LAPIS

http://www.lapismet.com

LABORATÓRIO DE ANÁLISE E PROCESSAMENTO DE IMAGENS DE SATÉLITES

2. Remote sensing applications for dryland management in Brazil

Humberto A. Barbosa, PhD

International Training Remote Sensing, 12-20 July 2016 Foz do Iguaçu, Brazil

MWAR-LAC

Managing Water Resources in Arid and semi-Arid Regions of Latin America and the Caribbean

CAZALAC Water Center for Arid and Semiarid Zones in Latin America and The Caribbean

United Nations Educational, Scientific and Cultural Organization

International Hydrological Programme

Flanders State of the Art

THE COMPLEXITY OF DROUGHT QUANTIFICATION AND ANALYSIS

- ***Droughts are difficult to pinpoint in time and space given different economic sectors and natural systems affected.***

- ***We identify a drought by its effects or impacts on different types of systems (agriculture, water resources, ecology, forestry, economy, etc.), but there is not a physical variable we can measure to quantify droughts.***

- ***Long-term drought objective metrics (streamflows, soil moisture, lake levels, etc.) are commonly not available. Moreover, using only objective metrics other relevant variables to determine drought severity (e.g. the atmospheric water demand) are not taken into account.***

- ***We use the so-called "DROUGHT INDICES" for drought quantification and analysis.***

EXISTING DROUGHT INDICES

***Precipitation-based drought indices*, including the SPI, rely on *two assumptions*:**

1) ***The variability of precipitation is much higher than that of other variables, such as the atmospheric water demand***
2) ***The other variables are stationary (i.e., they have no temporal trend).***

In this scenario, the importance of these other variables is negligible, and droughts are controlled by the temporal variability in precipitation.

Is this scenario plausible nowadays?

The Challenge and Our Goals

The challenge: How can early warning of physical drought conditions be provided in regions with low data availability and low capacity?

The goal: To develop a flexible framework for providing historic records, real-time monitoring and forecasts of relevant hydrological variables and drought indices

EXISTING DROUGHT INDICES

***Precipitation-based drought indices*, including the SPI, rely on *two assumptions*:**

1) ***The variability of precipitation is much higher than that of other variables, such as the atmospheric water demand***
2) ***The other variables are stationary (i.e., they have no temporal trend).***

In this scenario, the importance of these other variables is negligible, and droughts are controlled by the temporal variability in precipitation.

Is this scenario plausible nowadays?

The Challenge and Our Goals

The challenge: How can early warning of physical drought conditions be provided in regions with low data availability and low capacity?

The goal: To develop a flexible framework for providing historic records, real-time monitoring and forecasts of relevant hydrological variables and drought indices

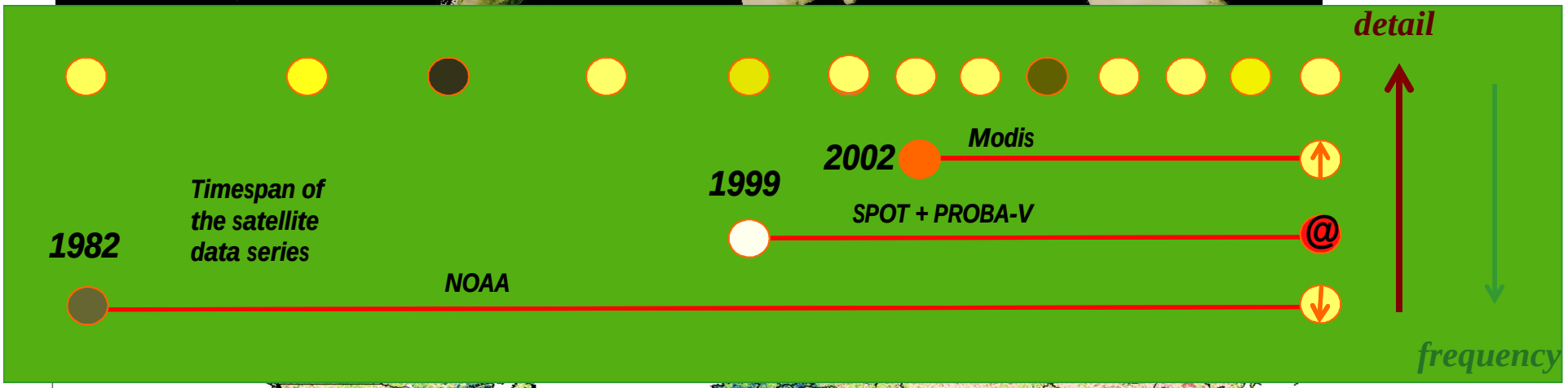
Background

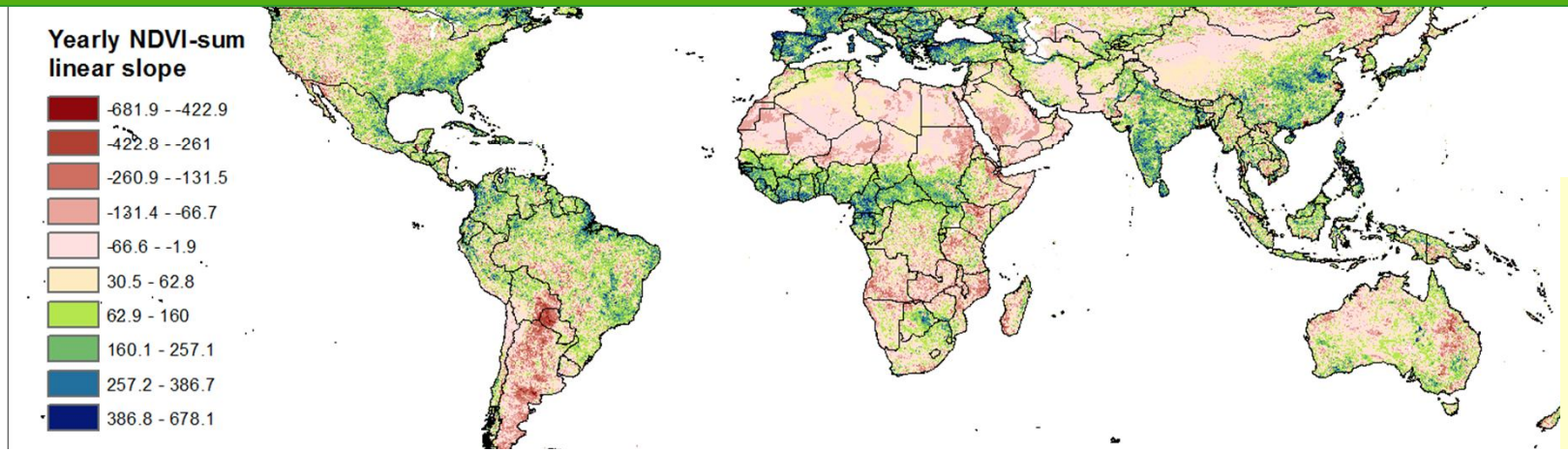
- **Vegetation over a ground, forms naturally or by cultivation attained a great importance in the context of changing climate scenario over the globe.**

- **Vegetation is also controlled by the climate which in turn leads to climate – vegetation feedback mechanism.**

Global variables / Indicators – satellite observation

MODIS
(ex. Oct13)





