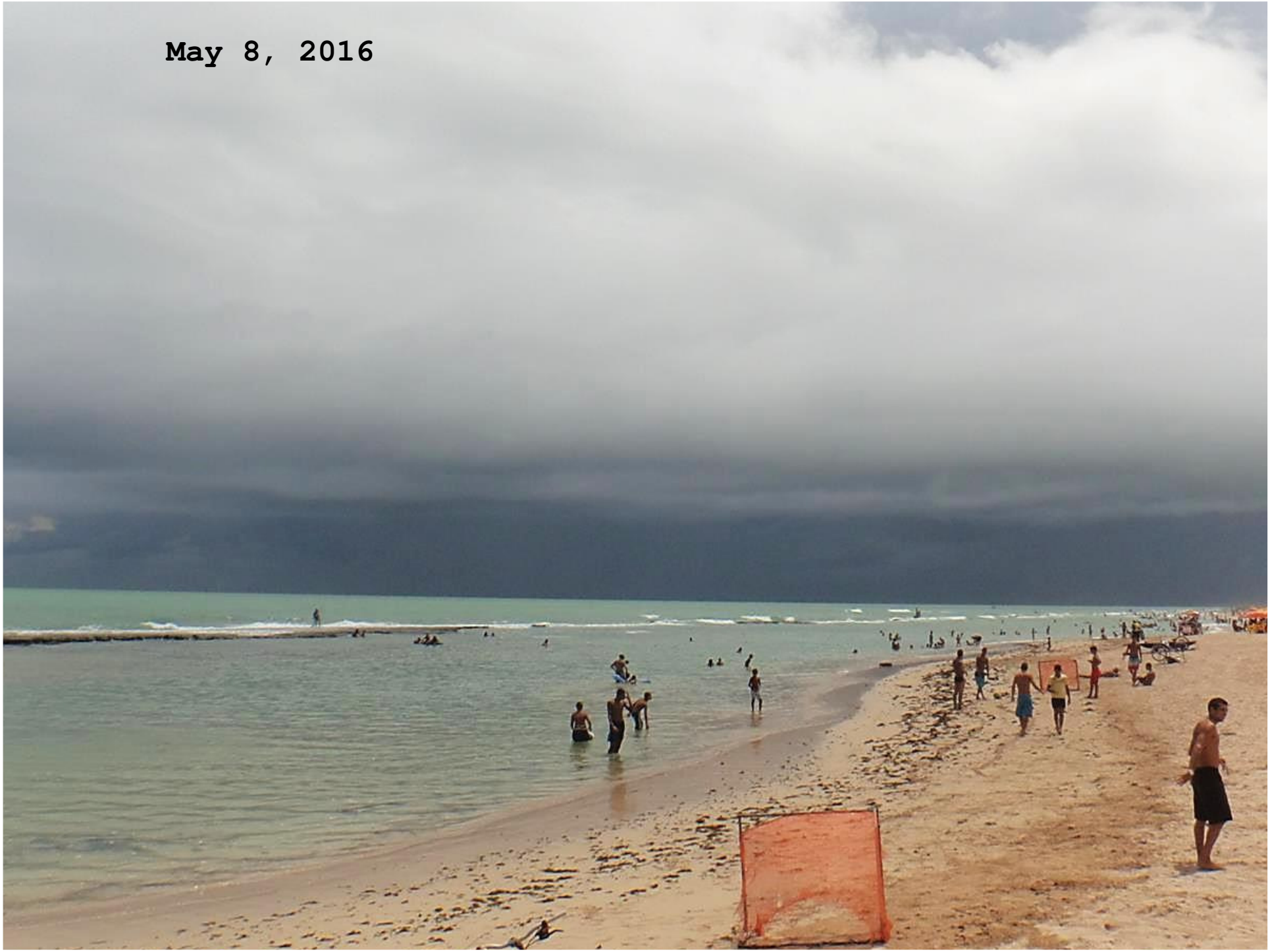
May 9, 2016



Greatest rainfall in the last 30 years?

Picture source: Jornal do Comércio website

May 8, 2016


May 8, 2016

Far from the mangrove area...

May 9, 2016

Greatest rainfall in the last 30 years?

Federal University of Pernambuco main street

Far from the mangrove area...

