Ministry of the Environment
Secretariat of Climate Change and Environment Quality
Division of Coastal and Air Quality

Erosion in Brazilian Coastline

An Overview

J. L. Nicolodi & A. Zamboni

The Brazilian Coastal Zone

8500 Km of coastal line

400 Municipalities in 17 States (388.000 km²)

Population: 44 million people (23%)

Main activities:

Tourism
Fisheries
Ports
Aquaculture
Oil explotation
Navigation
Industry
Others

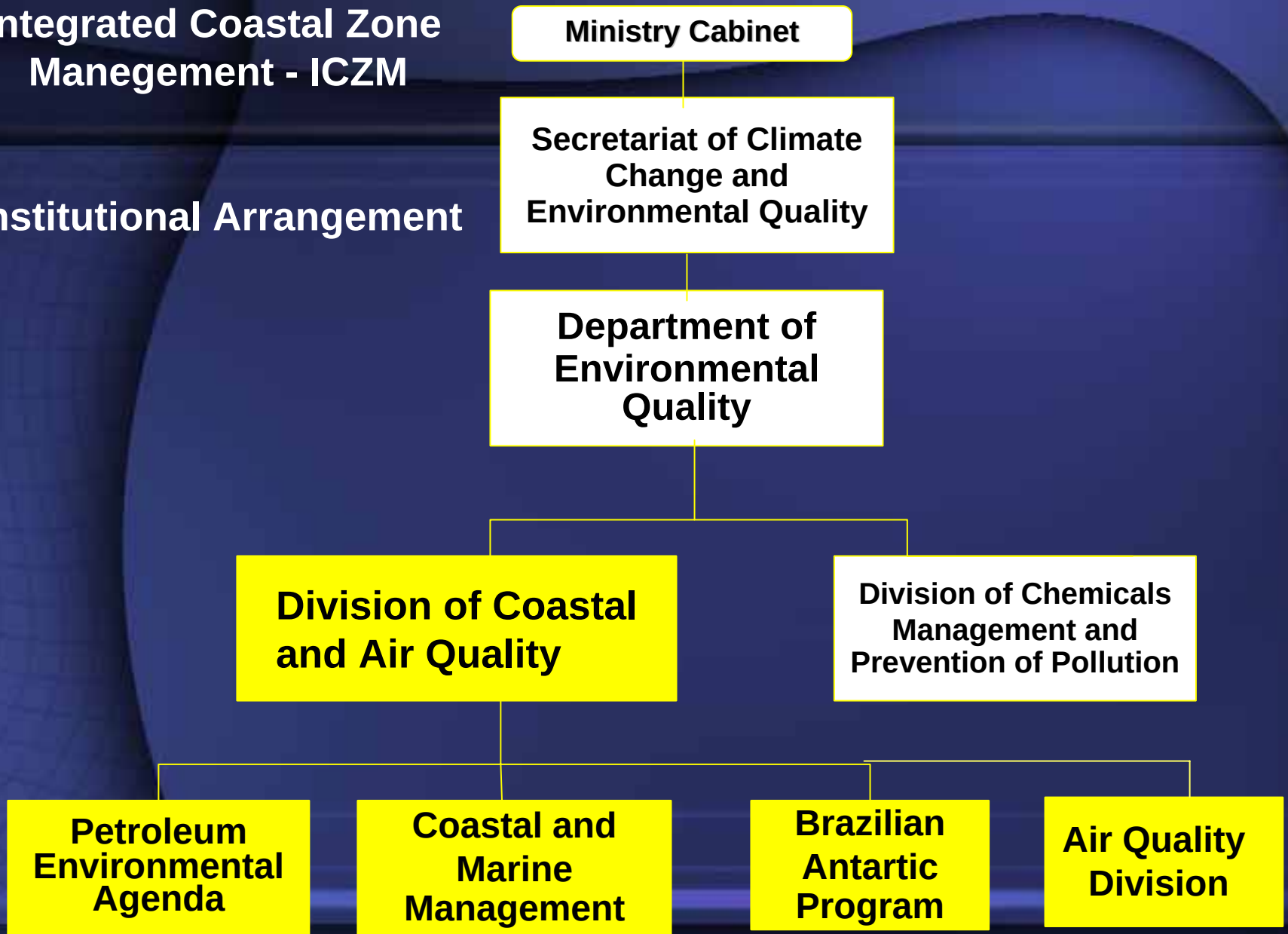
Territorial Sea: 12 nautical miles

Exclusive Economic Zone (EEZ):