NPP proxy
Sum NDVI
Gimms3G

Slope over
1982-2010

NDVI

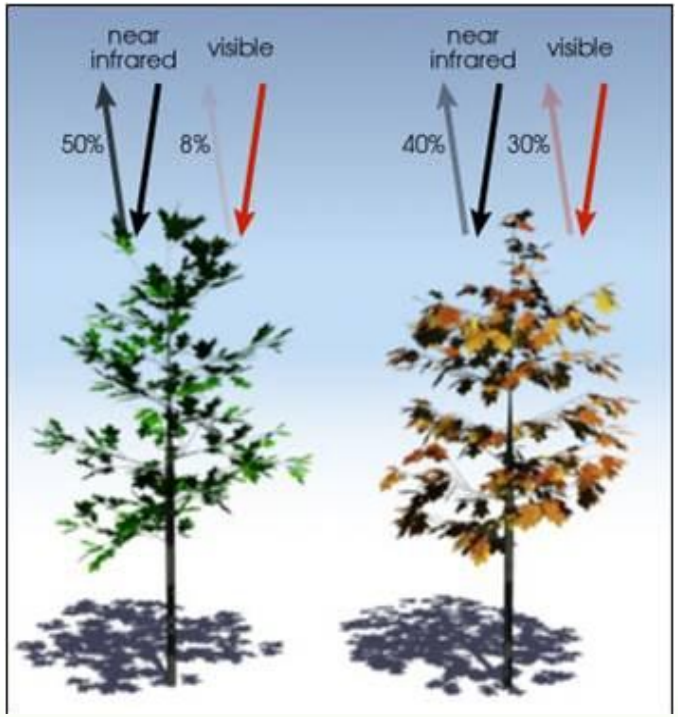
- *NDVI is calculated from the visible and near-infrared light reflected by vegetation.*

$$NDVI = \frac{NIR - RED}{NIR + RED}$$

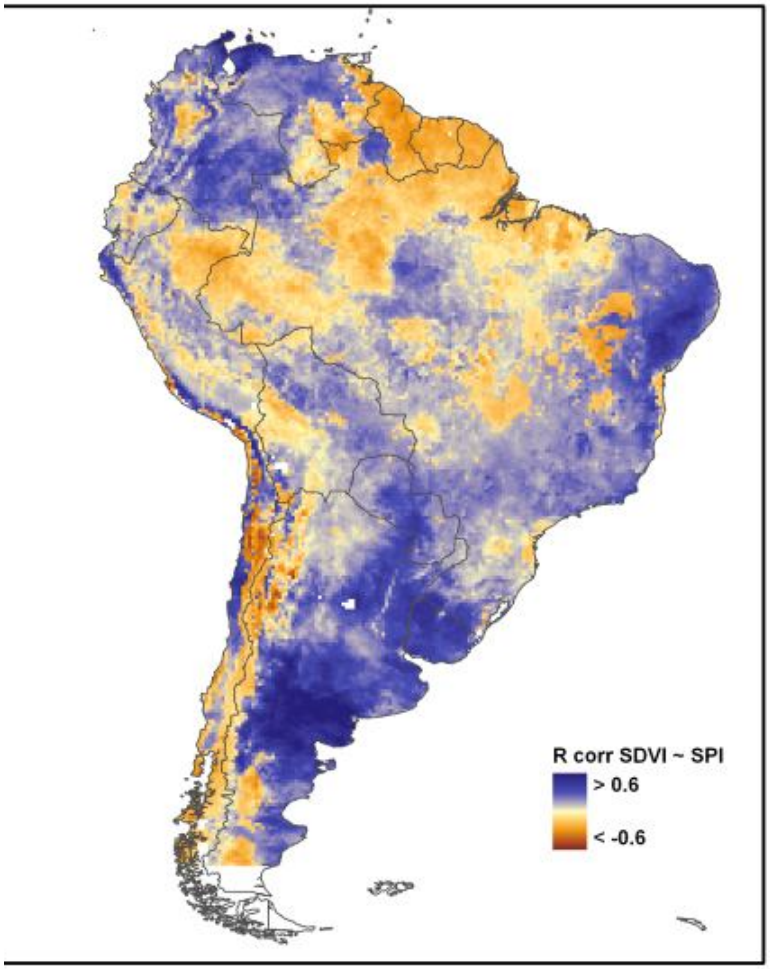
- *Healthy vegetation (left) absorbs most of the visible light that hits it, and reflects a large portion of the nearinfrared light.*

- *Unhealthy or sparse vegetation (right) reflects more visible light and less near-infrared light.*

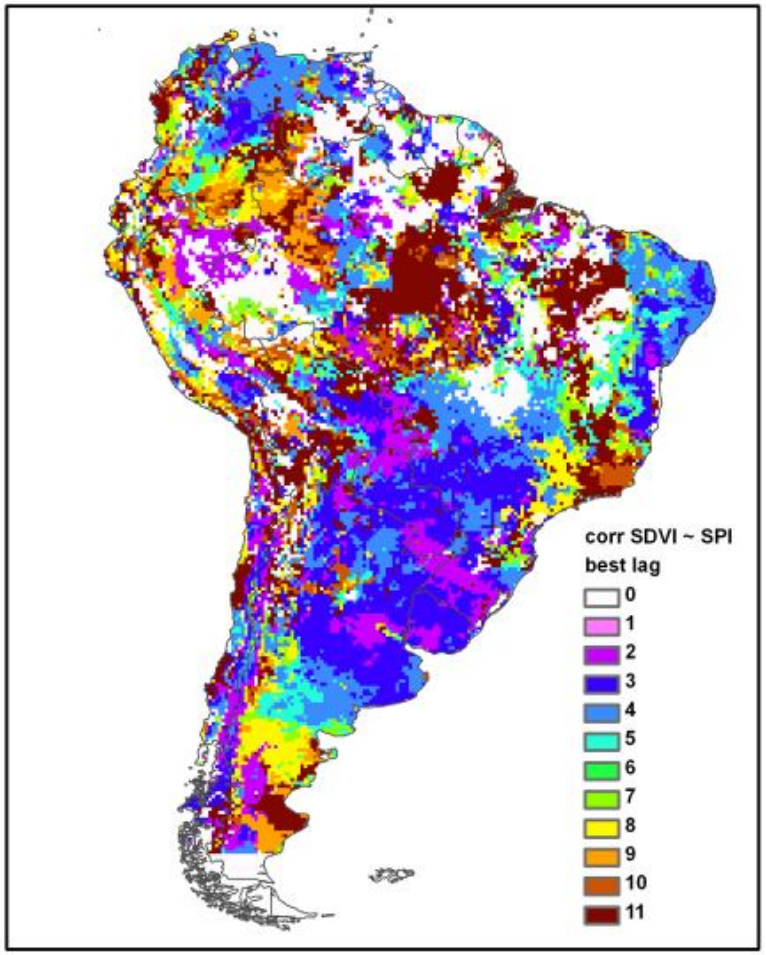
- *NDVI valves from -1 to +1.*



NDVI < 0	---	*Water Bodies*
0 < NDVI < 0.2	---	*Less Vegetation*
0.2 < NDVI < 0.4	---	*Medium Vegetation*
0.4 < NDVI < 0.8	---	*High Vegetation*
NDVI > 0.8	---	*Rain Forest*



Monítoreo de la degradación en América del Sur



Correlation between NDVI and SPI. Best lag expressed in months.

