Validation of Altimetric Satellites for HYdrology in Brazil – **VASHYB**

DANIEL MOREIRA – CPRM -Geological Survey of Brazil, Rio de Janeiro
JOECILA SANTOS- UEA- University of State of Amazonas

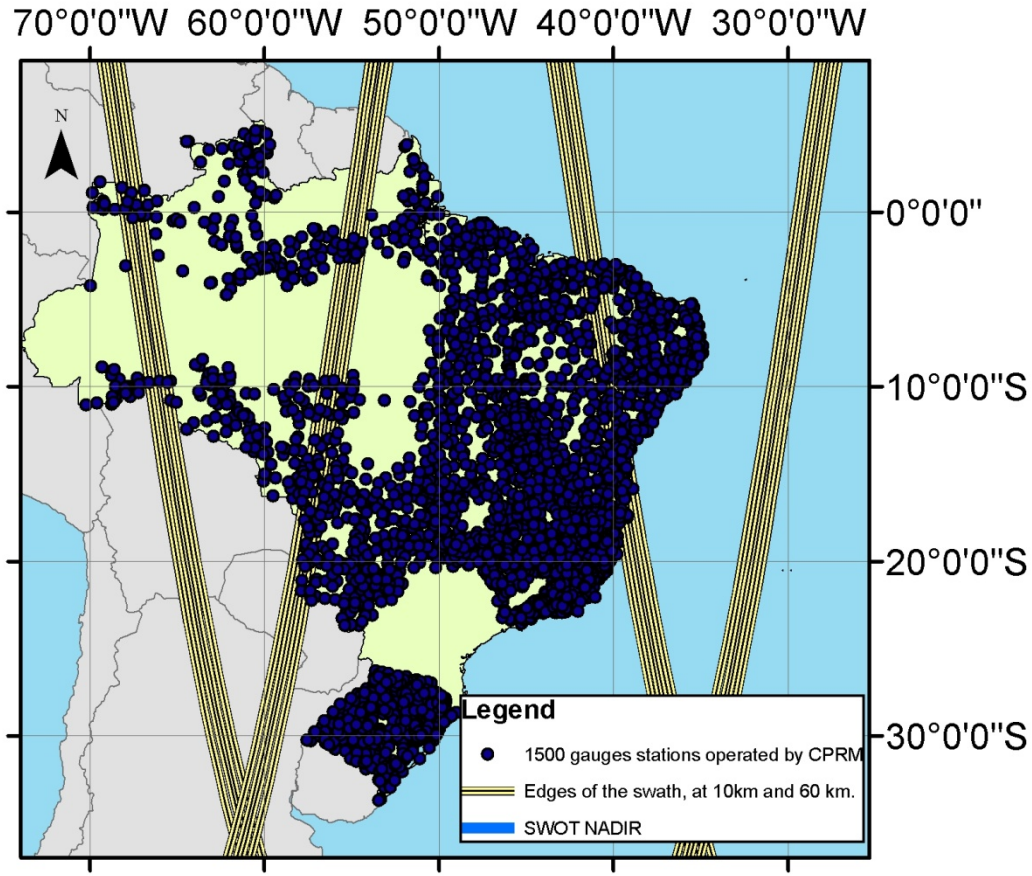
- Maintaining a hydrological network in remote basins is a costly task. The cost of this network operation is a huge expense for the country. Brazil is therefore a country that could greatly benefit of the complement to this network that altimetry could provide.
- ANA and CPRM are institution involved in the monitoring of the Brazilian rivers at the national level. They want to incorporate the altimetry data into the hydrological information that they distribute with free access.

- The objective of this project is to support the validation of the future altimetric satellites, SARAL, S3 A to D, Jason-3 and CS and the NASA/CNES mission SWOT. Assessment of the performance of these new (SAR, SARIn…) modes of measurements is a prerequisite before a monitoring of the Brazilian rivers can be foreseen by means of satellite altimetry.

The network of validation stations presented hereafter intends to bring the necessary ground information for the following calibration/validation questions :

- What is the accuracy on the water levels in different contexts, in particular for a large range of river widths
- How accurate are the slope and width estimates
- Is the long wavelength orbit error significant
- Is there significant roll errors and how large is the impact of the errors at the swath edges

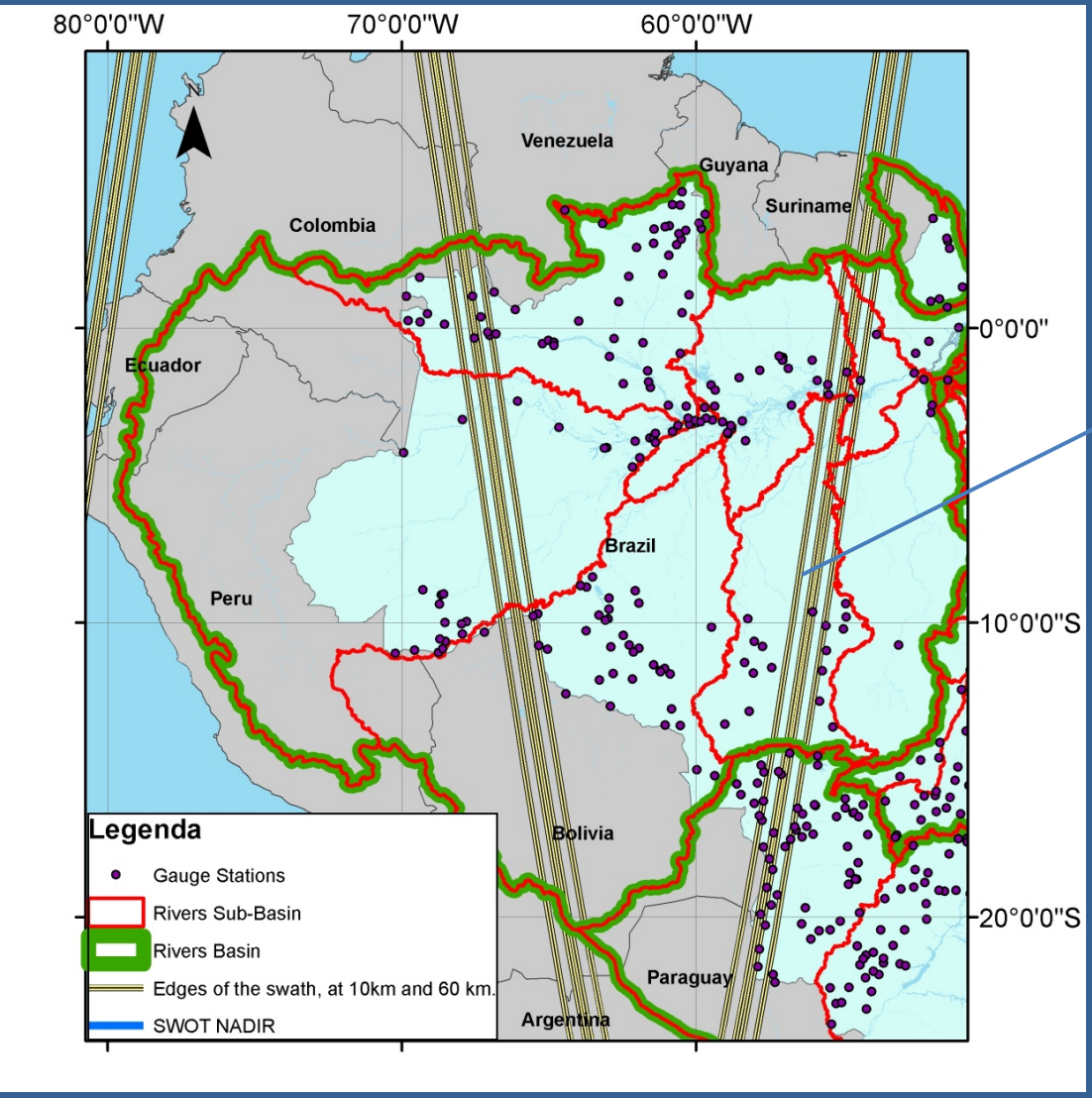
BRAZILIAN GAUGE NETWORK (CPRM/ANA)