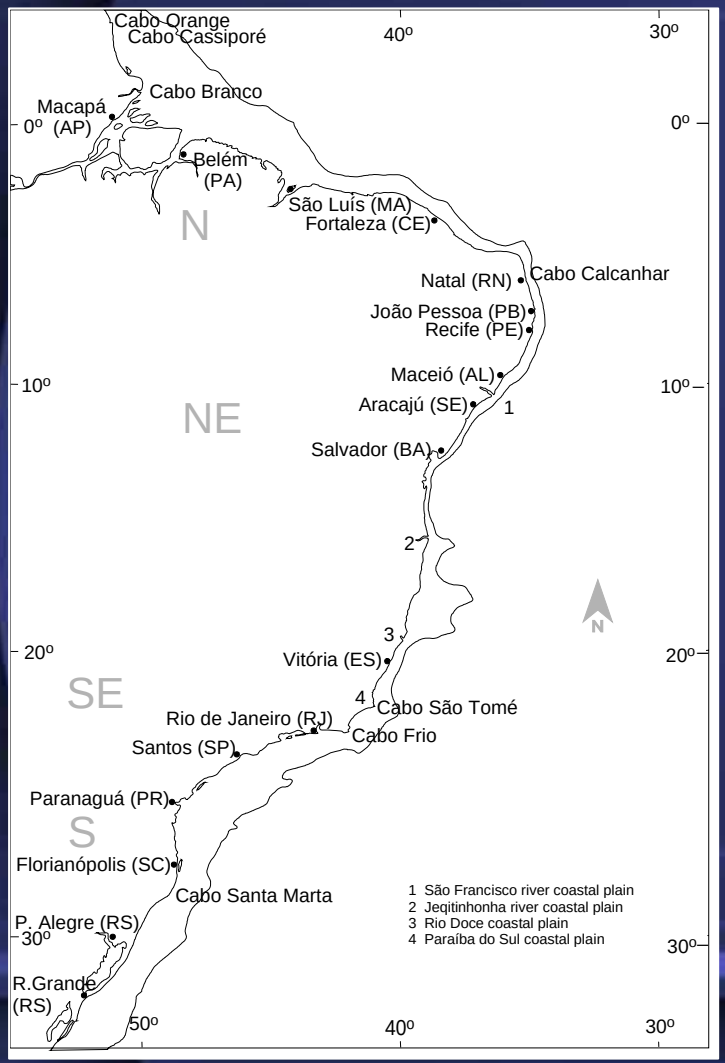
200 nautical miles

Integrated Coastal Zone Manegement - ICZM

Institutional Arrangement



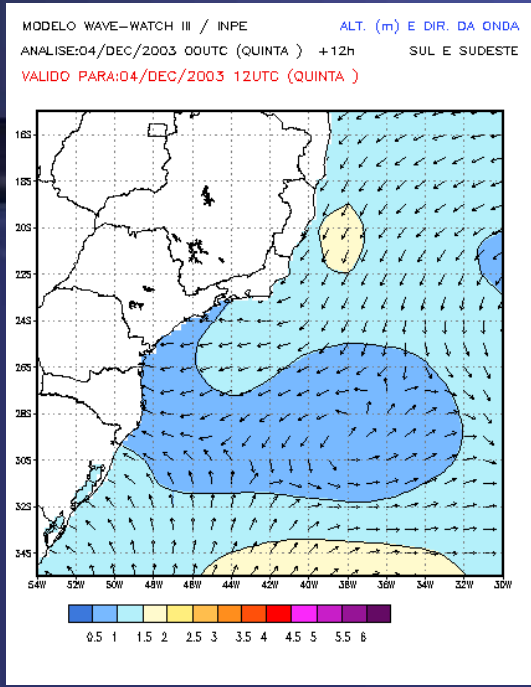
BRAZIL: Main Process Variables

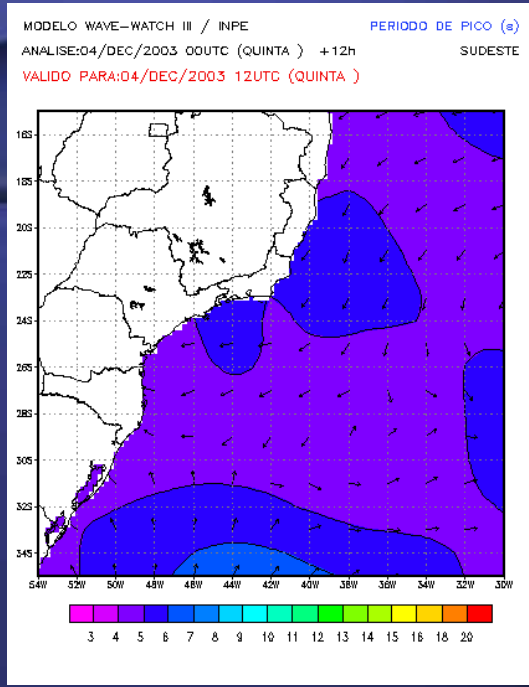


Wave climate

Fair weather

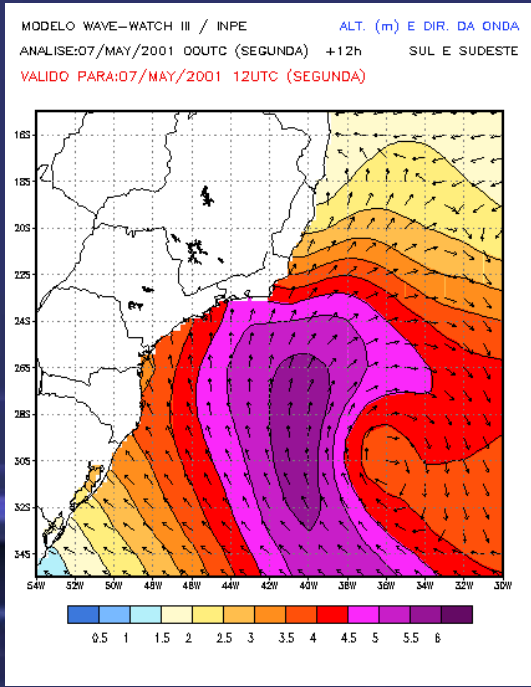
Dominance of waves driven by trade winds

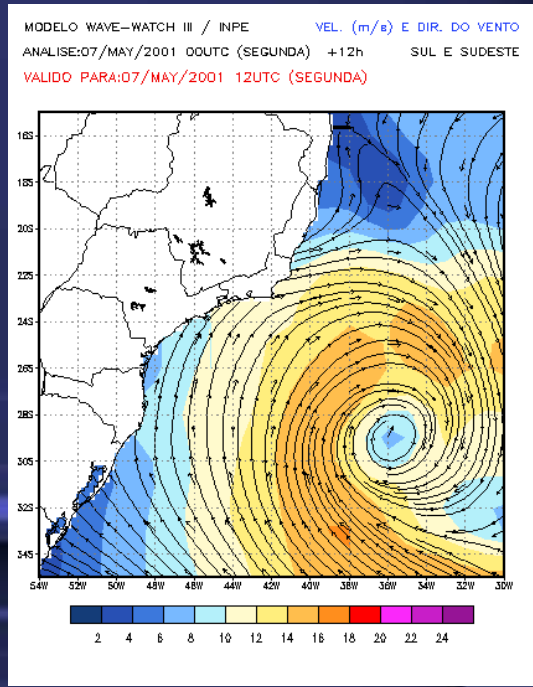




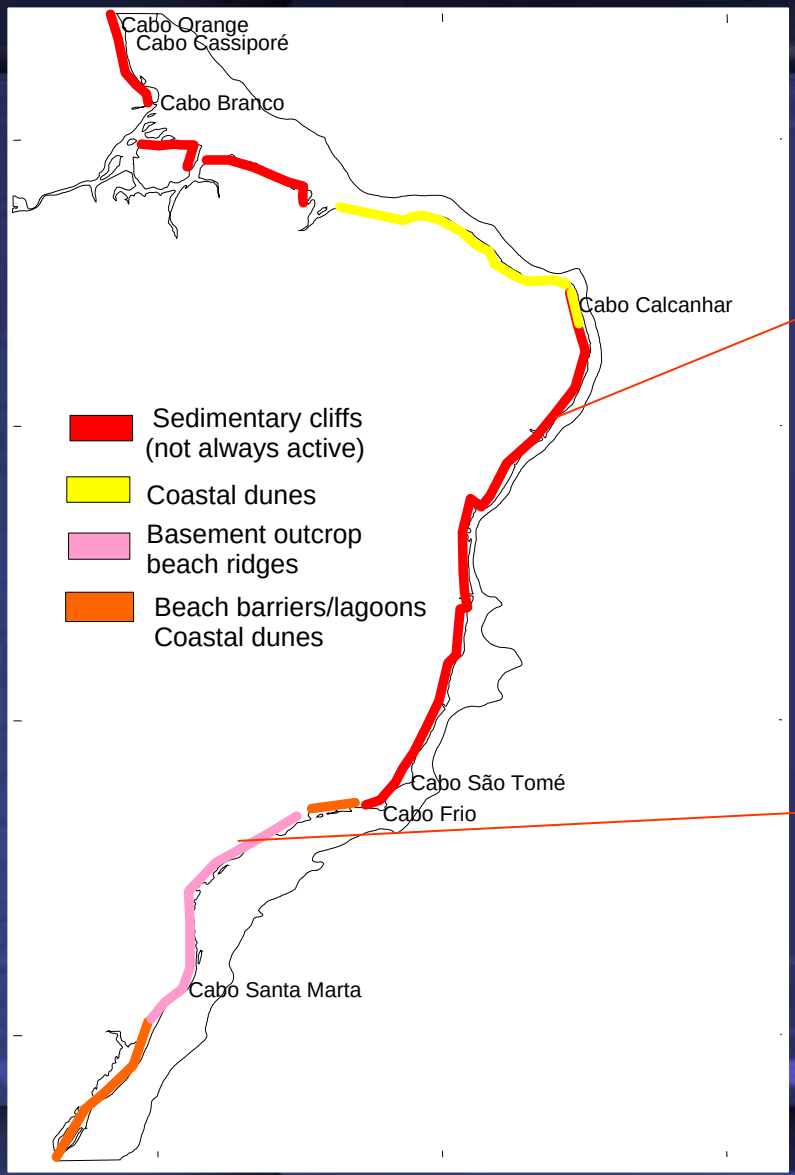
Storm

Winds and waves from the South associated to cold fronts





Sediment Sources



Active cliffs (Barreiras fm.)

Erosion of Precambrian basement rocks

Storm Surges and Extremes Events

March, 2004.