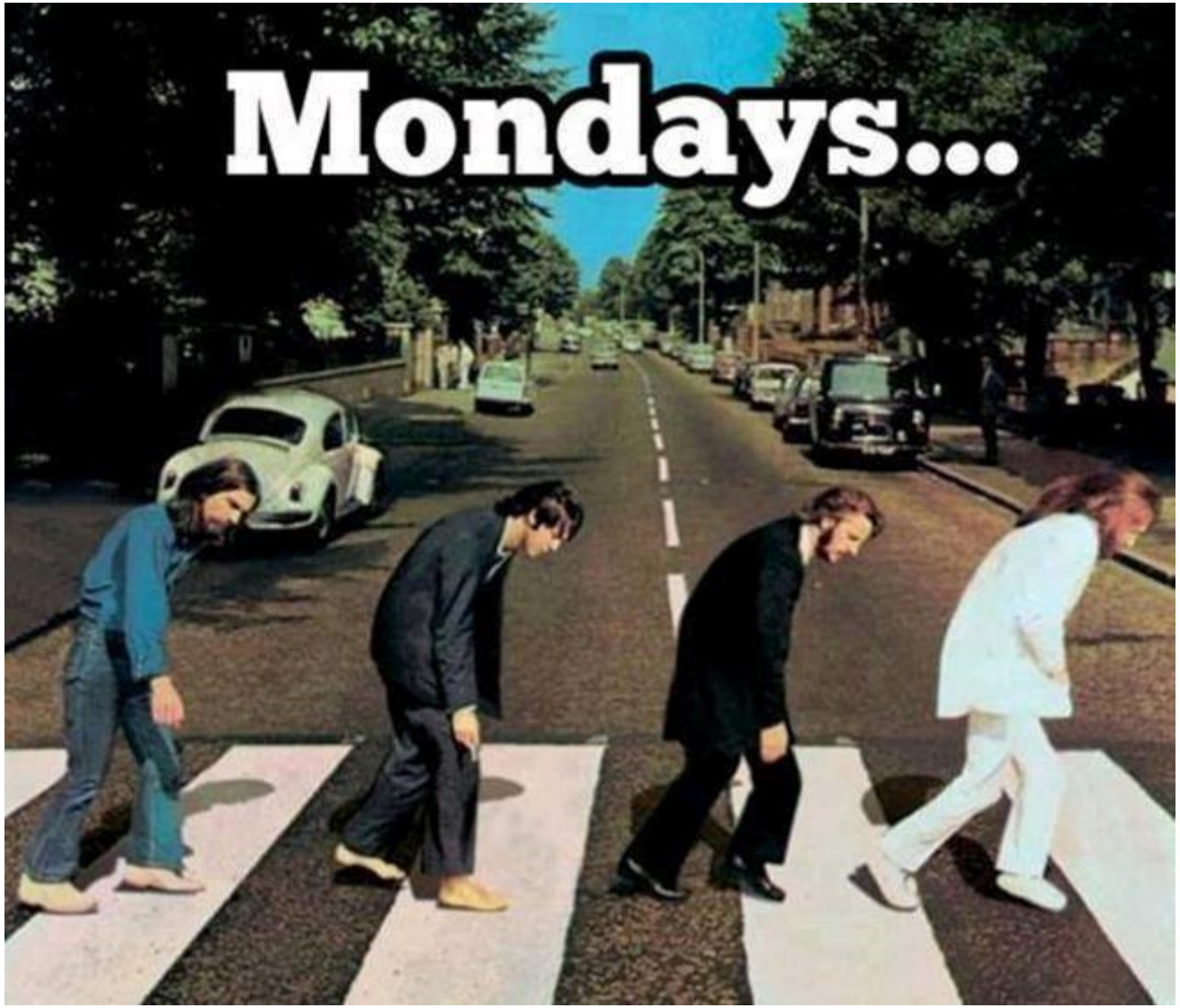
May 9, 2016

Far from the mangrove area...

