

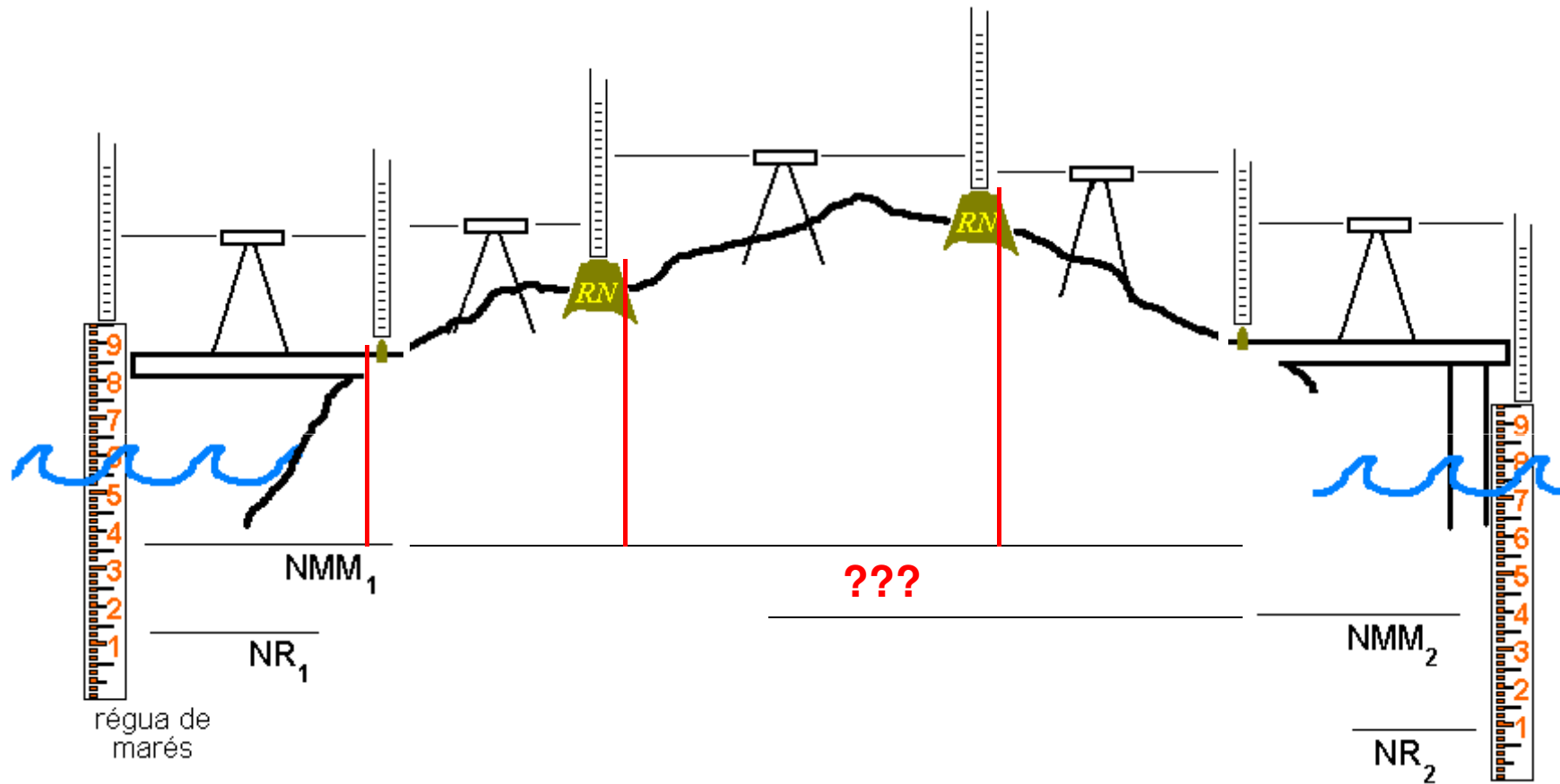
# The Brazilian Geodetic Tide Gauge Network (RMPEG)

Roberto Teixeira Luz

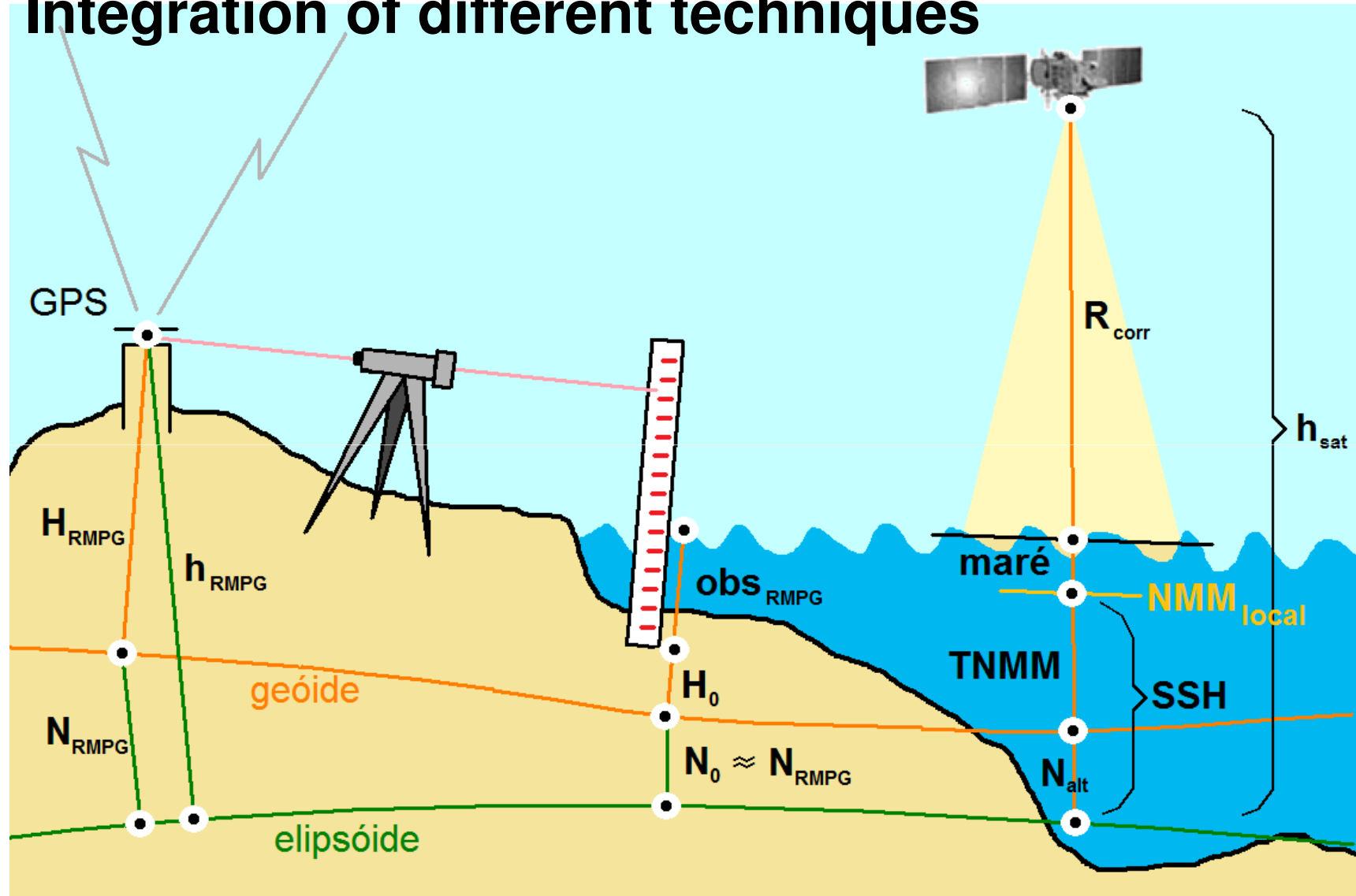
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*IAG2009*  
*31.8 – 4.9, Buenos Aires, Argentina*