SPOT-Vegetation 10 compuesto diario NDVI de datos (desde abril 1998 hasta marzo 2012) de 1 km (http://www.vgt.vito.be/)

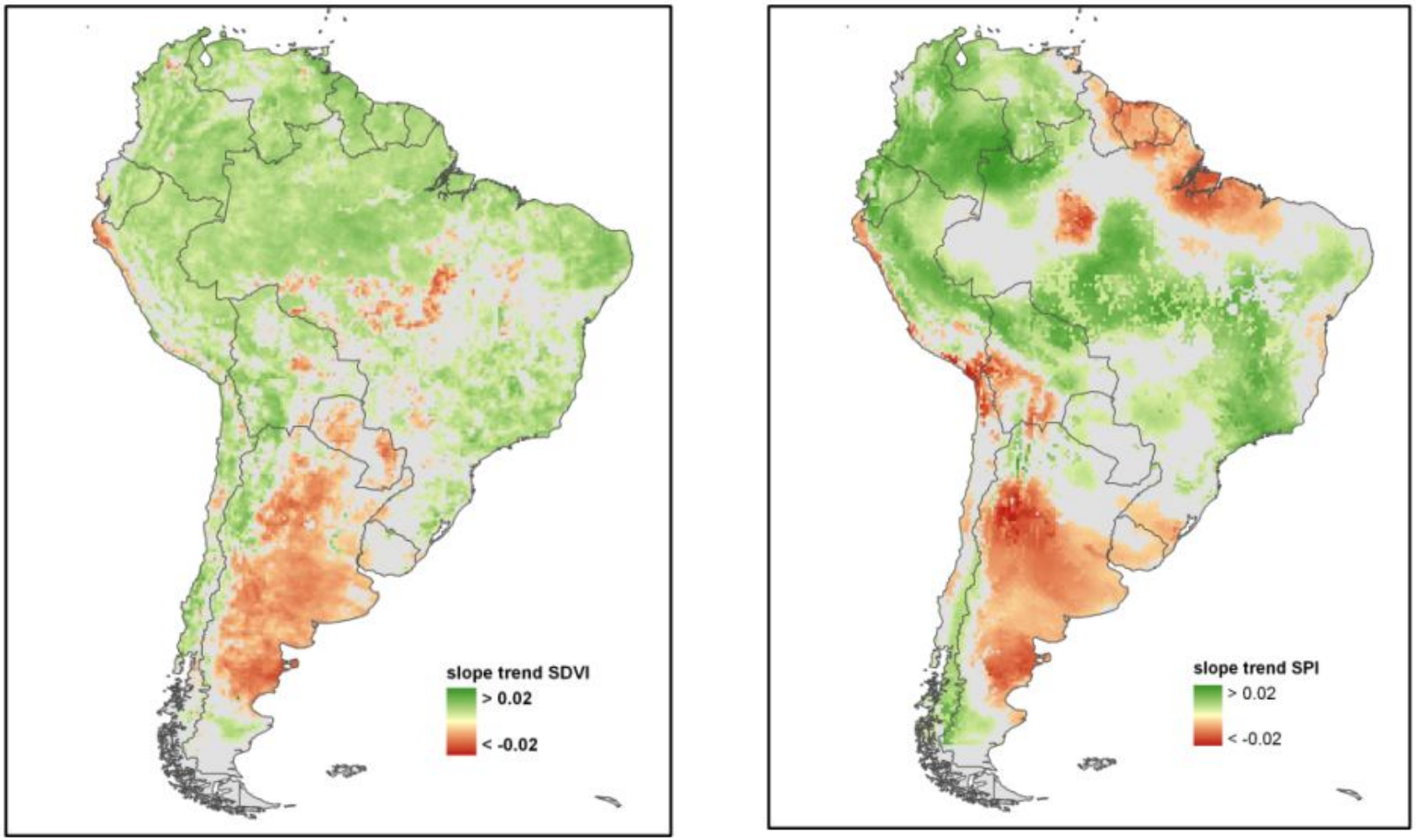
10-precipitación diaria en 0,25 ° , disponible en (ECMWF)

Standardized Difference Vegetation Index (SDVI)

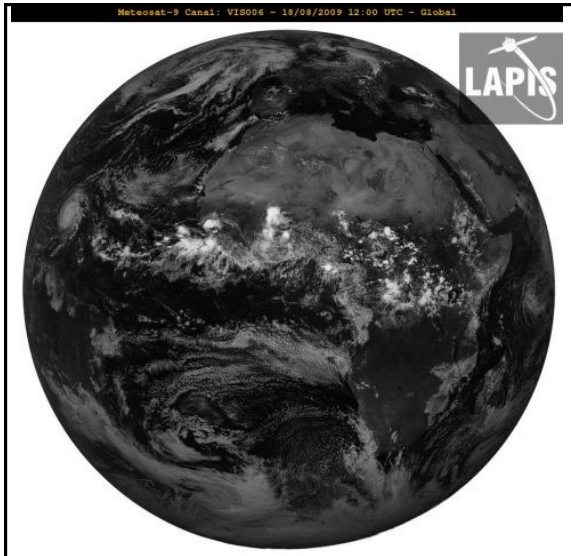
Standardized Precipitation Index (SPI)

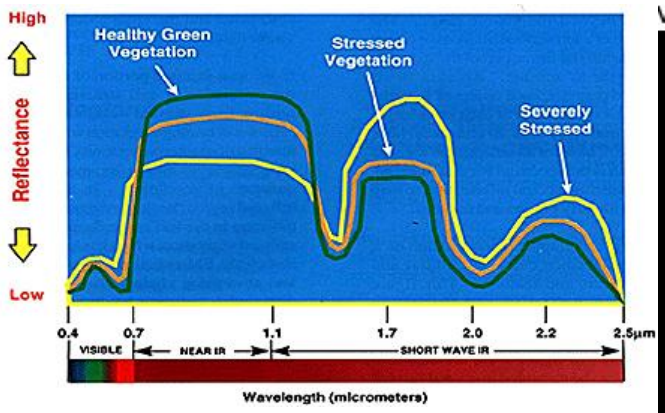
Fuente: Barbosa et al. (2012)

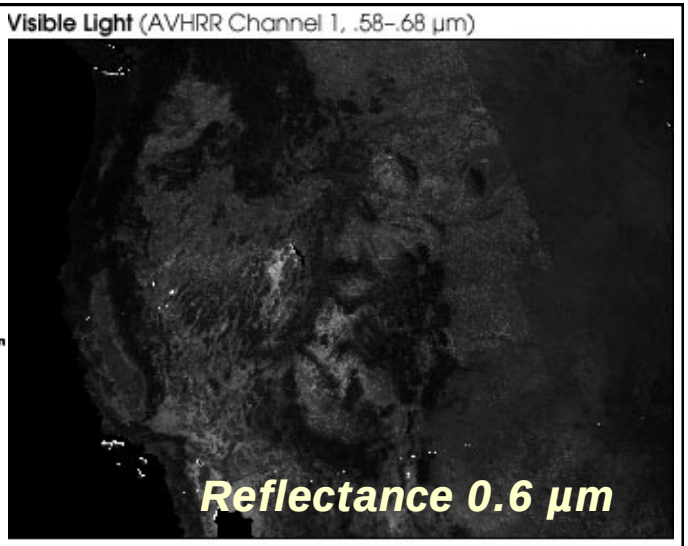
Slope of the trend analysis of SDVI (left) and SPI (right). Non significant trends are masked in grey.