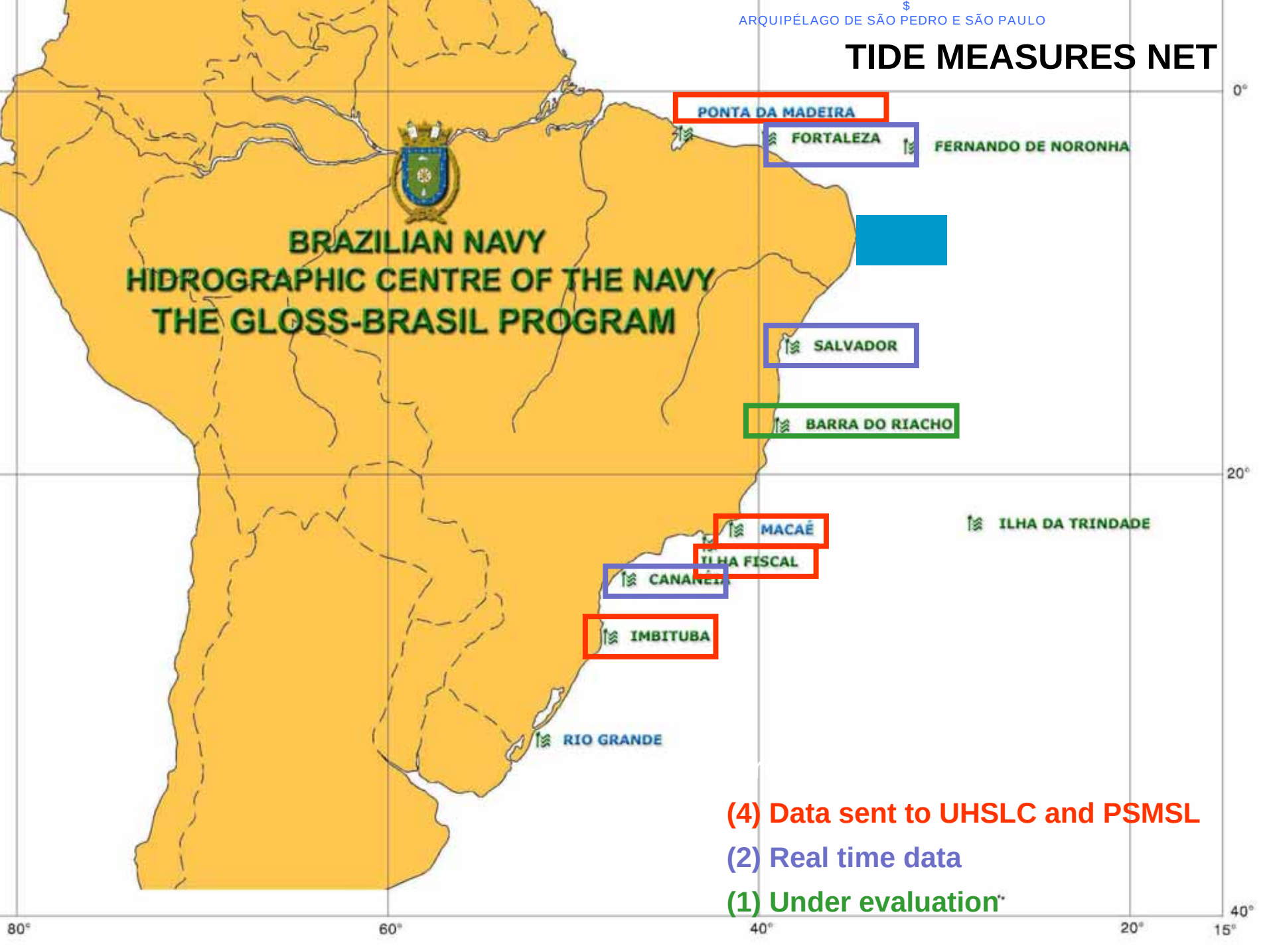
Catarina is the first hurricane in South Atlantic Ocean.

Wind velocity; (176 km/h, 109 mph)

Damages: 380 miliions US$

Deaths: 10

Of course, we was not prepared!!


ARQUIPÉLAGO DE SÃO PEDRO E SÃO PAULO
TIDE MEASURES NET
PONTA DA MADEIRA
FORTALEZA
FERNANDO DE NORONHA
BRAZILIAN NAVY
HIDROGRAPHIC CENTRE OF THE NAVY
THE GLOSS-BRASIL PROGRAM
SALVADOR
BARRA DO RIACHO
MACAÉ
ILHA DA TRINDADE
ILHA FISCAL
CANANÉIA
IMBITUBA
RIO GRANDE
(4) Data sent to UHSLC and PSMSL
(2) Real time data
(1) Under evaluation
0°
20°
40°
80°
60°
40°
20°
15°

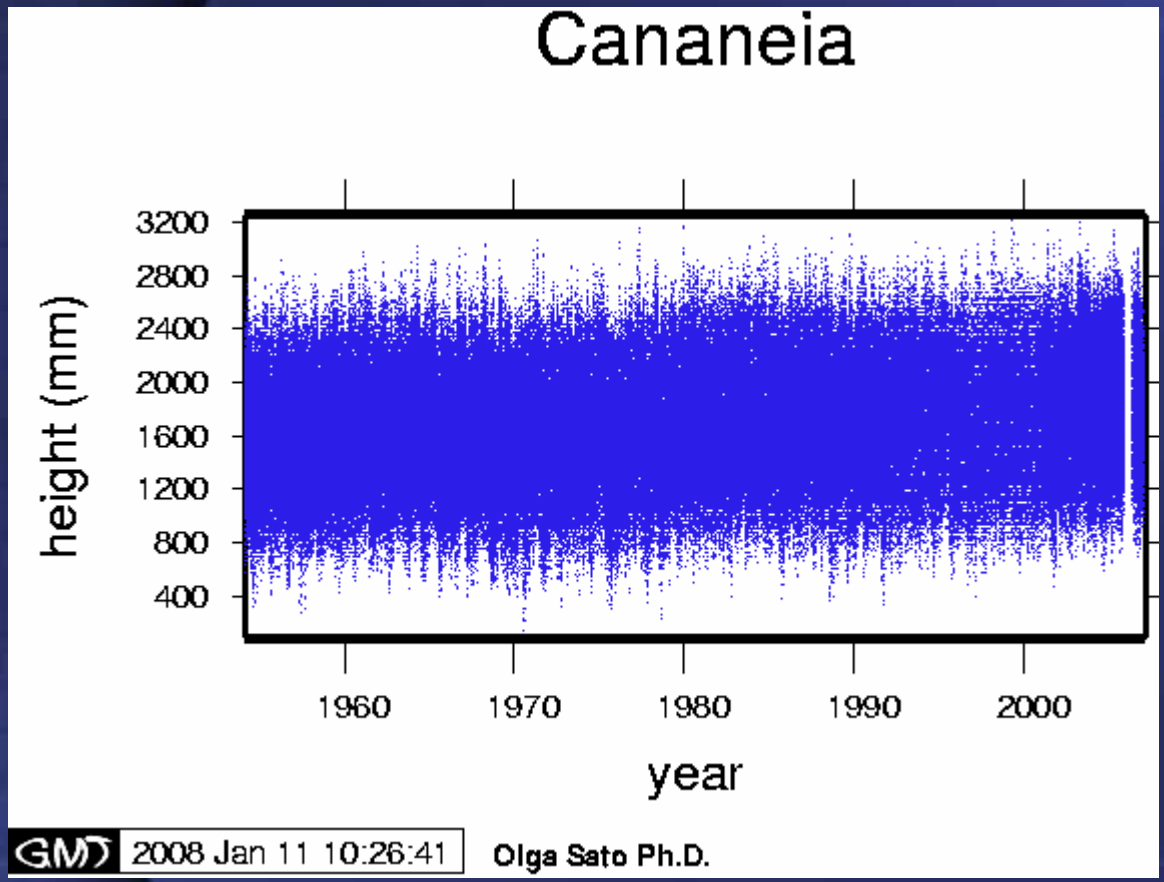
Fiscal Island – Rio de Janeiro

Data available: http://www.goosbrasil.org

The relationship between coastal erosion and sea level rise in Brazil still isn't clear.