Total budget of Brazilian Network (surveys, people, equipments)=
~ U$20.000.000/year

Money dedicated for complementary surveys
For science in satellite altimetry CAL/VAL (focus in SWOT science track)
= ~U$ 100.000 /year

CAL/VAL - AREAS



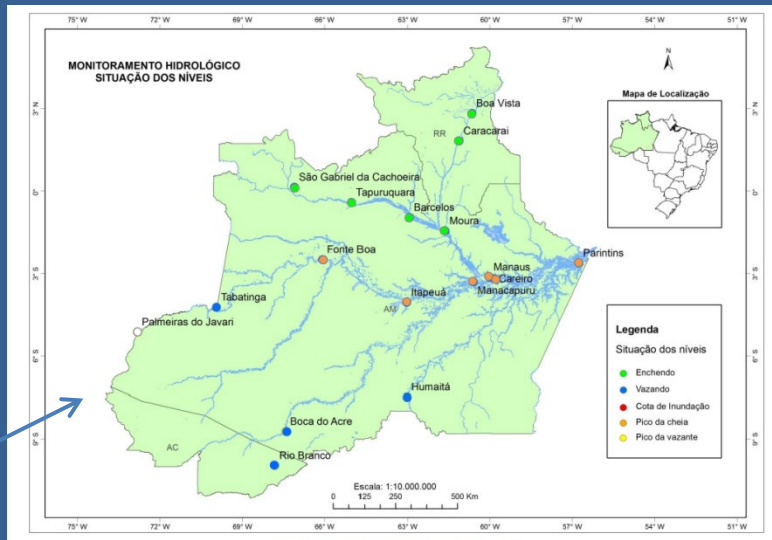


Figura 01: Mapa da situação dos níveis atuais

Curvas envoltórias das cotas diárias observadas em Manaus

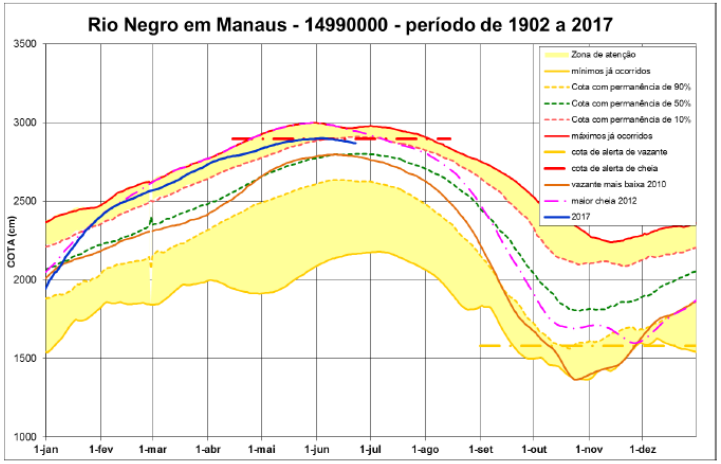
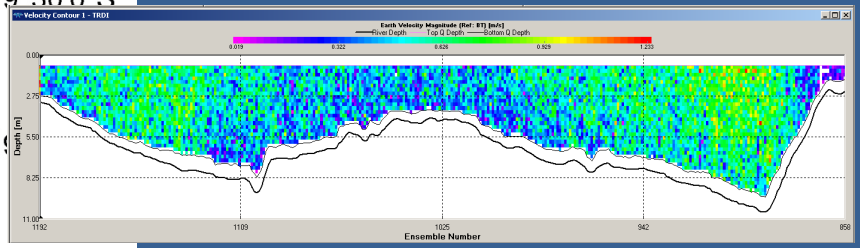
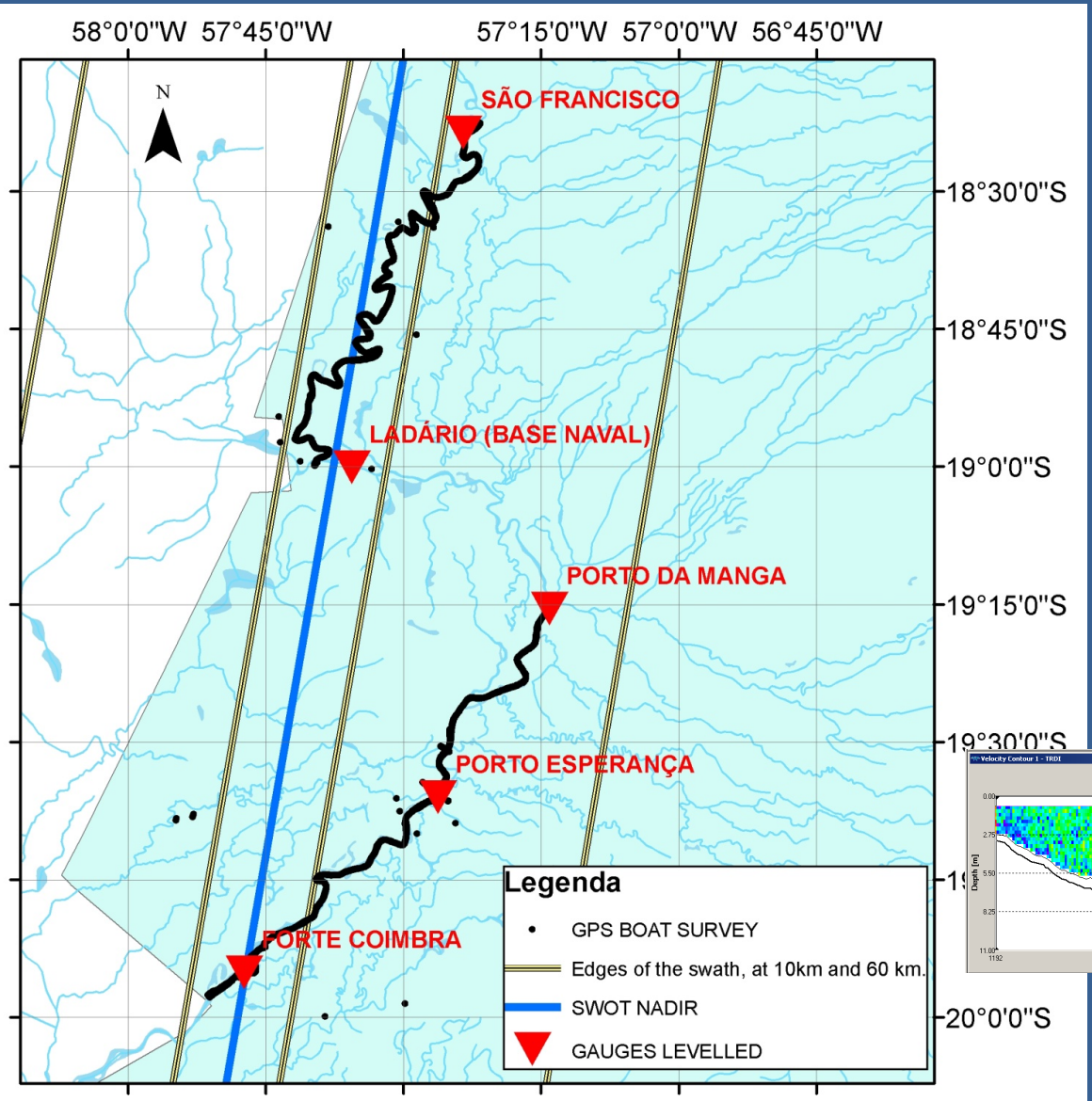