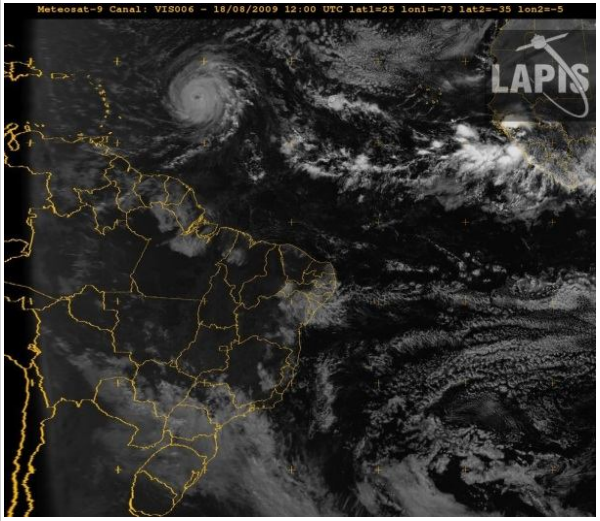
Fuente: Barbosa et al. (2012)

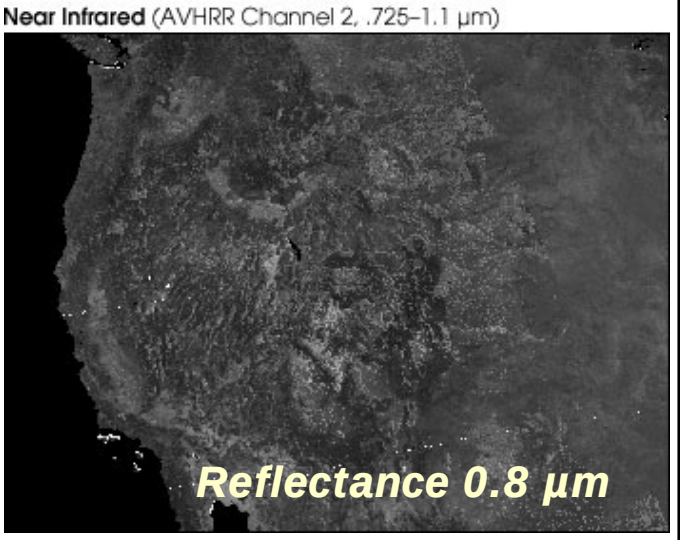


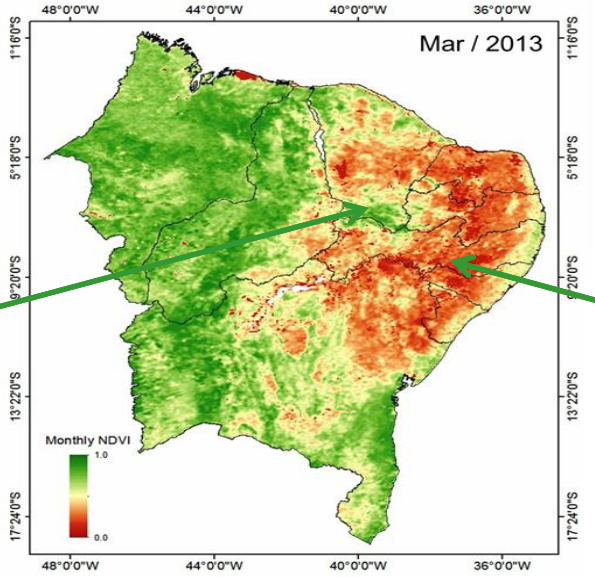




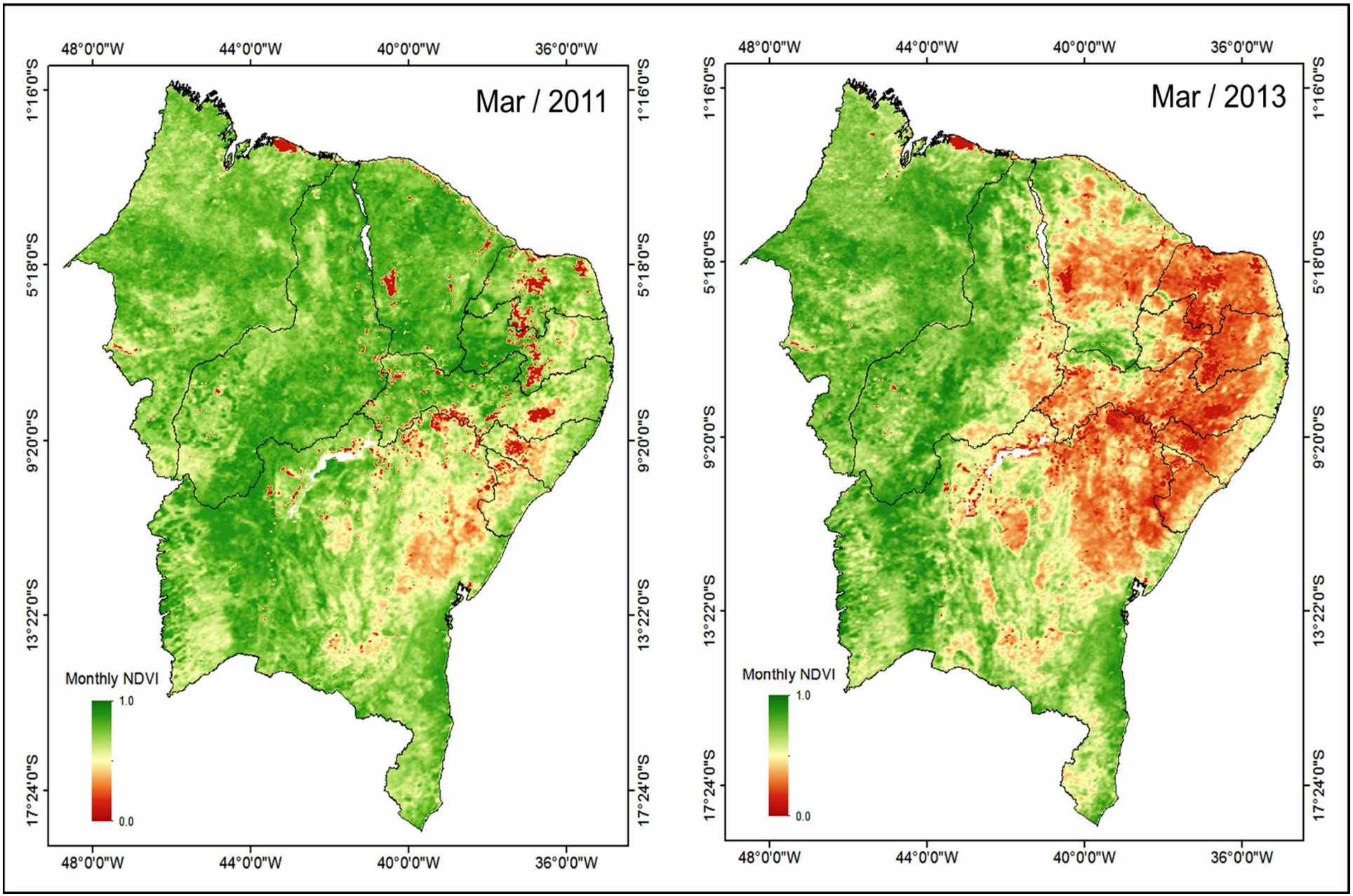
$$NDVI = \frac{R_{0.8} - R_{0.6}}{R_{0.8} + R_{0.6}}$$







LAPIS e INSA: (MSG NDVI)

