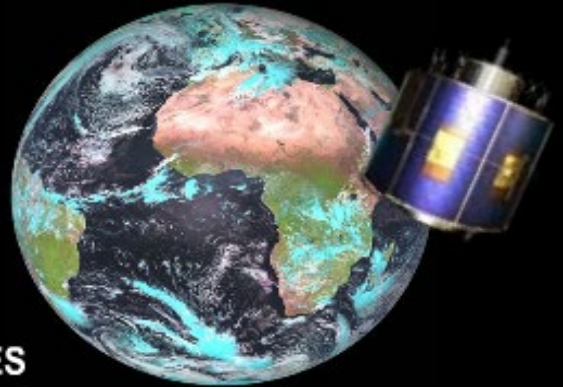
LAPIS

www.lapismet.com.br



LABORATÓRIO DE ANÁLISE E PROCESSAMENTO DE IMAGENS DE SATÉLITES

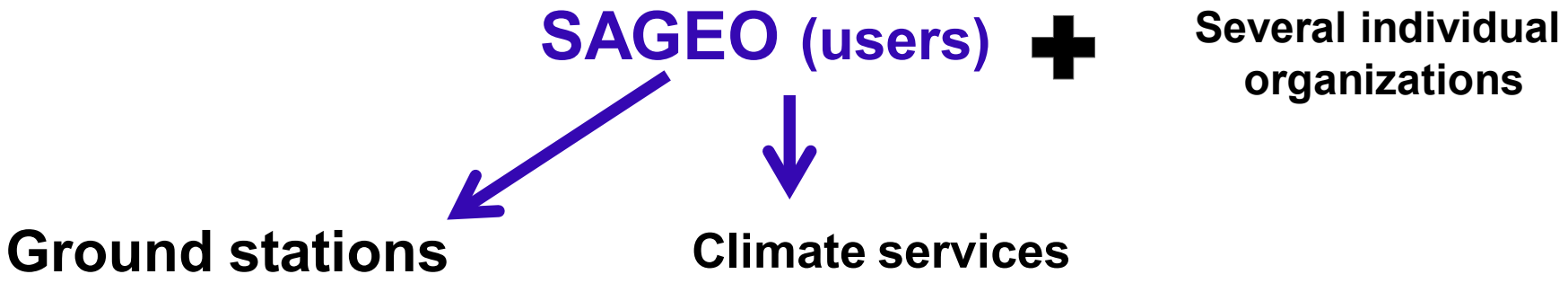
Successes and lessons from the use of European satellites in Brazil

Humberto A. Barbosa

OUTLINE:

- Introduction of LAPIS
- SAGEO (users)
- LAPIS EUMETCast station
- Examples & LAPIS cases
- Outcome from SAGEO

LAPIS coordination group in Brazil (called SAGEO, **S**outh **A**mer ican
Group of **E**UMETCast Users)



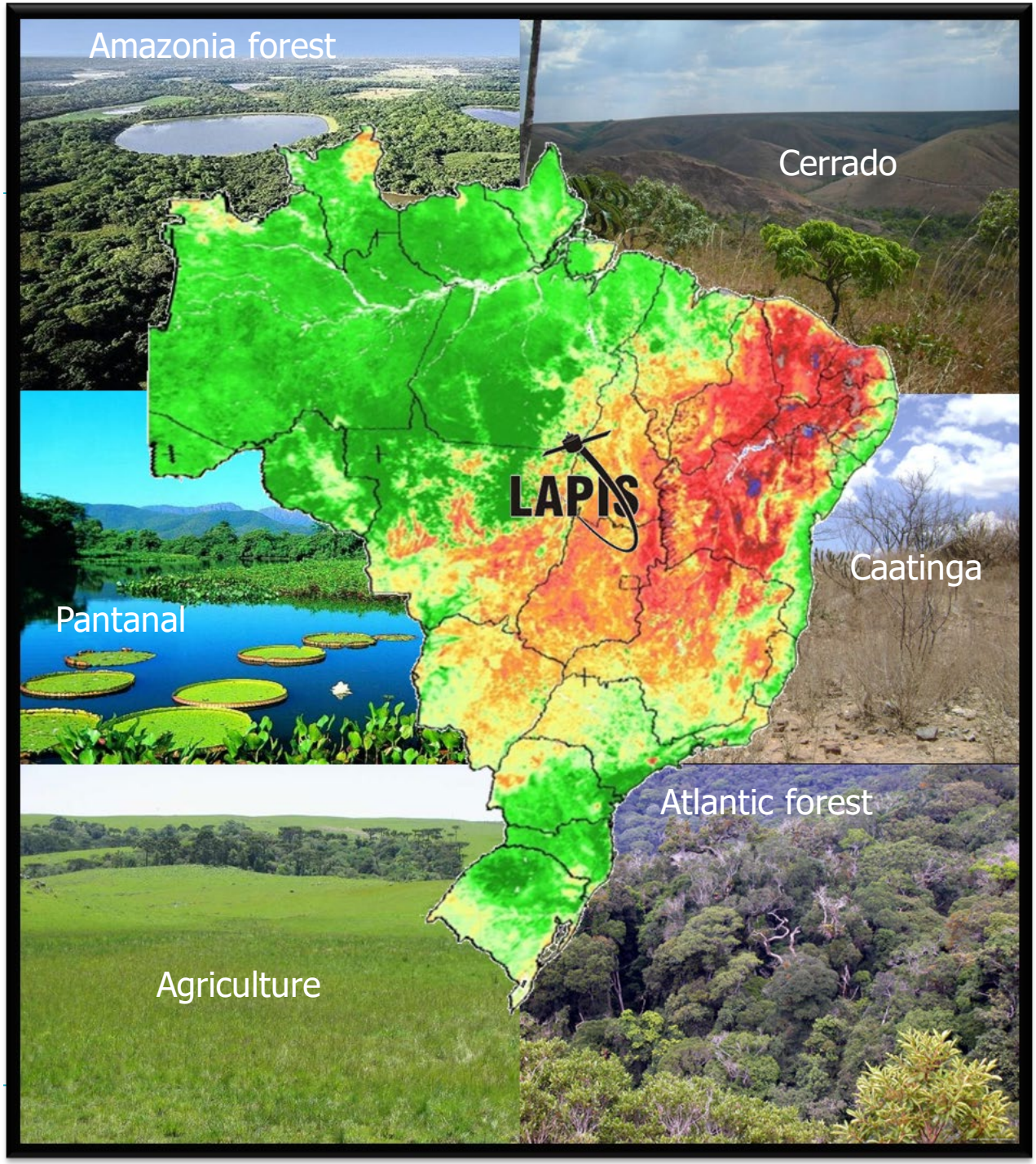
Develop trainings and tutorials on **how to use the data and products** on the system and on what software packages work with the data and products.

Develop a chat or blog or other (www.lapismet.com.br) to serve as a support system covering product usage, software questions, or other related issues.

Make recommendations to the Eumetsat on possible new data or products and removal of unused data or products from the system.

MOTIVATION:

Climate Services for Drought in Brazil

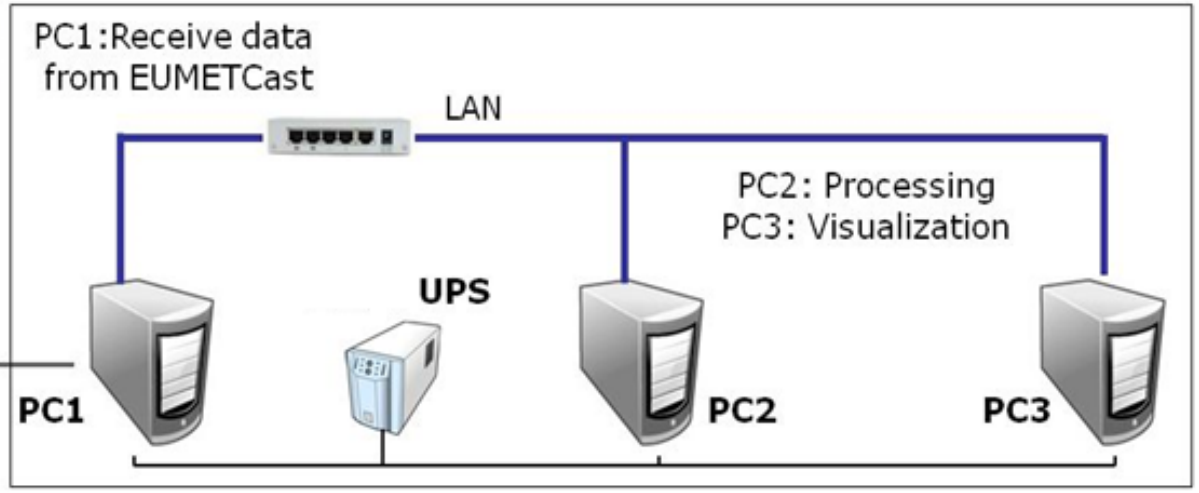


scale

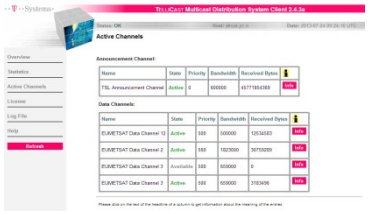
0 0.2 0.5 0.8 1

drought health

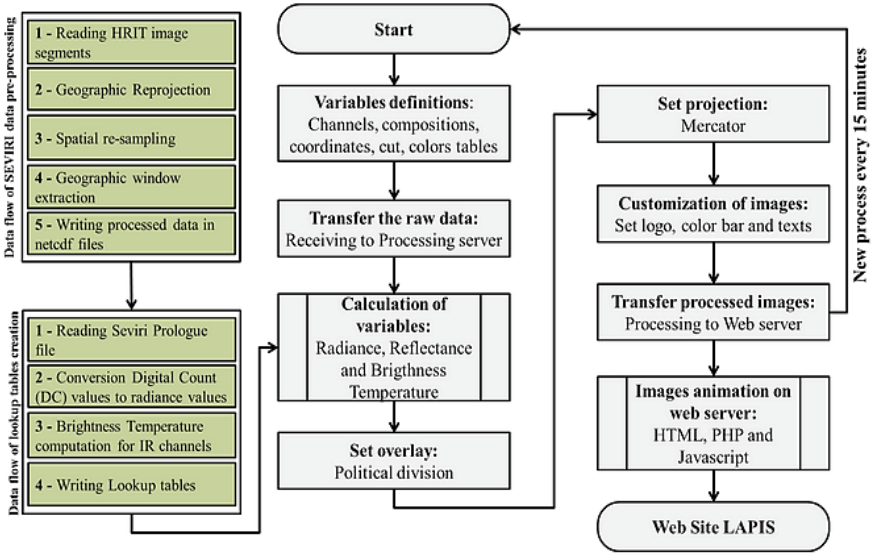
Station for EO data exploitation



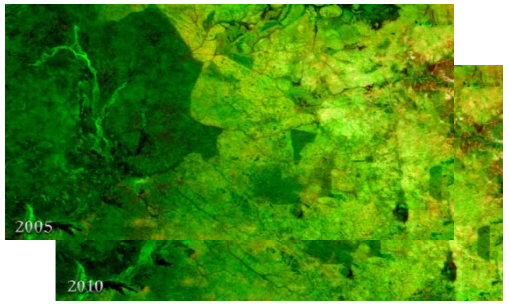
Reception



Pre-processing

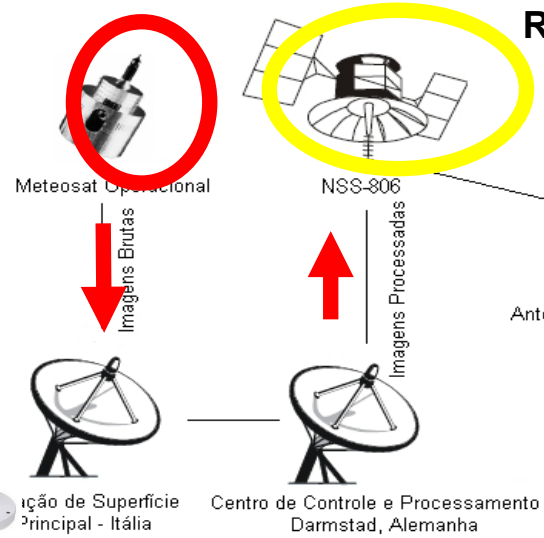


Analysis

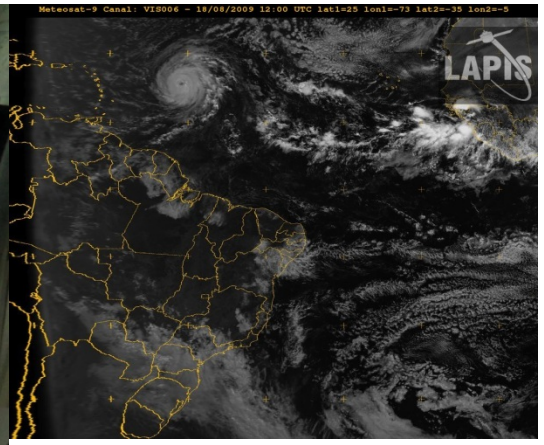


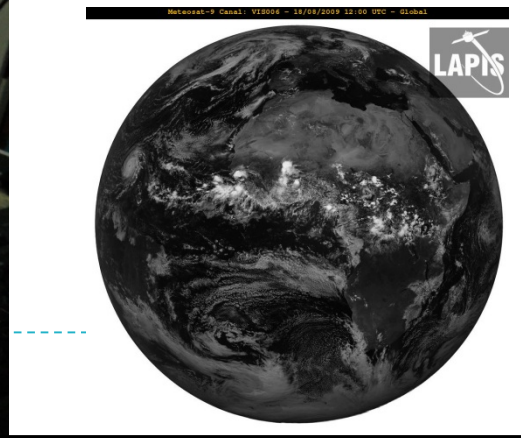
- **Main goal of the EumetCast station is to ensure operational services**

Receive, processing and visualization data from EumetCast station



EUMETCast Lapis





EO datasets for LAPIS

Low Resolution Products:

- Copernicus/GIO and PROBA-V (in continuity with VGT: no SPOT-V anymore)
- Other platforms for fire monitoring and oceanographic applications.
- Precipitation
- Geostationary Products (MSG/LandSAF)

Medium Resolution Products

- Sentinel series

LAPIS station key principles

Open System: based on Open Source technologies (Ubuntu, GDAL, Mapserver/OpenLayers, postGresQL, **python**, php)and open to Users contributions (needs specifications and developments).

Co-operative tools: can be used as pre-processing tools for feeding downstream applications (e.g. ILWIS, MSGToolBox, MCIDAS-V)

Flexible in the Installation/Re-Installation:

- Installation on a generic PC (Ubuntu OS or Windows)
- Installation and activation of all components on a single computer.
- Lighter Historical Datasets to facilitate re-install

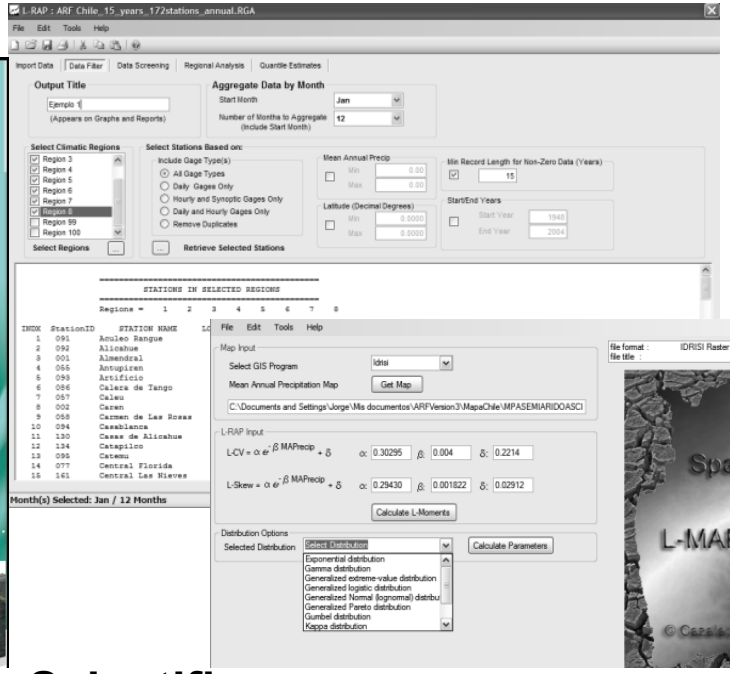
- **Online version of the Web user *http://www.lapismet.com.br***

Products developed

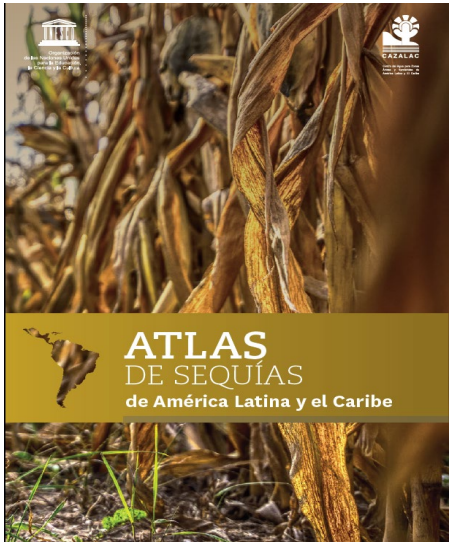
Workshops and Webinars

Manuals

Software



Atlas



Scientific papers

ELSEVIER

ISPRS Journal of Photogrammetry and Remote Sensing

Volume 148, February 2019, Pages 235-252

Assessment of Caatinga response to drought using Meteosat-SEVIRI Normalized Difference Vegetation Index (2008–2016)

Humberto Alves Barbosa [a], T.V. Lakshmi Kumar [b], Franklin Paredes [c], Simon Elliott [d], J.G. Ayuga [e]

Users in Brazil:

- **Research and Academia**
- **National Meteorological and Hydrological Services and other operational agencies**

Access to data:

- **Internet**
- **DVB-S / S2 (e.g. EUMETCast América (off), EUMETCast África (on))**