Gráfico 01: Cotagrama do Rio Negro em Manaus. Cota em 23/06/2017: **28,69 m**

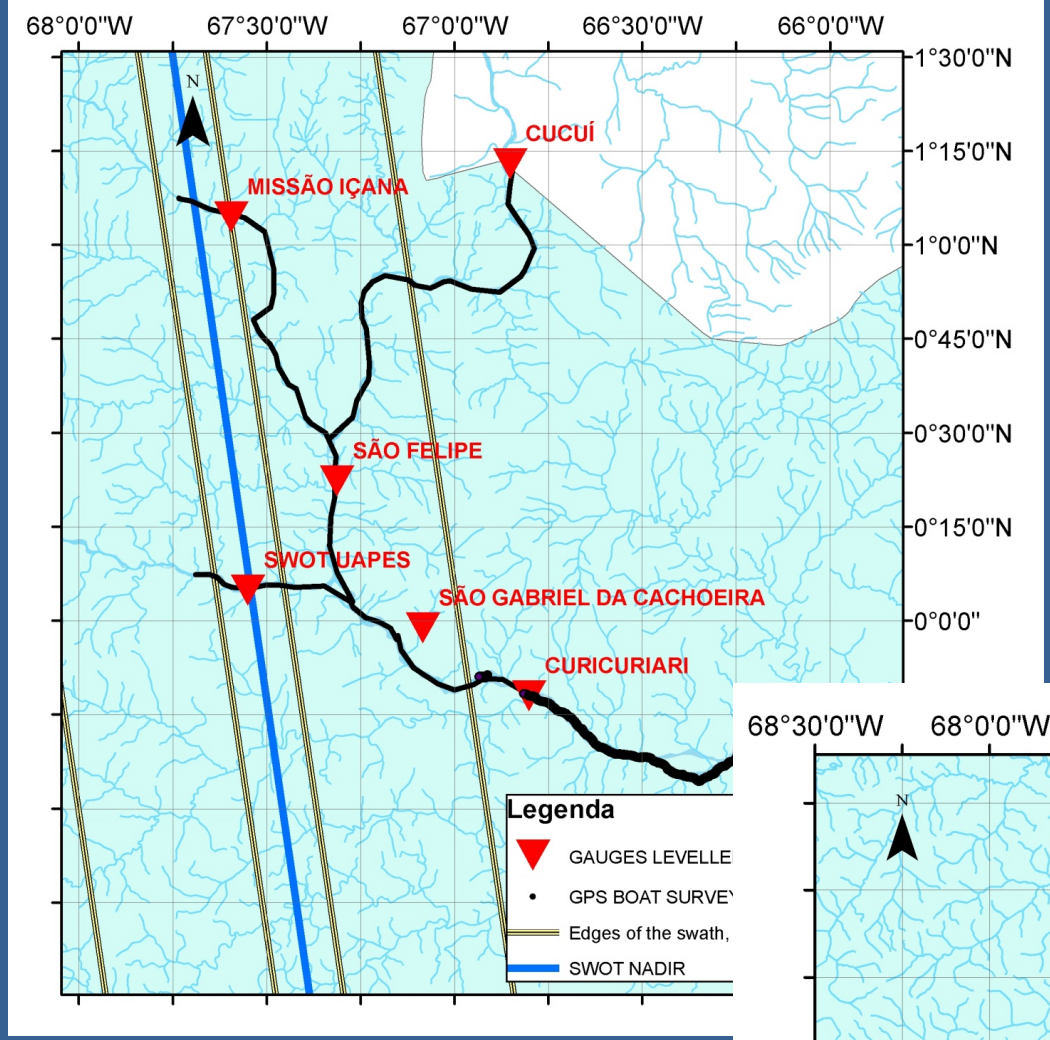
PARAGUAY RIVER CAL/VAL SITE

Discharge (Ref: BT) Right to Left		
Good Bins	8	
Top Q	219.723	[m³/s]
Measured Q	1504.213	[m³/s]
Bottom Q	192.218	[m³/s]
Left Q	11.599	[m³/s]
Right Q	0.157	[m³/s]
Total Q	1927.911	[m³/s]
Navigation (Ref: BT)		
Boat Speed	0.323	[m/s]
Boat Course	184.52	[°]
Water Speed	0.304	[m/s]
Water Dir.	215.21	[°]
Calc. Depth	3.172	[m]
Length	597.04	[m]
Distance MG	587.43	[m]
Course MG	137.88	[°]
Duration	490.43	[s]

