Along track profiles of dynamic ocean topography as an essential tool for the improvement of Brazilian heights

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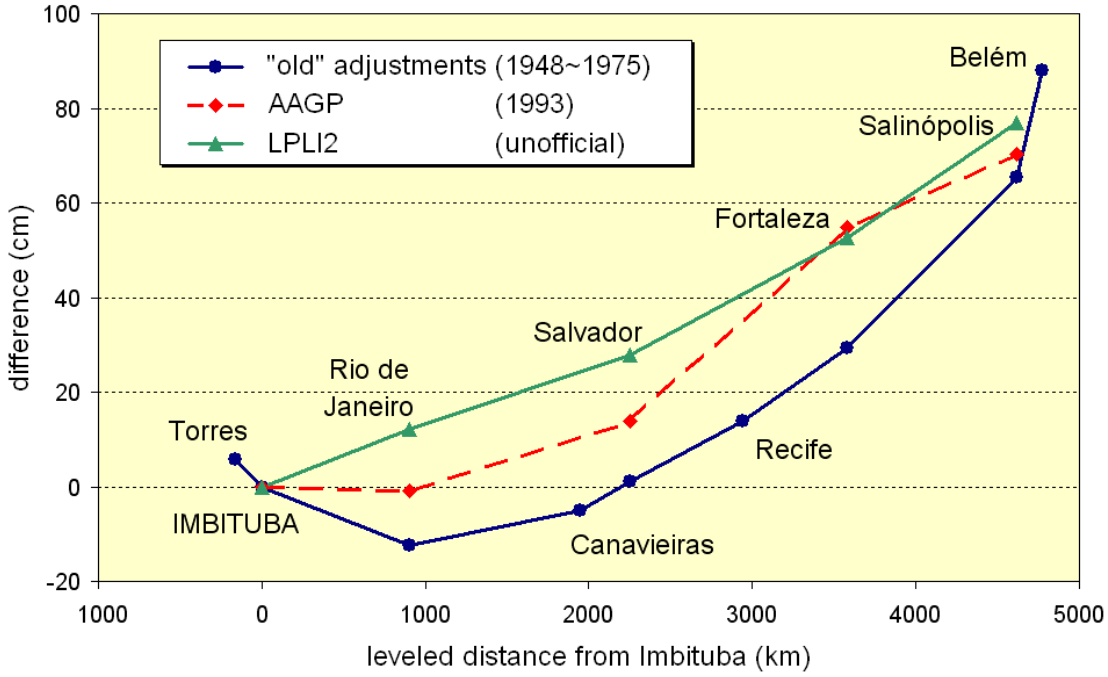
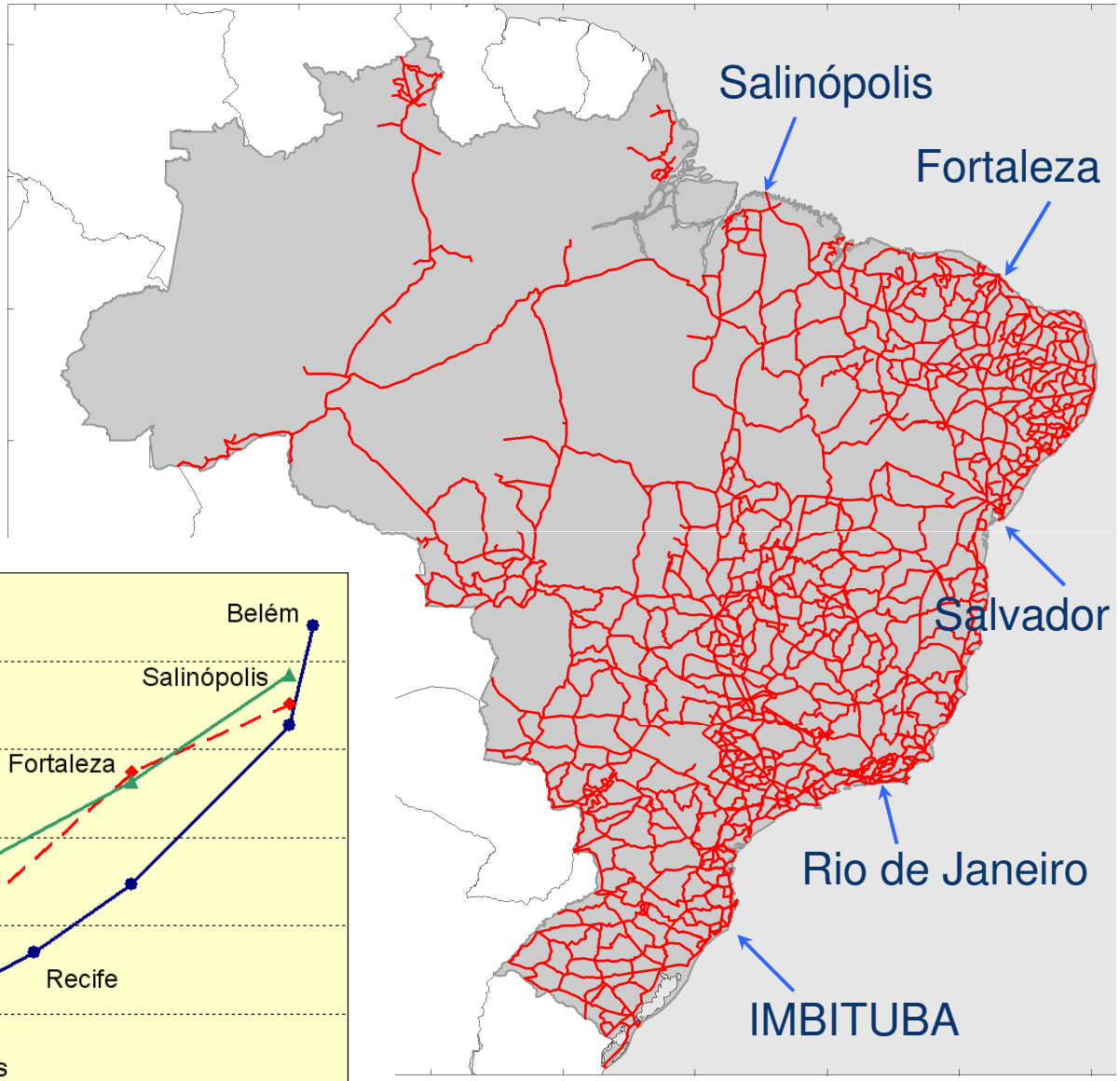
Background