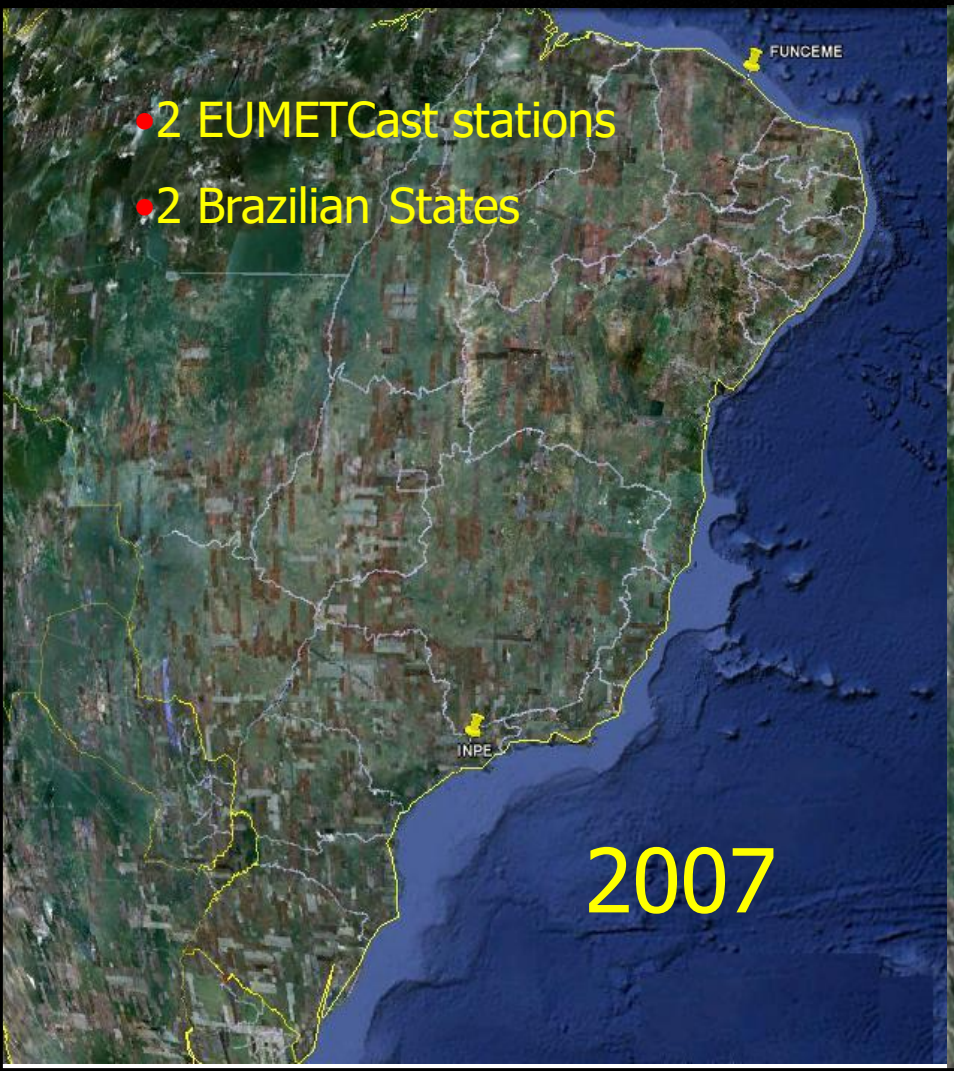
Software:

- **Low cost**

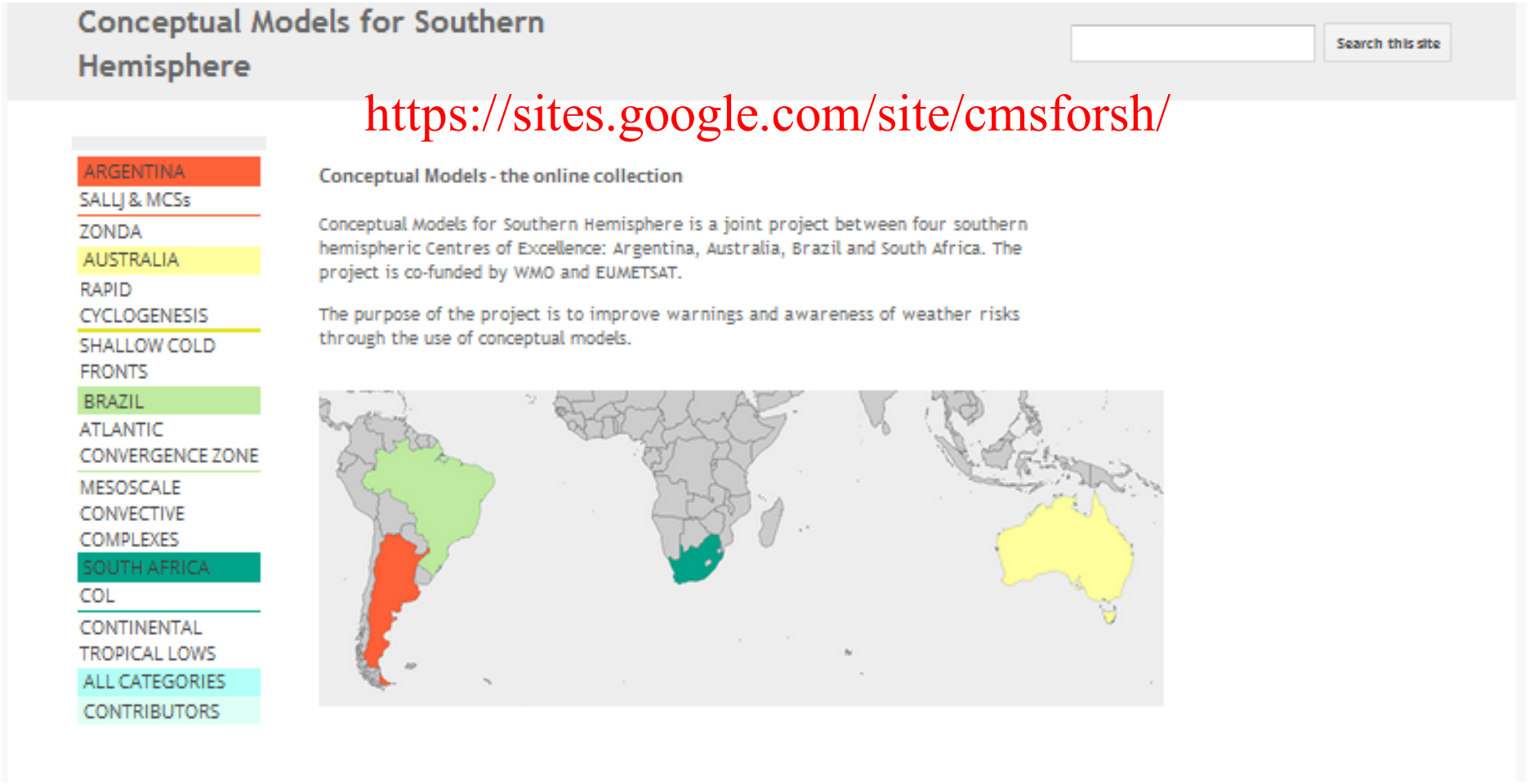
SAGEO grup

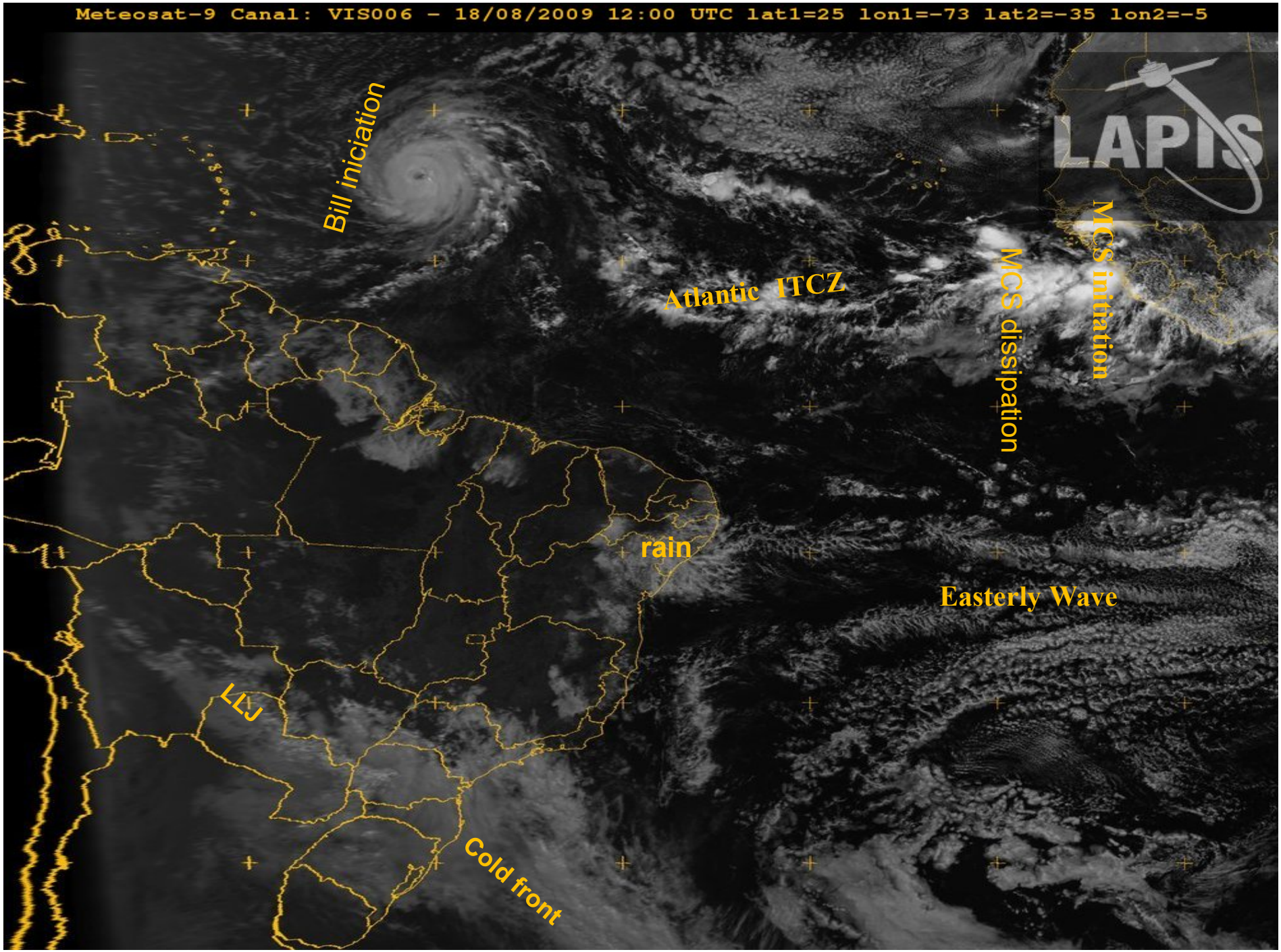
LAPIS

LABORATÓRIO DE ANÁLISE E PROCESSAMENTO DE IMAGENS DE SATÉLITES



Conceptual Models - the online collection Conceptual Models for Southern Hemisphere is a joint project between four southern hemispheric Centres of Excellence: Argentina, Australia, Brazil and South Africa. The project is co-funded by WMO and EUMETSAT. The purpose of the project is to improve warnings and awareness of weather risks through the use of conceptual models.



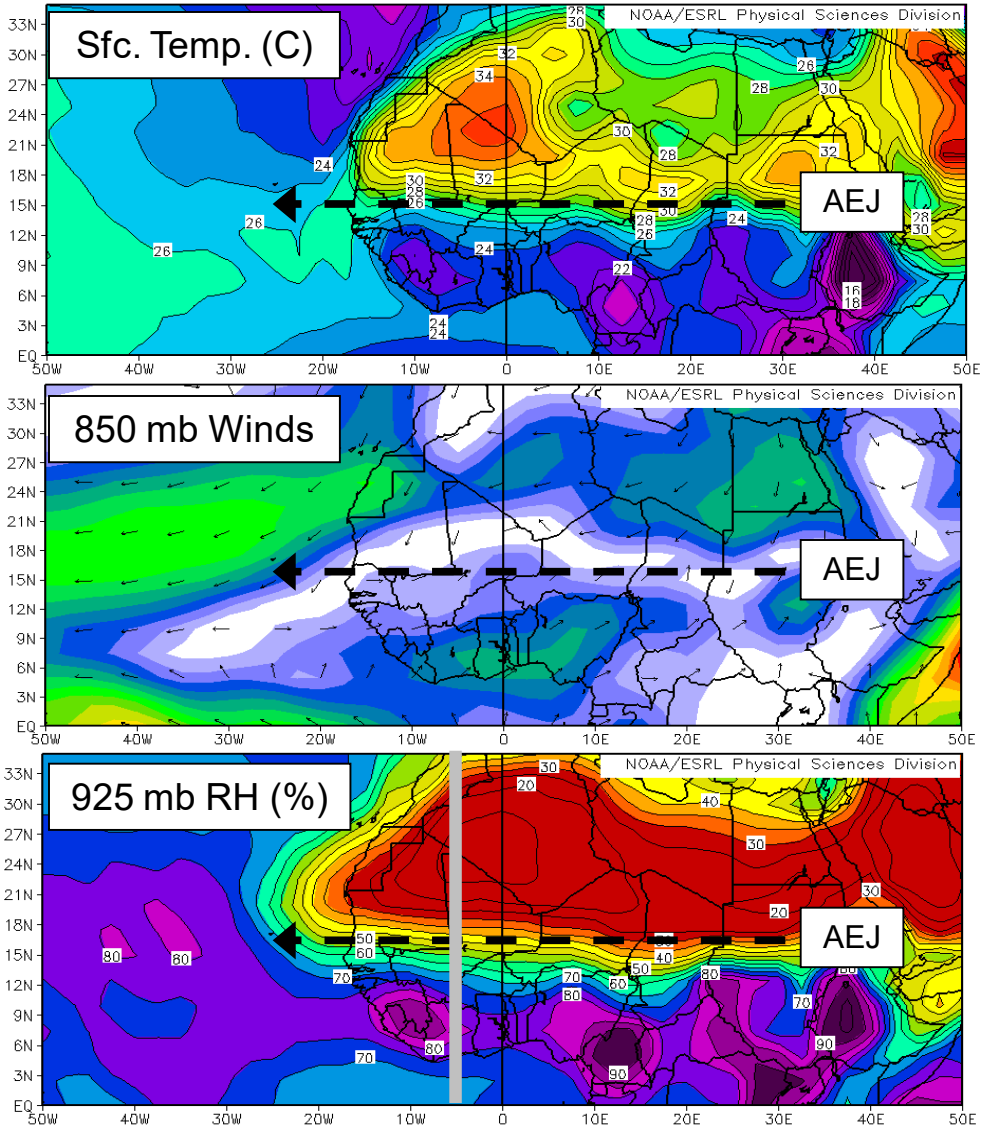

Meteosat-9 Canal: VIS006 - 18/08/2009 12:00 UTC lat1=25 lon1=-73 lat2=-35 lon2=-5
LAPIS
Bill iniciation
Atlantic ITCZ
MCS dissipation
MCS initiation
rain
Easterly Wave
LLJ
Cold front

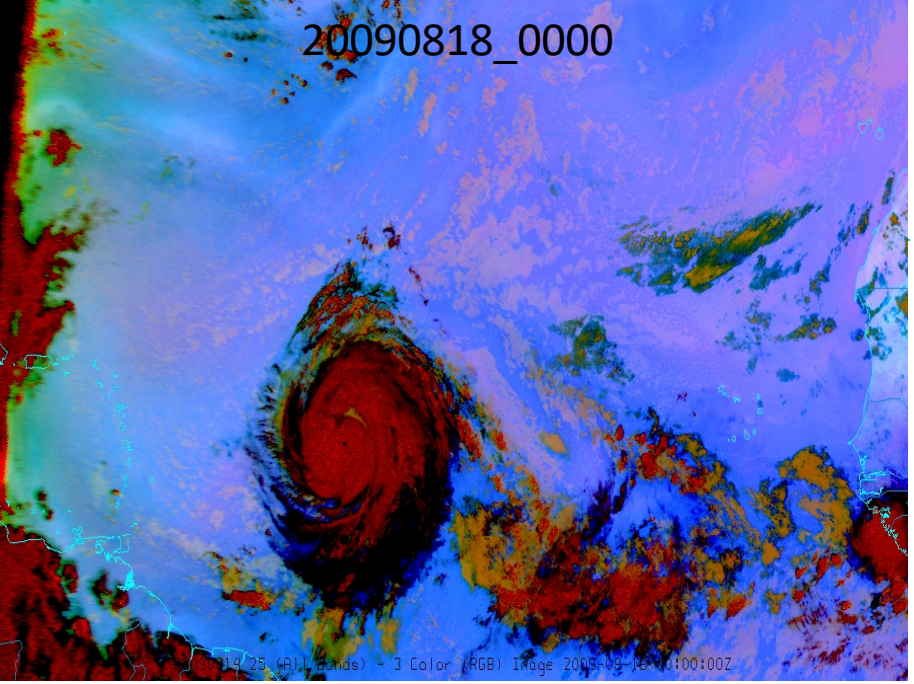
African Easterly Jet (AEJ)