# Heights *versus* MSL



# Integration of different techniques



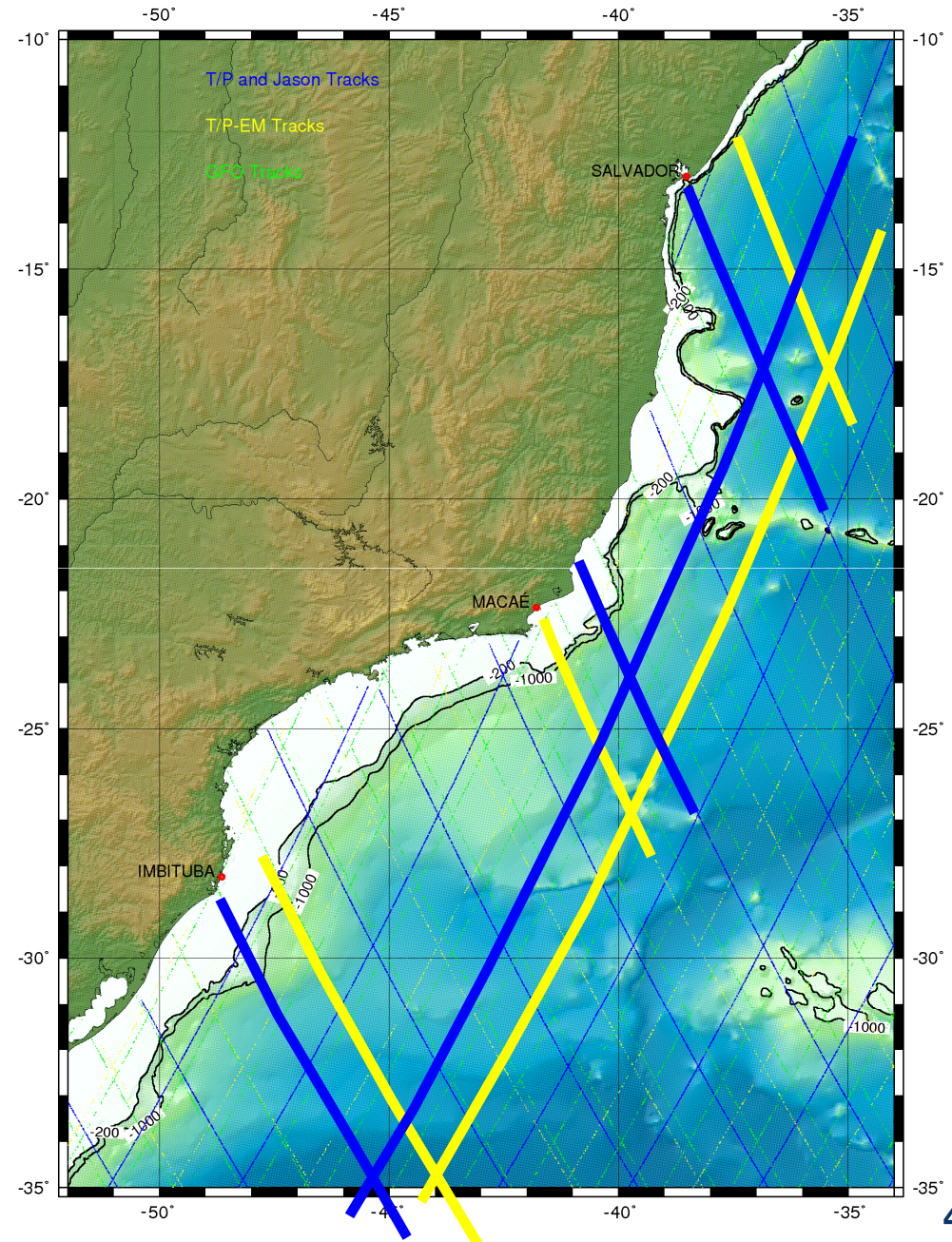
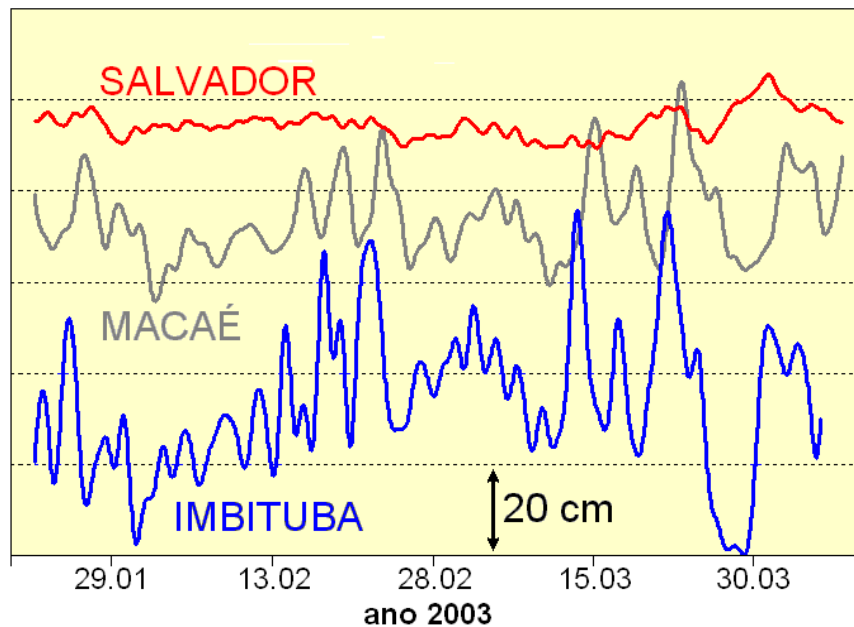
(adapted from Bosch et al., 2008)