The network of tide measures is recent.

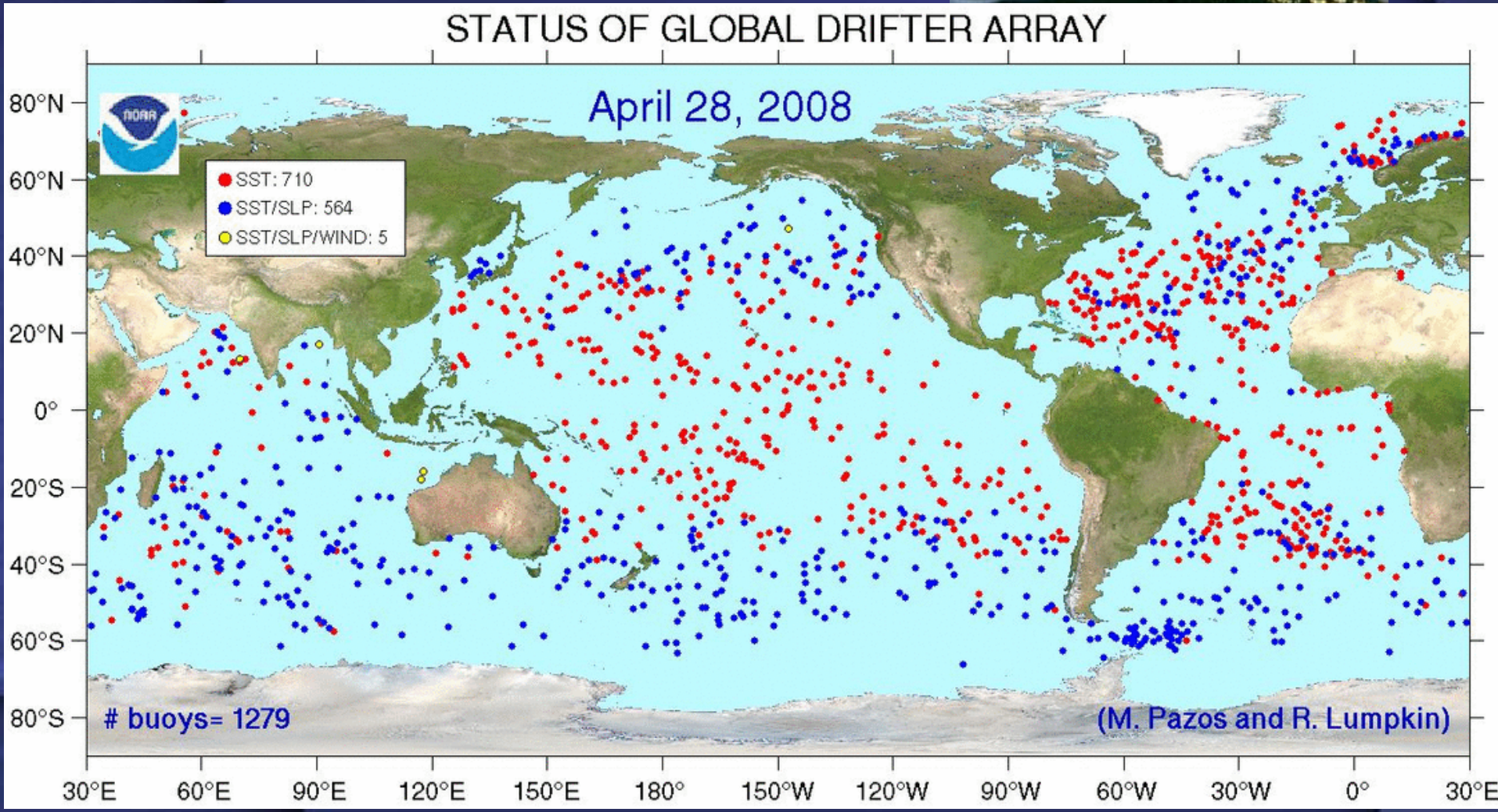
The oldest brazilian record, from Cananéia – São Paulo, was done in 1955.



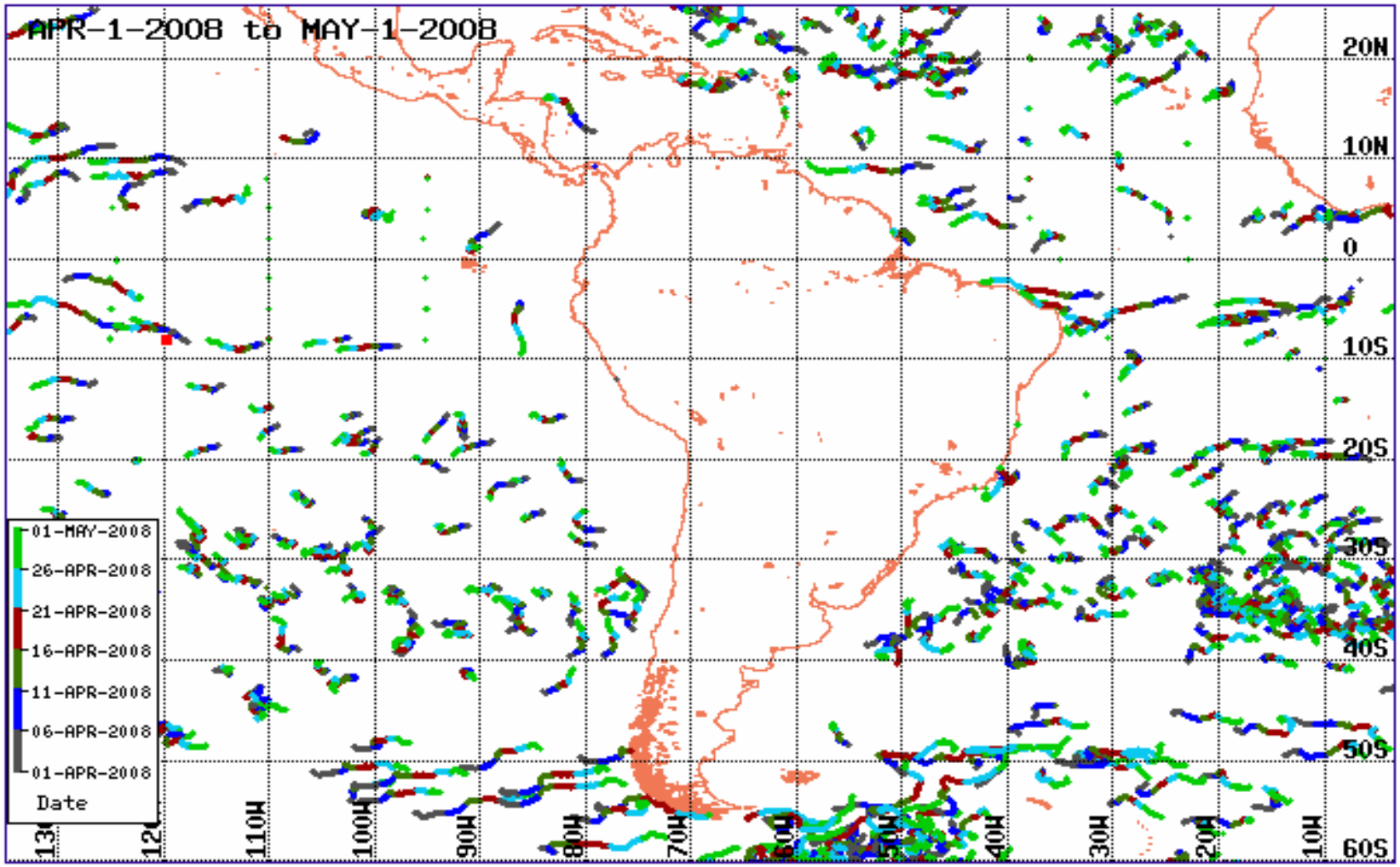
Mean 3.4 mm / year

For a better comprehension of the erosion causes, we need to improve understanding of the South Atlantic dynamics.