May 9, 2016

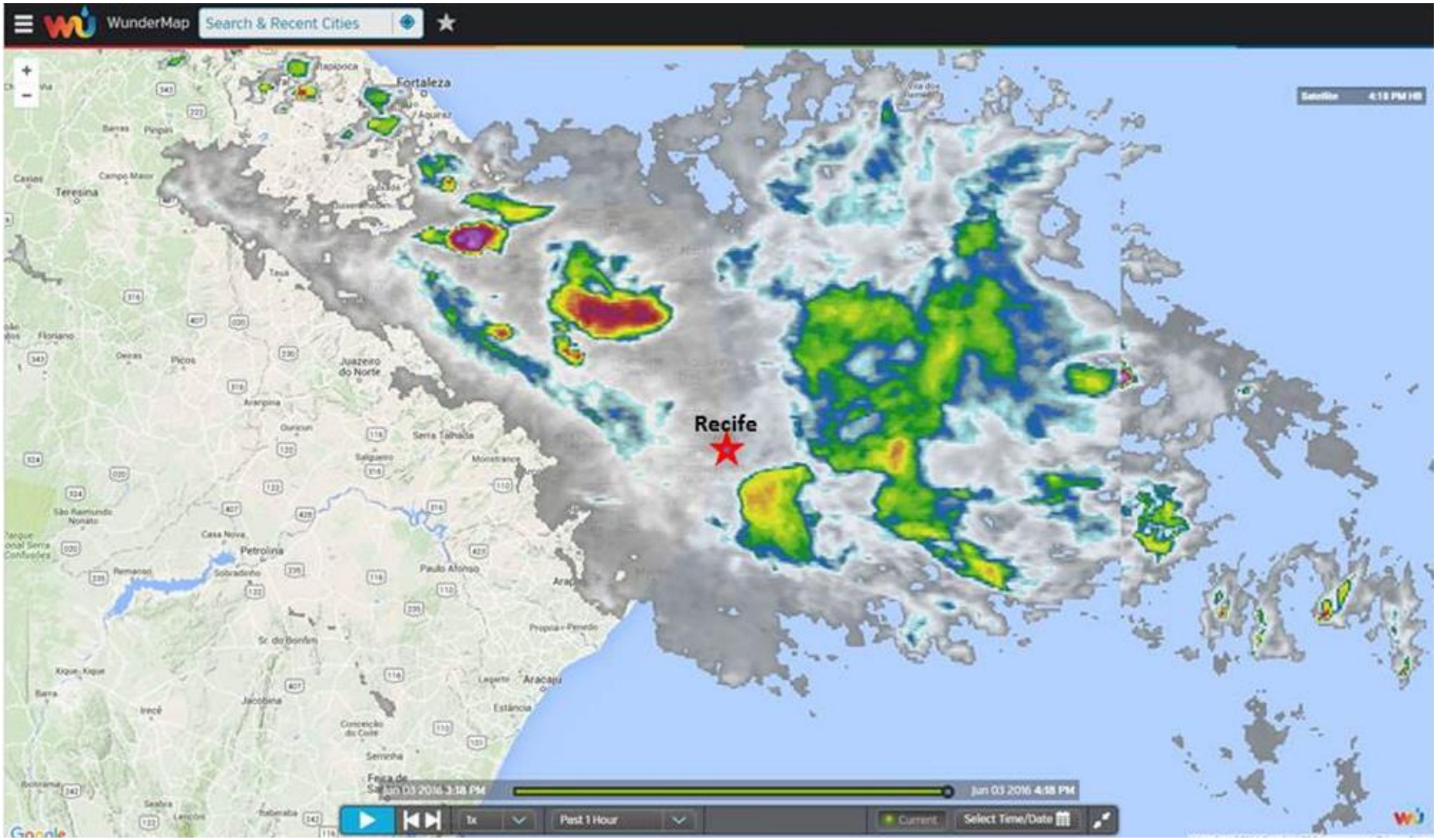

ALUGA 991267848
1000 m²

It was ...



but that monday...

June 3, 2016


WunderMap
Search & Recent Cities
Fortaleza
Teresina
Juazeiro do Norte
Recife
Petrolina
Aracaju
Past 1 Hour
Select Time/Date

June 3, 2016

- Heavy rain brings a lot of trouble to the city

- Why floods bring less trouble to the south part of Recife City?

- Do we need more green areas in the cities?

- Coastal lakes?

- The mangrove ?