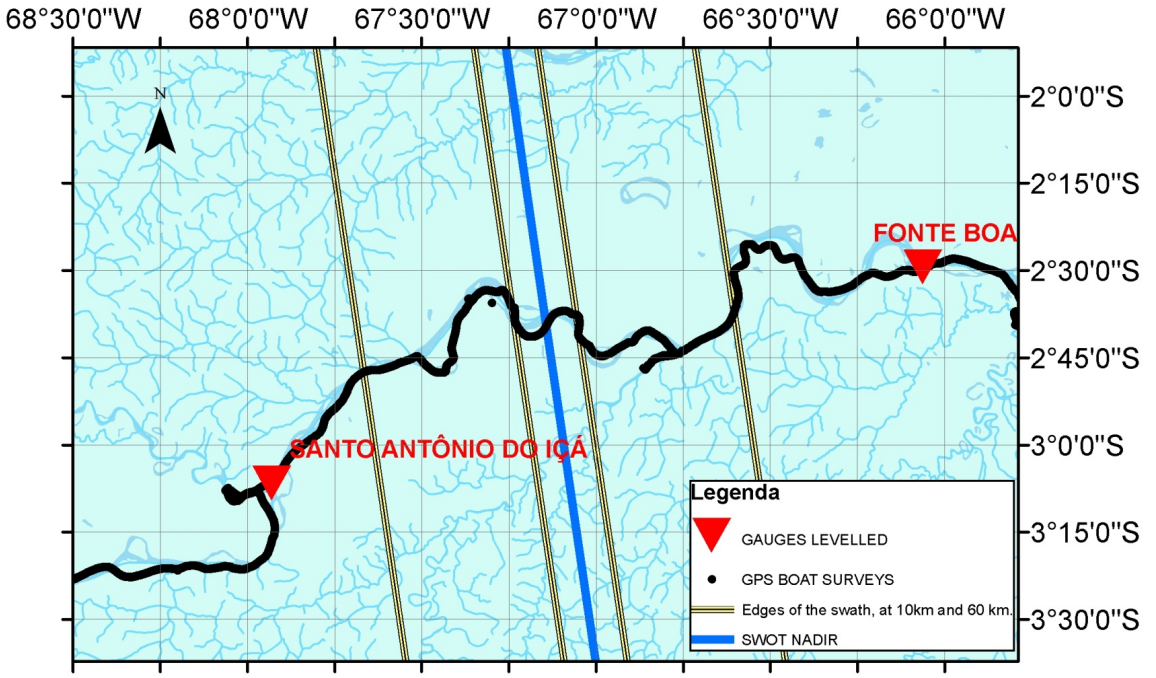




NEGRO RIVER CAL/VAL SITE



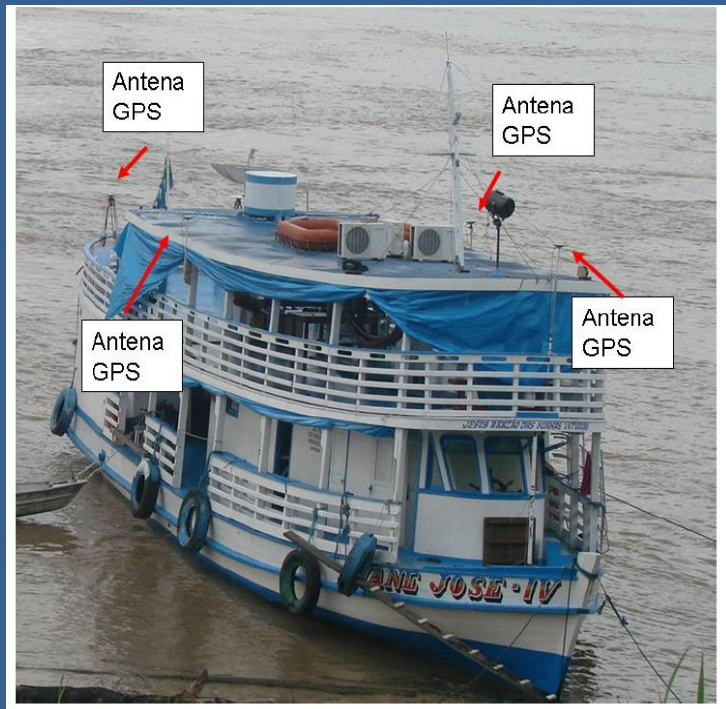
SOLIMÕES RIVER CAL/VAL SITE

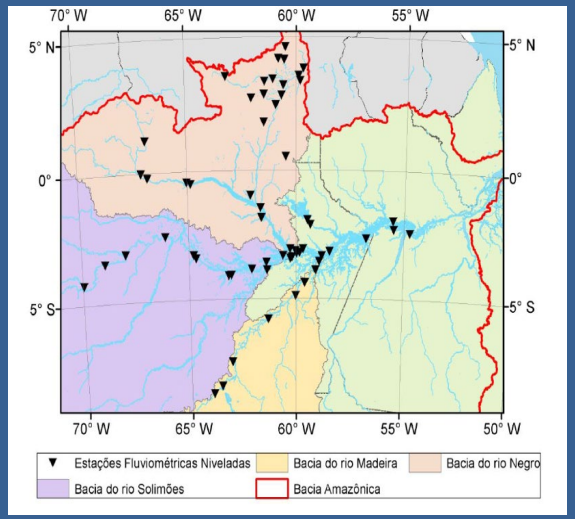


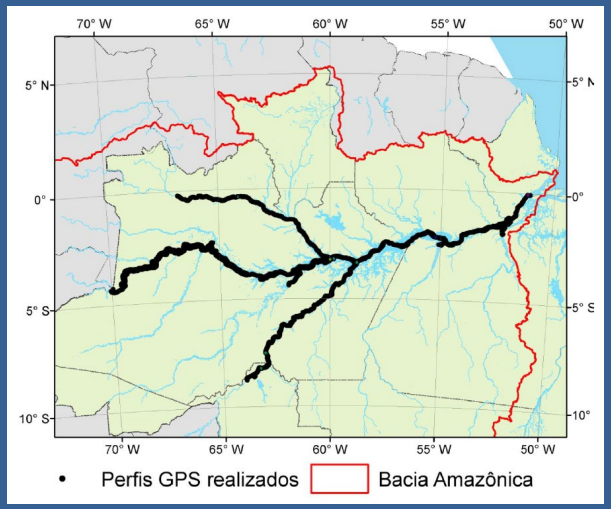
ACTIVITIES in preparation of CAL/VAL

23- FIELD CAMPAINGS ,
30.000 km of river profiles surveyed .
+70 gauges leveled

Amazon basin data are processed and available
We are currently processing Paraguay River data (profiles, bathymetry and gauge leveling)