THE GOOS / BRAZIL PROGRAM
National Buoys Program - Drifting buoys



GTS Buoys | GTS Buoys (WMO Code ZZYY) | PlatformID | <<Back



-28.65

-60.4

Final Date 1 May 2008

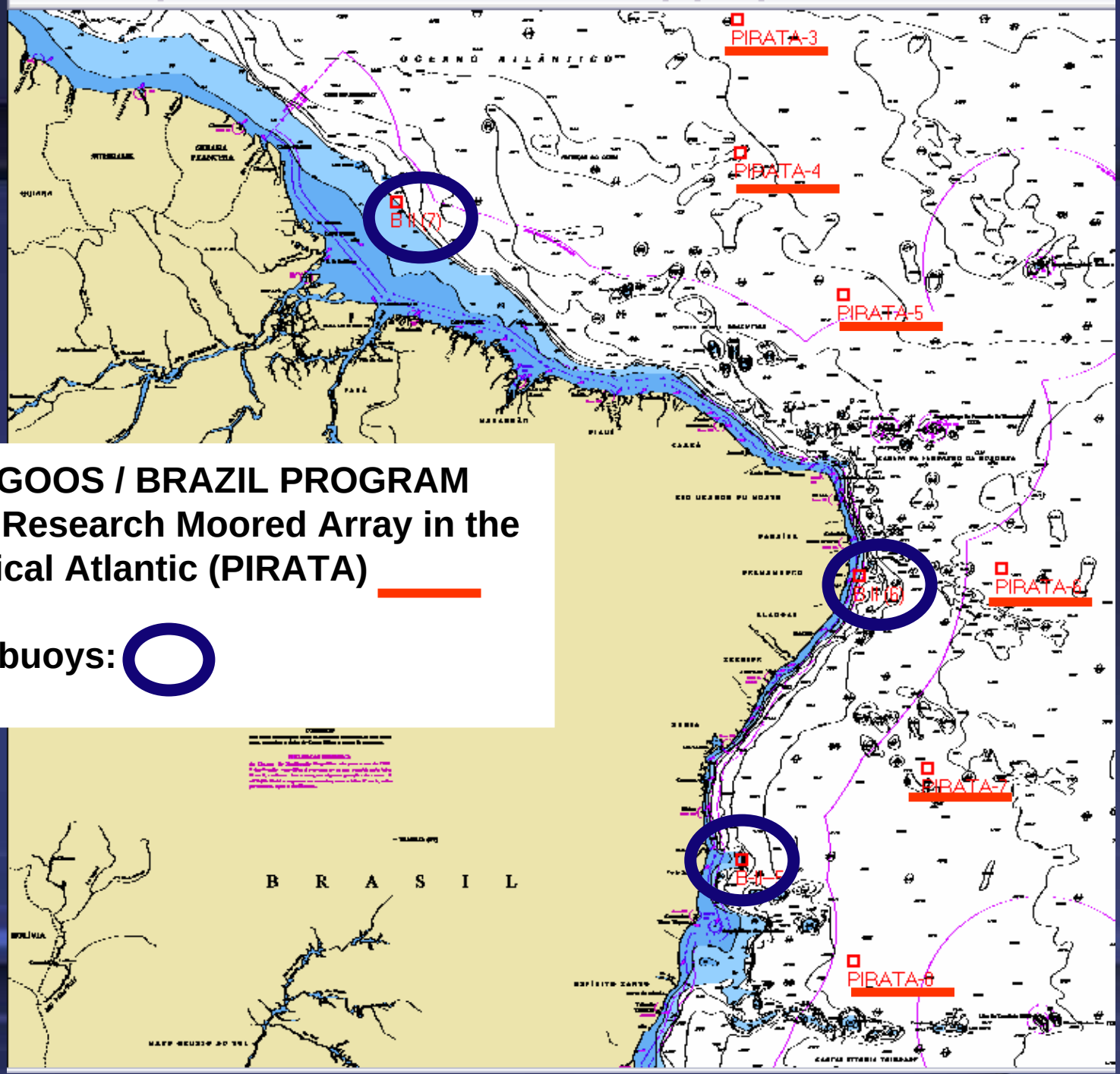
Initial Date 1 Apr 2008

Graphics | Go!

Select area on any of the two maps

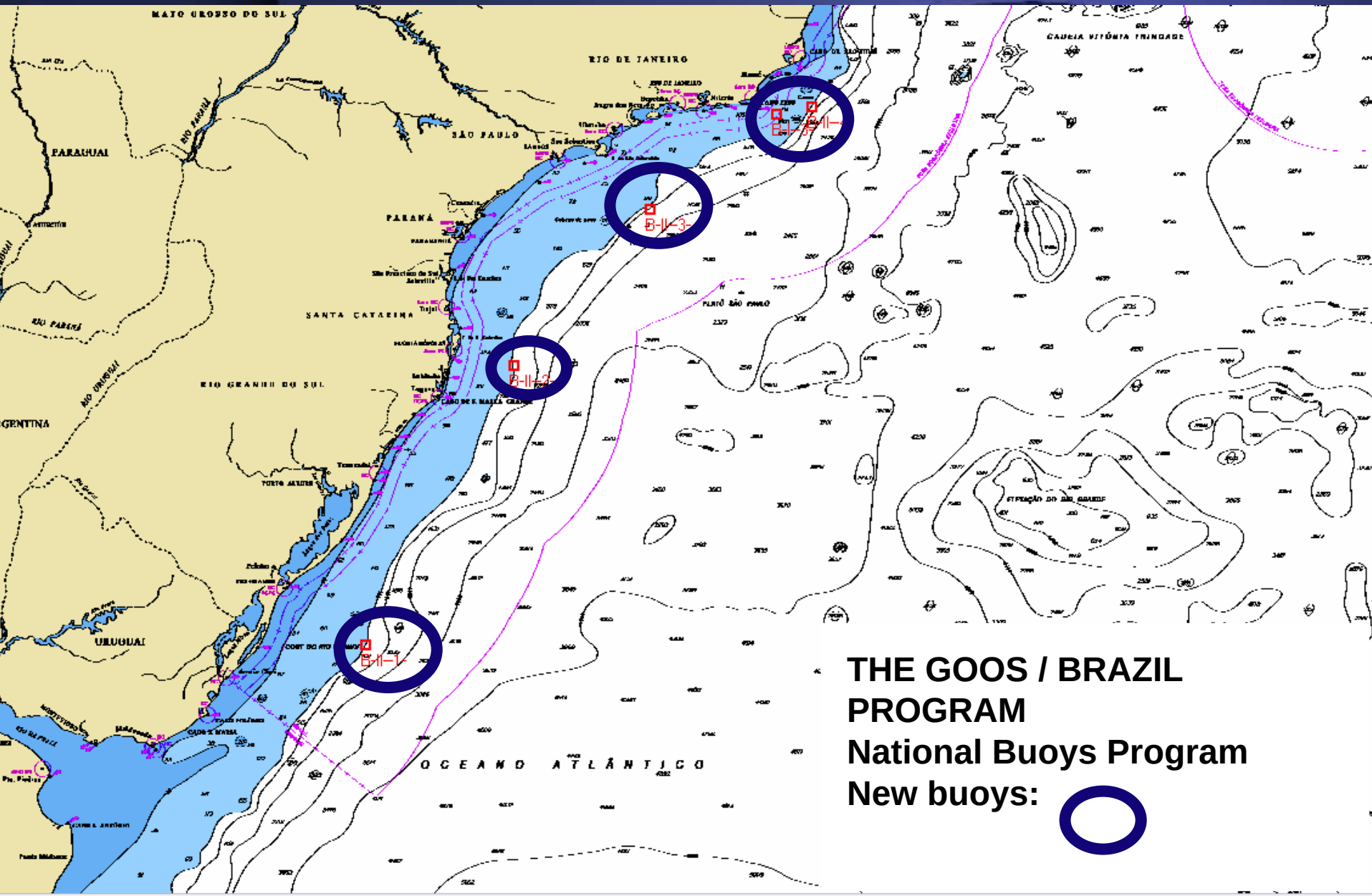
(•) Map ( ) Lat-Time

( ) Lon-Time ( ) Depth-Time



THE GOOS / BRAZIL PROGRAM
Pilot Research Moored Array in the Tropical Atlantic (PIRATA)