the Pina mangrove

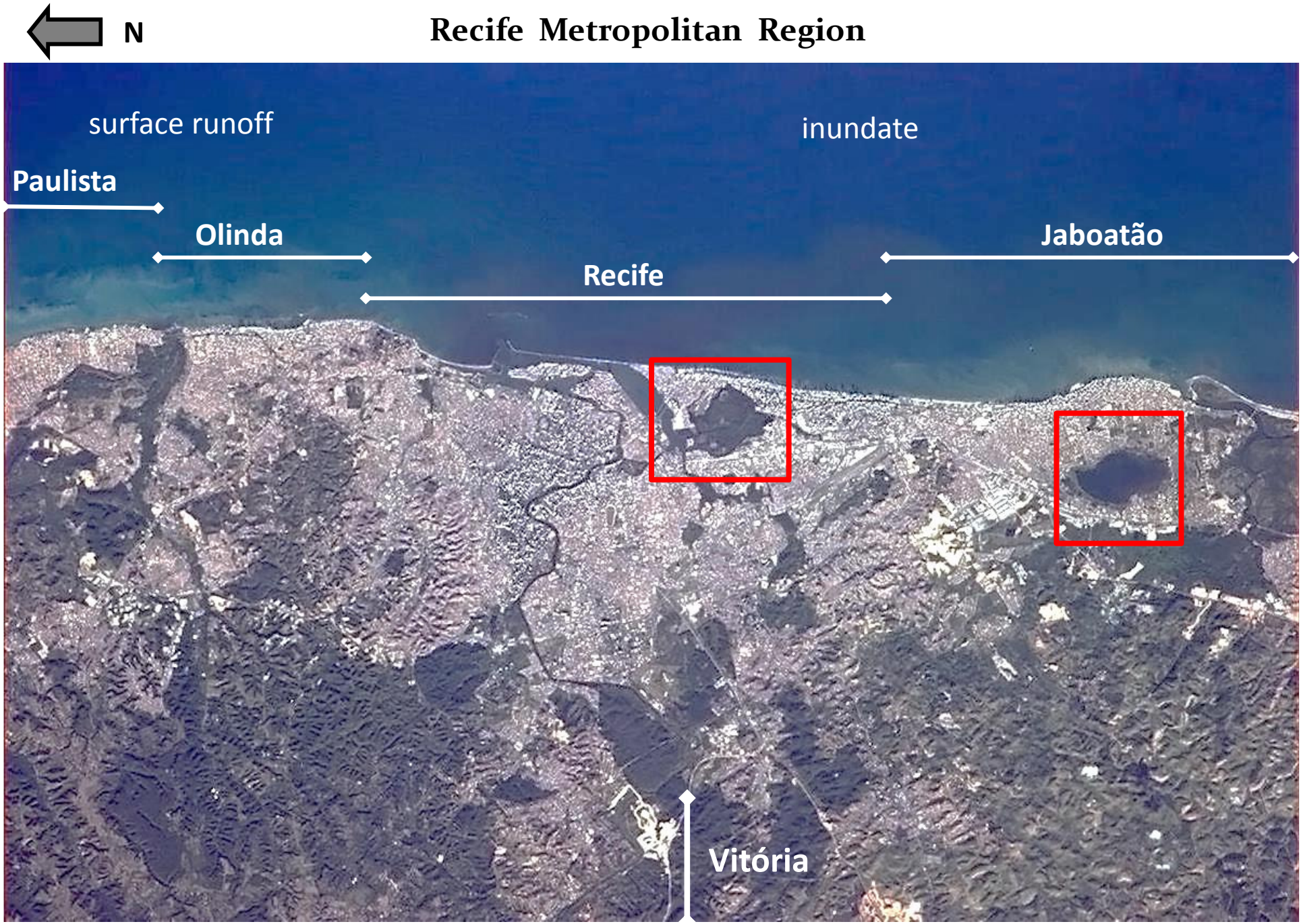

N
Recife Metropolitan Region
surface runoff
inundate
Paulista
Olinda
Recife
Jaboatão
Vitória


Image © 2011 TerraMetrics
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
©2010 Google
Data das imagens: 25 de Nov de 2009
8°05'06.70"S 34°53'22.33"O elev 8 m
Altitude do ponto de visão 5.03 km


Image © 2016 TerraMetrics
©2010 Google
Data das imagens: 25 de Nov de 2009
8°05'28.88"S 34°53'42.47"O elev 3 m
Altitude do ponto de visão 3.98 km


mangrove
lake
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image © 2016 TerraMetrics
Image © 2016 CNES / Astrium
8°09'32.50"S 34°55'20.10"O elev 28 m
©2010 Google
Datas das imagens: 14 de Dez de 2015 - 1 de Ago de 2016
Altitude do ponto de visão 13.34 km