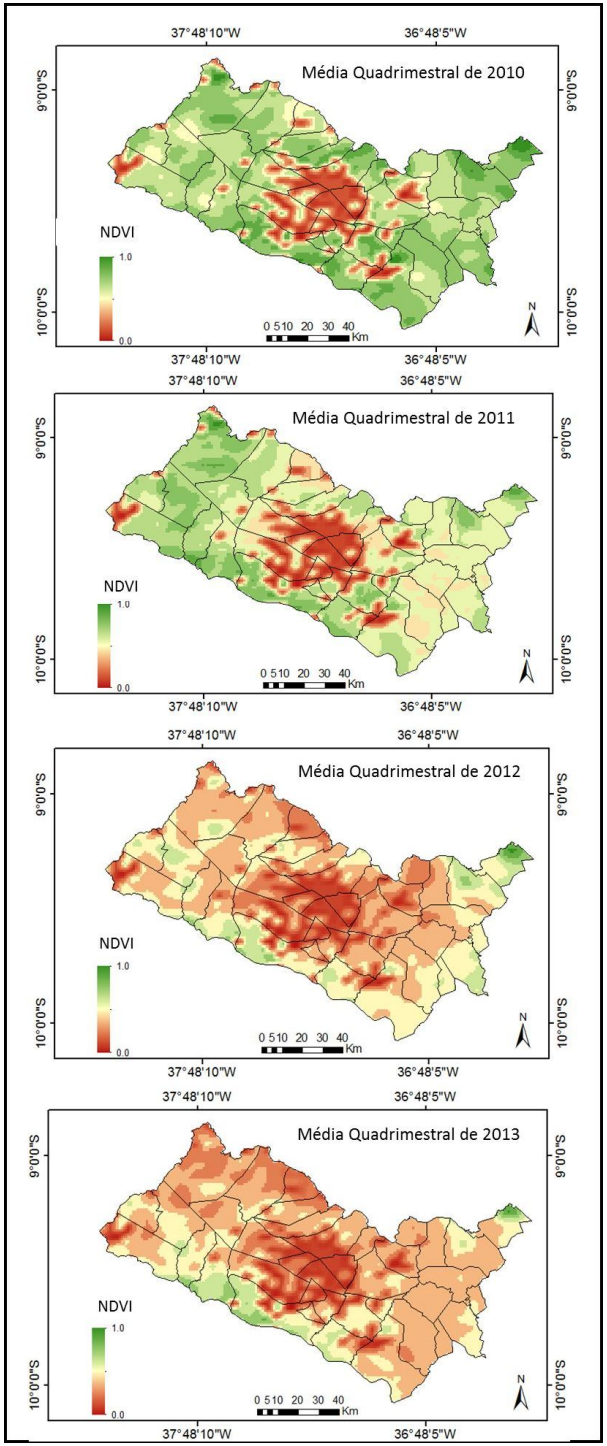


LAPIS and INSA: MSG NDVI

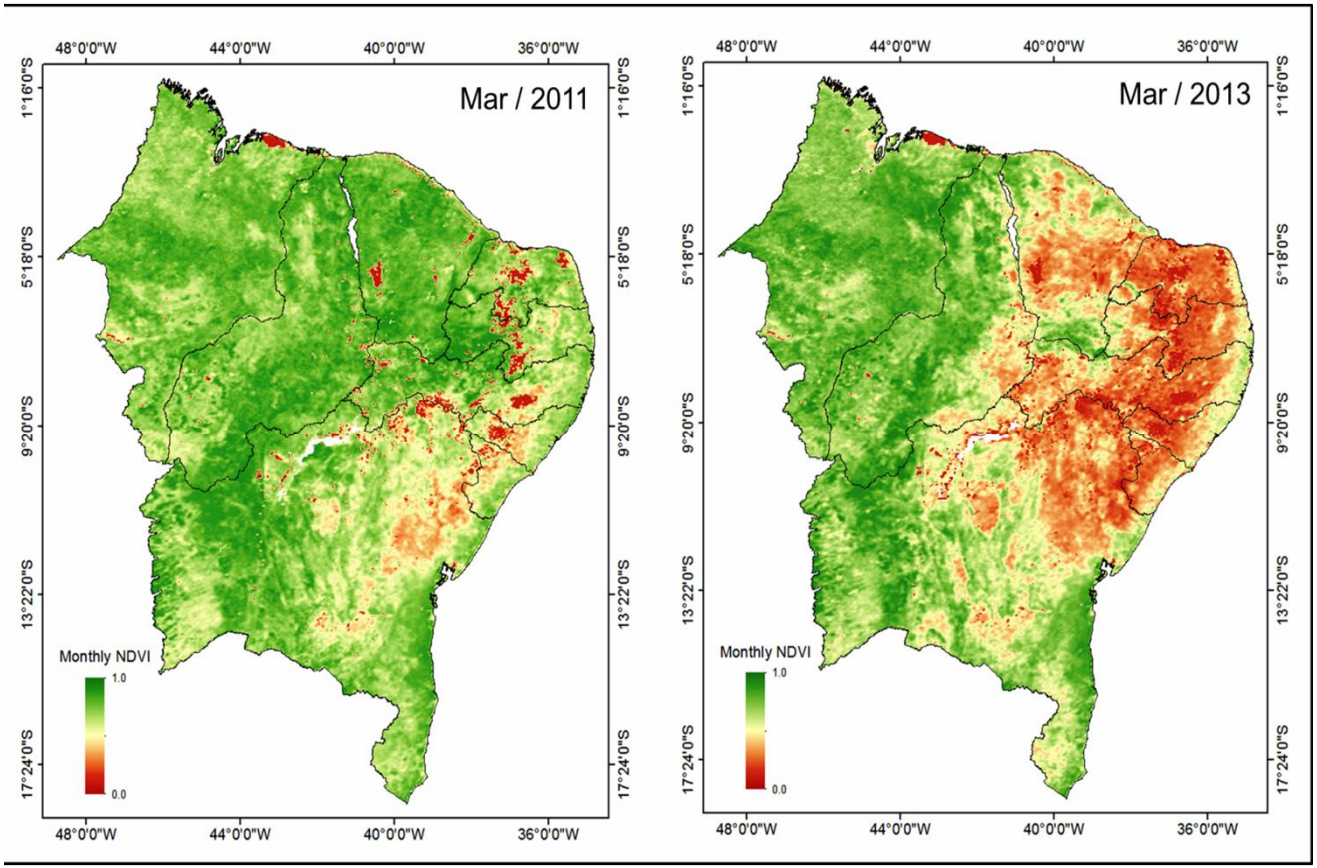
INSA
INSTITUTO NACIONAL DO SEMIÁRIDO

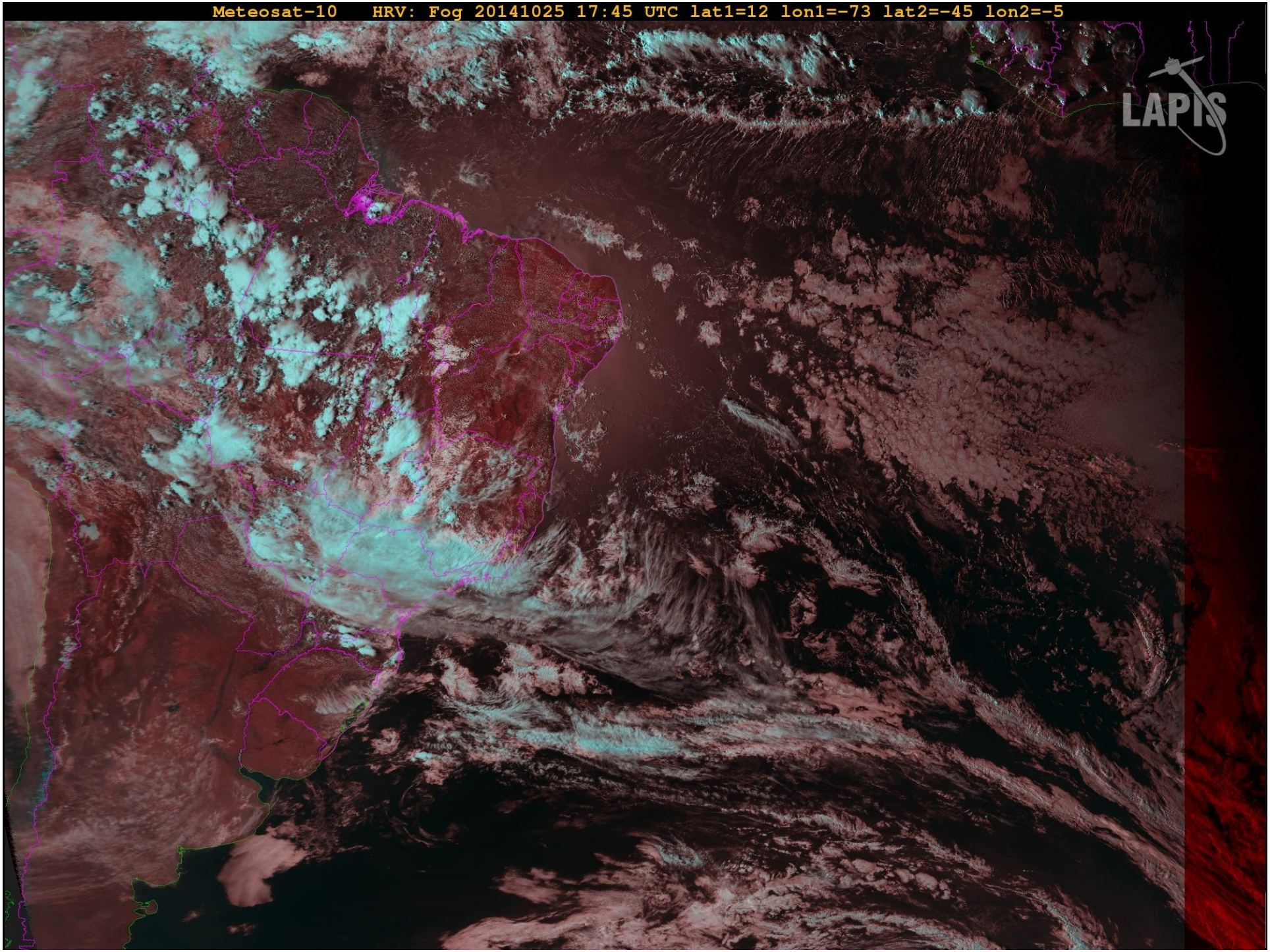
LAPIS

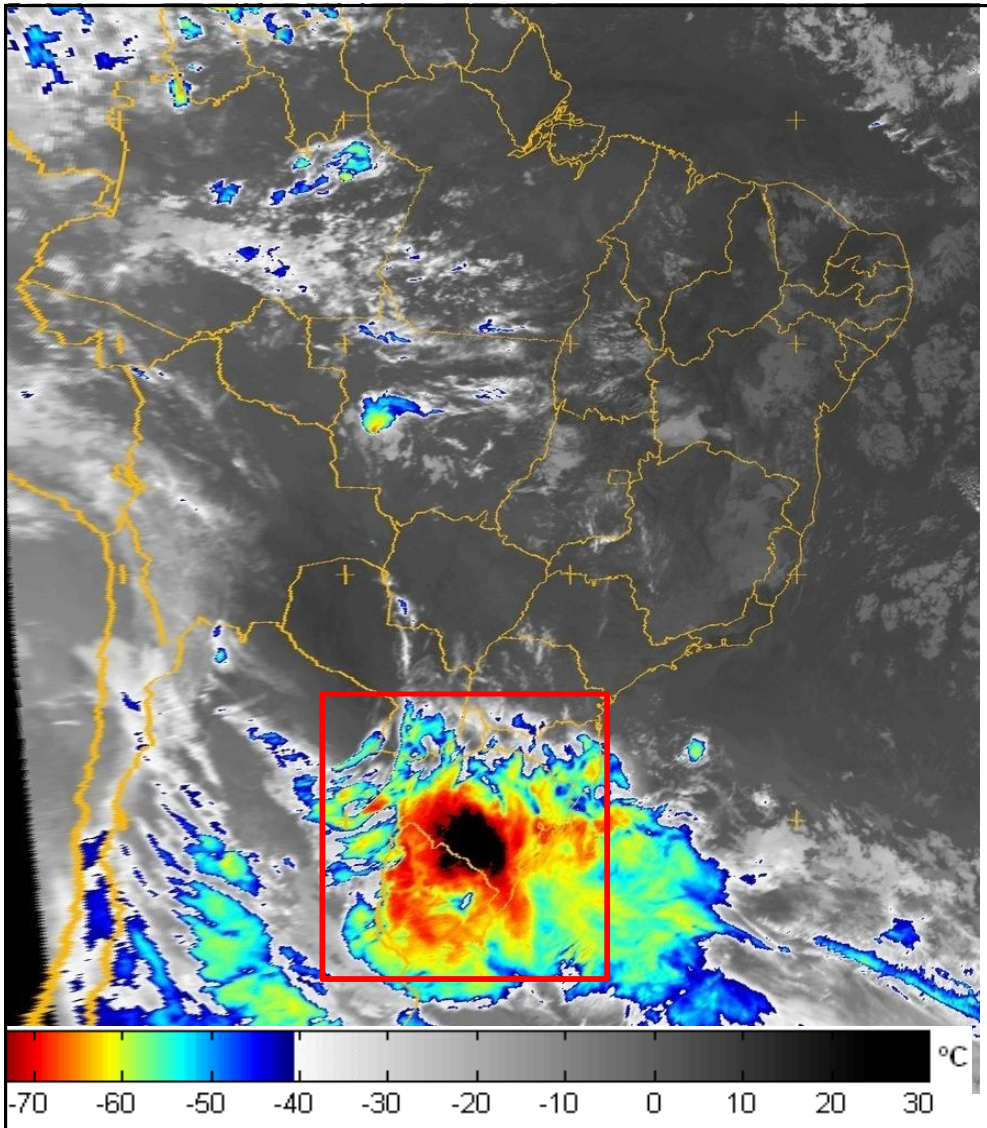
Alagoas

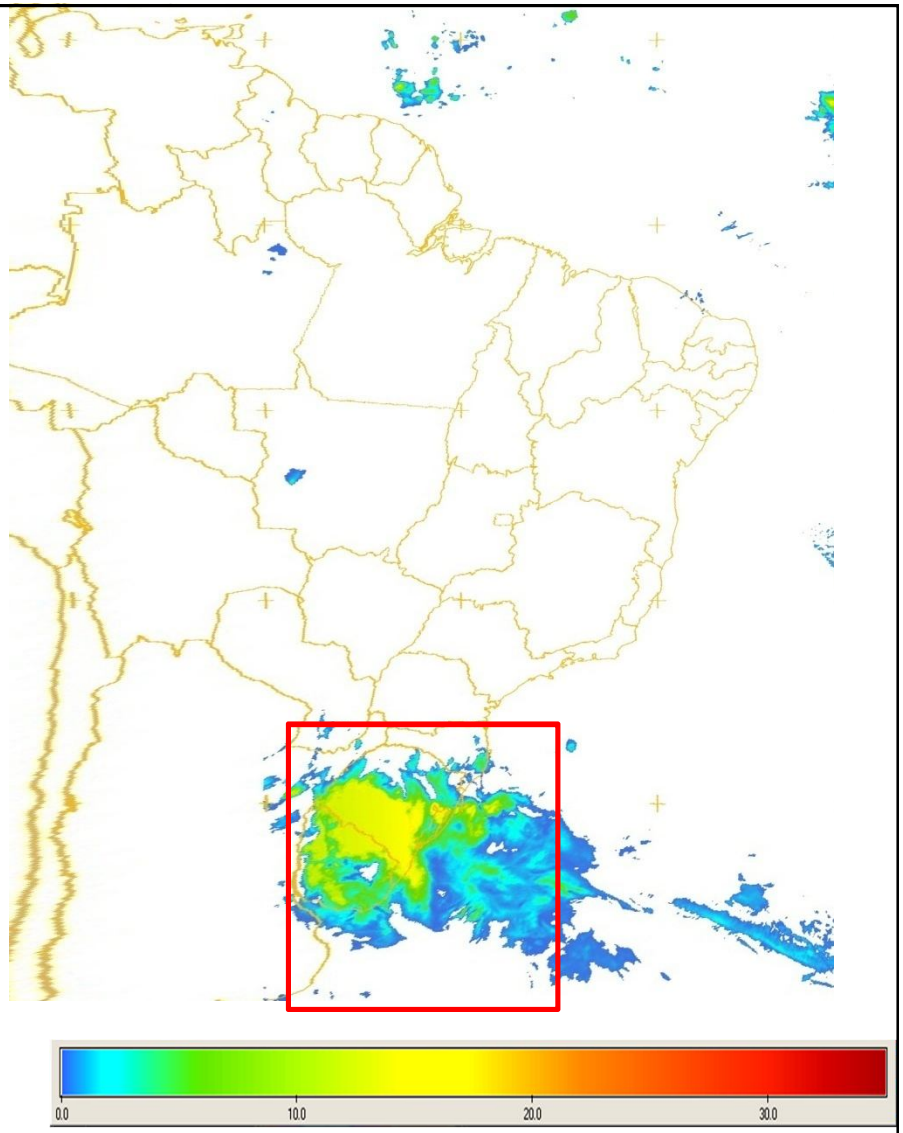


Nordeste




Meteosat-10 HRV: Fog 20141025 17:45 UTC lat1=12 lon1=-73 lat2=-45 lon2=-5
LAPIS

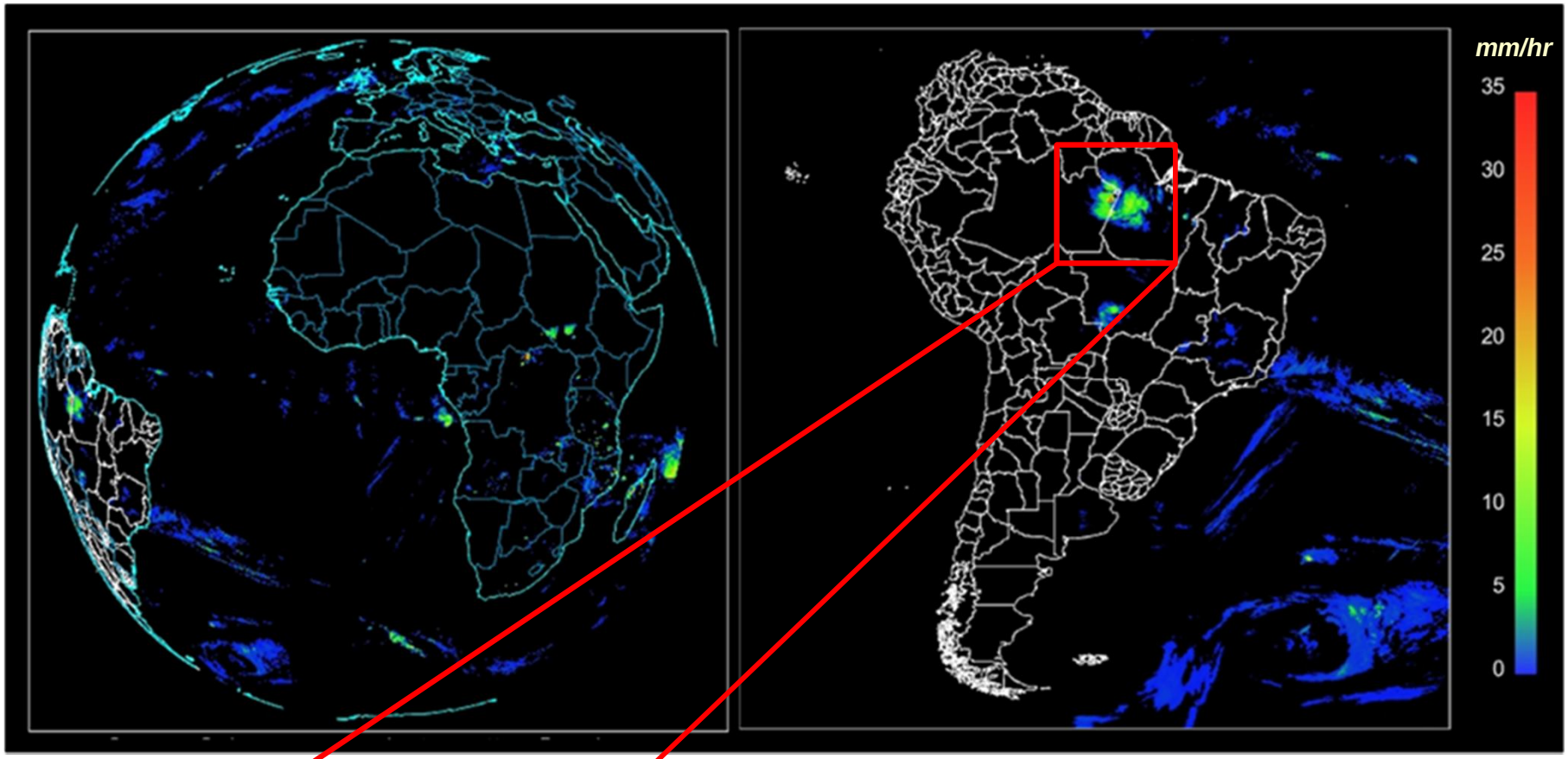


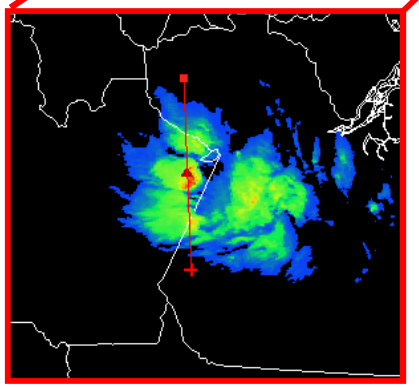


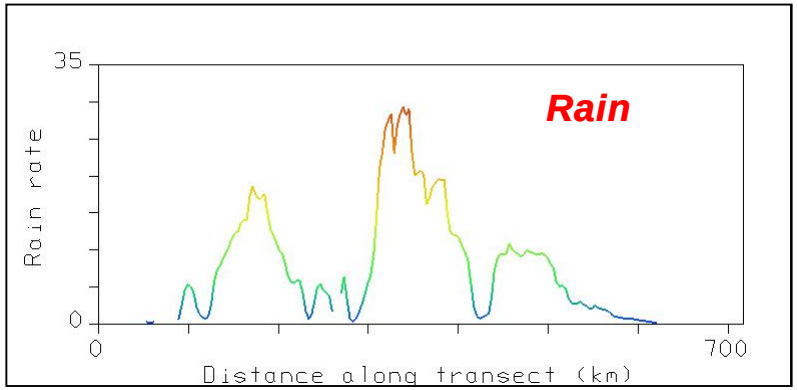
: MSG IR10.8

Product: MSG MPE Rainfall

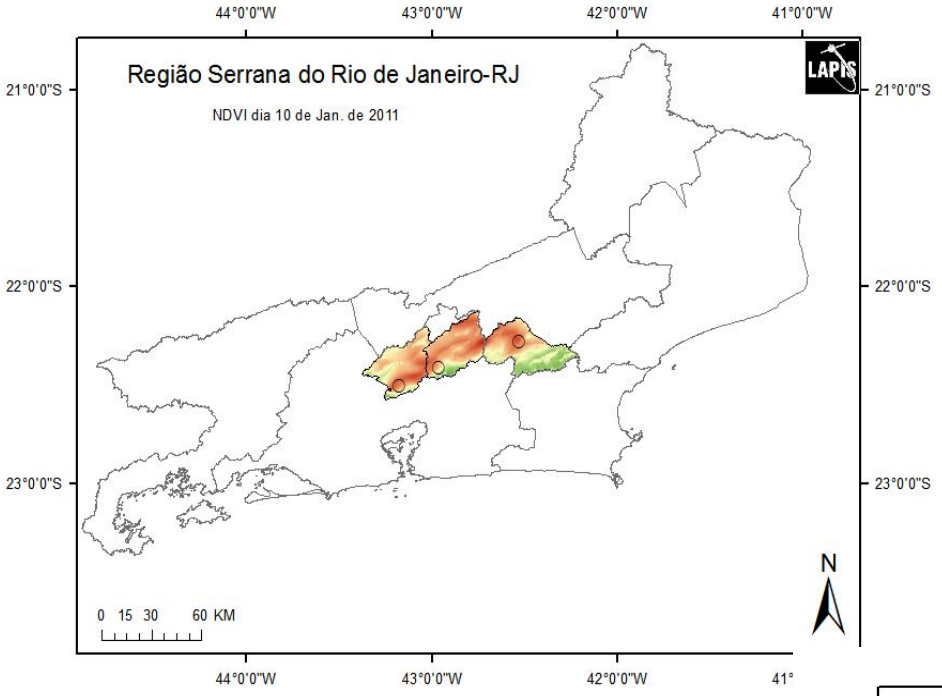
Imagem MPE


mm/hr
35
30
25
20
15
10
5
0

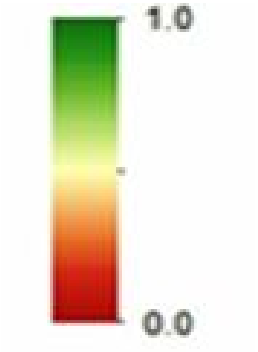



35
0
Rain rate
Rain
0
700