“Leveling with altimetry”  
towards RMPG stations

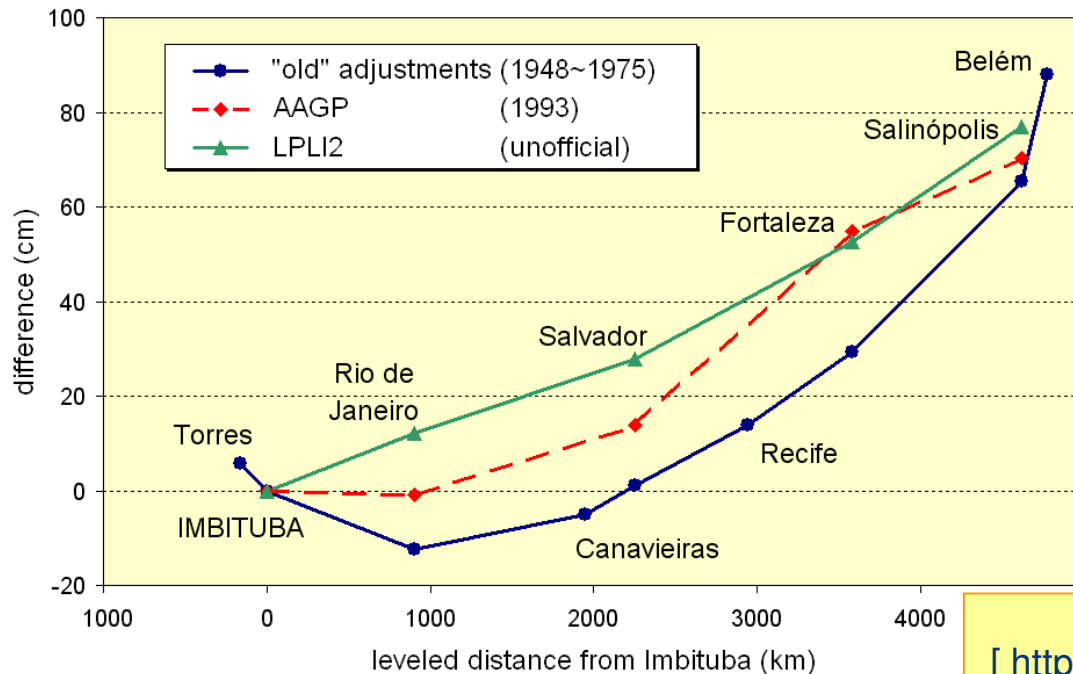
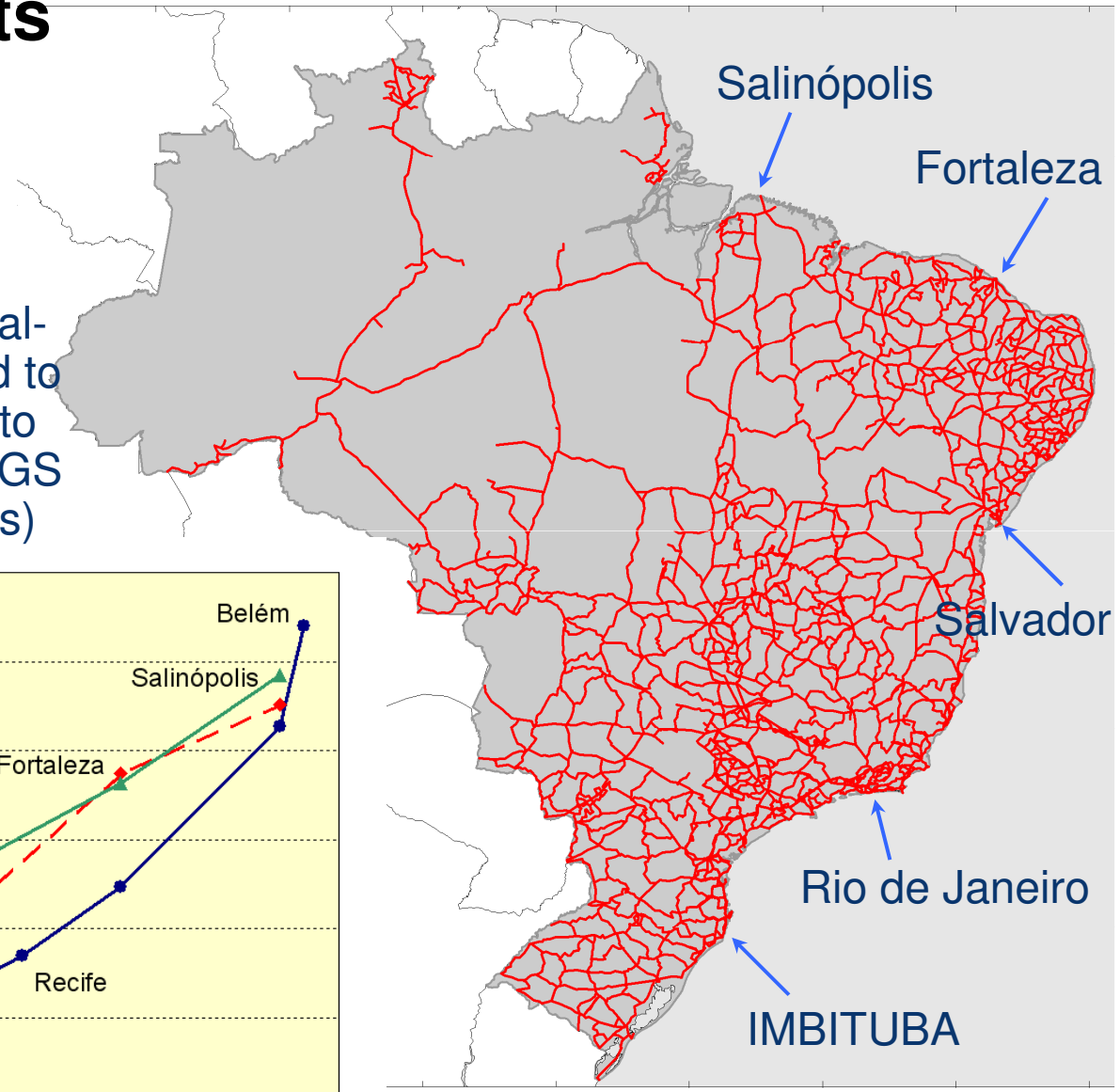
>>> presentation on DOT,  
session “Gravity 11”

Weekly MSL (168h-filter) showing almost no  
meteorological effects at Salvador station



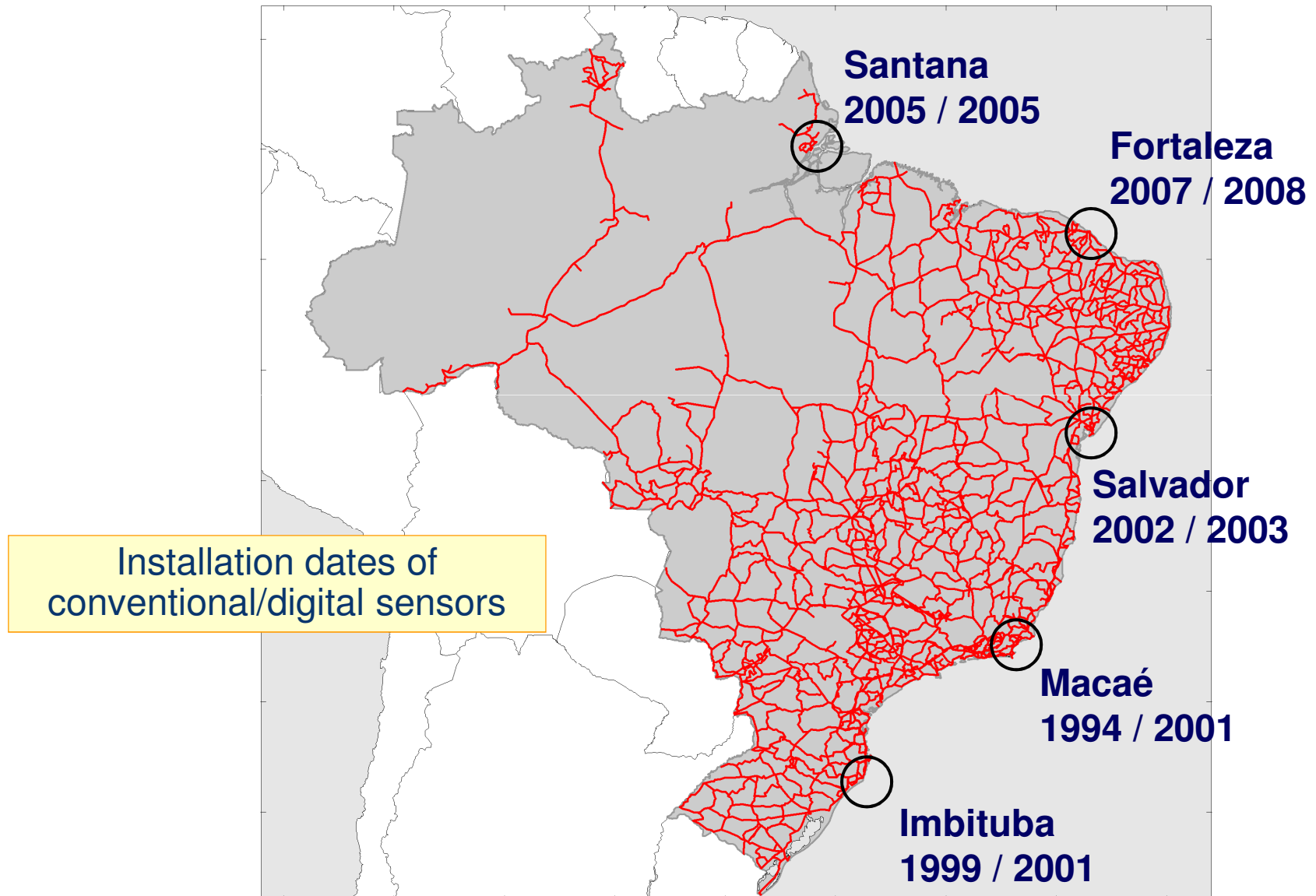
# Brazilian heights

Differences between normal-orthometric heights referred to the **Imbituba Datum** and to some other local MSL at IAGS TG-stations (1950's-1960's)