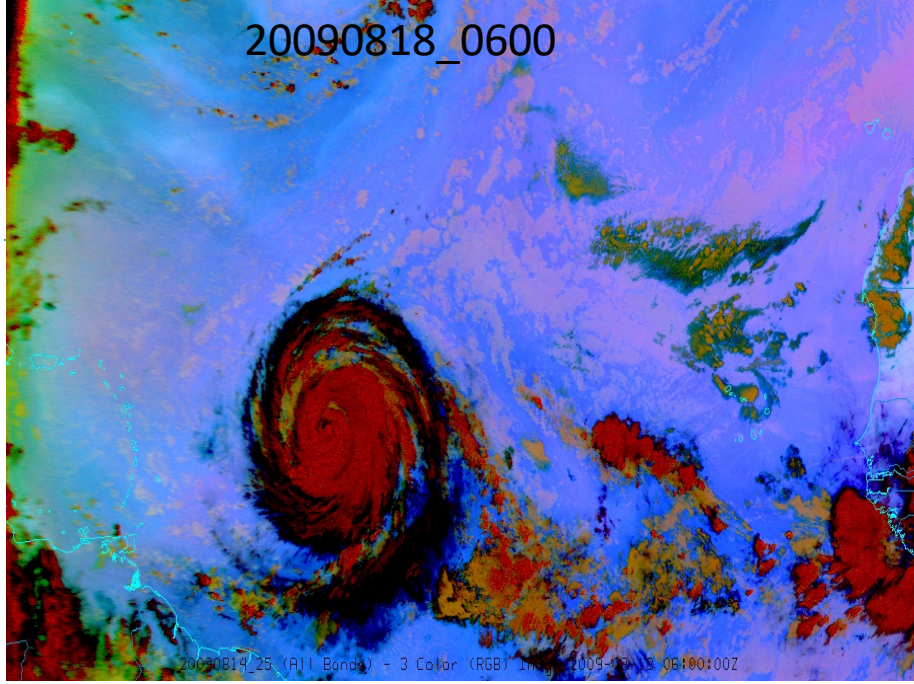
Origin: Develop over sub-Saharan Africa from instabilities along the African Easterly Jet

Basics:

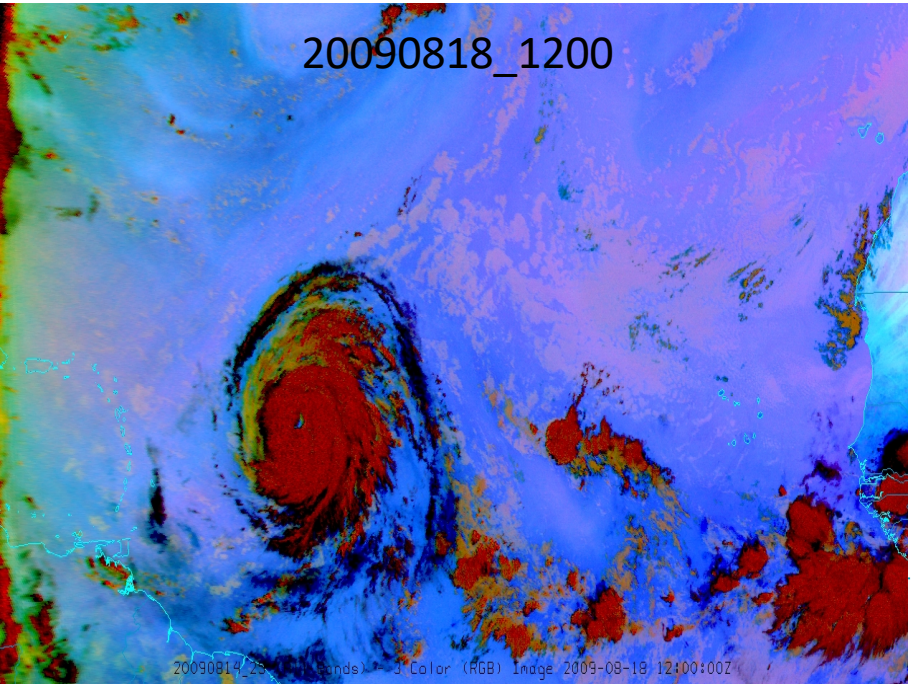
- Wavelengths of ~3000 km
- Move westward at 6-8 m/s
- 60-80 easterly waves cross the Atlantic each year between June and October
- 7-9 develop into tropical cyclones

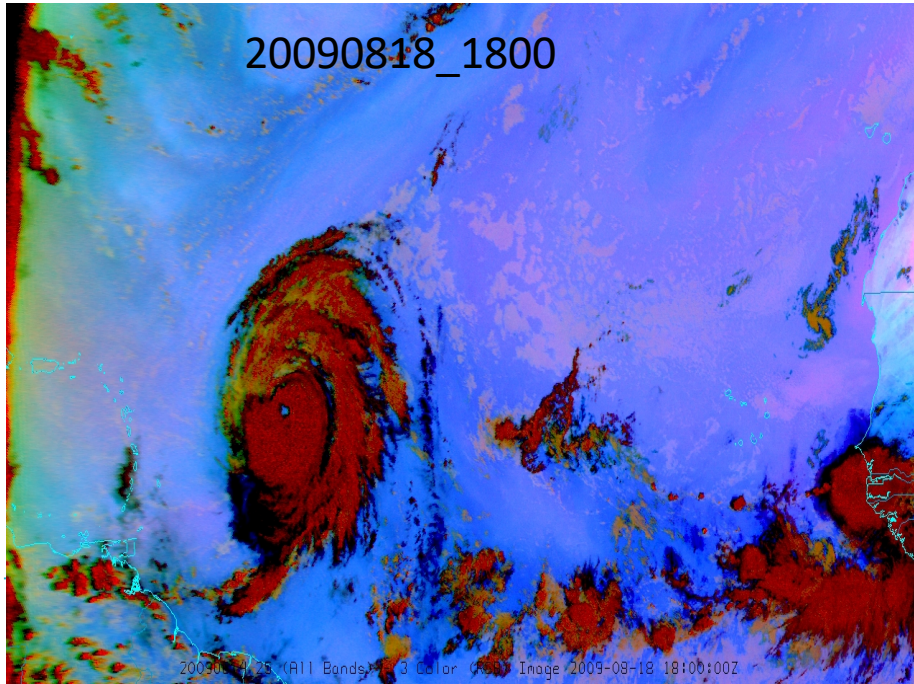






DUST





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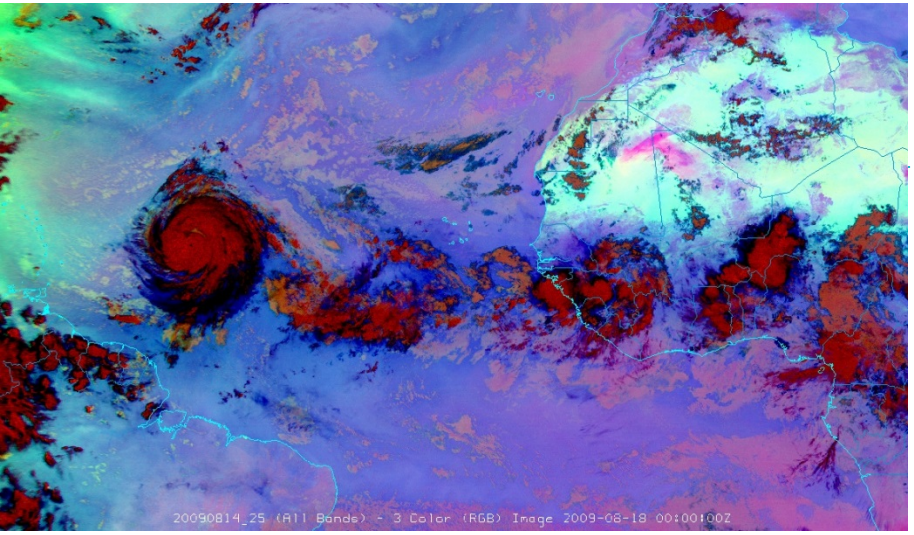

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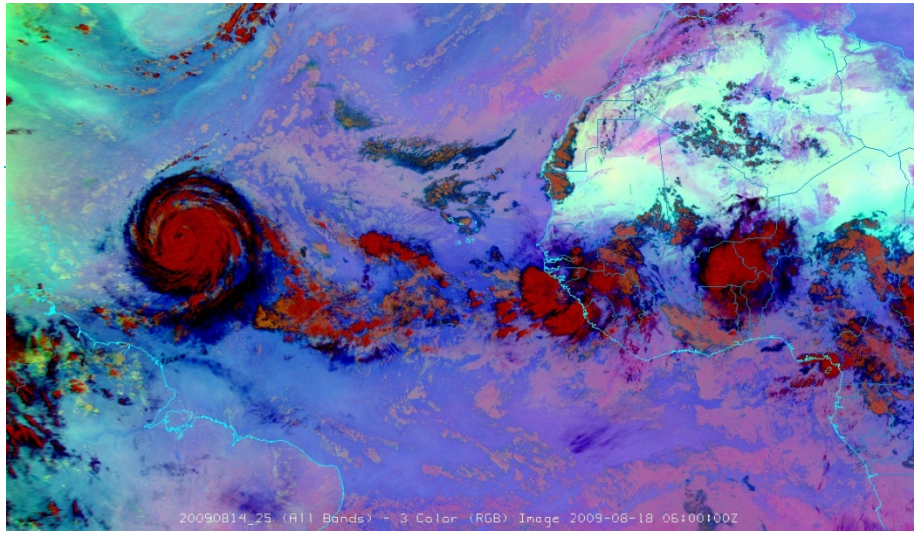
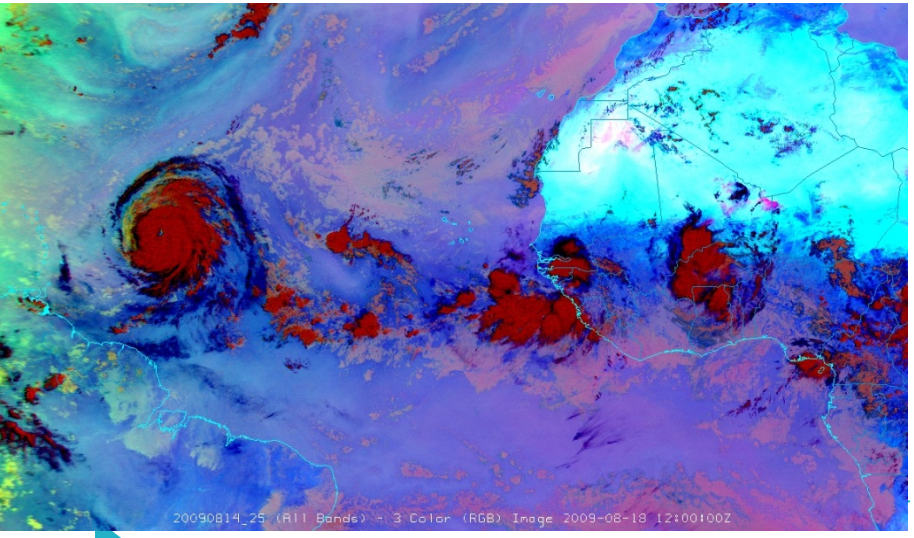


ACMP_CloudMicrophysic

20090818_1200



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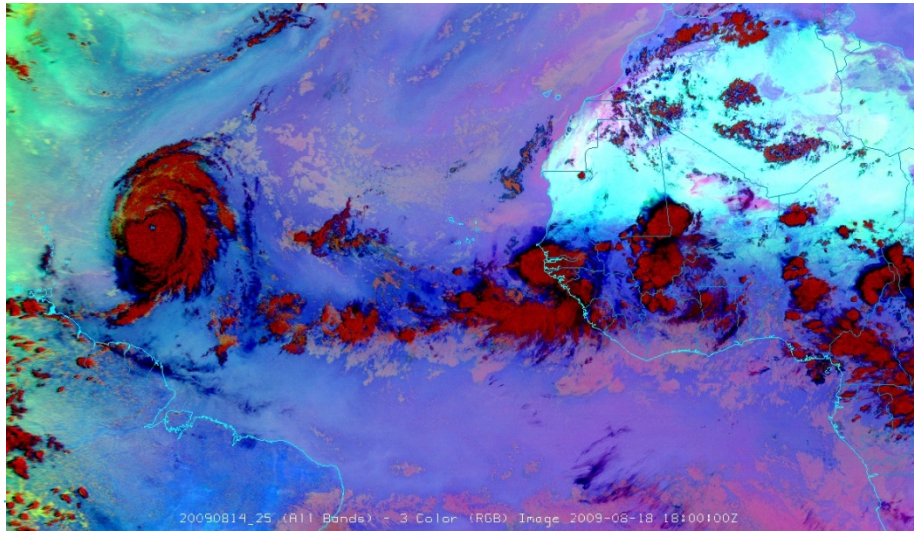

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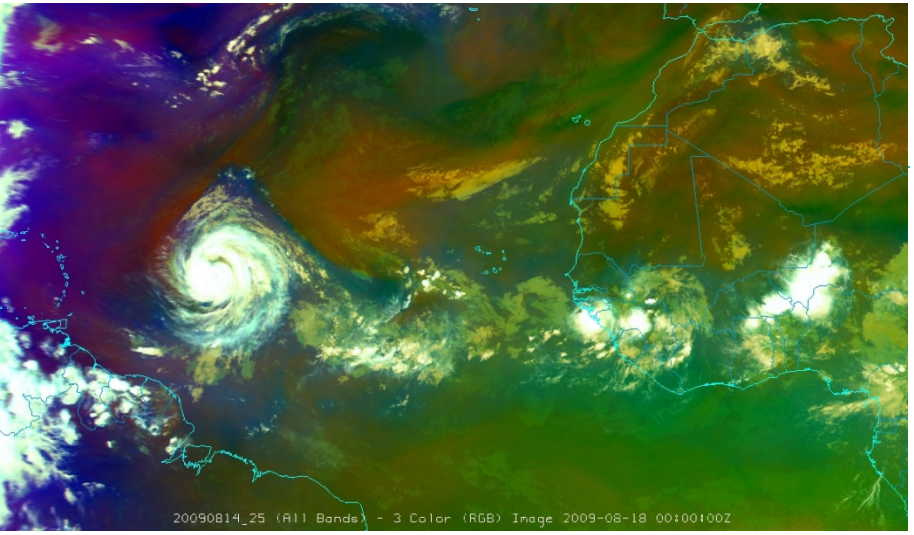

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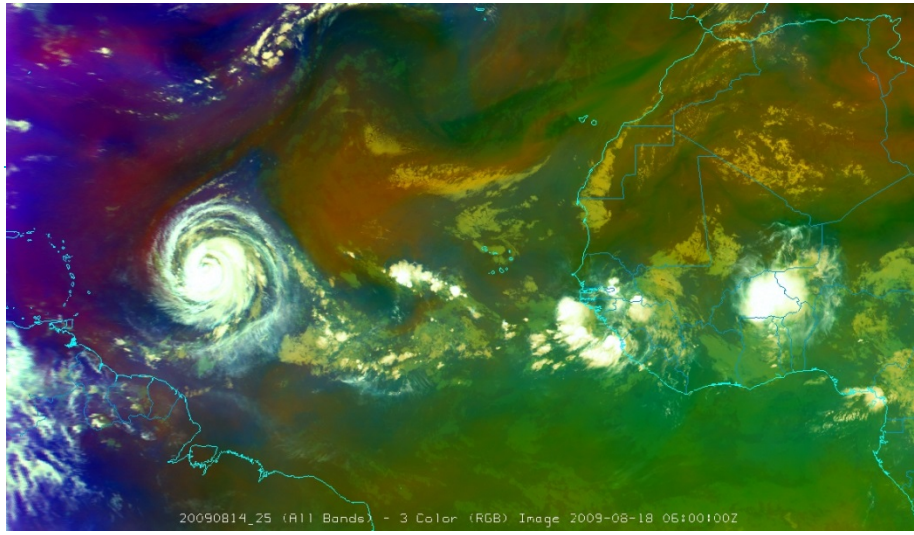

AIRM

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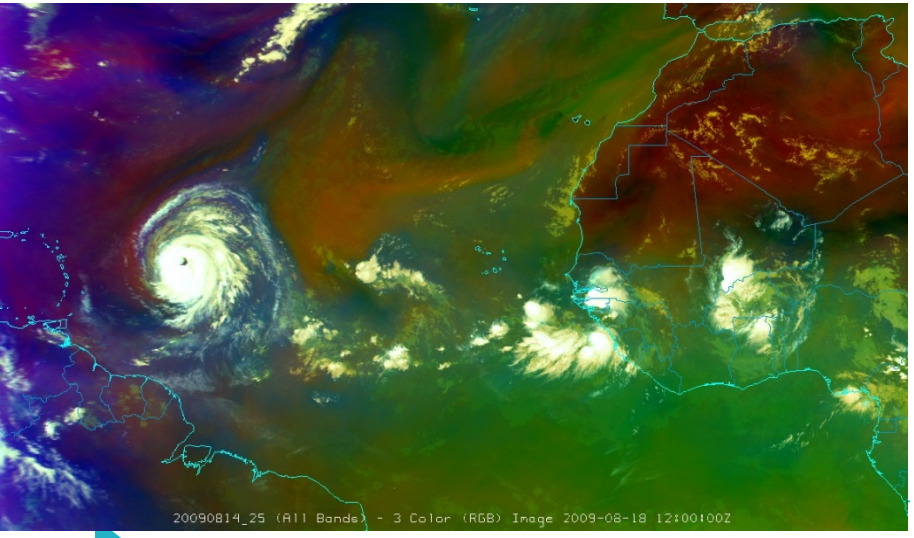

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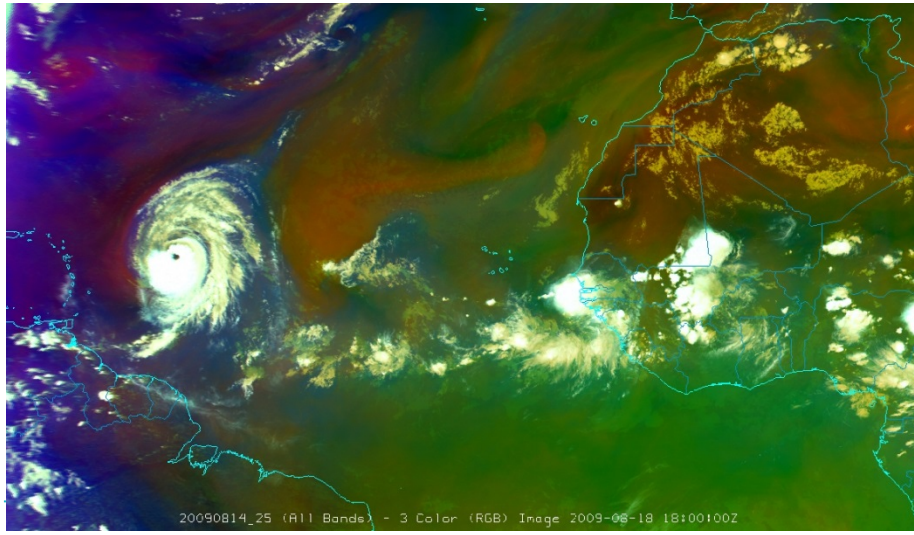