New buoys:


MATO GROSSO DO SUL
RIO DE JANEIRO
SÃO PAULO
PARANÁ
SANTA CATARINA
RIO GRANDE DO SUL
PARAGUAI
URUGUAI
OCEANO ATLÂNTICO
PLATÔ SÃO PAULO
ELEVAÇÃO DO RIO GRANDE
CADEIA VITÓRIA TRINDADE
B-II-1
B-II-2
B-II-3
B-II-4
THE GOOS / BRAZIL PROGRAM
National Buoys Program
New buoys:

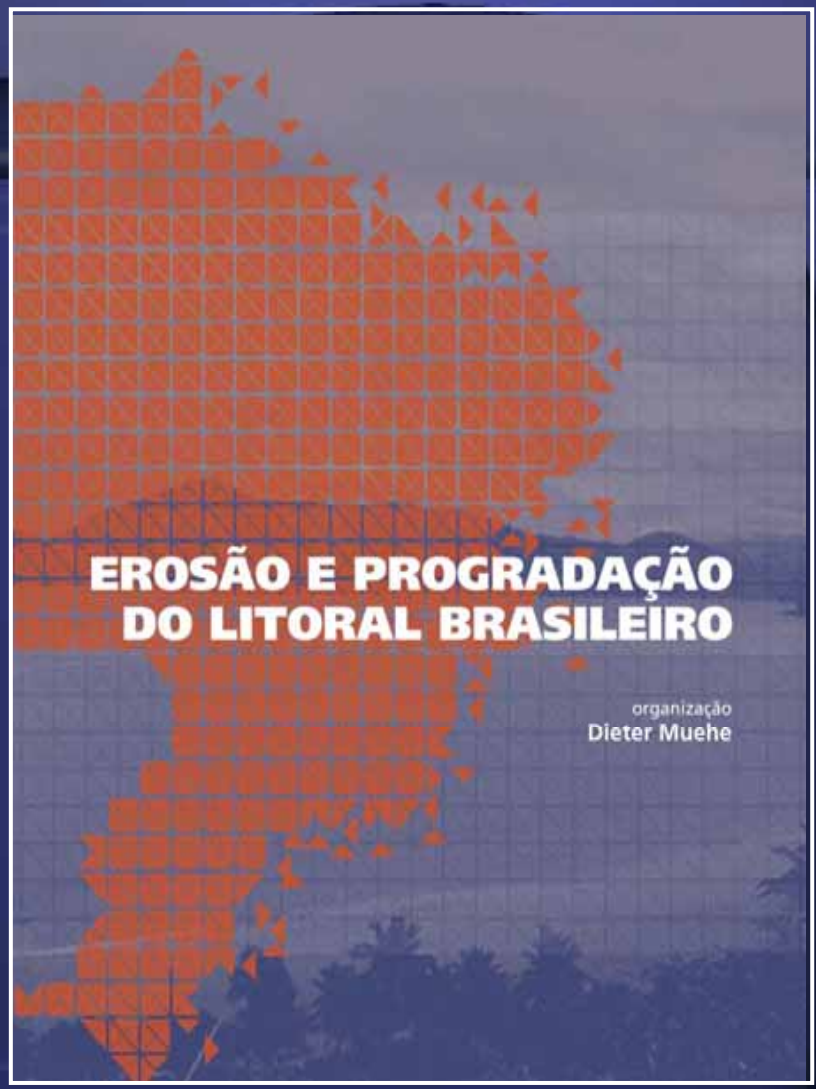
Coastal Erosion In Brazil

2006: Publishing of book *Erosion and Accreting in the Brazilian Coast*

Summary results of various studies conducted by universities in 17 states

Available on the website

www.mma.gov.br/sigercom



Paraíba

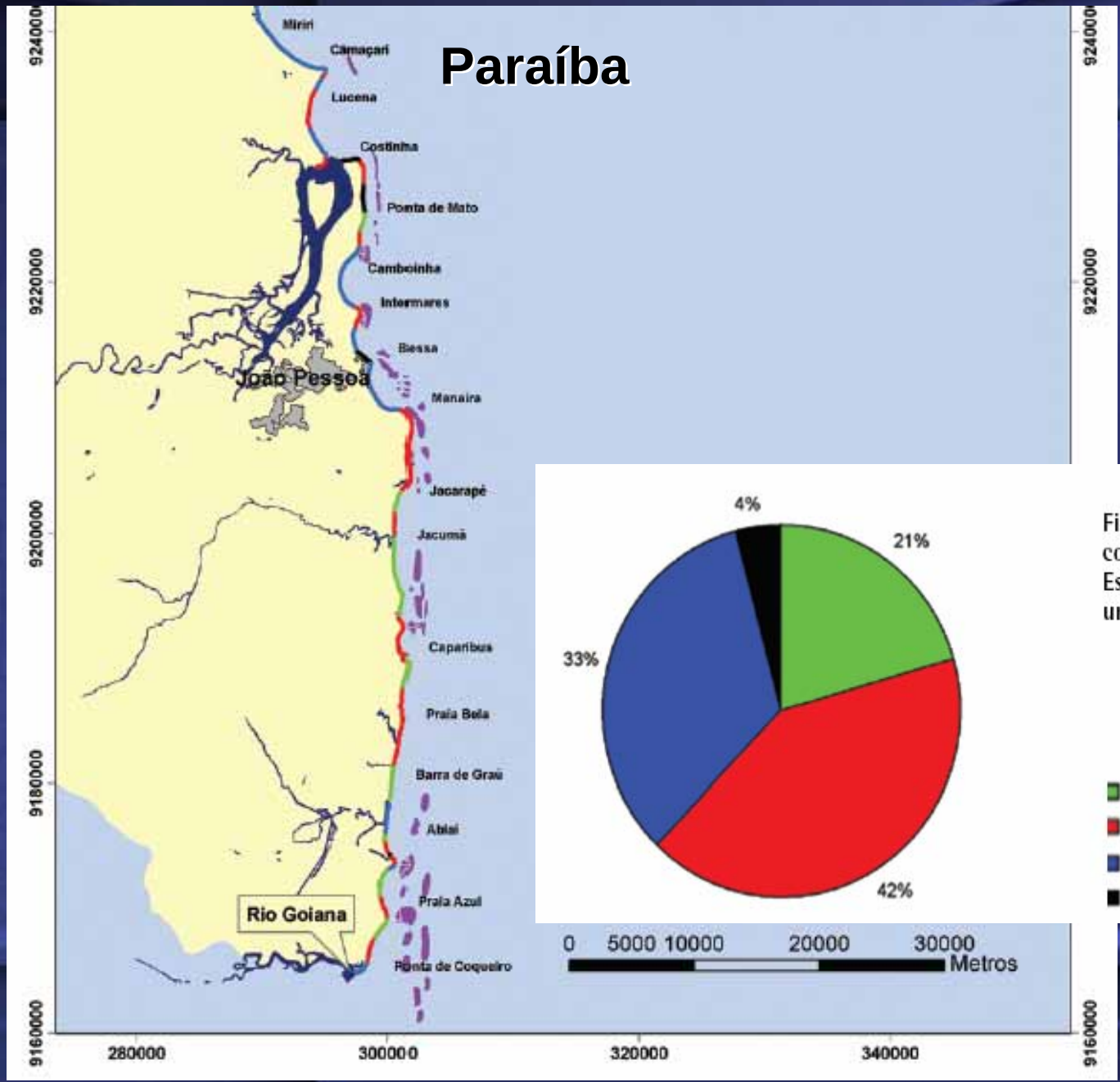


Figura 2. Síntese das tendências de comportamento da linha de costa para o Estado da Paraíba. O trecho estudado tem uma extensão de 140 km.