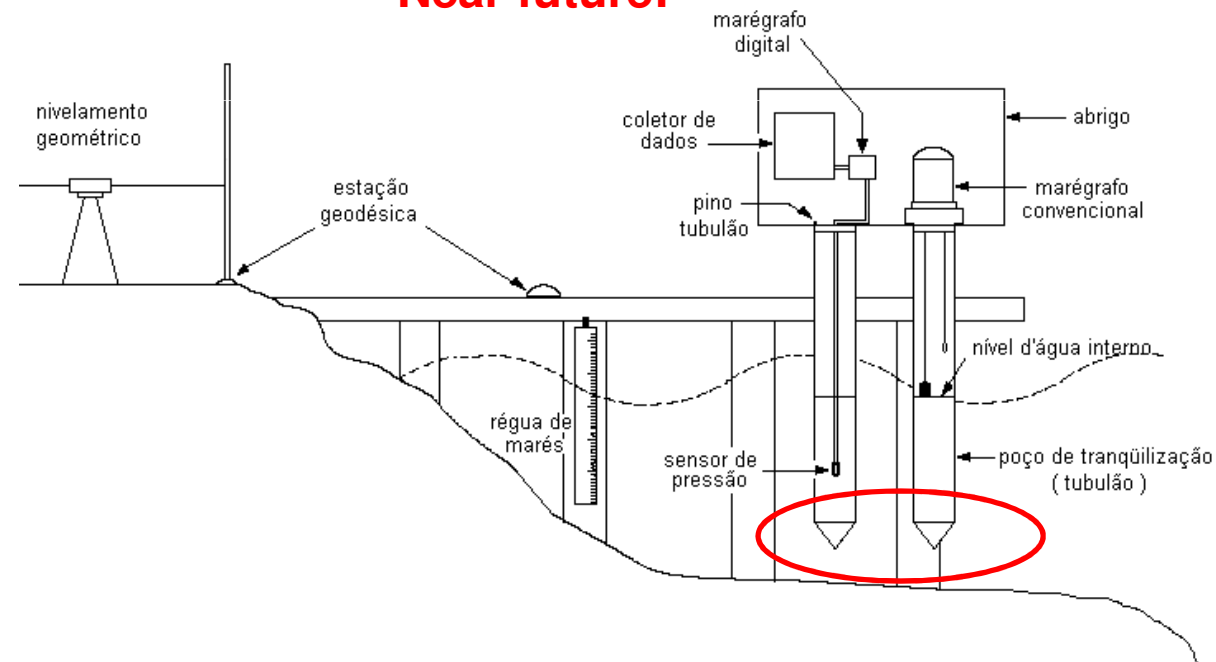
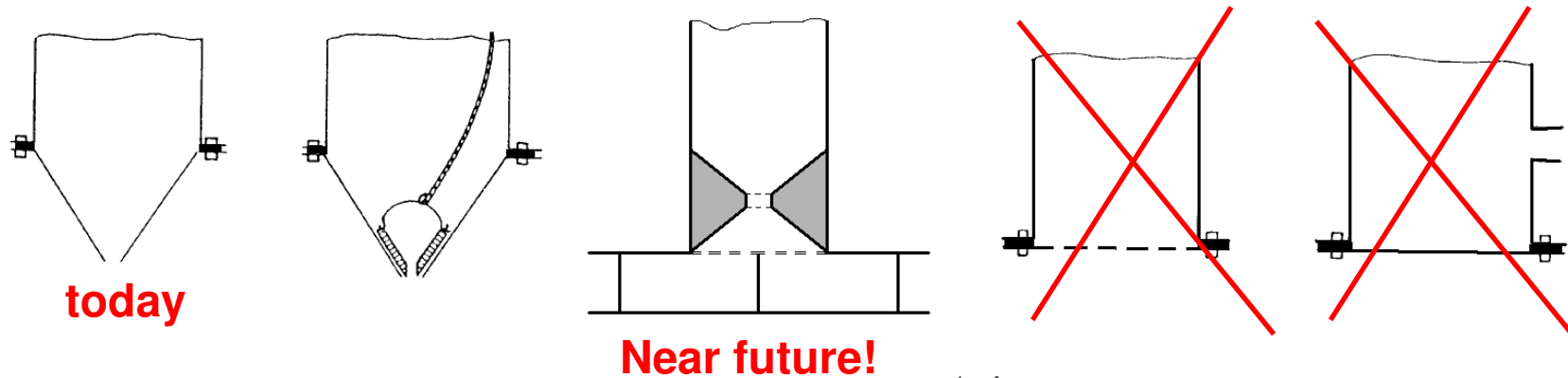


Luz, R. T. (2008). Estratégias...  
 [ <http://www.sirgas.org> , "Documentación", "Artículos" ]

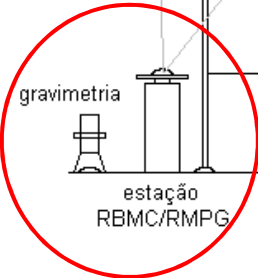
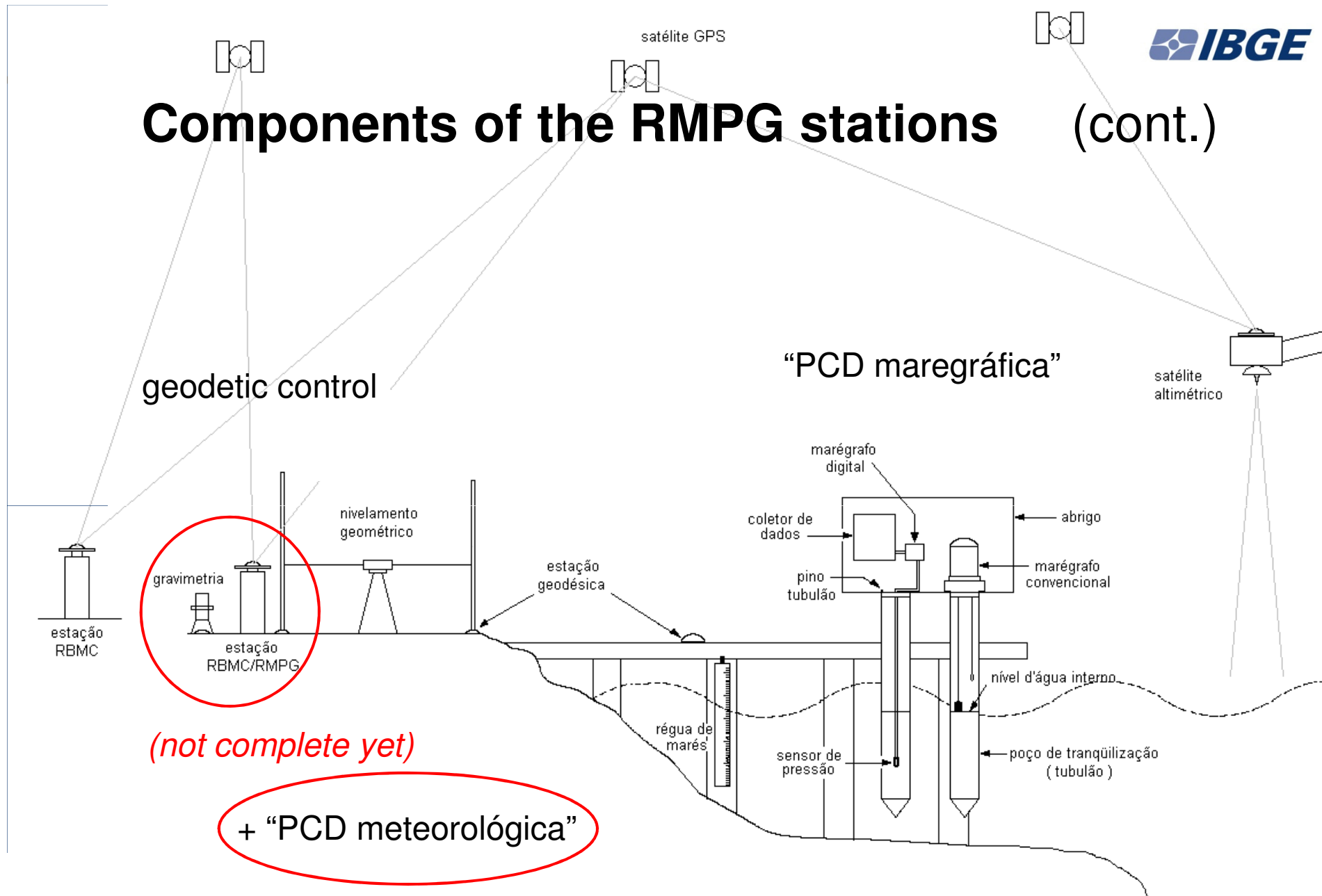
## The establishment of the RMPG stations