Distance along transect (km)

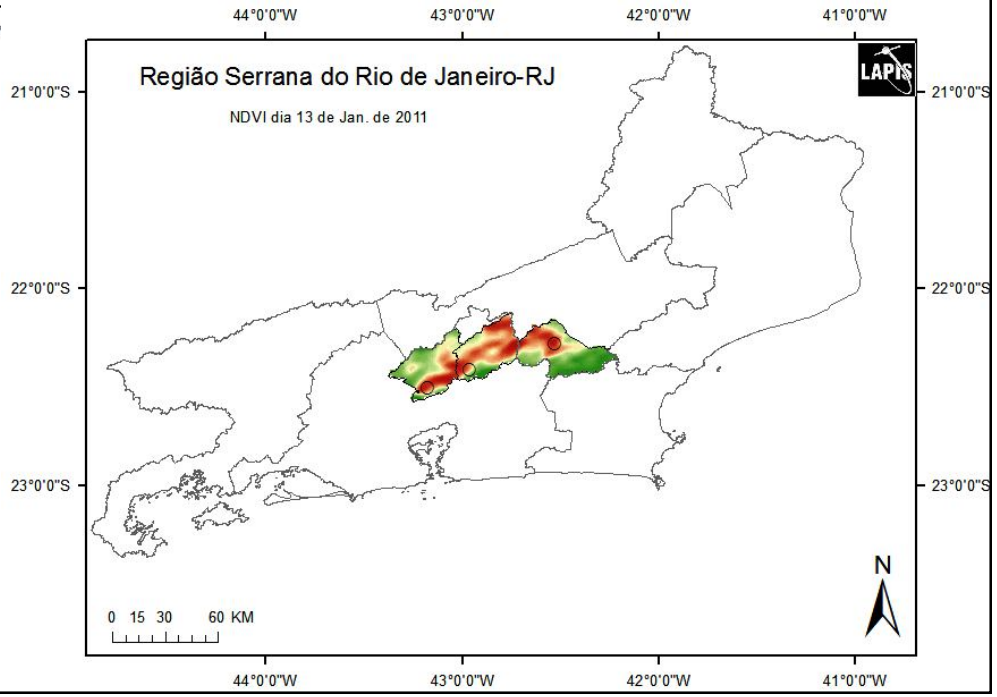
Pre- Event



Daily NDVI MSG SEVIRI



Post- Event



Landslide, Rio, Jan 11 2011

EUMETcast Book for sale:

http://www.ebxlivros.com.br/SISTEMA-EUMETCAST:-UMA-ABORDAGEM-APLICADA-DOS-SATELITES-METEOSAT-DE-SEGUNDA-GERACAO--/

Questions

Q1) What types of drought/flood tools or research has your institution funded, and how has that helped achieve your priorities.

Q2) What do you think are the great gaps in your priorities that drought/flood "science and tools" could help close?

Q3) What strategies are there to enhance the drought/flood science - governance linkages?

LAPIS

LABORATÓRIO DE ANÁLISE E PROCESSAMENTO DE IMAGENS DE SATÉLITES

The End