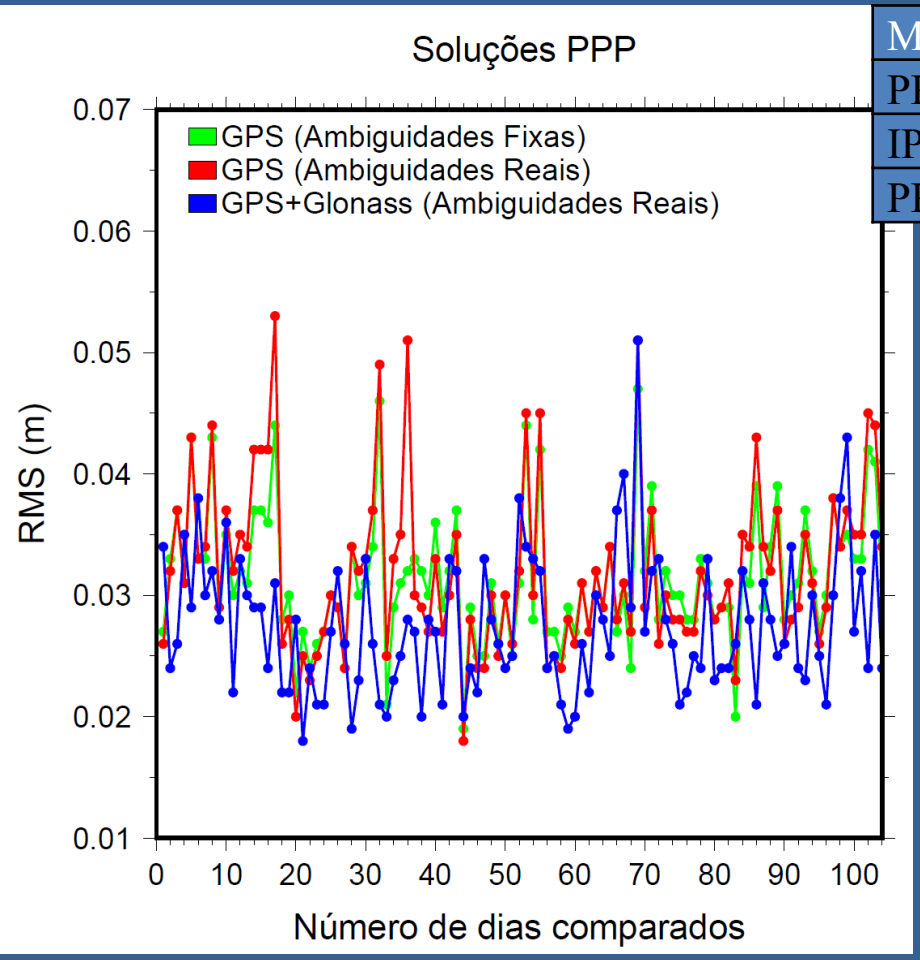




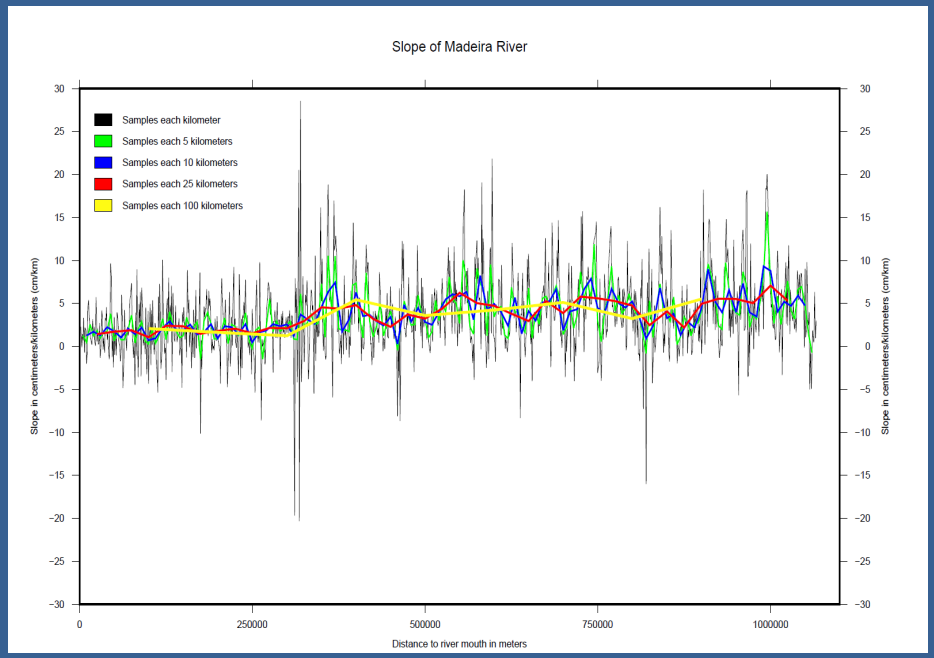


GNNS SURVEYS QUALITY

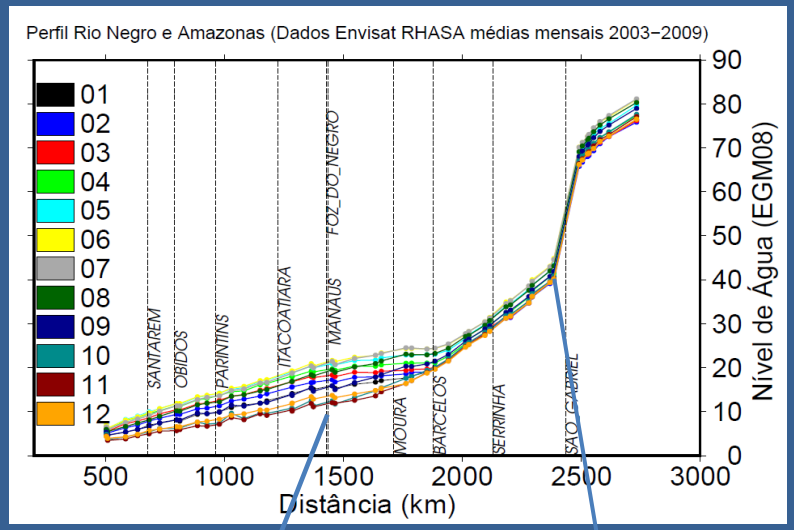
-SUPPORT OF GRGS CNES/CLS TEAM
-USING GNSS PROCESSING SOFTWARE GINS-PC