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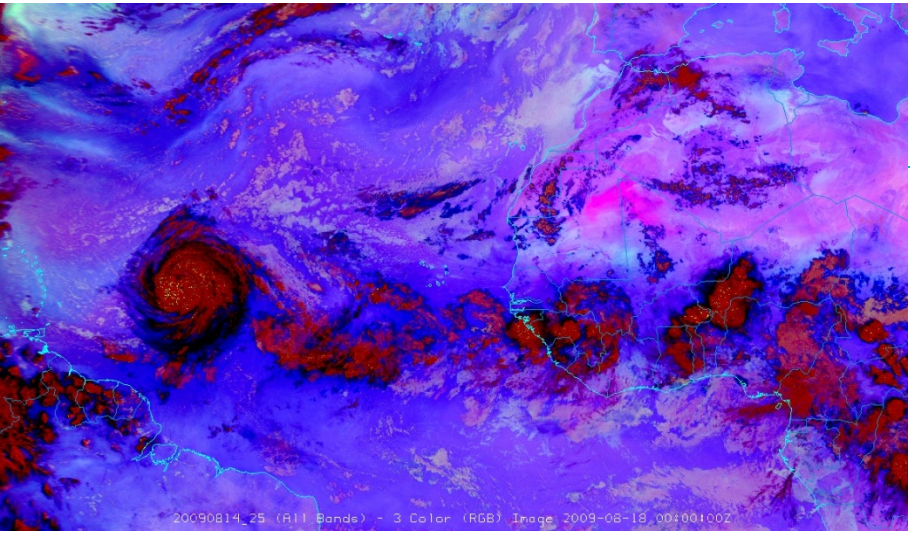

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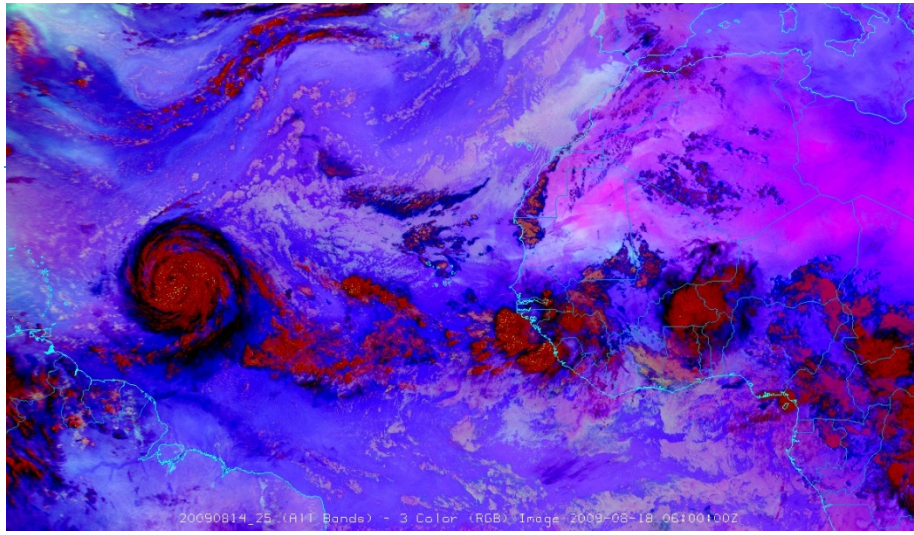

NCMP_NightTime_Cloud_Microphysics

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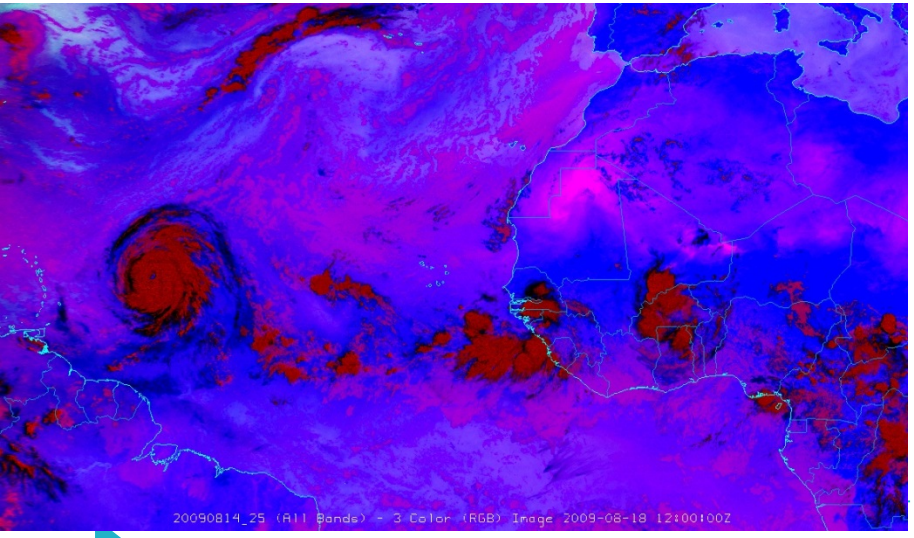

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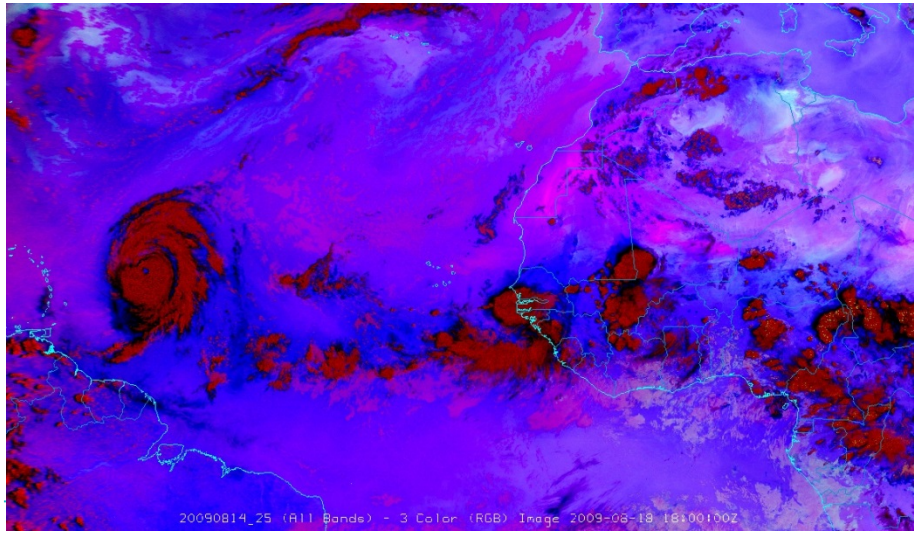
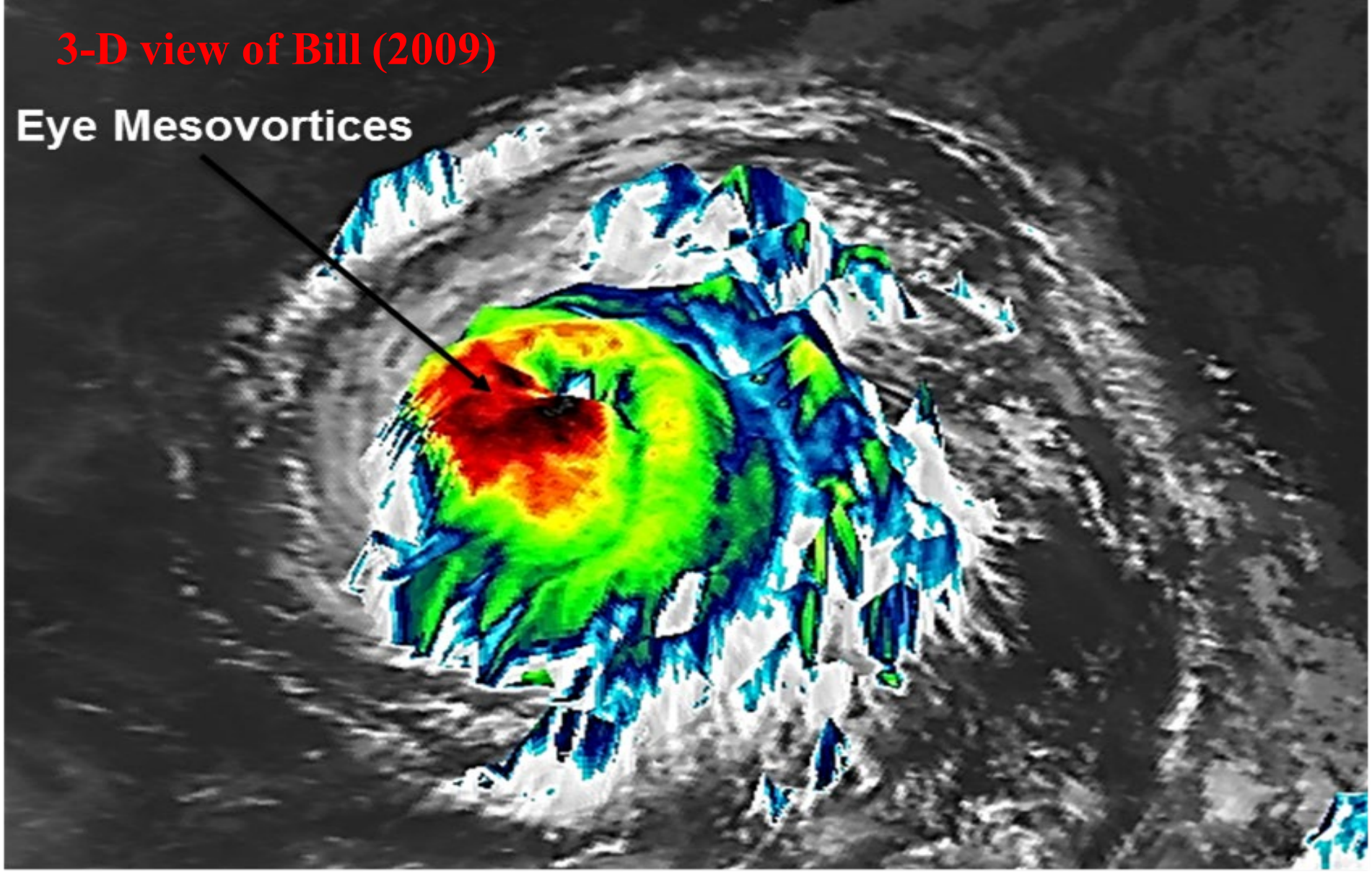
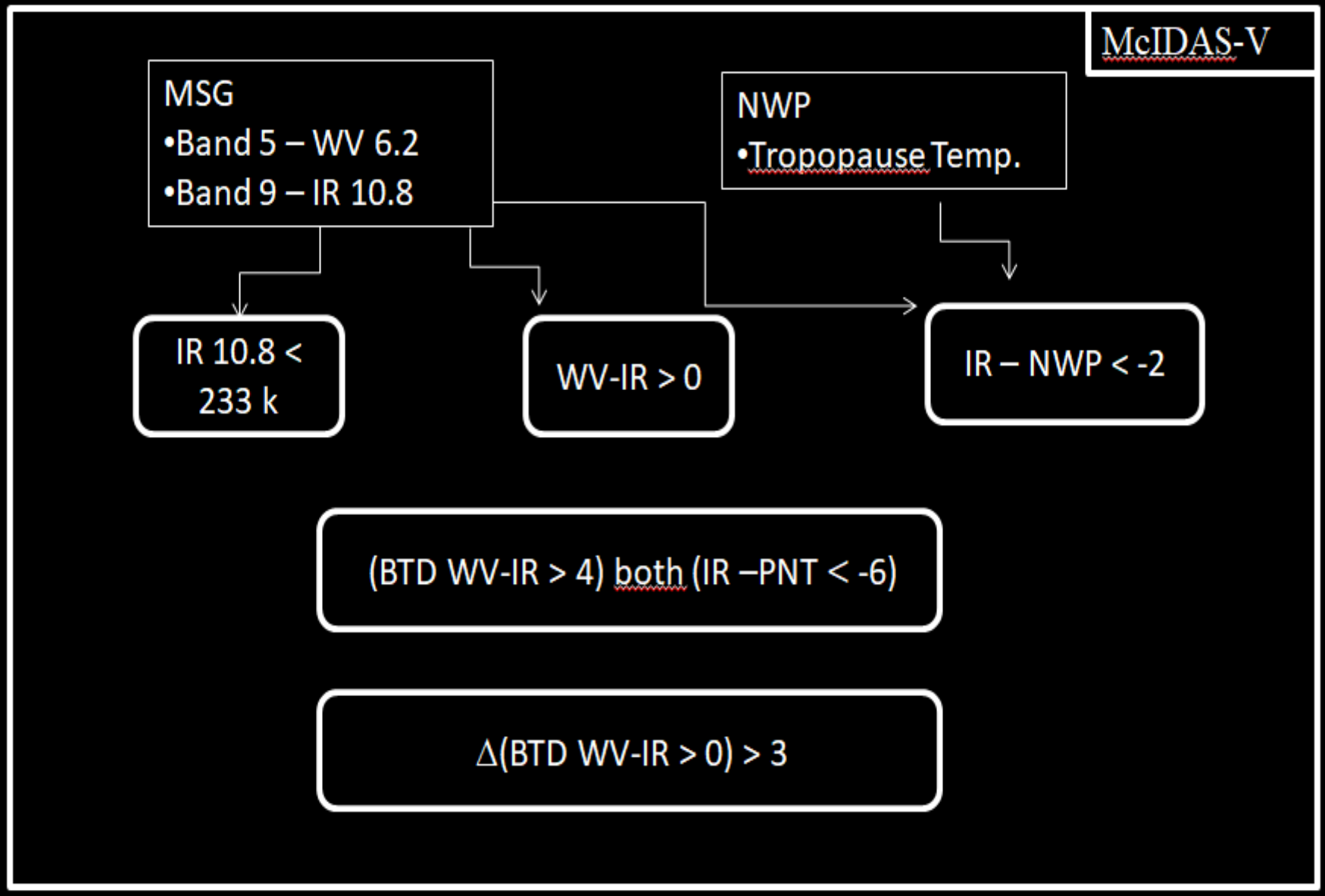
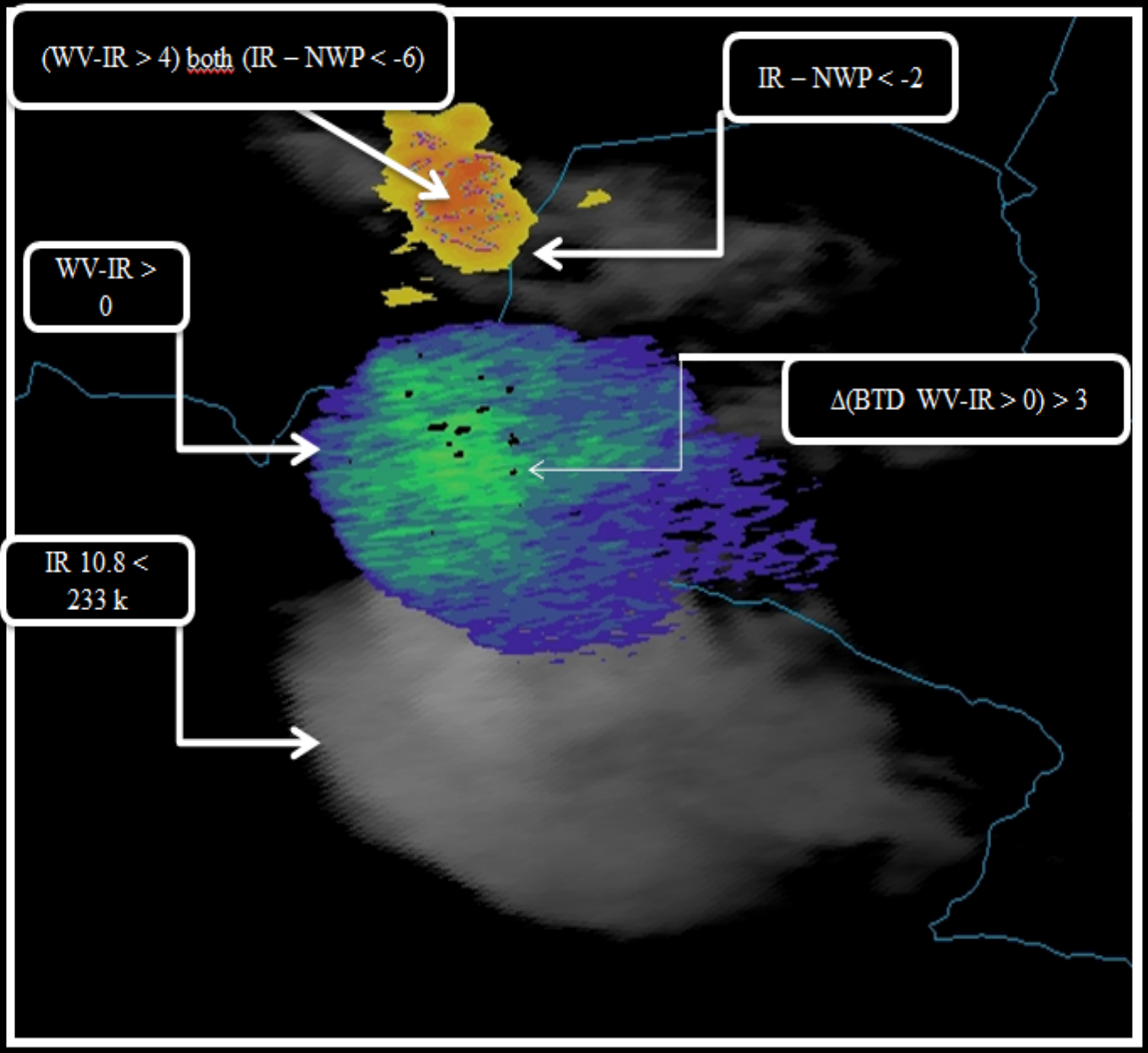