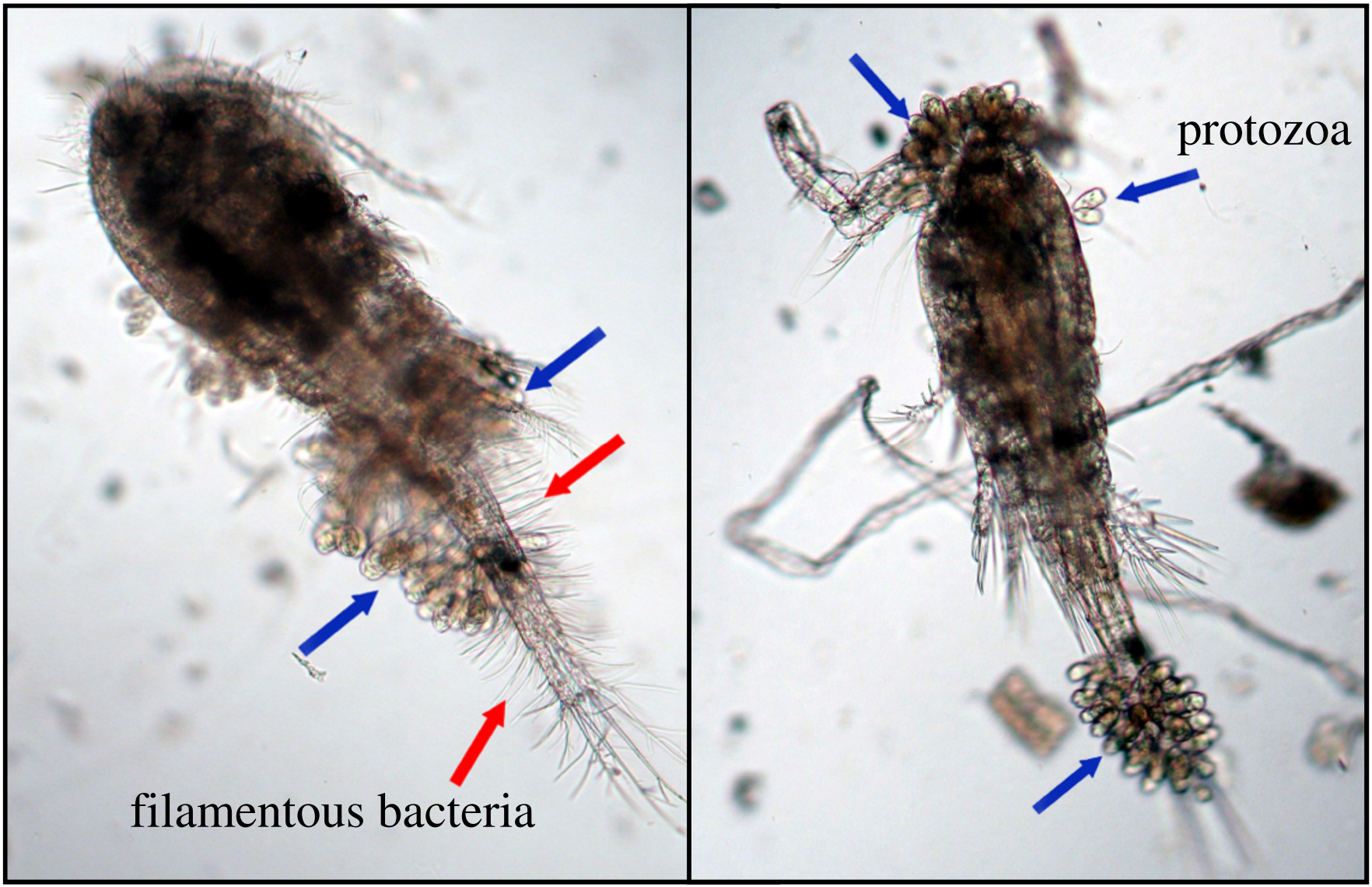

the Pina mangrove and heavy rains?


mangrove reduces the air temperature
"*heat island effect*" is reduced here


Mangrove is receiving large amounts of sewage

Mangrove is receiving large amounts of sewage


Mangrove is receiving large amounts of sewage
SEJAM
EM-VINDOS


filamentous bacteria
protozoa

Recife needs more sewage treatment

only 32% of the metropolitan area
- but no treatment at south part


Mangrove is also receiving large amounts of diffuse load

Mangrove is also receiving large amounts of diffuse load

Mangrove is also receiving large amounts of diffuse load

Mangrove is receiving large amounts of diffuse load

source ARCAM AMSTERDAM CENTRE FOR ARCHITECTURE


Crocs
Street Inlet

Fences ???

With lots of diffuse loads…
mangrove is accumulating sediment (deposition)

Aracajú Capital City
(1980s)

- no mangroves
- sewage channels
- sedimentation

Aracajú Capital City
(2014)

- mangroves
- sewage channels
- sedimentation
- flood risk...