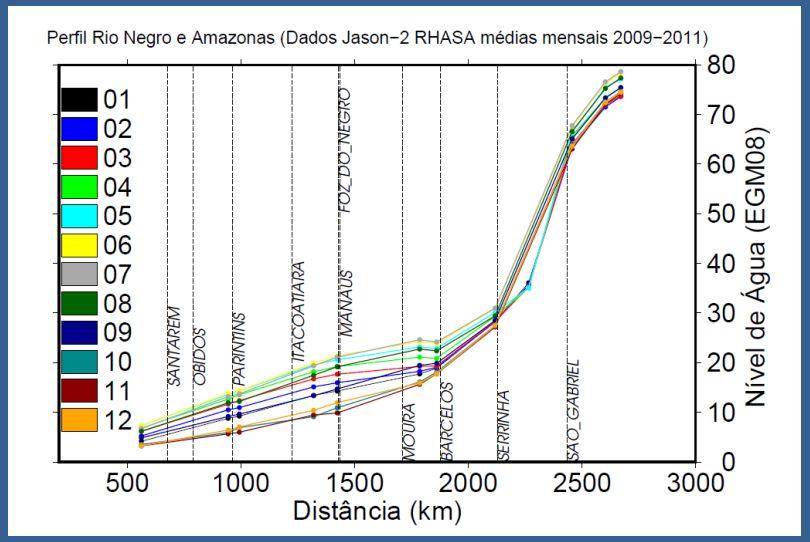


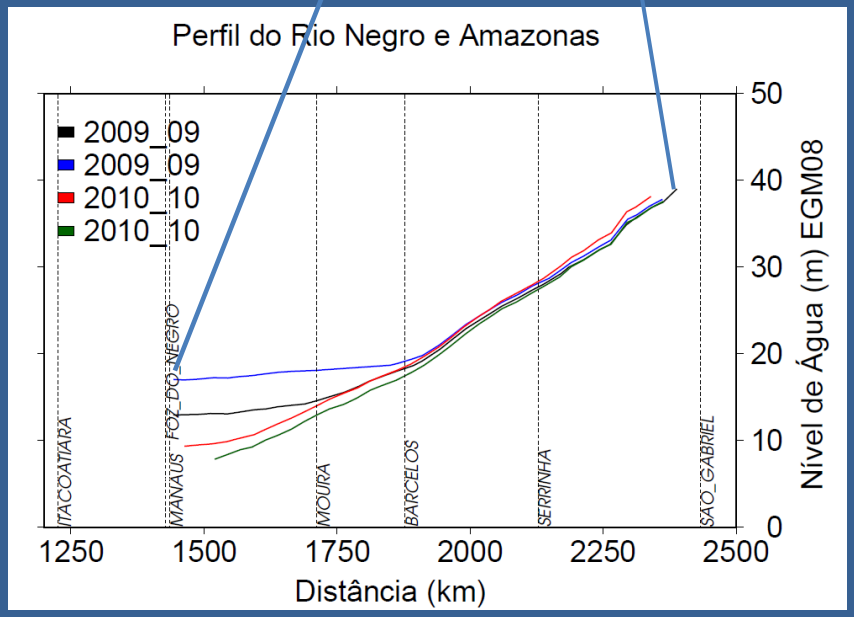
METHOD	NORTH	EAST	HEIGHT
PPP (GPS)	10mm	12mm	32mm
IPPP (GPS)	4mm	9mm	31mm
PPP (GPS +GLONASS)	9mm	10mm	27mm