3-D view of Bill (2009)
Eye Mesovortices
300
280
260
240
220
200
180
Temperature (k)

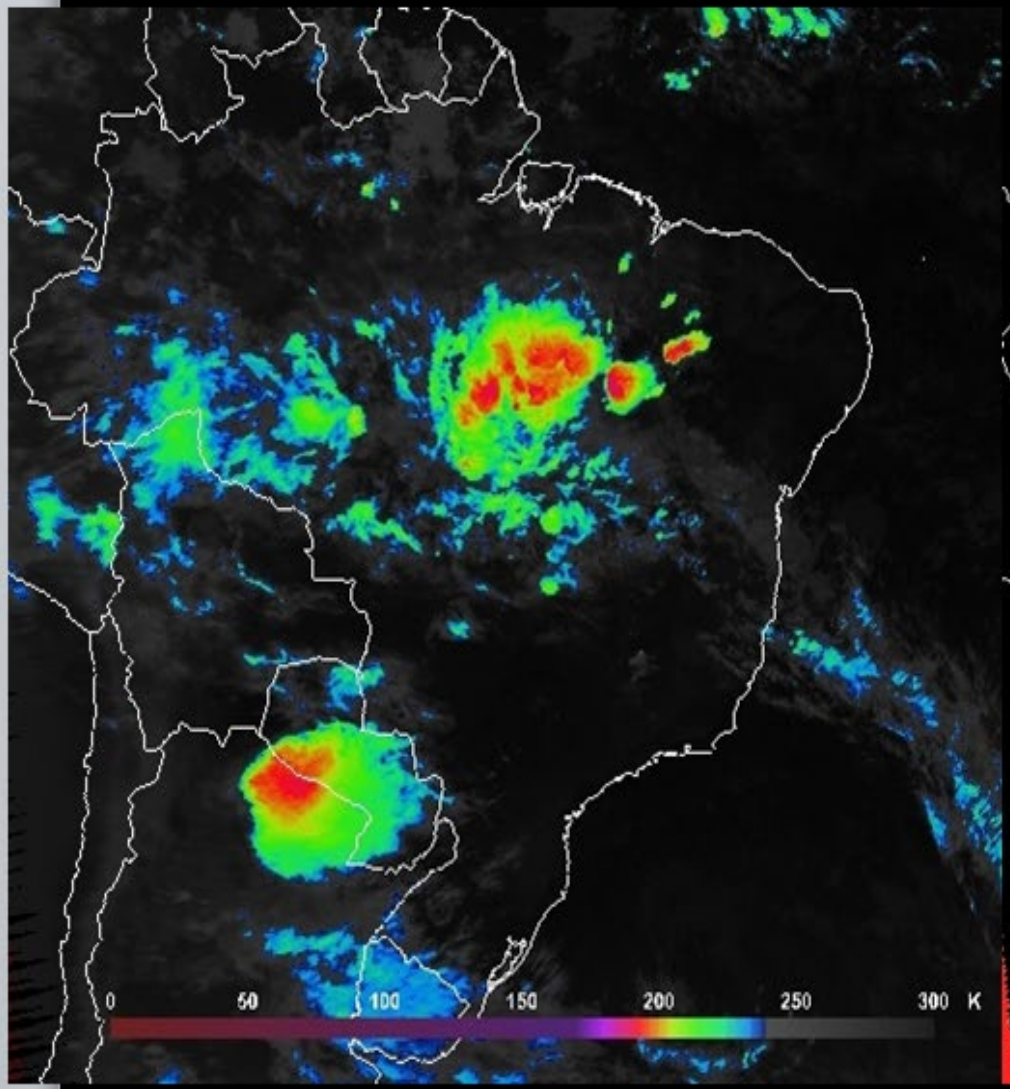
METHODOLOGY

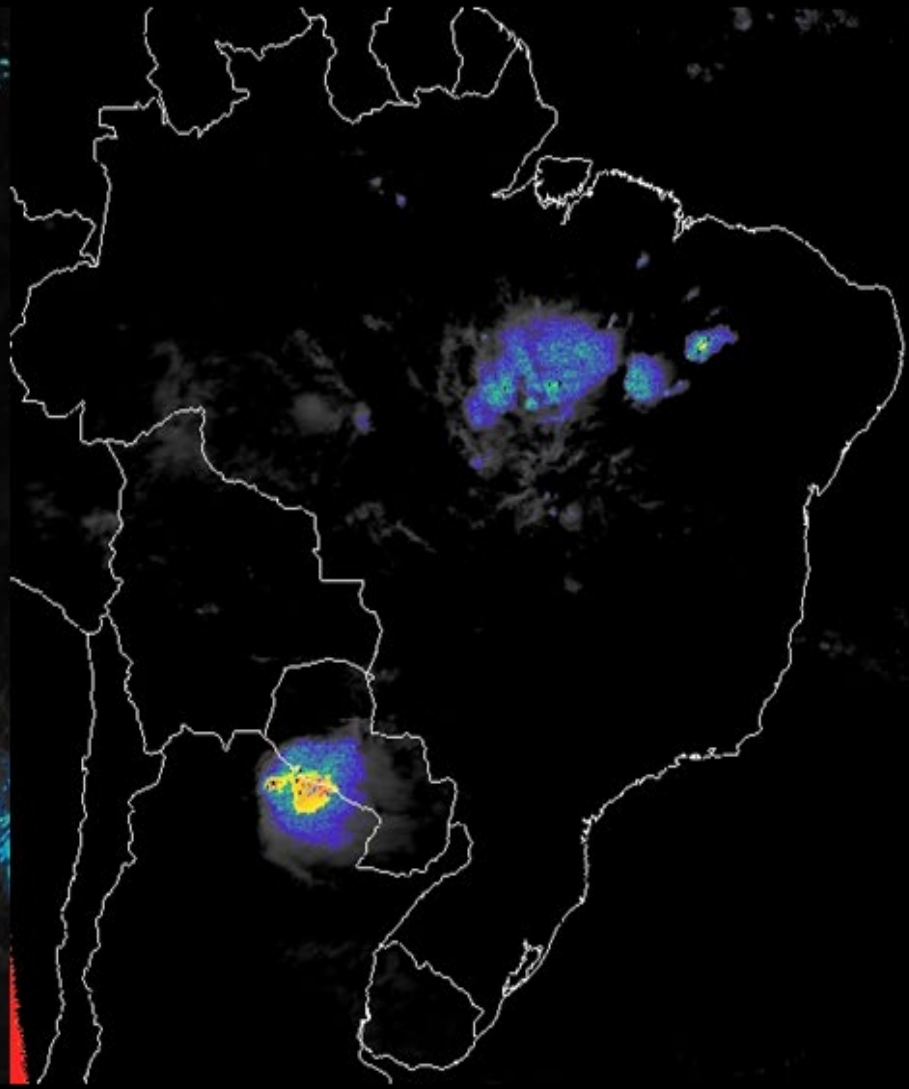


VISUALIZATION

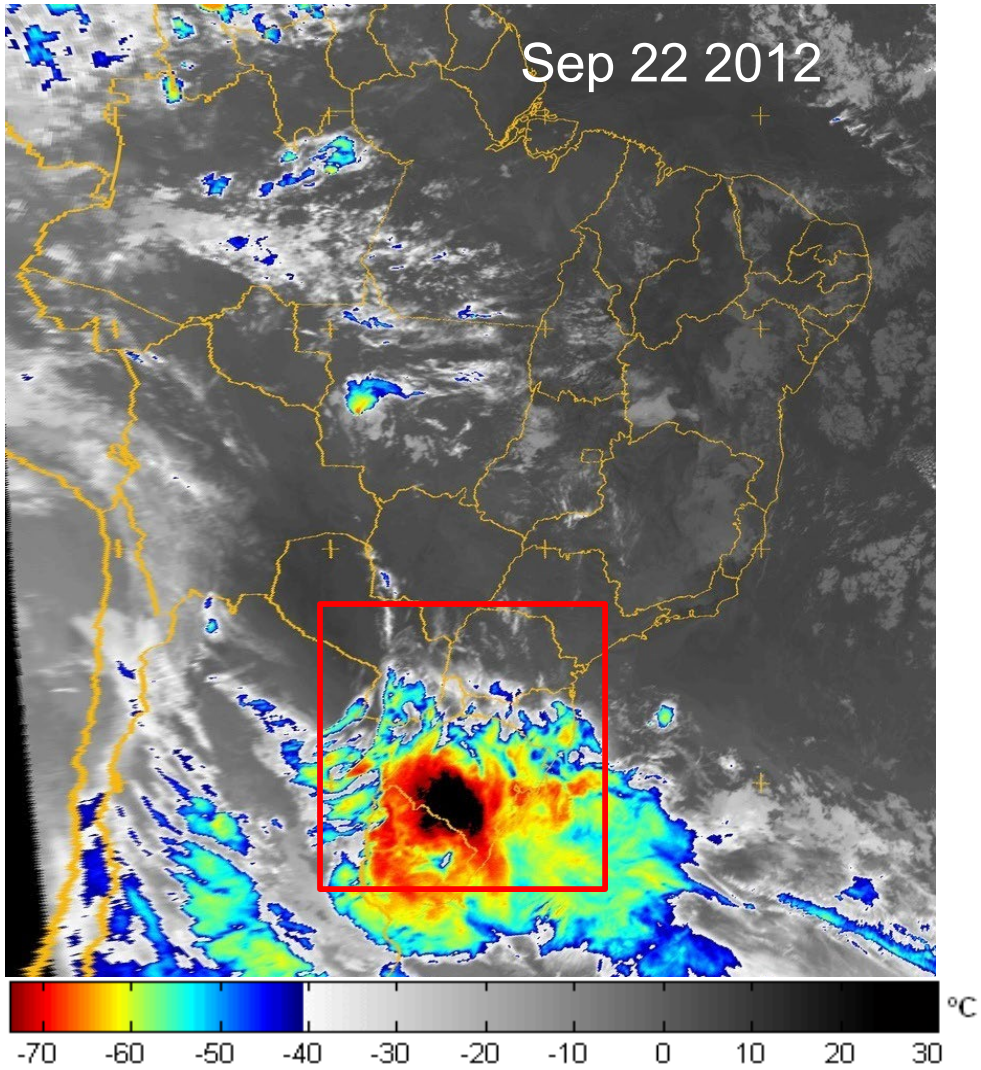


VISUALIZATION

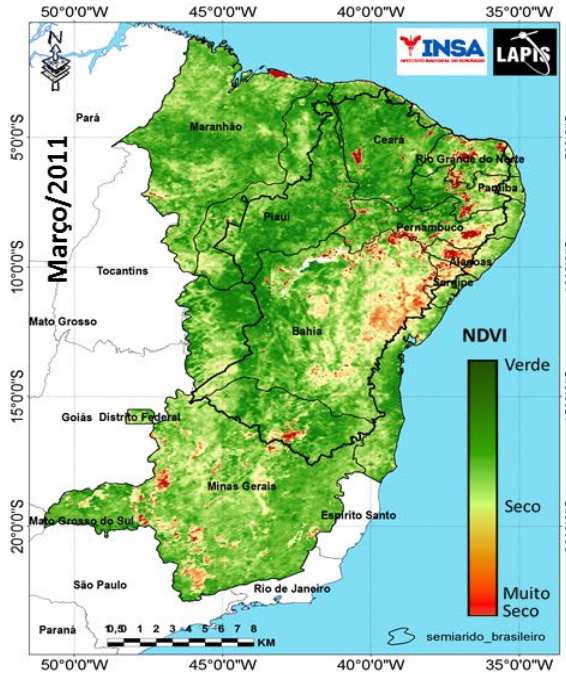


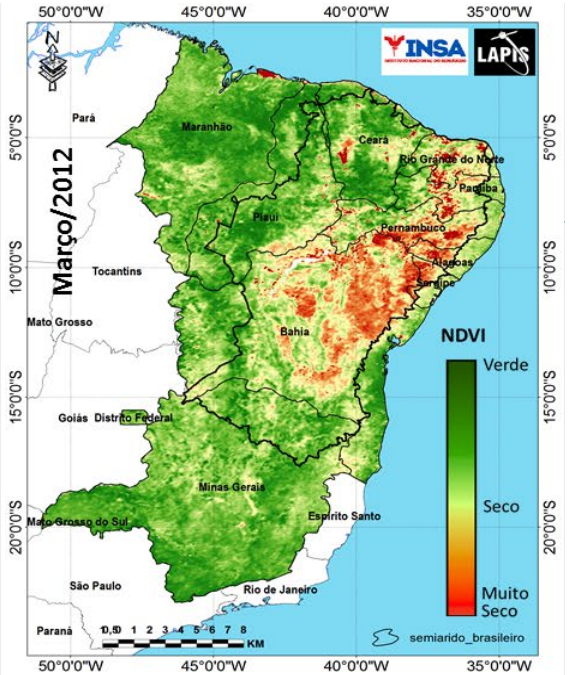


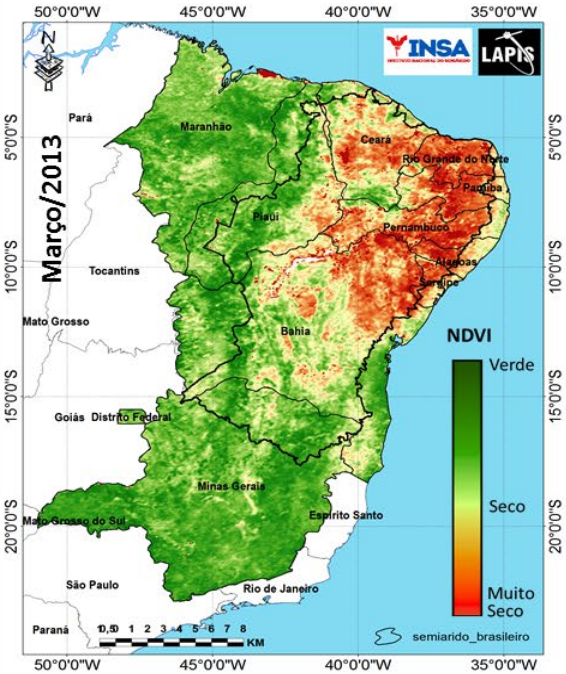
MSG IR_108 (Temp)

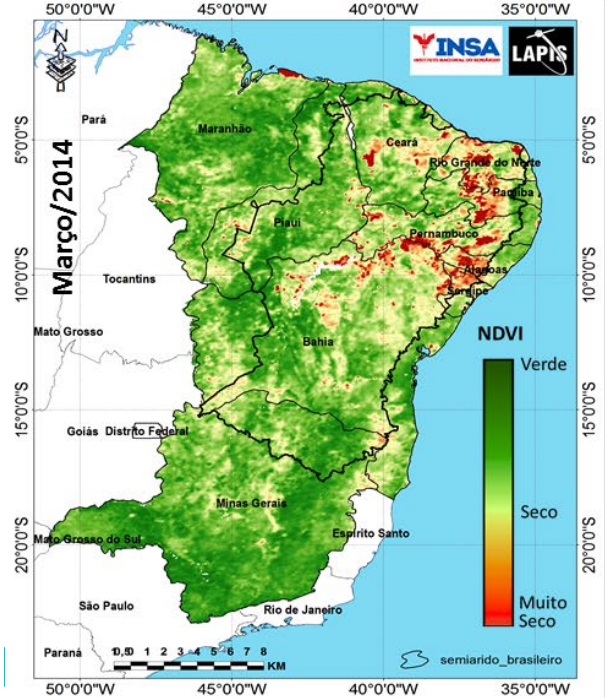


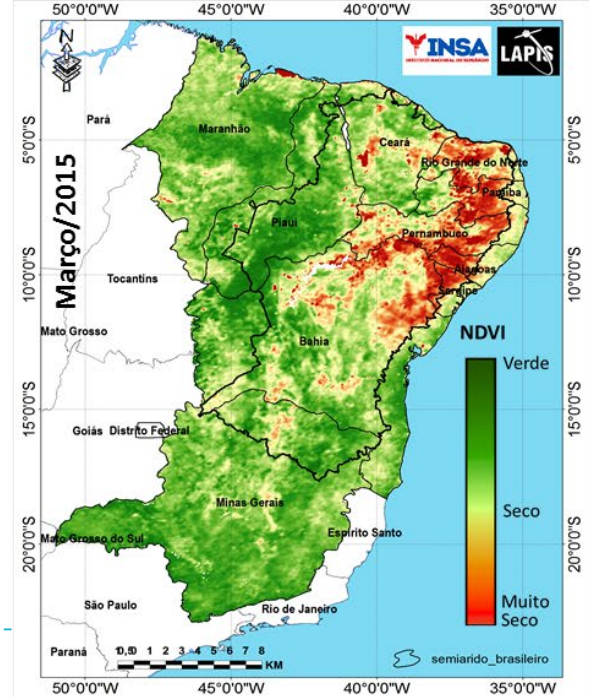
MSG MPE (rain)