Sedimentation is lethal to mangroves!!!!

Prediction based on evidences:

what happens if we do nothing?

mangrove destruction + { **(sediment + diffuse load)** + **river high levels** } + **high tide**

"urban pressure" — *"blocked channels"* — (rain at river basin)

Prediction based on evidences:

“equation for disaster”

mangrove destruction + { **(sediment + diffuse load)** + **river high levels** } + **high tide**

“urban pressure” — *“blocked channels”* — **(rain at river basin)**

=

catastrophic flood

catastrophic flood

= people can die
= no mobility
= financial losses
= urban infrastructure in danger
= rescue teams with limited mobility
= chaos

catastrophic (historic) flood:

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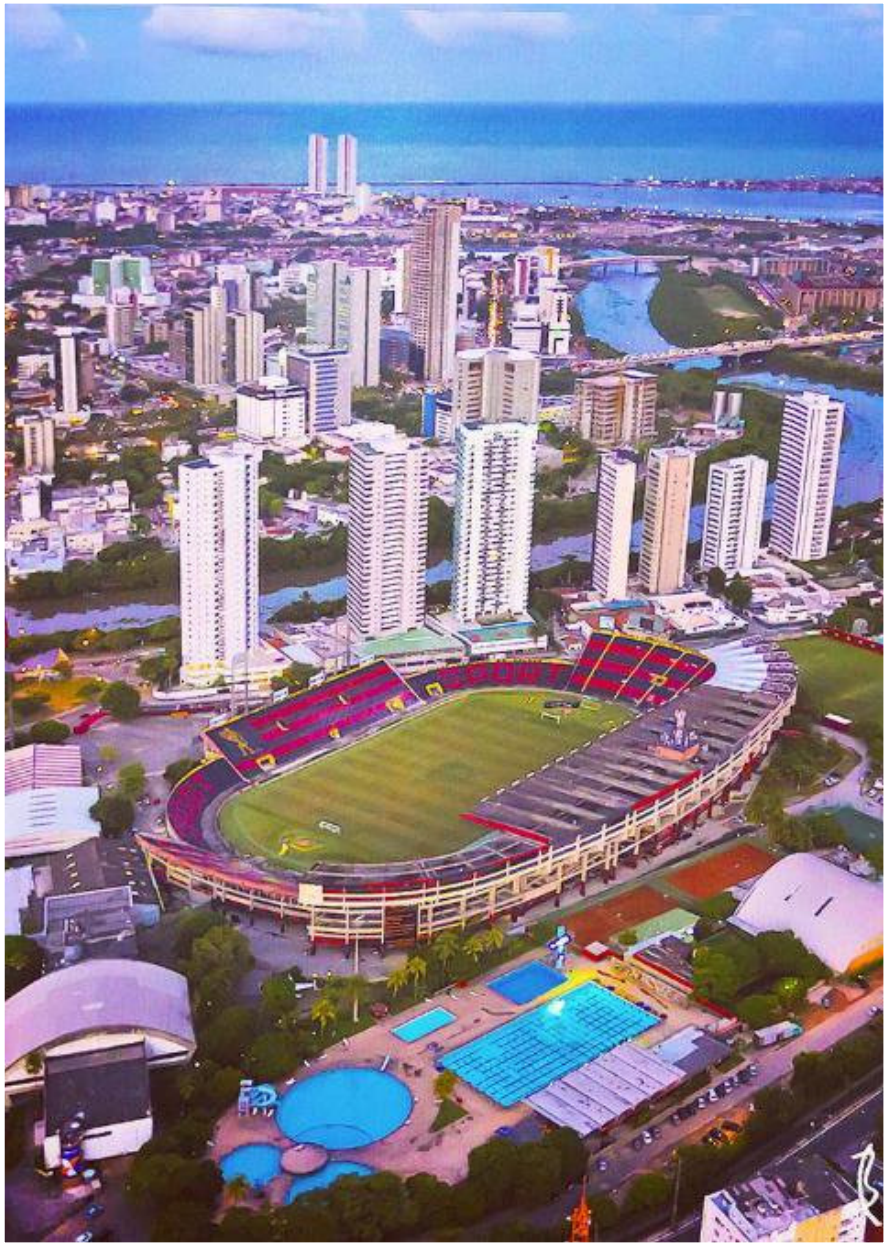
catastrophic (historic) flood:



thank you for your attention