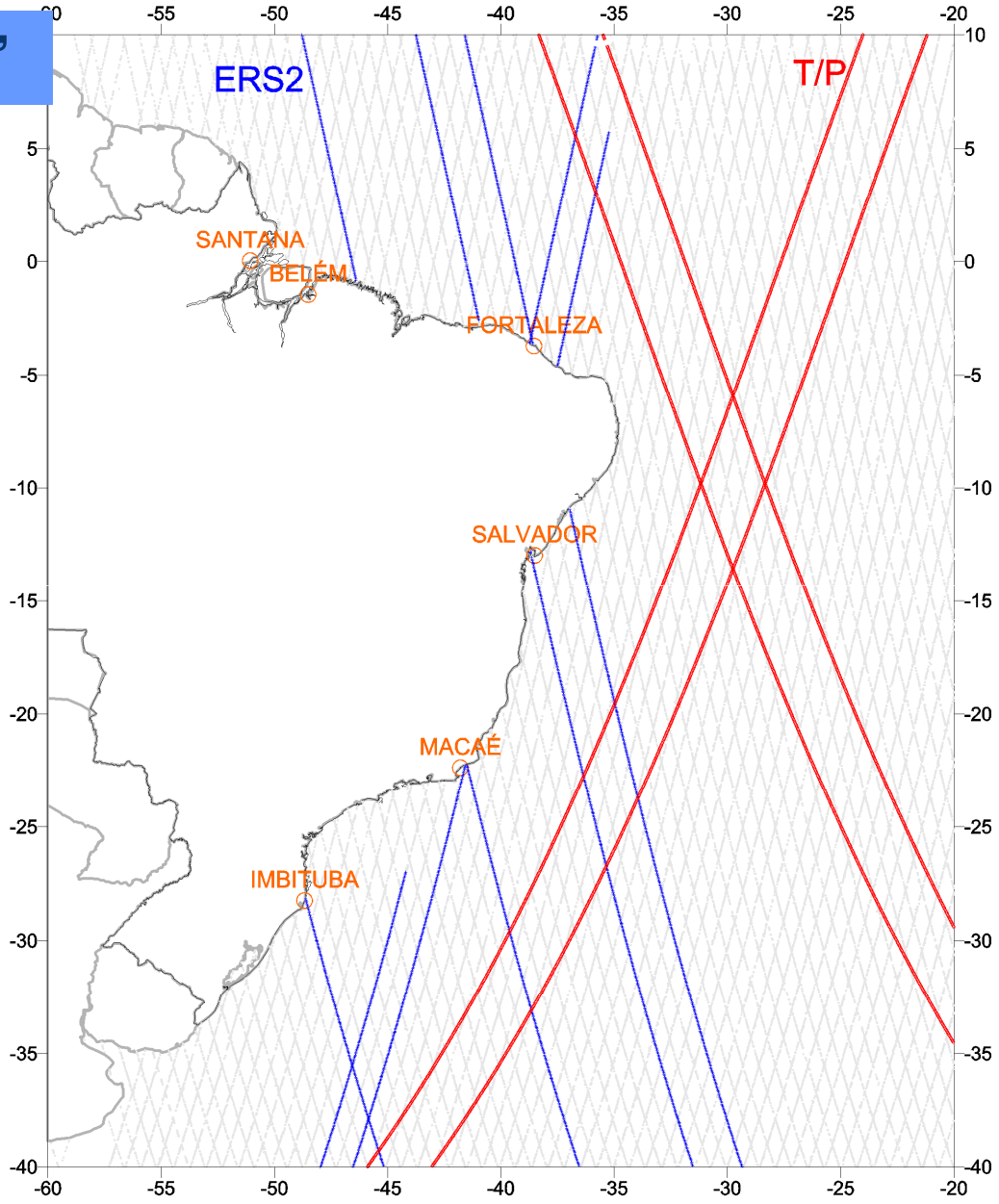
Differences between normal-orthometric heights referred to the **Imbituba Datum** and to some other local MSL at IAGS TG-stations (1950's-1960's)