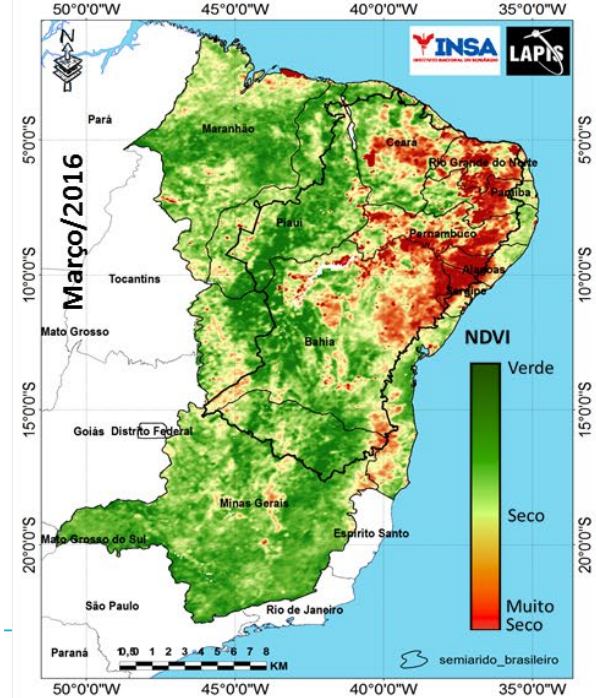

Março/2011
INSA
LAPIS
NDVI
Verde
Seco
Muito Seco
semiarido_brasileiro
50°0'0"W
45°0'0"W
40°0'0"W
35°0'0"W
5°0'0"S
10°0'0"S
15°0'0"S
20°0'0"S
Pará
Maranhão
Ceará
Rio Grande do Norte
Paraíba
Piauí
Pernambuco
Alagoas
Sergipe
Tocantins
Mato Grosso
Bahia
Goiás
Distrito Federal
Minas Gerais
Mato Grosso do Sul
Espirito Santo
São Paulo
Rio de Janeiro
Paraná
KM


Março/2012
INSA
LAPIS
NDVI
Verde
Seco
Muito Seco
semiarido_brasileiro
50°0'0"W
45°0'0"W
40°0'0"W
35°0'0"W
5°0'0"S
10°0'0"S
15°0'0"S
20°0'0"S
Pará
Maranhão
Ceará
Rio Grande do Norte
Paraíba
Piauí
Pernambuco
Alagoas
Sergipe
Tocantins
Mato Grosso
Bahia
Goiás
Distrito Federal
Minas Gerais
Mato Grosso do Sul
Espirito Santo
São Paulo
Rio de Janeiro
Paraná
KM


Março/2013
INSA
LAPIS
NDVI
Verde
Seco
Muito Seco
semiarido_brasileiro
50°0'0"W
45°0'0"W
40°0'0"W
35°0'0"W
5°0'0"S
10°0'0"S
15°0'0"S
20°0'0"S
Pará
Maranhão
Ceará
Rio Grande do Norte
Paraíba
Piauí
Pernambuco
Alagoas
Sergipe
Tocantins
Mato Grosso
Bahia
Goiás
Distrito Federal
Minas Gerais
Mato Grosso do Sul
Espirito Santo
São Paulo
Rio de Janeiro
Paraná
KM


Março/2014
INSA
LAPIS
NDVI
Verde
Seco
Muito Seco
semiarido_brasileiro
50°0'0"W
45°0'0"W
40°0'0"W
35°0'0"W
5°0'0"S
10°0'0"S
15°0'0"S
20°0'0"S
Pará
Maranhão
Ceará
Rio Grande do Norte
Paraíba
Piauí
Pernambuco
Alagoas
Sergipe
Tocantins
Mato Grosso
Bahia
Goiás
Distrito Federal
Minas Gerais
Mato Grosso do Sul
Espirito Santo
São Paulo
Rio de Janeiro
Paraná
KM


Março/2015
INSA
LAPIS
NDVI
Verde
Seco
Muito Seco
semiarido_brasileiro
50°0'0"W
45°0'0"W
40°0'0"W
35°0'0"W
5°0'0"S
10°0'0"S
15°0'0"S
20°0'0"S
Pará
Maranhão
Ceará
Rio Grande do Norte
Paraíba
Piauí
Pernambuco
Alagoas
Sergipe
Tocantins
Mato Grosso
Bahia
Goiás
Distrito Federal
Minas Gerais
Mato Grosso do Sul
Espirito Santo
São Paulo
Rio de Janeiro
Paraná
KM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NDVI
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35°0'0"W
5°0'0"S
10°0'0"S
15°0'0"S
20°0'0"S
Pará
Maranhão
Ceará
Rio Grande do Norte
Paraíba
Piauí
Pernambuco
Alagoas
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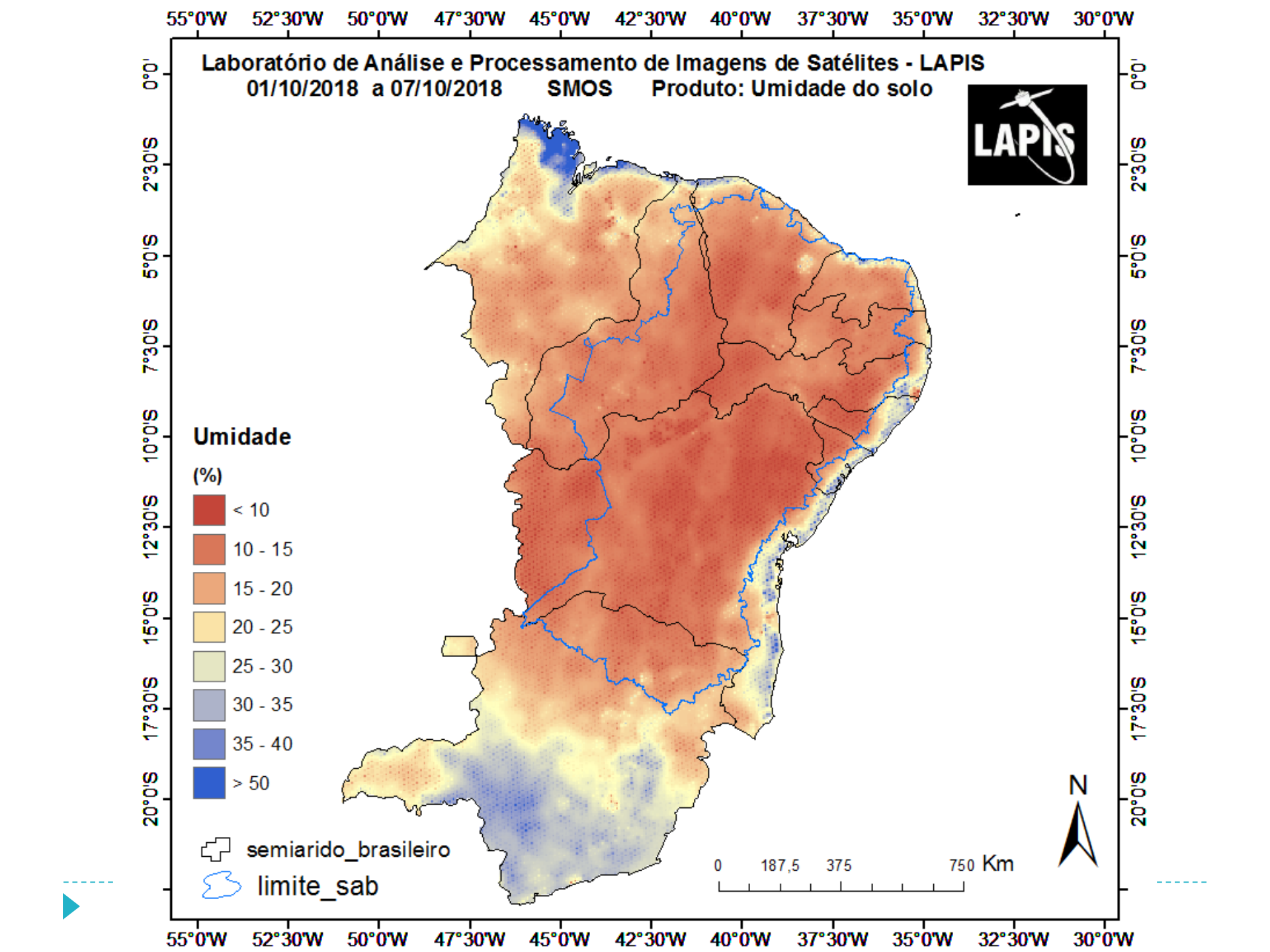
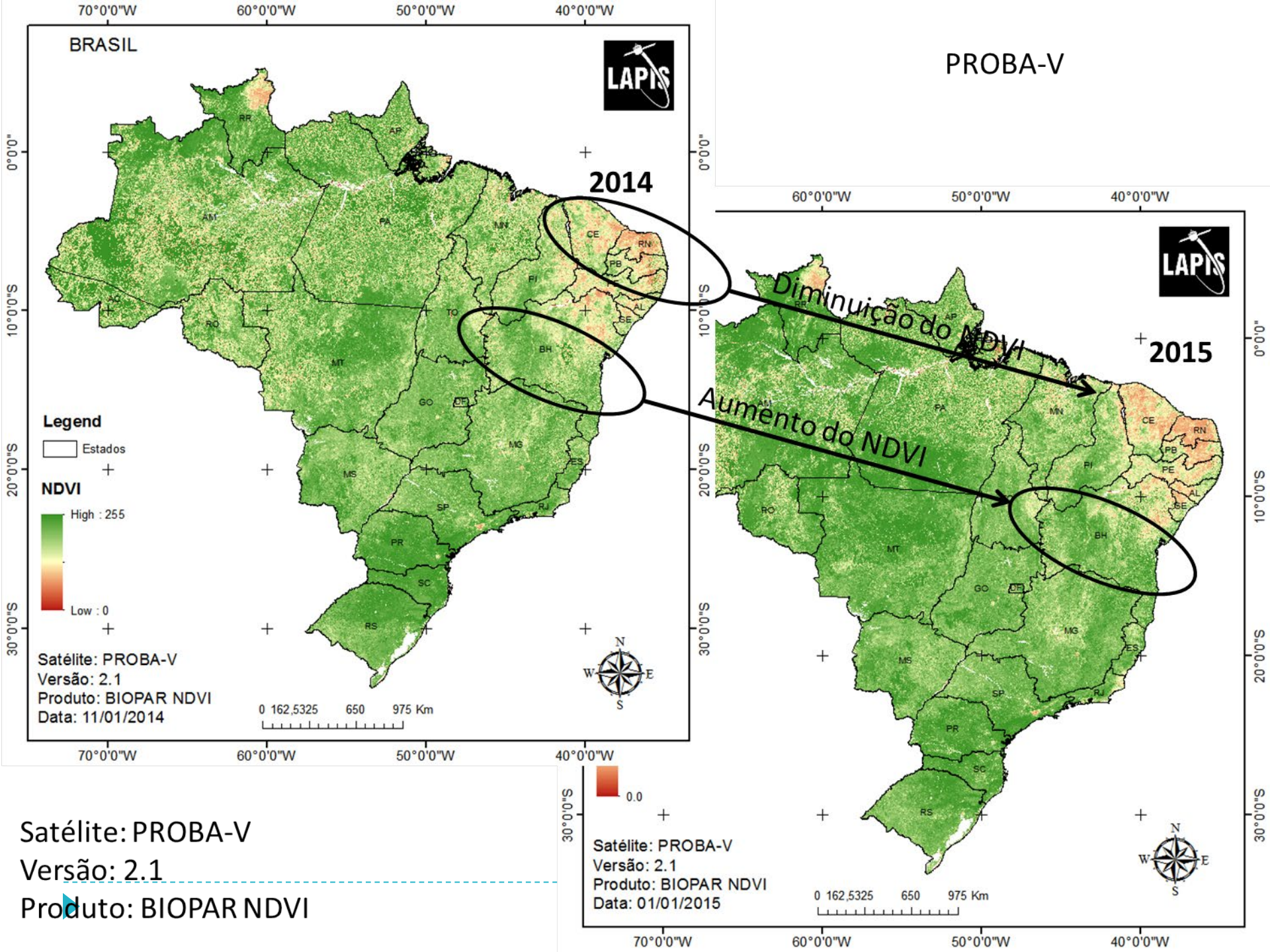
Espirito Santo
São Paulo
Rio de Janeiro
Paraná
KM


Laboratório de Análise e Processamento de Imagens de Satélites - LAPIS
01/10/2018 a 07/10/2018 SMOS Produto: Umidade do solo
LAPIS
55°0'W
52°30'W
50°0'W
47°30'W
45°0'W
42°30'W
40°0'W
37°30'W
35°0'W
32°30'W
30°0'W
0°0'
2°30'S
5°0'S
7°30'S
10°0'S
12°30'S
15°0'S
17°30'S
20°0'S
Umidade
(%)
< 10
10 - 15
15 - 20
20 - 25
25 - 30
30 - 35
35 - 40
> 50
semiarido_brasileiro
limite_sab
0
187,5
375
750 Km
N