# Components of the RMPG stations



# Components of the RMPG stations (cont.)



*(not complete yet)*

+ “PCD meteorológica”



## Components of the RMPG stations (cont.)

RMPG (*Rede Maregráfica Permanente para Geodésia*)

Station	Digital SL sensor(s)	Back-up sensor (graphical)	DCP-met	CGPS	TG-CGPS dist. (m)
Santana	06.2005	06.2005	06.2005	07.2008	140
Belém	2010 ?				
Fortaleza	04.2008	09.2007	– x –	08.2008	600
Salvador	10.2004	12.2002	– x –	04.2007	150
Macaé	07.2001	11.1994	– x –	2009 ?	
Imbituba	08.2001	06.1998	08.2001	12.2006	650

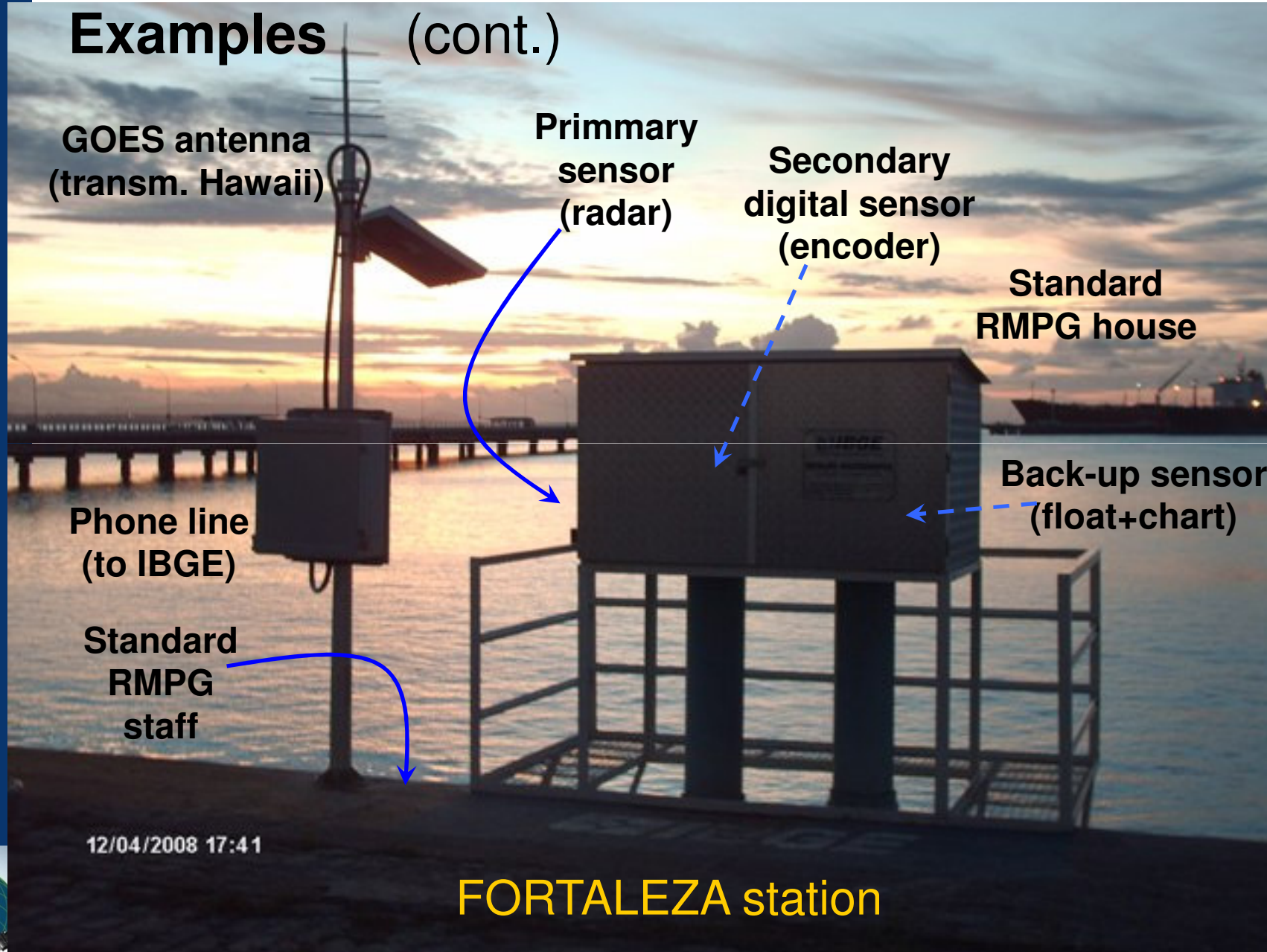


# Examples

MACAÉ station



## Examples (cont.)



GOES antenna  
(transm. Hawaii)

Primary  
sensor  
(radar)

Secondary  
digital sensor  
(encoder)

Standard  
RMPG house

Back-up sensor  
(float+chart)

Phone line  
(to IBGE)