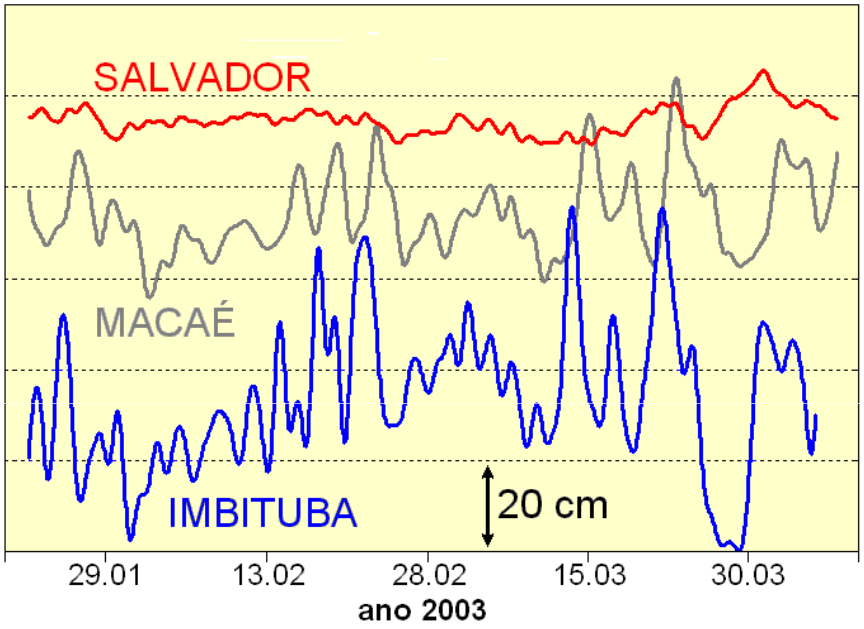


The “profile approach”