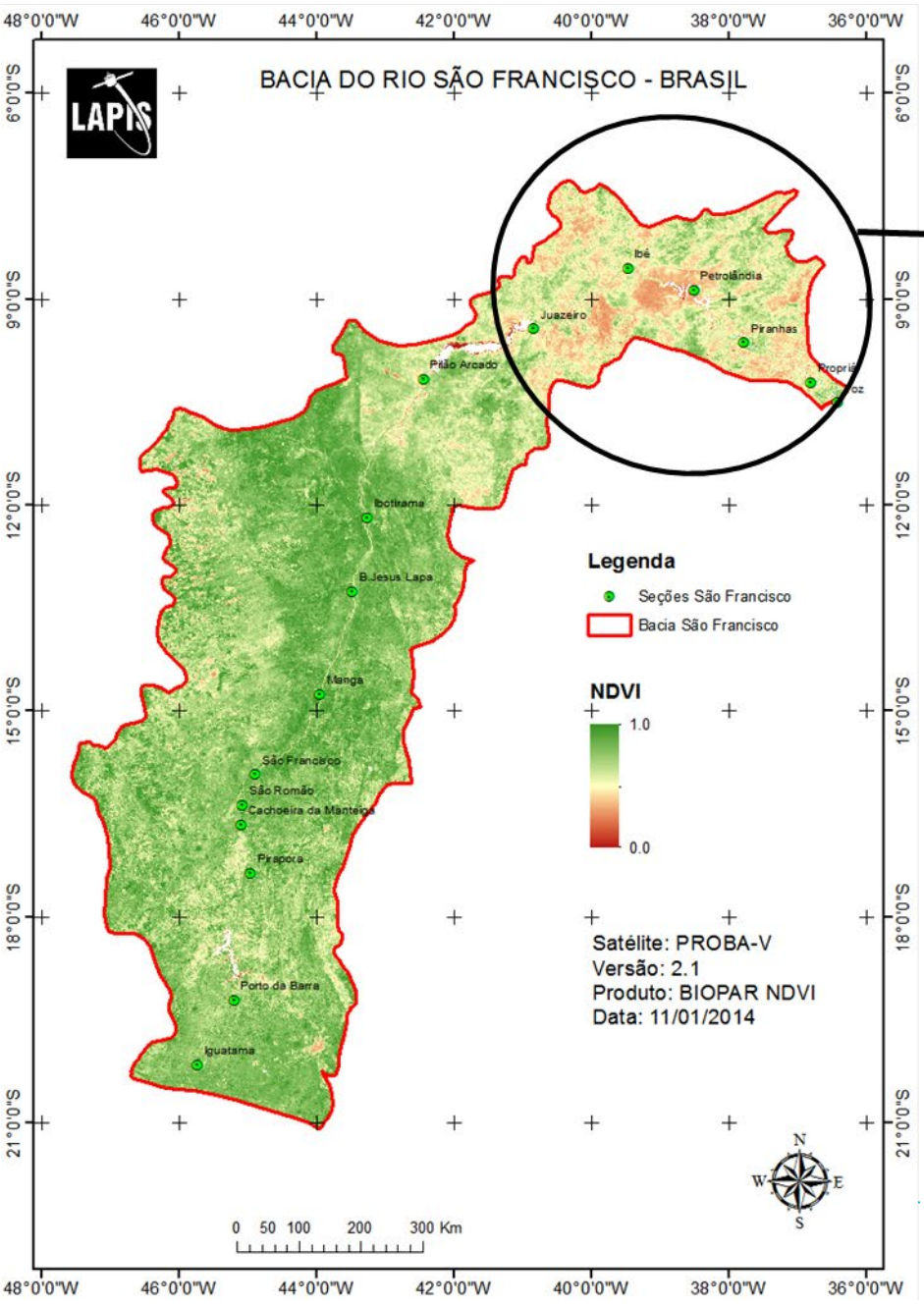


Satélite: PROBA-V

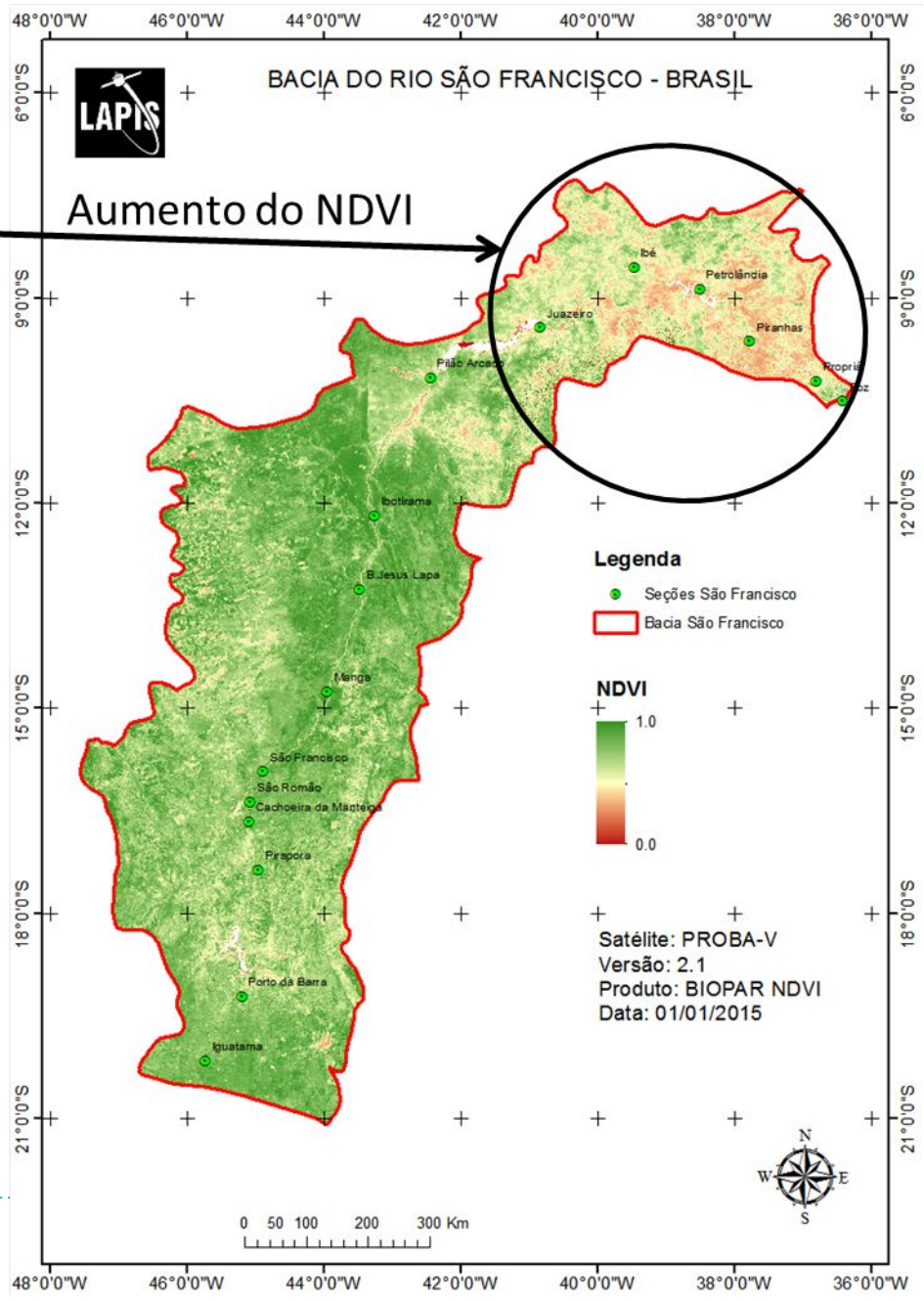
Versão: 2.1

Produto: BIOPAR NDVI

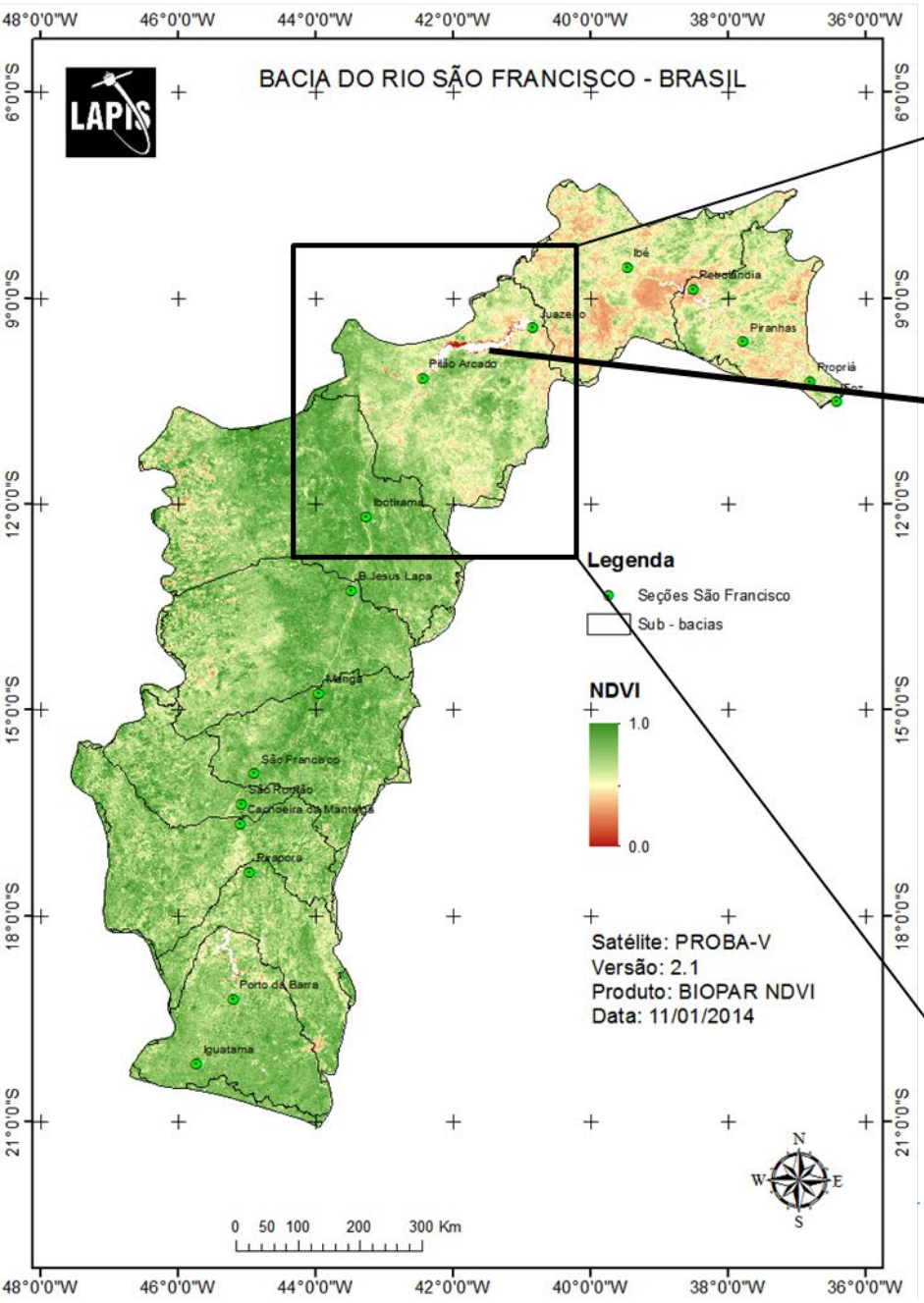
BACIA DO SÃO FRANCISCO

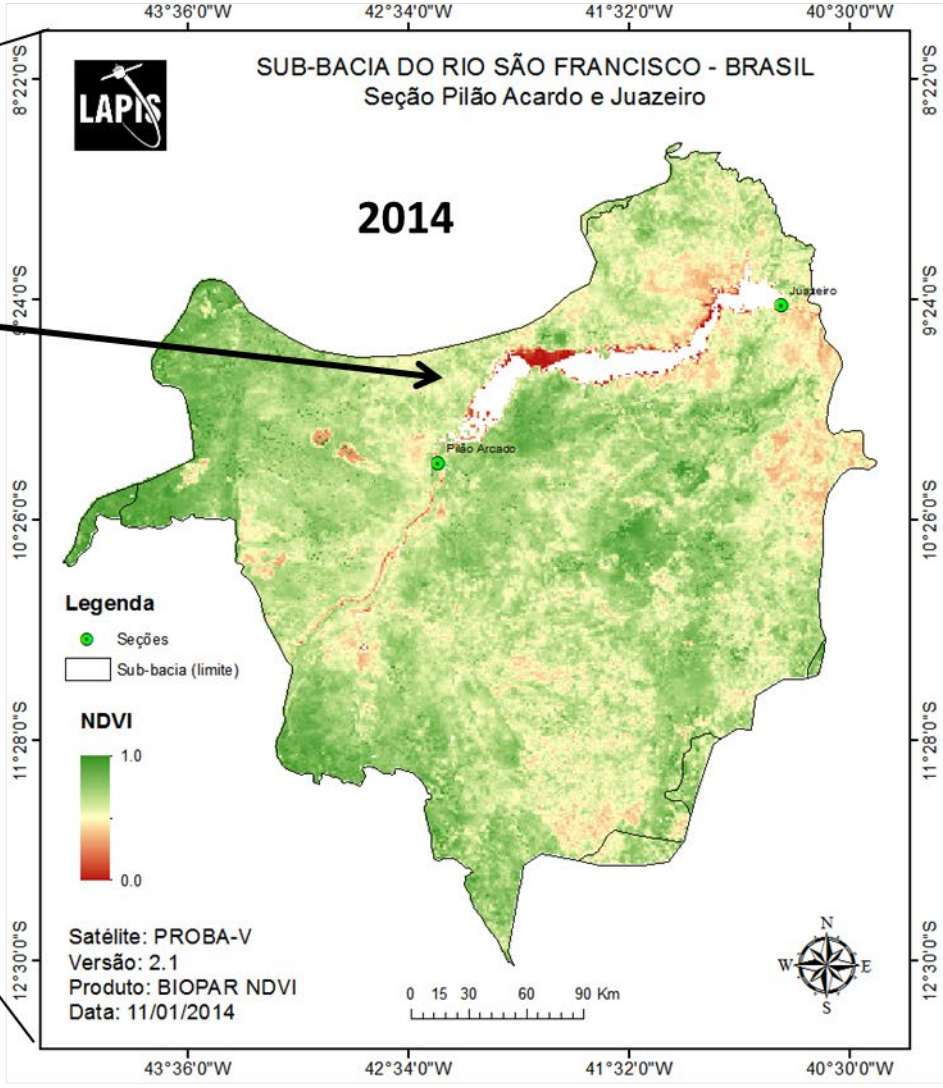


Aumento do NDVI

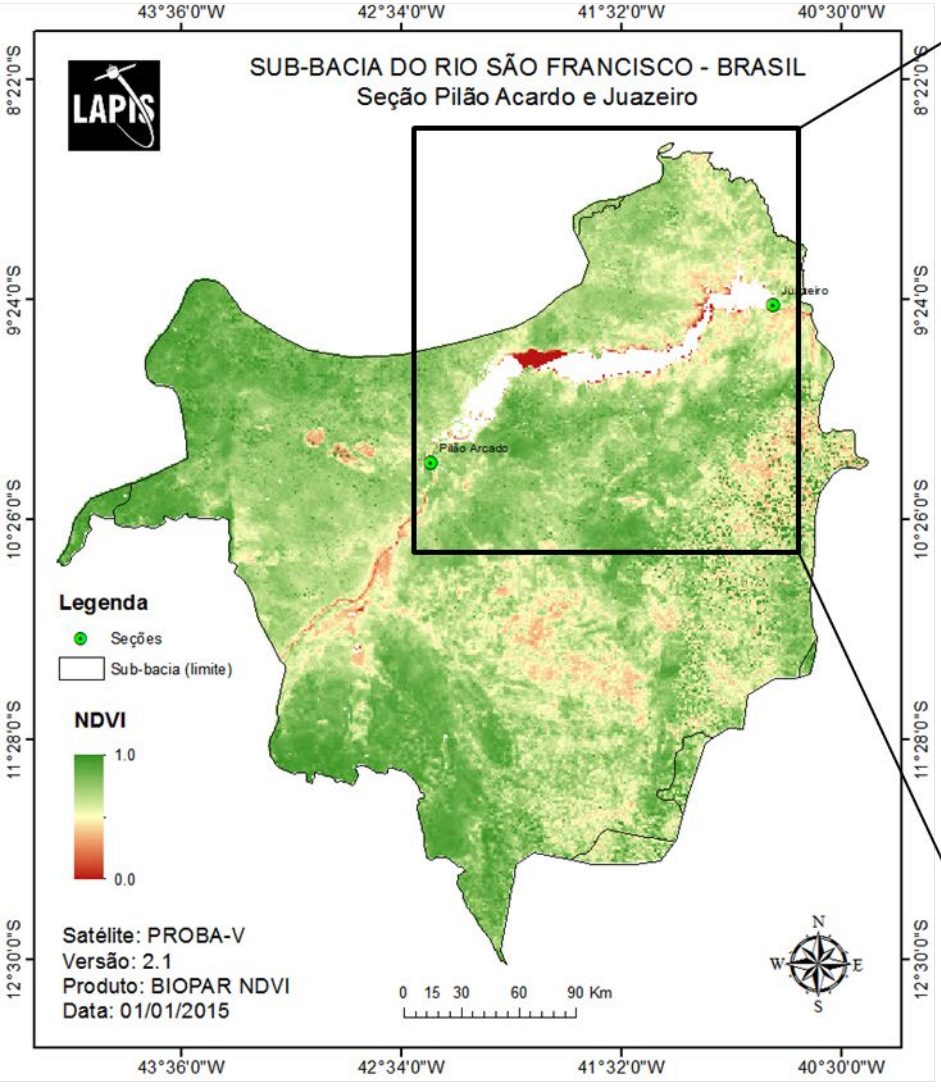


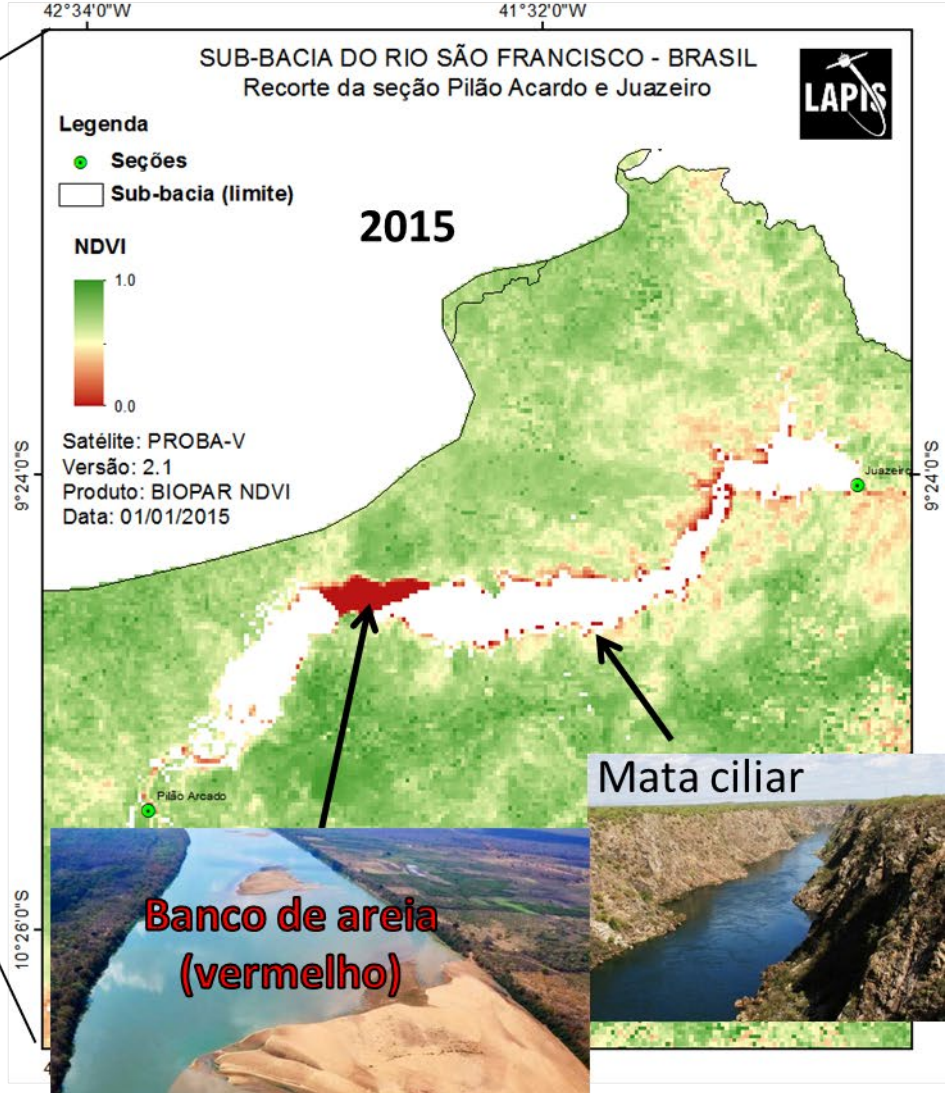
SUB-BACIA DO SÃO FRANCISCO



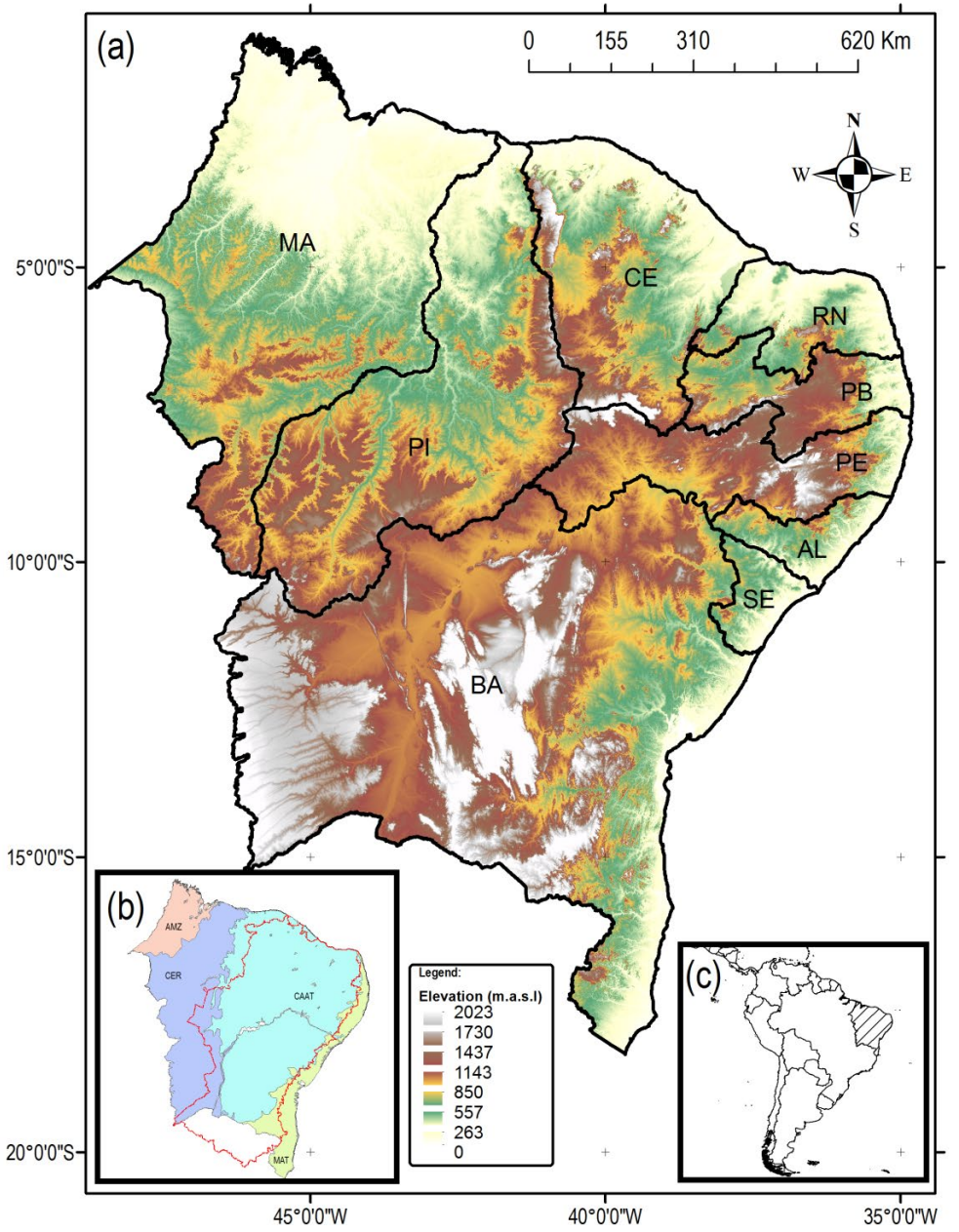


RECORTE DA SUB-BACIA DO SÃO FRANCISCO





- **Area**: ~ 1,542,000 km^2 (~ 19% of Brazil).
- **Population**: ~ 53 million (~34 people km^{-2})
- **Annual mean precipitation**: 250-2000 mm
- **Motivation**: Microwave-based satellite rainfall products offer an opportunity to assess rainfall-related events in Northeast Brazil (NEB), where rain-gauge stations are sparse.
- **Aim**: intercomparison of rainfall estimates from the SM2RAIN-CCI product against in situ rainfall observations under different bioclimatic conditions at the NEB.