Approximately 40% of the Brazilian coast has suffered any kind of Erosion process.

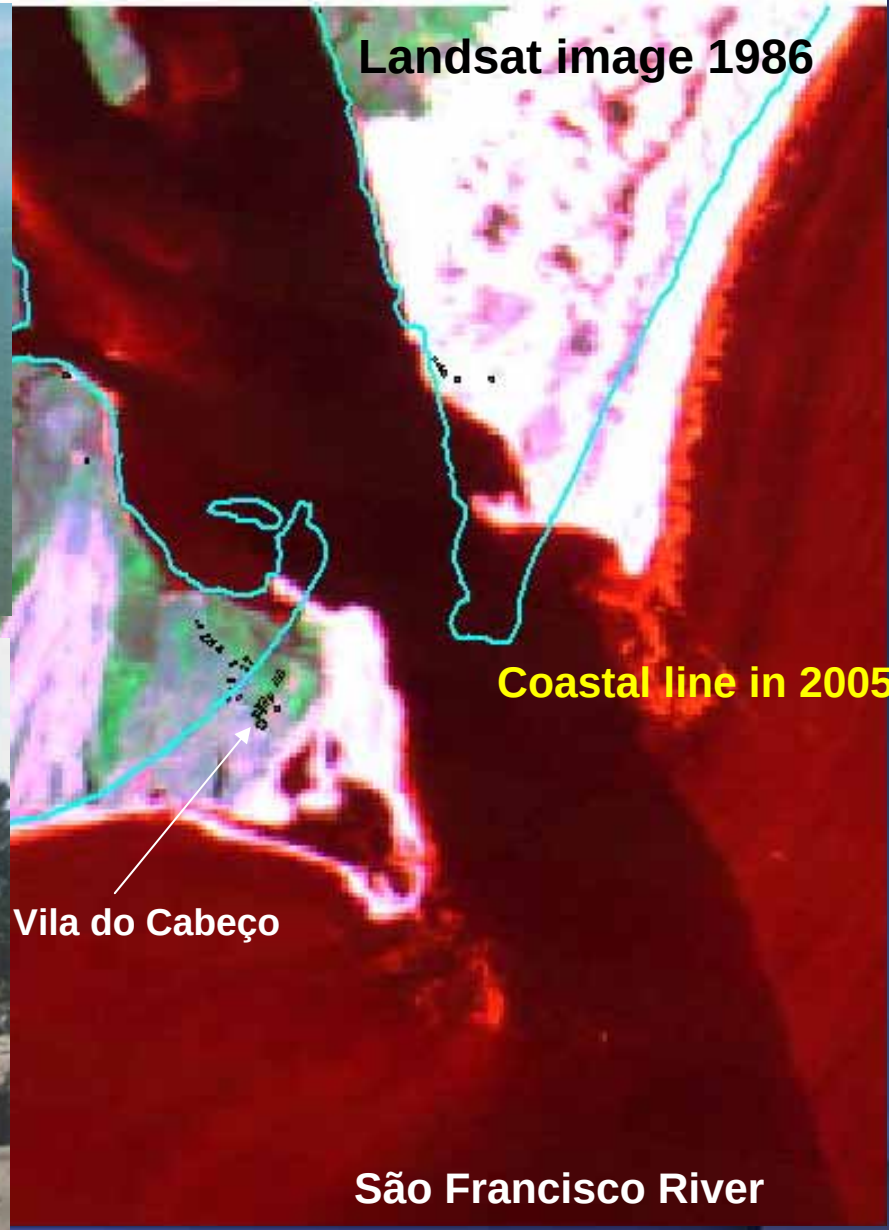
Residents of low income is the most affected

Walls of contention. The beach is gone...

Destruction of roads.

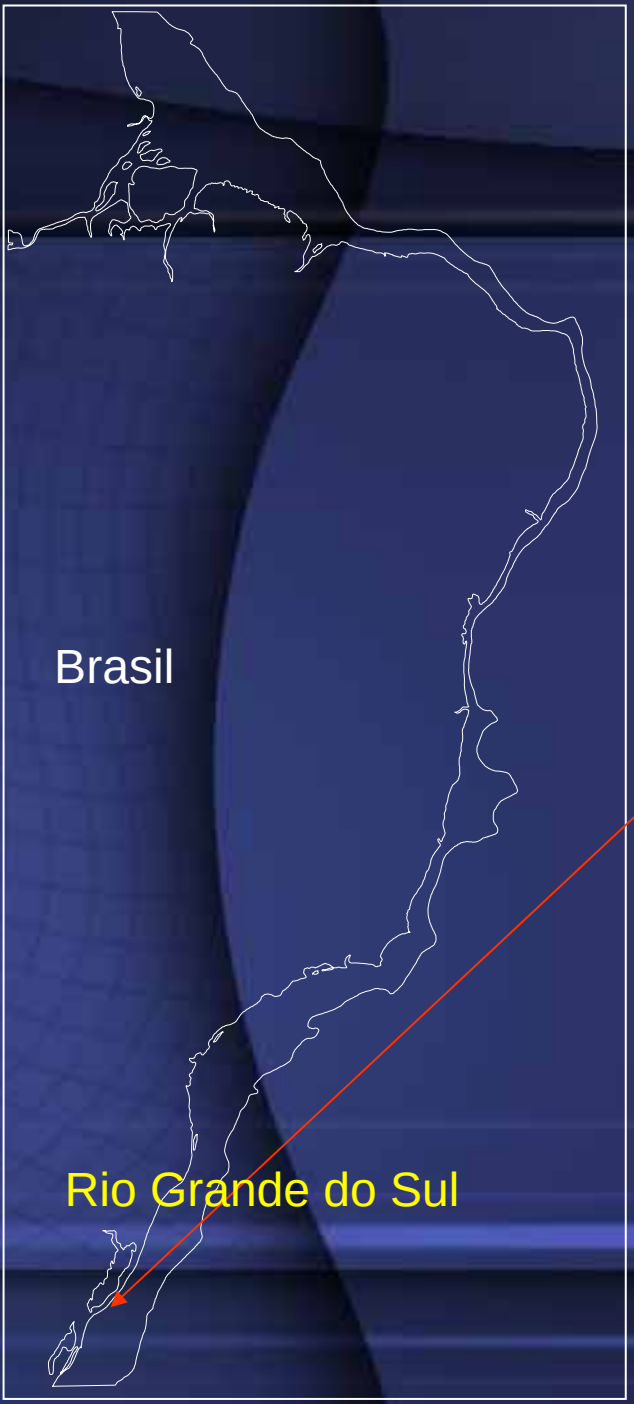
In this place, almost 20 thousand people have been removed.