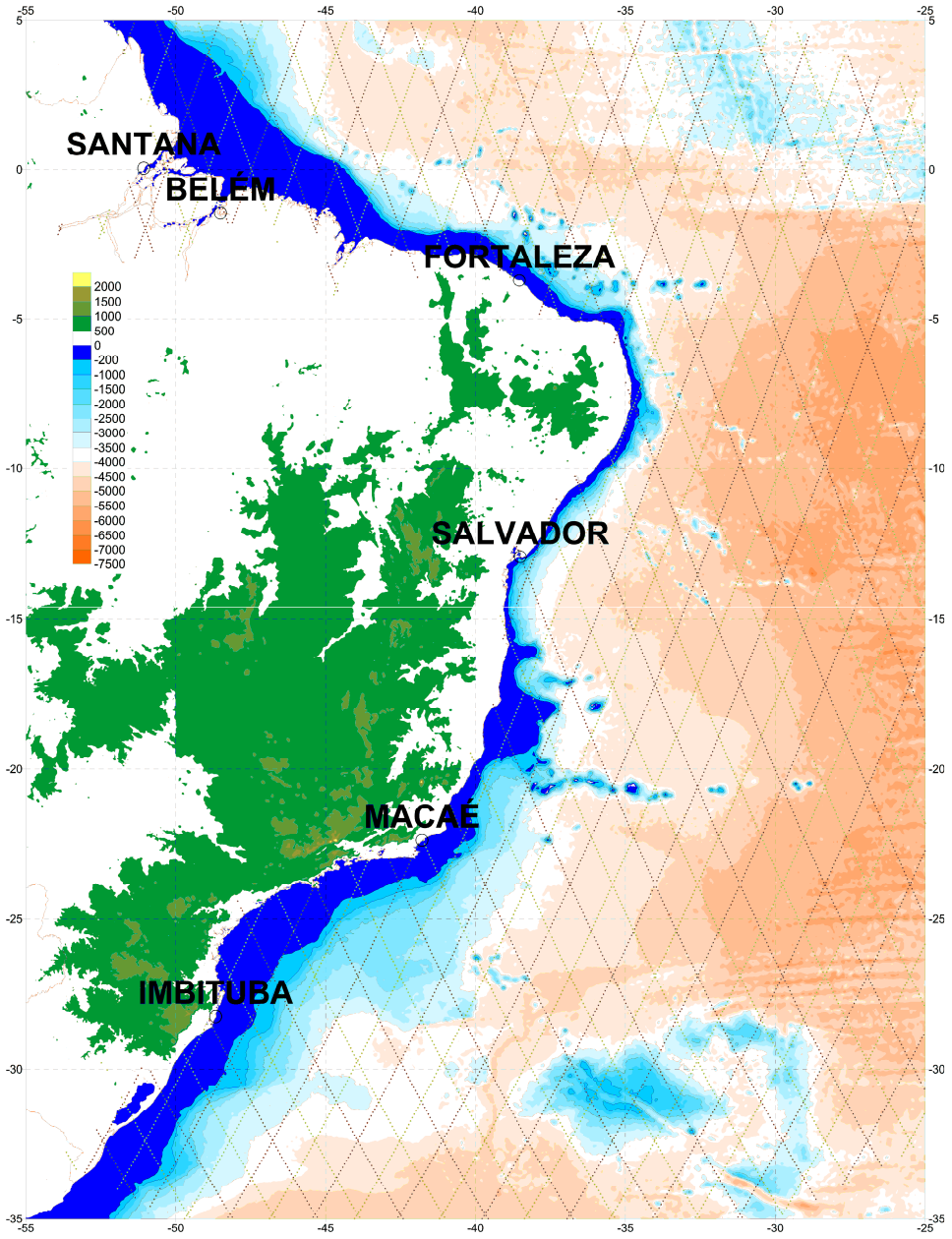
“Leveling with altimetry” towards selected stations of the Permanent Geodetic Tide Gauge Network (RMPG)



The “profile approach”



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



“Leveling with altimetry”

The difference between (mean) sea level and the geoid is the **Dynamic Ocean Topography (DOT)**