Standard  
RMPG  
staff

12/04/2008 17:41

**FORTALEZA station**

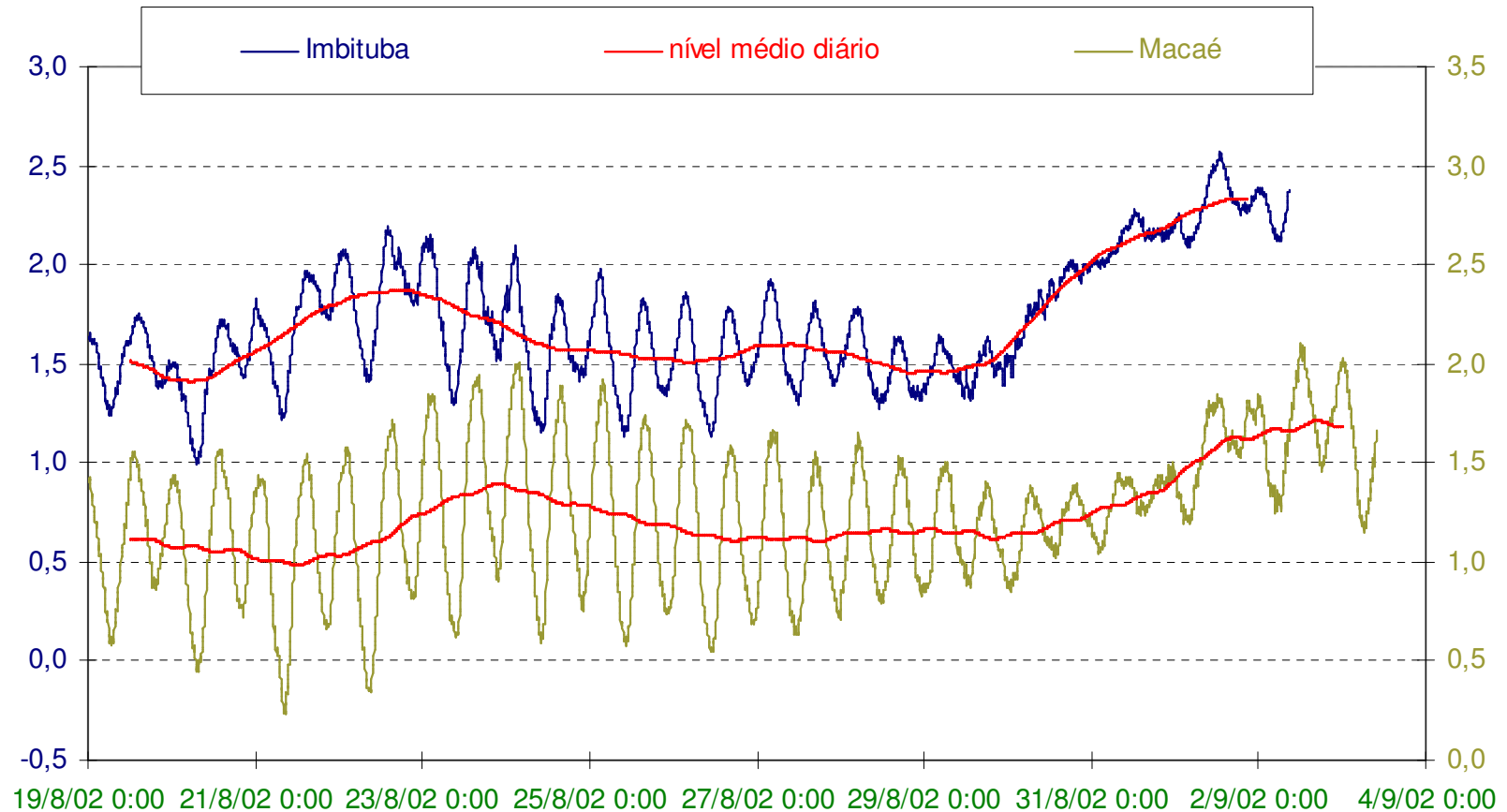
## Partnerships

- Centro de Hidrografia da Marinha (CHM)
- Petrobras
- Companhia Docas de Imbituba (CDI)
- Universidade Federal da Bahia (UFBA)
- Companhia Docas de Santana (CDSA)
- Companhia Docas do Ceará (CDC)
- Universidade Federal do Paraná (UFPR)
- Universidade Federal do Rio de Janeiro (UFRJ)
- Diretoria de Hidrografia e Navegação (DHN) - Programa GLOSS/Brasil
- *Global Sea Level Observing System (GLOSS) da IOC/UNESCO :*
  - › *University of Hawaii Sea Level Center (UHSLC)*
  - › *Permanent Service for Mean Sea Level (PSMSL)*
- *Deutsches Geodätisches Forschungsinstitut (DGFI)*