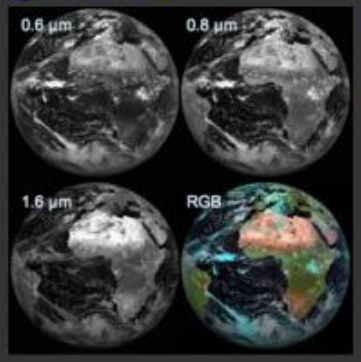
Objetivos Projetos Contatos

Menu Principal
- Home
- Equipe
- Pesquisas
- Publicações
- Softwares
- Contatos

Produtos
- Estação de Recepção

Links

EUMETSAT



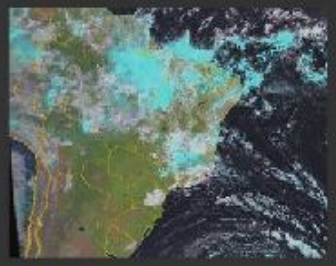
Lapis

Qui, 24 de Setembro de 2009

- *Thank you for listening!*
- *Questions?*

O **L**aboratório de **A**nálise e **P**rocessamento de **I**magens de **S**atélites (LAPIS) da Universidade Federal de Alagoas (UFAL) realiza atividades de pesquisa, assistência tecnológica e treinamento de recursos humanos para a recepção, processamento, interpretação e integração de imagens dos satélites da série METEOSAT. Para atender a essa demanda, em 2007 a UFAL instalou e operacionalizou a terceira estação de recepção de imagens do satélite METEOSAT Segunda Geração (MSG) do Brasil. Como atividades de pesquisa e transferência de conhecimento, a equipe do LAPIS elabora aplicativos para tratamento de imagens, disponibiliza produtos meteorológicos e ambientais derivados do MSG para setores operacionais e oferece treinamento na área. Desenvolvidas inteiramente com ferramentas open-source e freeware.

Eventos
- 2006
- 2007
- 2008
- 2009



Instituto de Ciências Atmosféricas – ICAT
Universidade Federal de Alagoas – UFAL
Campus A. C. Simões, BR 104 Norte
Tabuleiro do Martins
57072-970 Maceió, AL – Brasil
Fone/Fax: +55 (82) 3214-1376

Contact info:

Prof. Humberto Barbosa
barbosa33@gmail.com

Internet 100%