Lighthouse built in 1873 - 700 m from the coastline


Landsat image 1986
Coastal line in 2005
Vila do Cabeço
São Francisco River

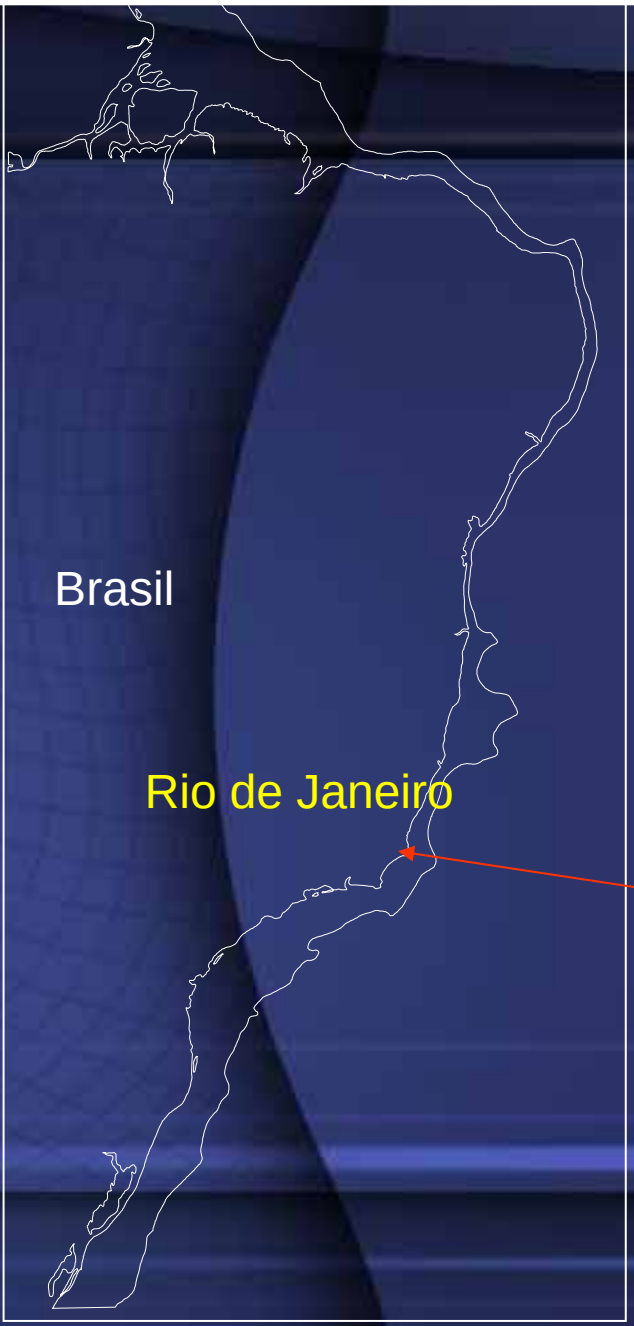

Brasil
São Paulo
Santa Catarina


Sadia


Brasil
Rio Grande do Sul


1988
Conceição
Lighthouse
House
1997
New lighthouse
Conceição
Lighthouse
House
1999

What is the cost of coastal erosion?



Study conducted by UFRJ encompassed 14 km of the Maricá beach:

Evaluation of financial losses (US$)

Total loss of houses: 1 million
Recovery of infrastructure: 325.000
Prices devaluation: 730.000
Total: 2.055.000,00

$ 150.000,00 per km

Maricá beach- RJ

Controllers of erosive processes in Brazil.

- **Sea level changes**
-**Changes in the intensity and direction of the wave energy,**
- **Natural sand supply,**
- **Uncontroled urbanization process,**
- **Underground water over exploitation.**

Outlines:

-Nothing is more critical for the beaches stable state than the sand supply,

- The stability of a sandy beach depends on the balance between the intensity and direction of the waves and sediment available for transport as well.

- The sand transport maintance should be a environmental goal.

- For a long term solutions it’s necessary to establish technical standards and effective regulatory frameworks to protect the "rights of Sand“ to migrate along the coast.

Adopted alternatives in Brazil:

Reconstruction of beaches.

Comparatively low impact than hard structures!!!

Example: Piçarras – SC

Cortesia: Antonio F. Klein

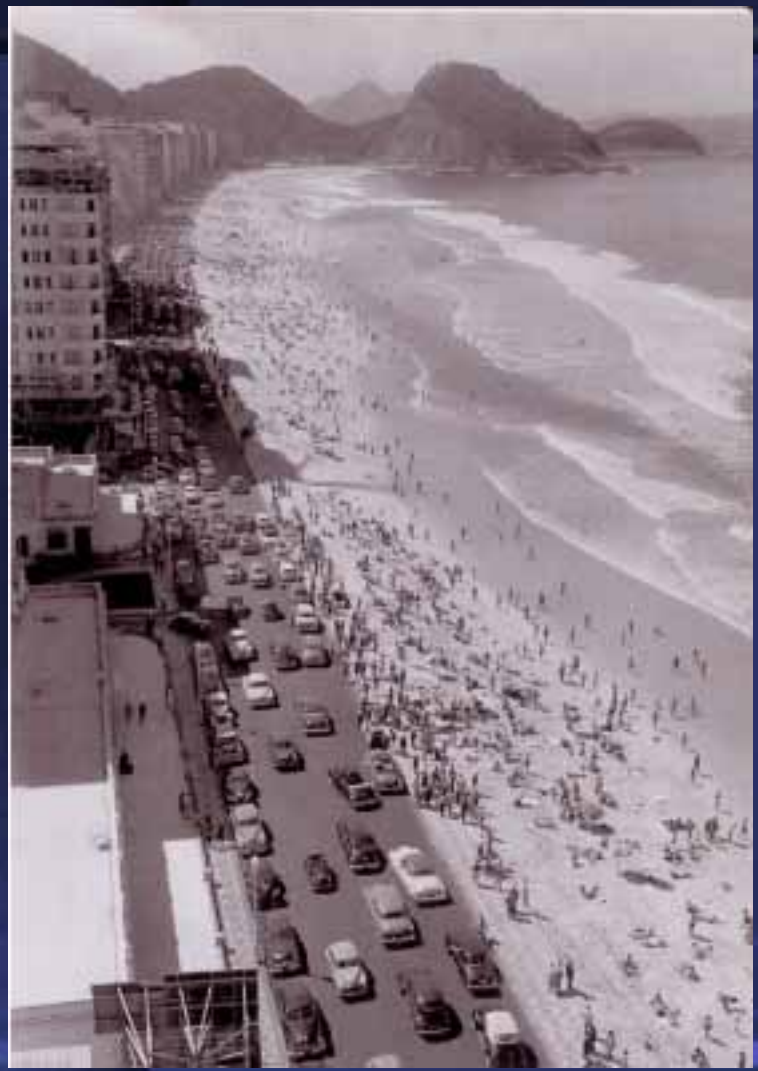
1984 – 1994: 1,5km of beaches were eroded

1999: 2.2 kilometers of beaches rebuilt.

Estimated cost: US$ 2 million.

Cortesia: Antonio F. Klein

Copacabana - RJ



1950

Today

Main action lines:

Empowering the Integrated Coastal Zone Management

Improving South Atlantic dynamics knowledges (waves, currents, sea level, etc)

Implementing a erosion monitoring program

Establishing a no occupation areas in costal zone

Developing of integrated management coastal zone and river basins

Adopting the option for no hard strutures as a preferencial guideline.

In september MMA will organize the first Brazilian Coastal Erosion Symposium in order to discuss policy guidelines for the Coastal Engineering solutions and its relationship with the environmental quality .

Ministry of the Environment

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