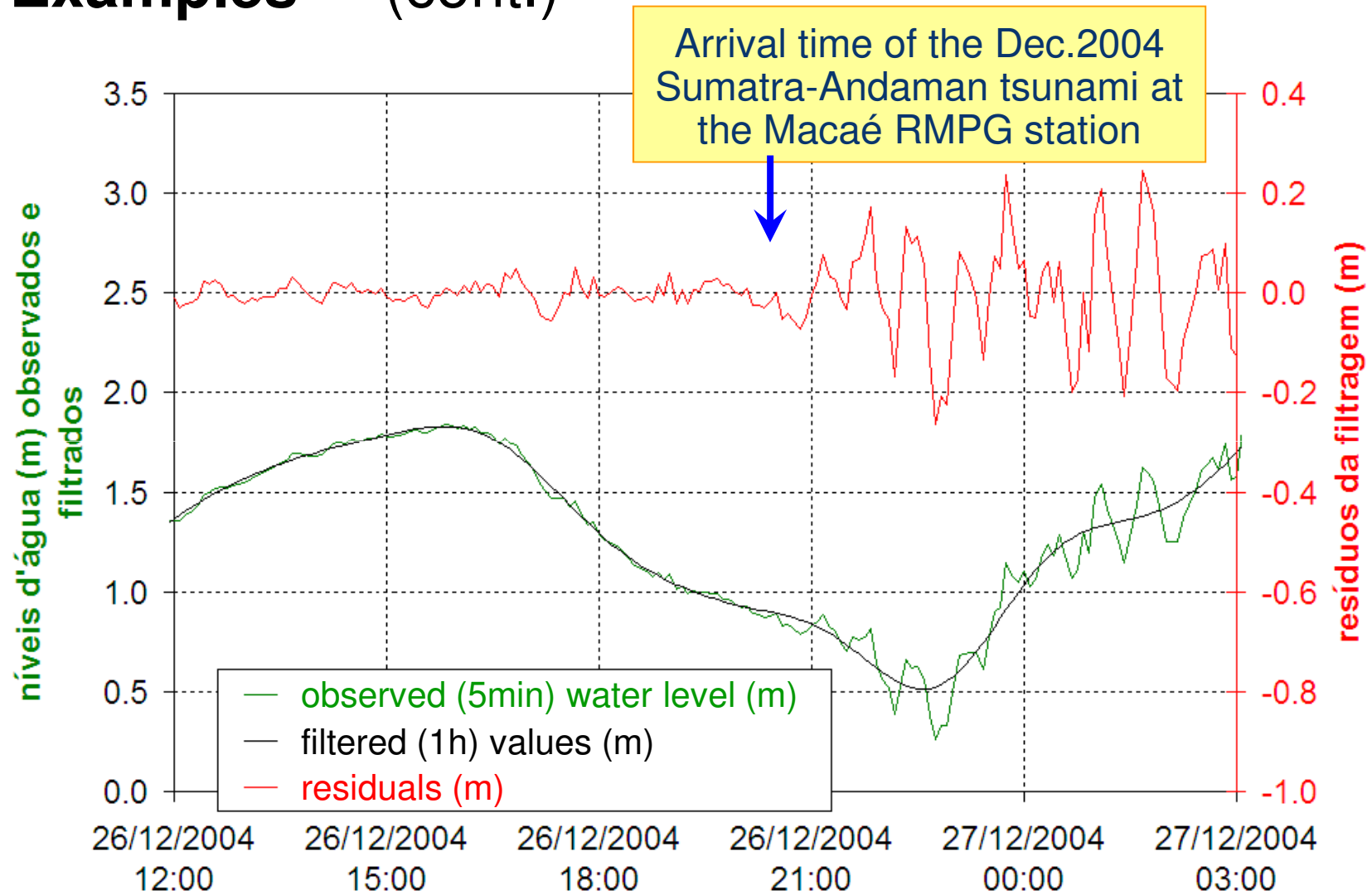


# Examples (cont.)

**RMPG - Níveis d'água MACAÉ e IMBITUBA**

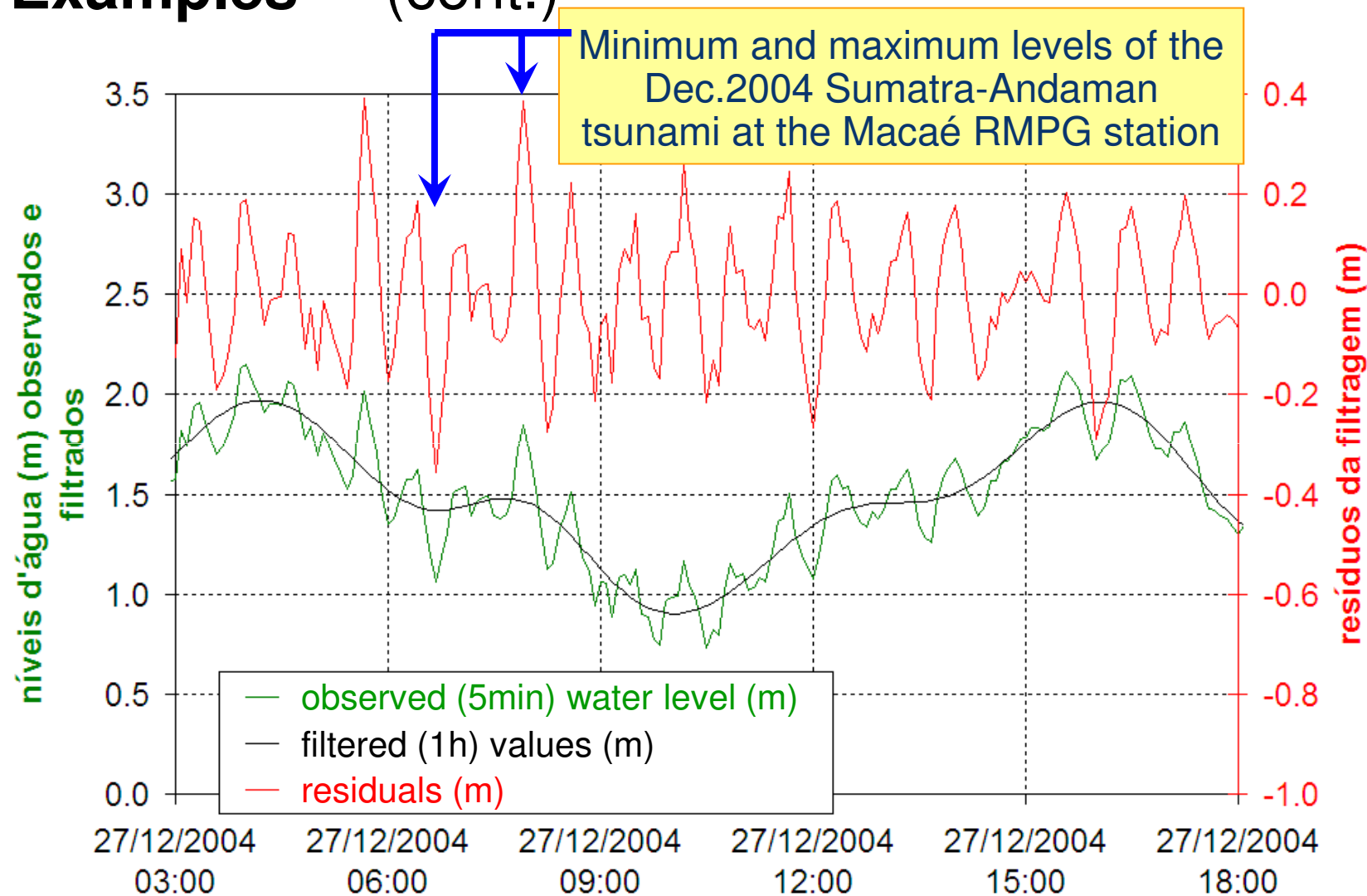


## Examples (cont.)



[http:// www.ibge.gov.br / canal\\_artigos /](http://www.ibge.gov.br/canal_artigos/) , "Geodésia"

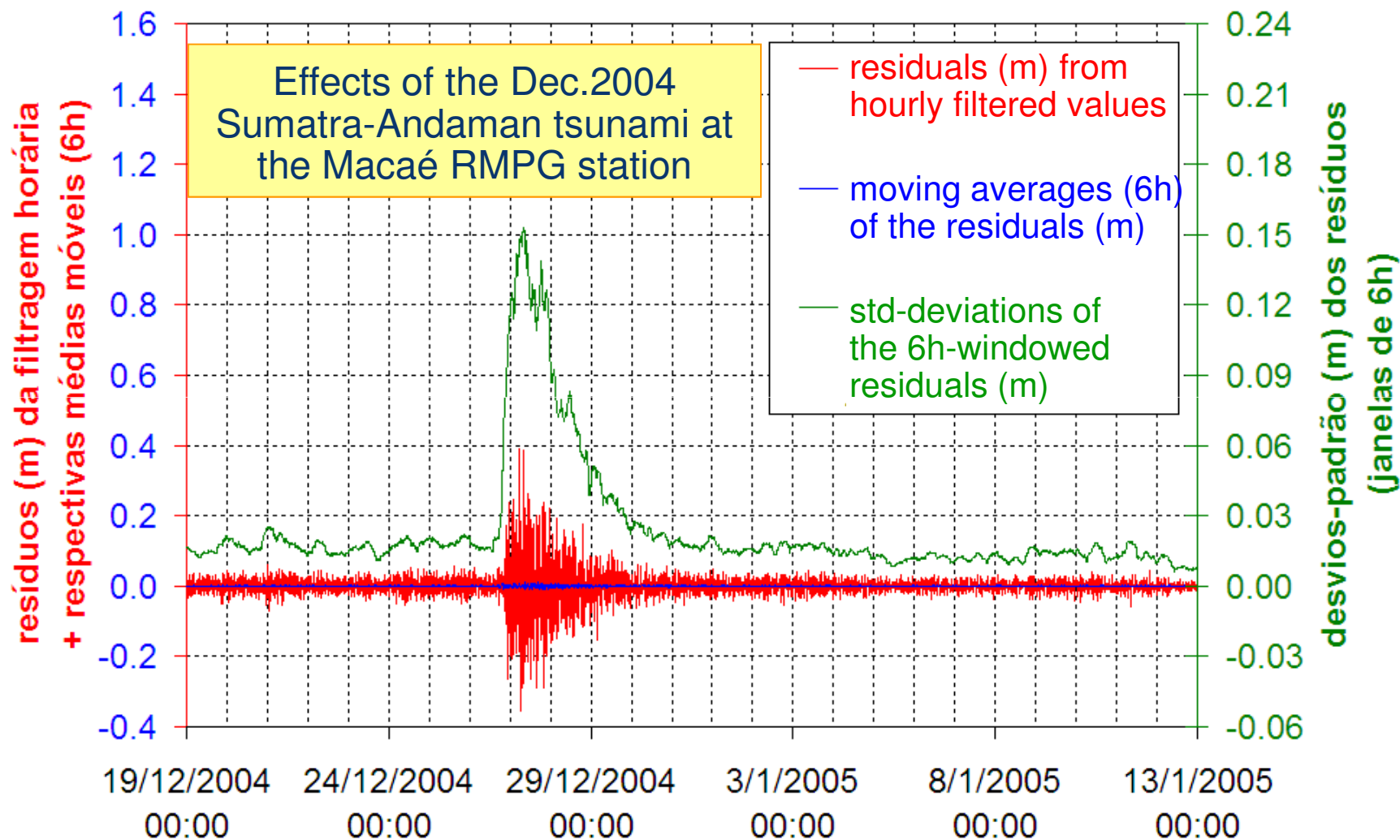
# Examples (cont.)



[http:// www.ibge.gov.br / canal\\_artigos /](http://www.ibge.gov.br/canal_artigos/) , "Geodésia"