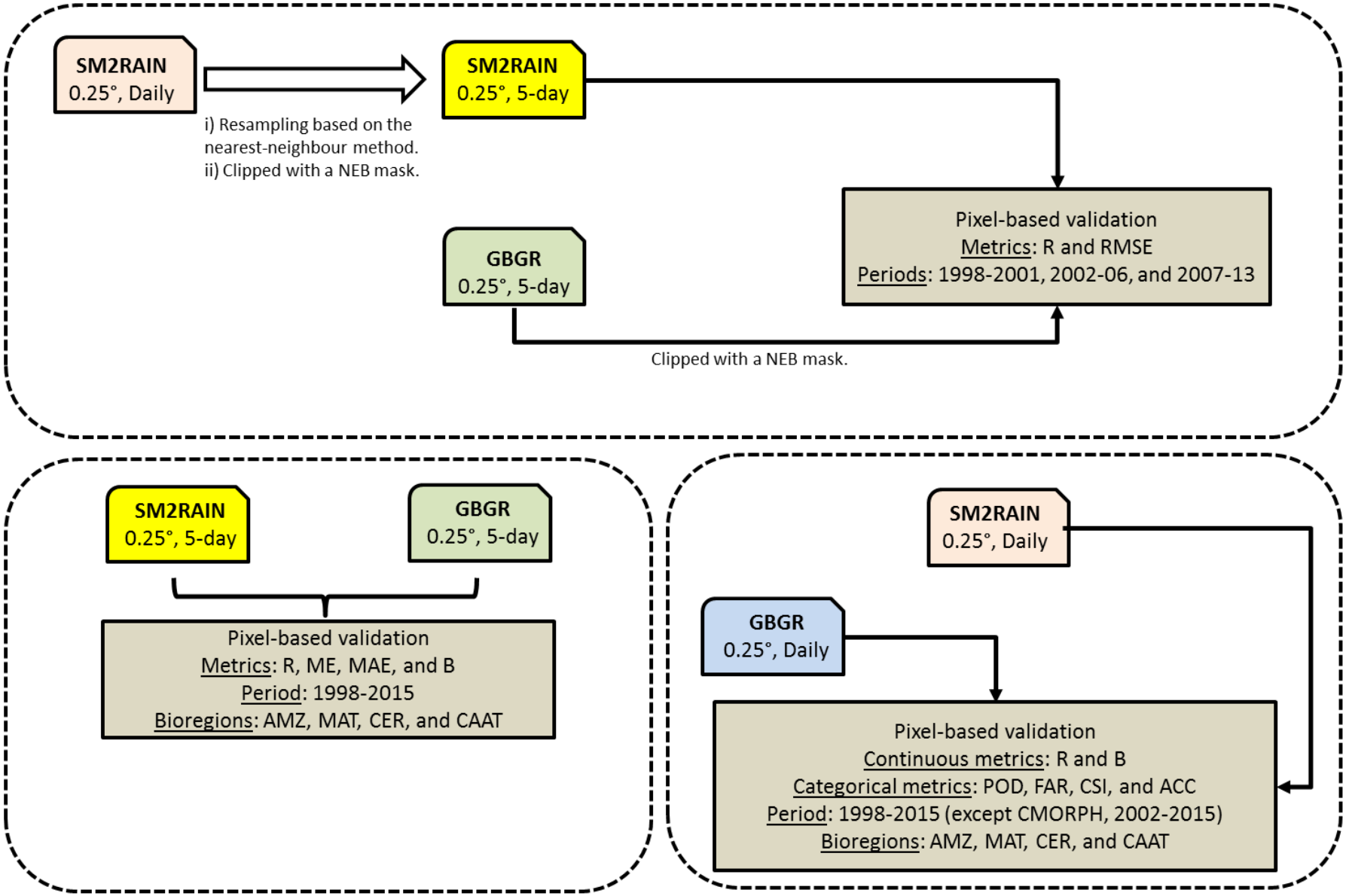
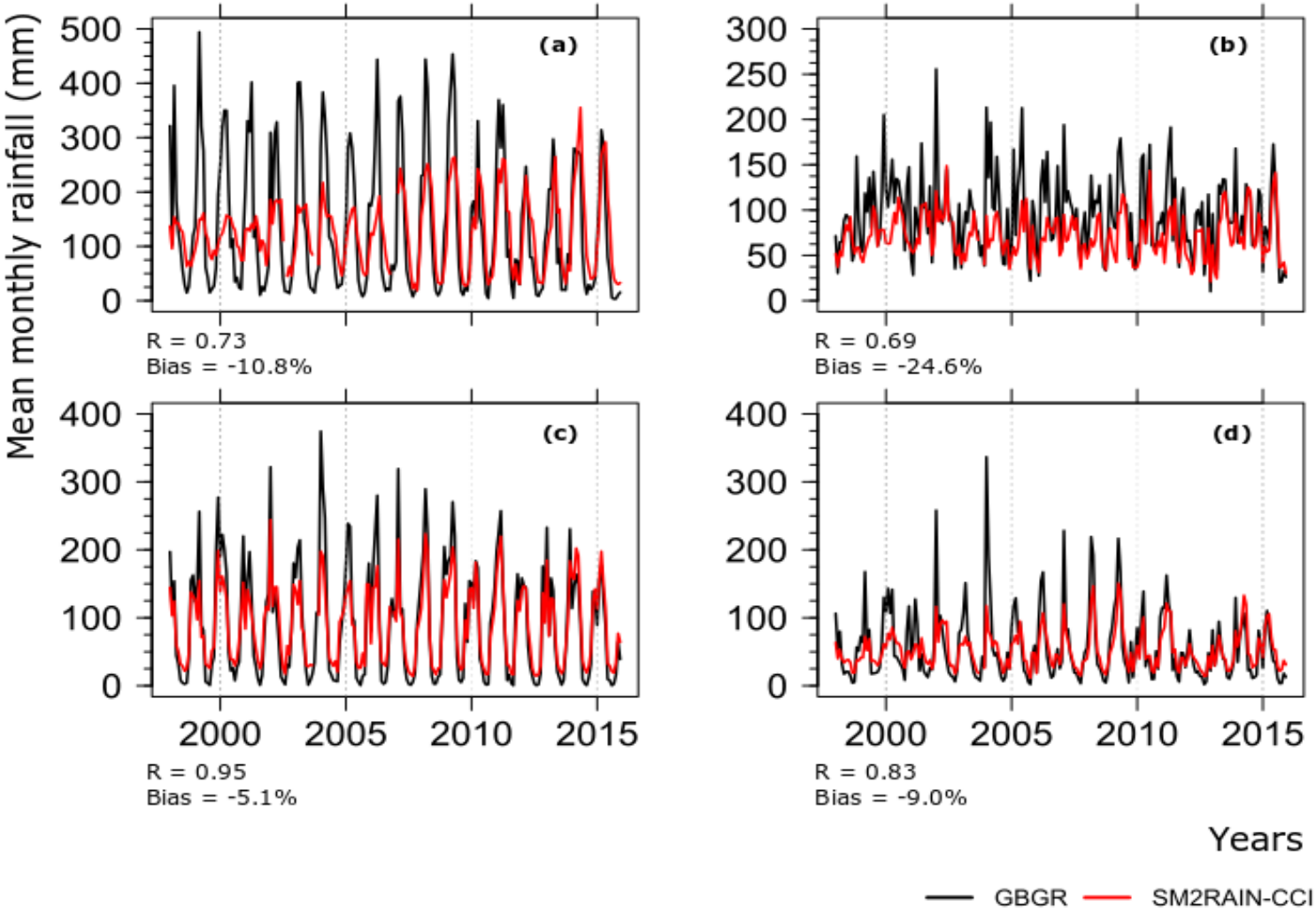
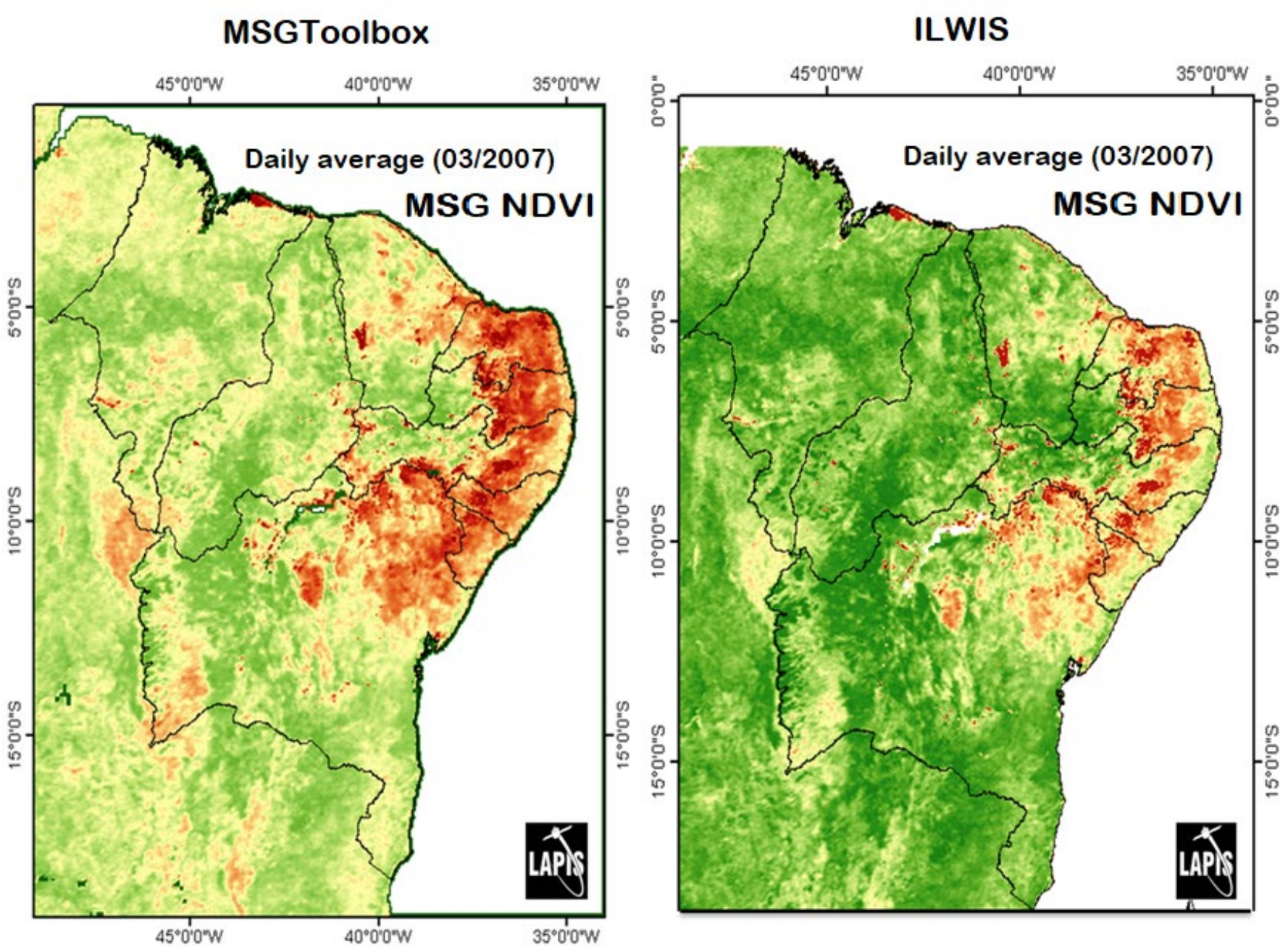


Fig. - Flowchart of the summarized research design and method.

Fig. - Mean monthly rainfall derived from the GBGR data (black line) and the 5-day SM2RAIN-CCI dataset (red line) over the biomes: (a) AMZ; (b) MAT; (c) CER; and (d) CAAT during the period 1998-2015.



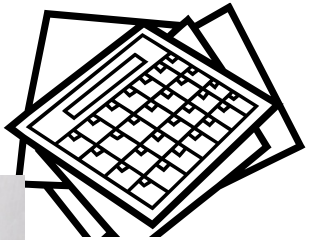


Intercalibration MSGToolbox versus ILWIS

Sentinel 1A image – September 08th

Sentinel 1A image – October 14th

Building capacity and EUMETCast Workshops



Outcome from SAGEO:

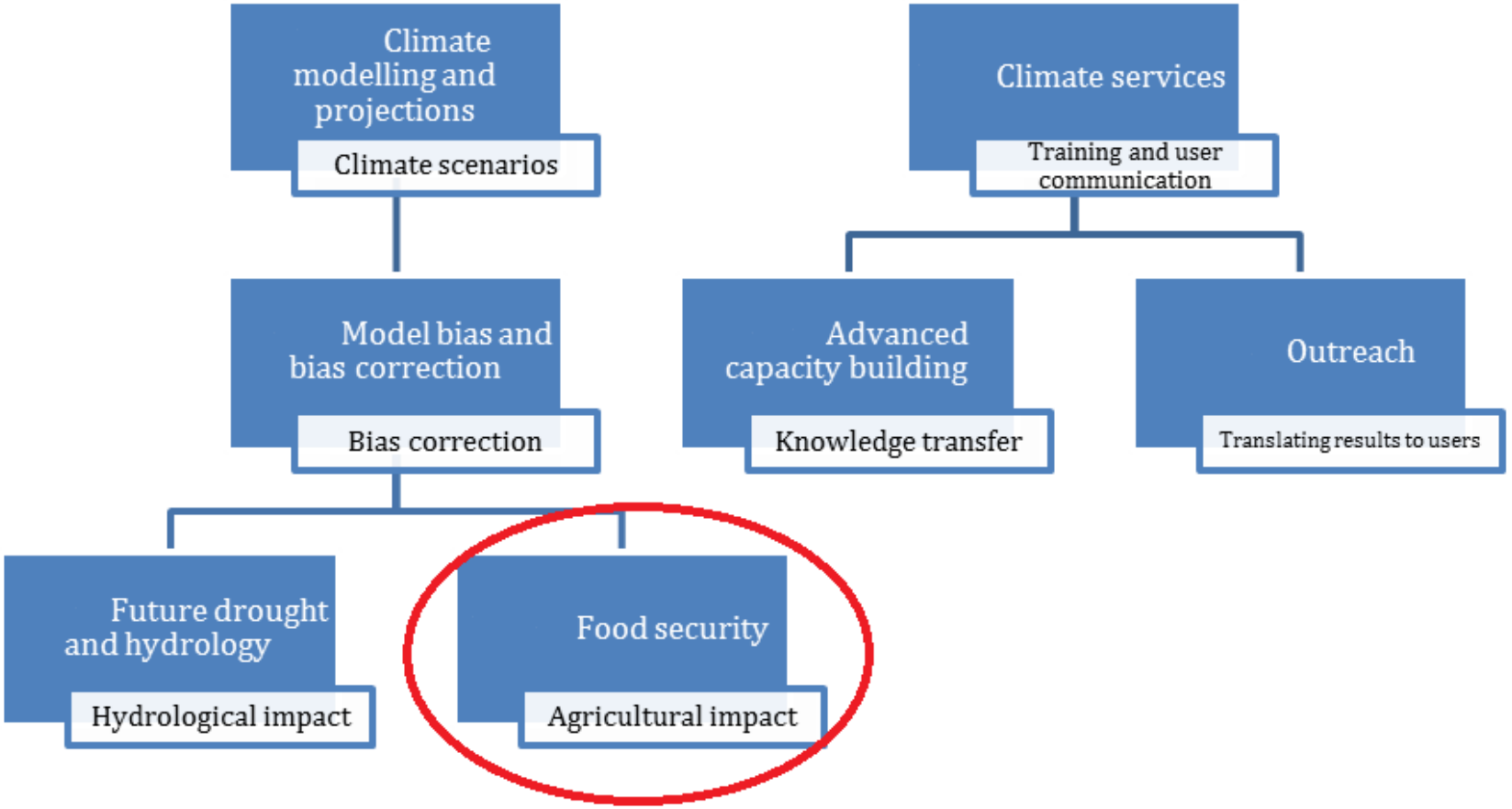
Points:

1. **How to ensure effective dialogue of SAGEO with satellite operators (EUMETSAT and NOAA) at technical level?**

2. **How to ensure continued support to the SAGEO?**

Identify thematic priority: Disaster risk reduction, particularly for: Data exchange, associated with early warnings. Topics related to Climate as well as emergencies and disasters (risk reduction, as well as response)

How vulnerable is LAC to future climate extremes?



Thanks!

[www.lapismet.com.br]