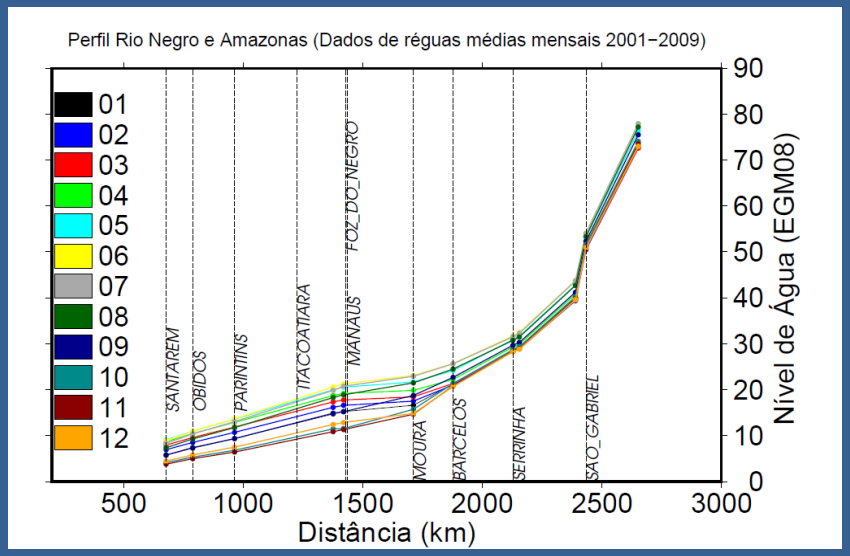


RIVER PROFILES BY DIFFERENT TECHNIQUES

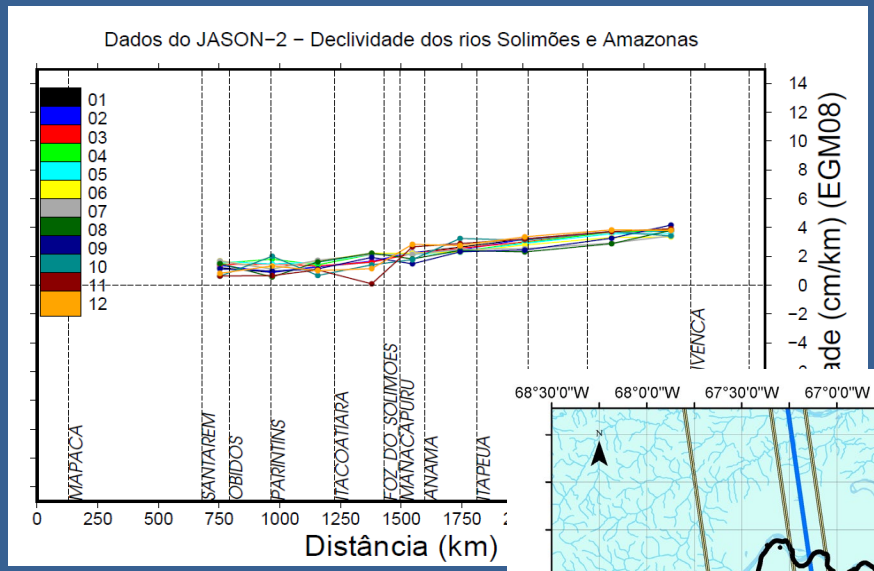


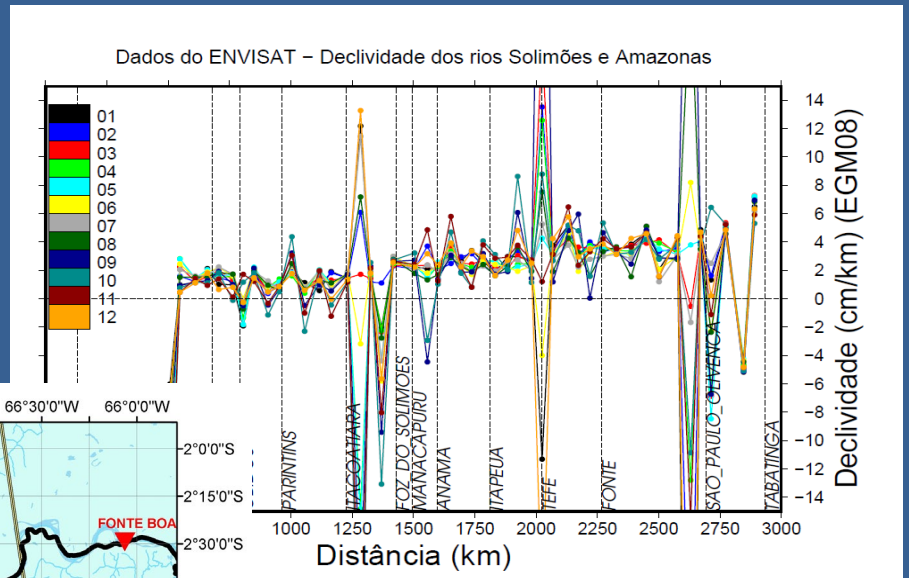


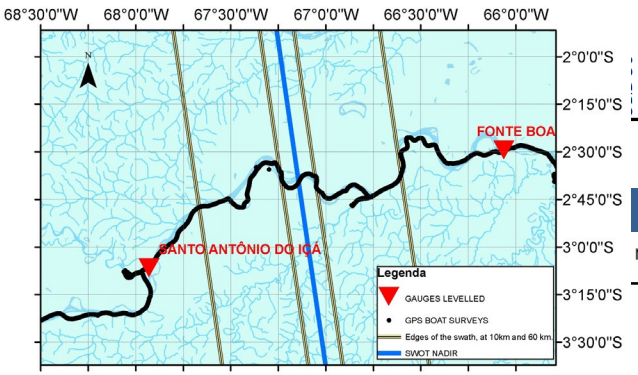


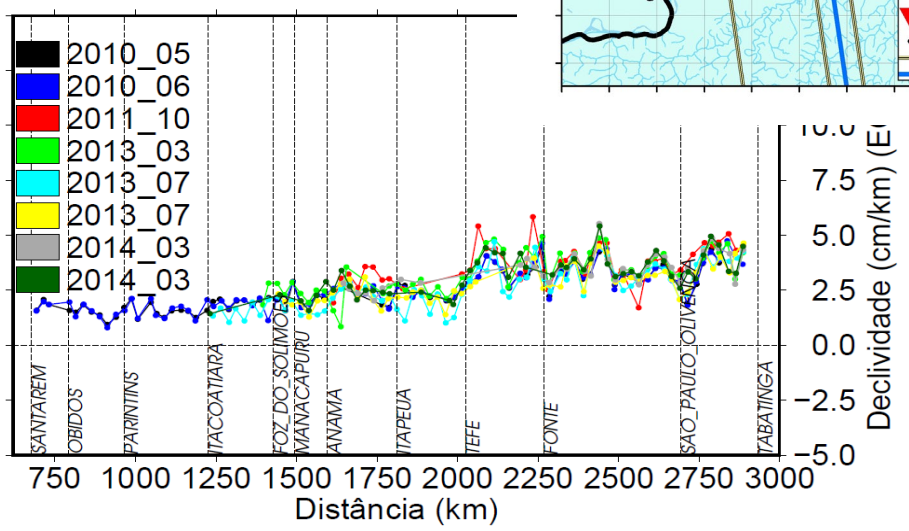


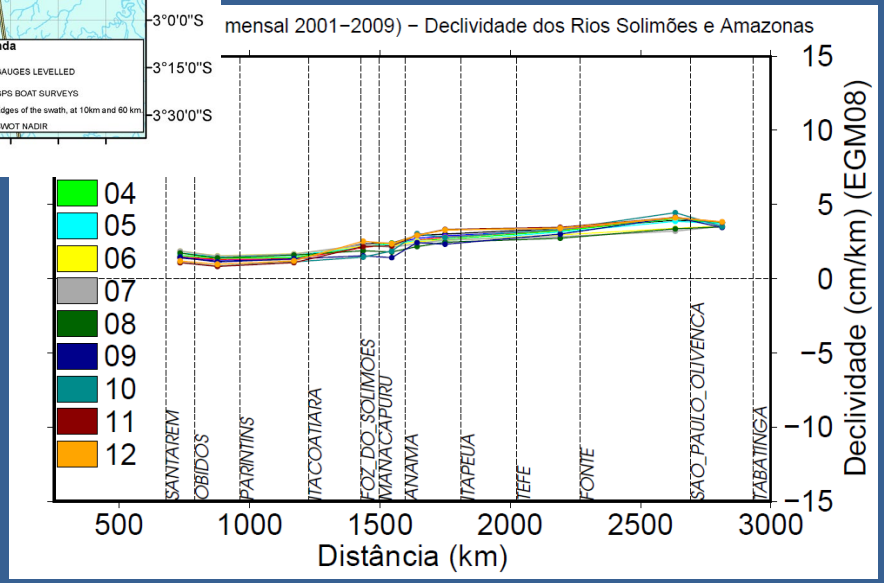
Slopes derived by different techniques