## Examples (cont.)



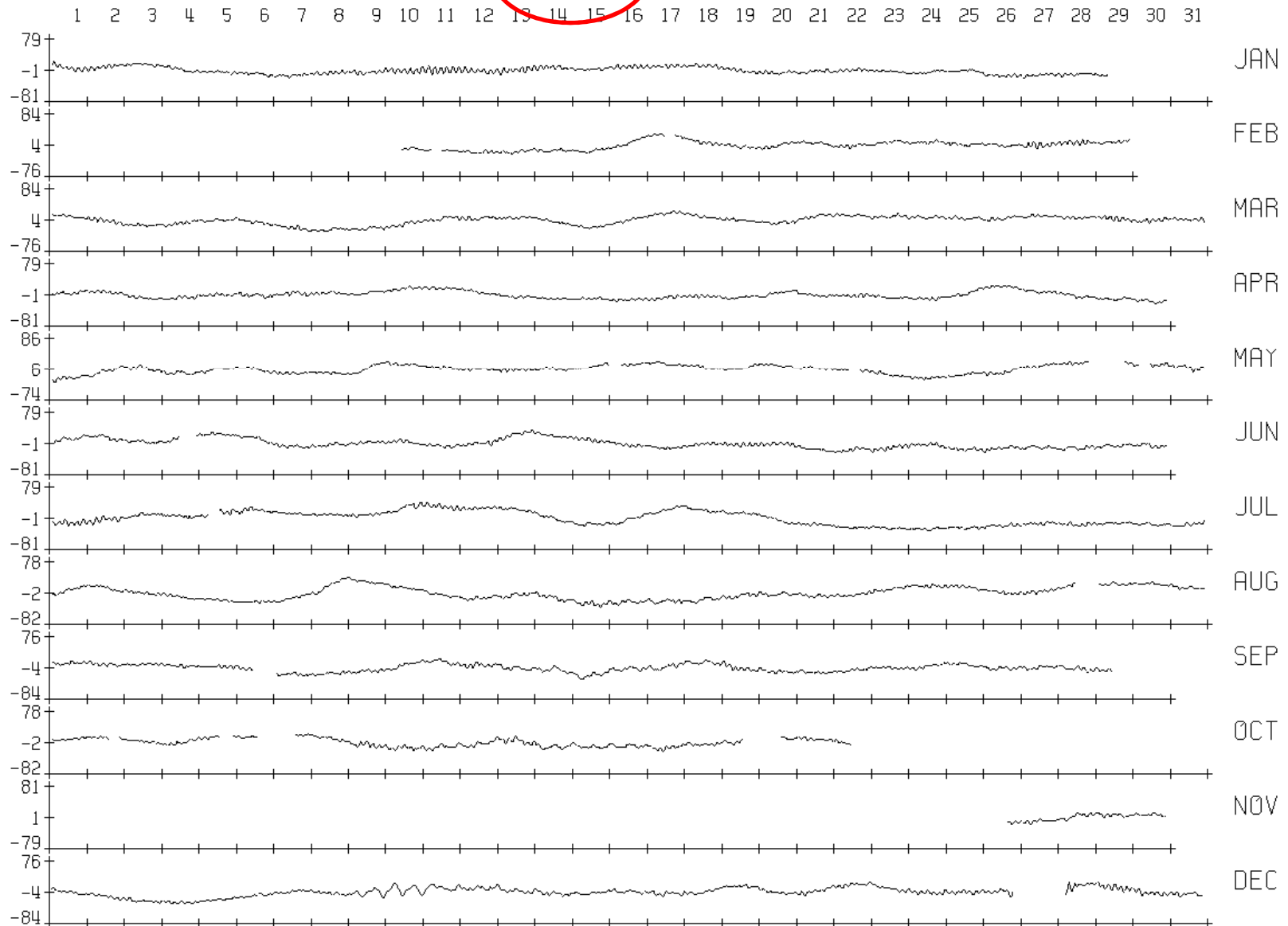
[http:// www.ibge.gov.br / canal\\_artigos /](http://www.ibge.gov.br/canal_artigos/) , “Geodésia”



# Quality control

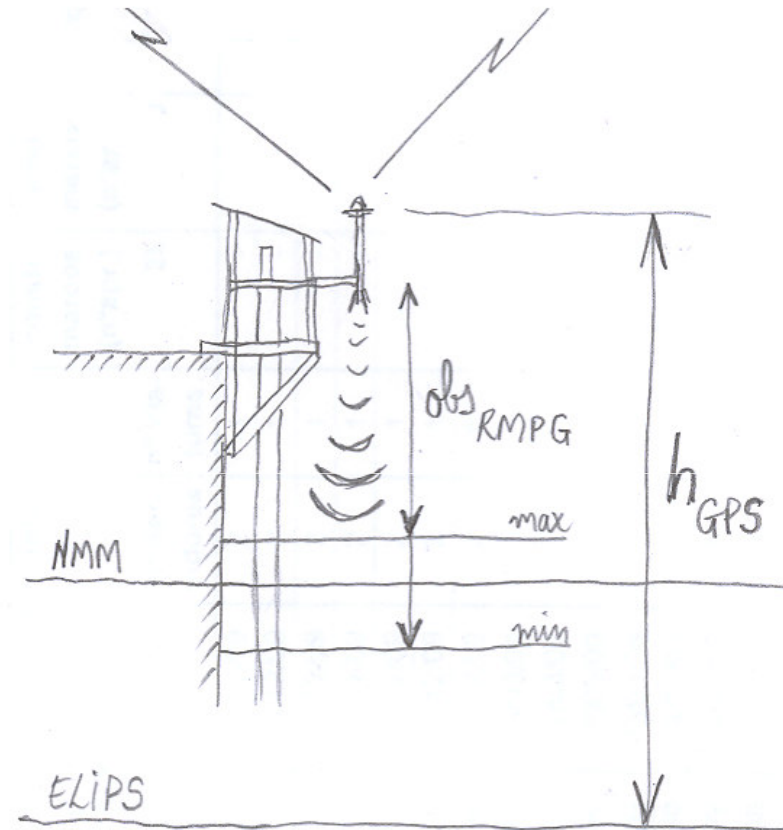
SLPR2 (UHSLC)

MEAN  $\pm$  80 CM Macae 2004 RESIDUAL (PREDICTION BASED ON 1 3/12 3 DATA) STD = 11.48

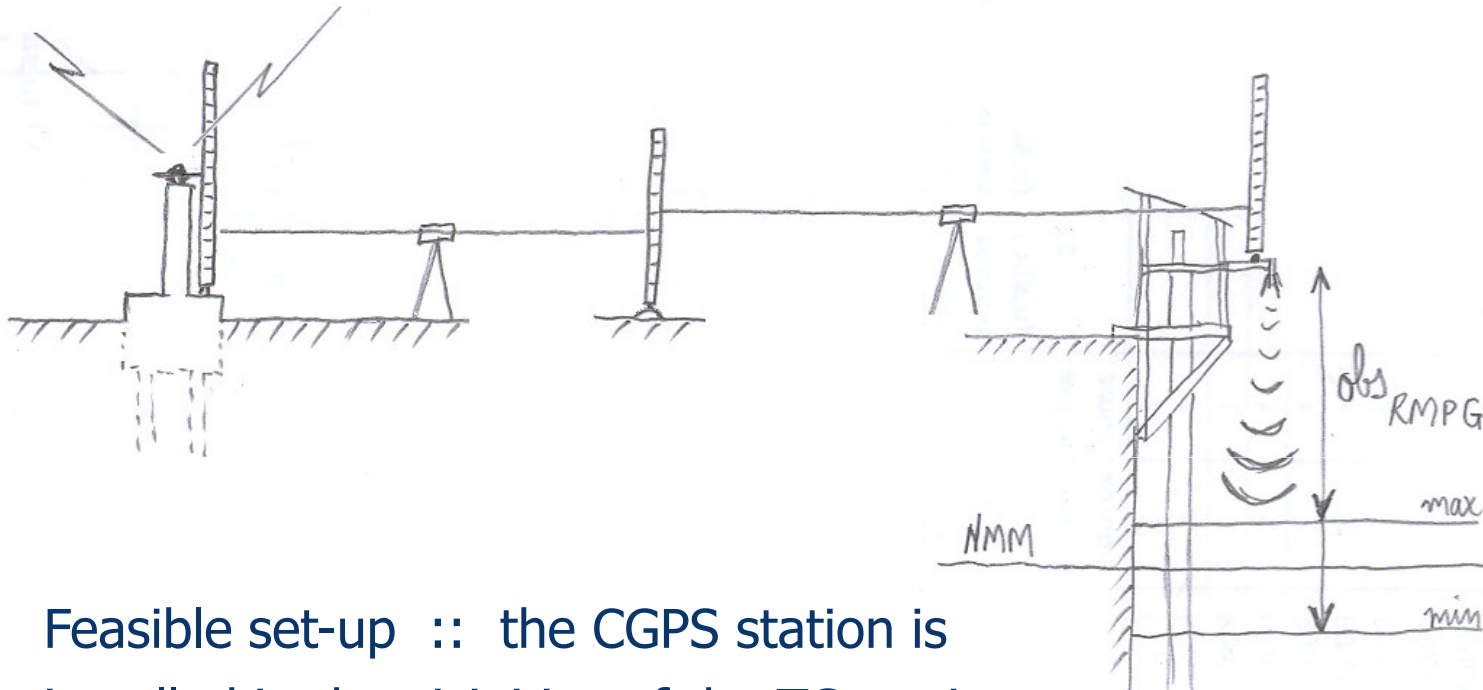


## Geodetic control

Ideal set-up :: the tide gauge geocentric positioning is provided by the CGPS antenna directly connected to the sea level sensor



## Geodetic control (cont.)



Feasible set-up :: the CGPS station is installed in the vicinities of the TG station, and both time series must be connected via “scientific” spirit leveling ( $1.5\text{mm}\cdot\text{D}^{1/2}$ )