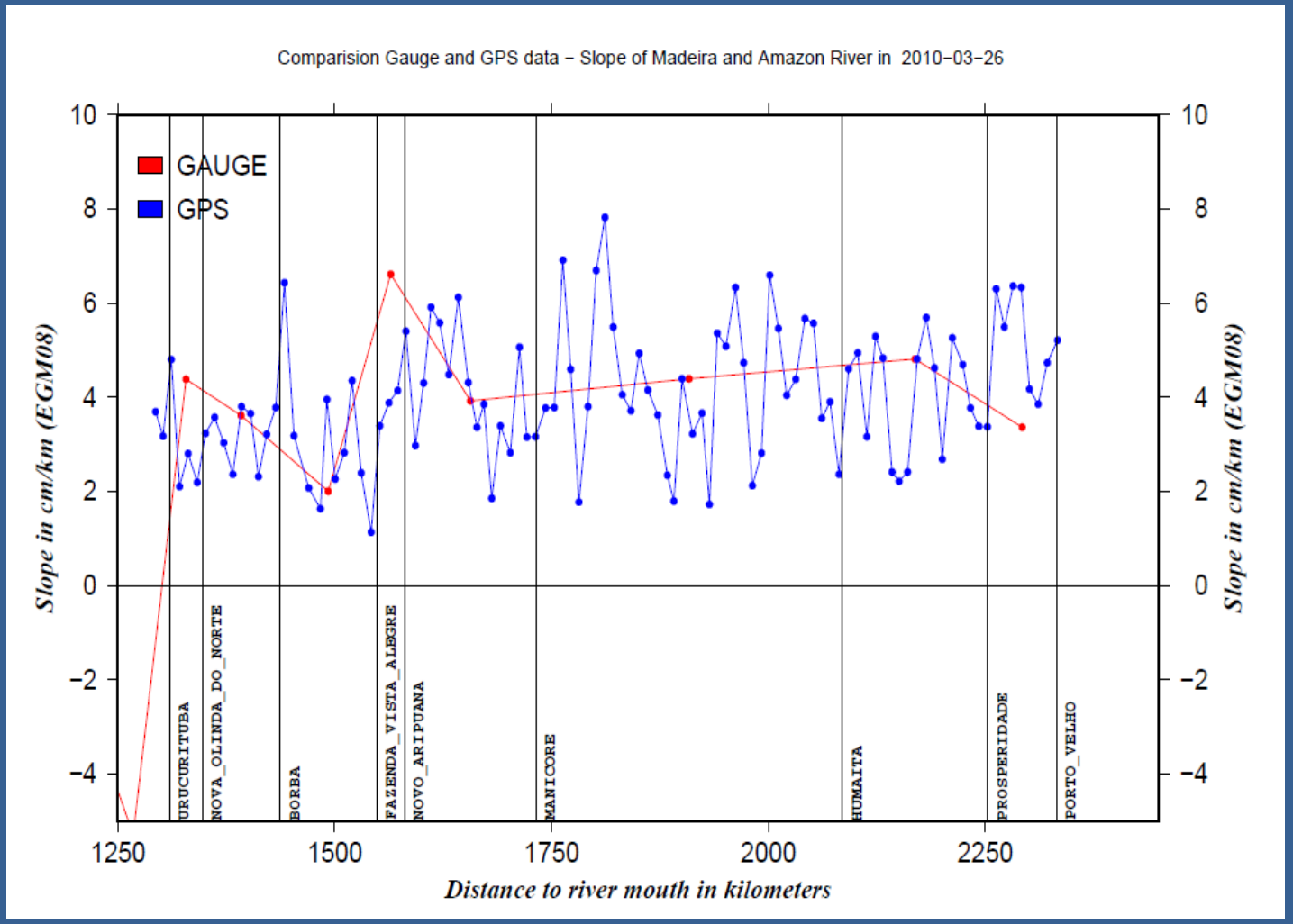











Comparision Gauge and GPS data – Slope of Madeira and Amazon River in 2010-03-26
GAUGE
GPS
Slope in cm/km (EGM08)
Slope in cm/km (EGM08)
Distance to river mouth in kilometers
10
8
6
4
2
0
−2
−4
1250
1500
1750
2000
2250
URUCURITUBA
NOVA_OLINDA_DO_NORTE
BORBA
FAZENDA_VISTA_ALEGRE
NOVO_ARIPUANA
MANICORE
HUMAITA
PROSPERIDADE
PORTO_VELHO