If DOT is known, levelling along the coast line can be controlled

Mean Sea Level (DOT) changes with time

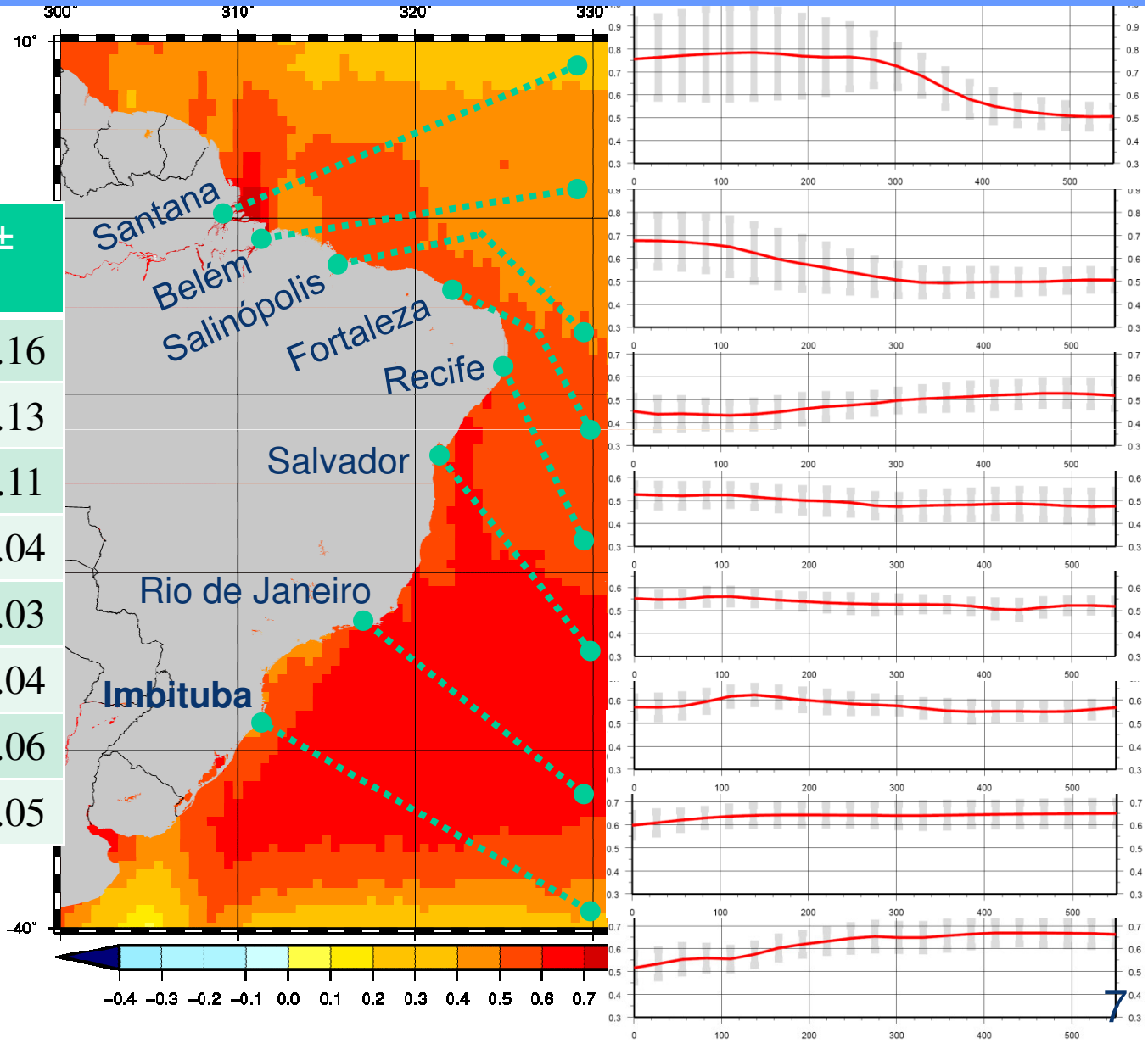
Estimate DOT by Altimetry and Gravity Field Models

Profile approach:

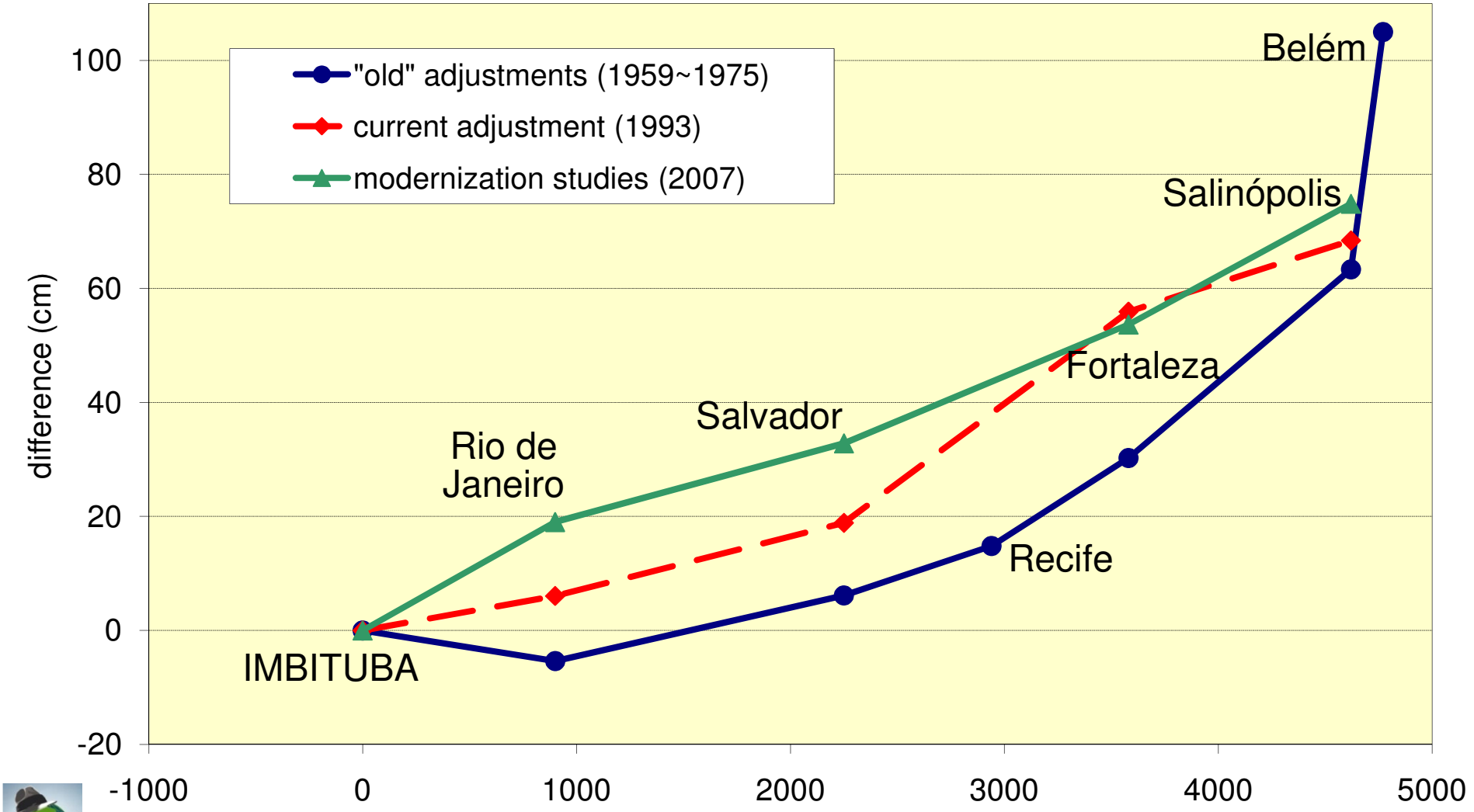
- Basic Eqn: ***DOT = h – N*** *(sea heights minus Geoid)*
- Principles: avoid gridding, stay as long as possible on altimetry ground tracks, consistent filtering of geoid and sea surface heights)
- Gauss 200 km filter applied to both, geoid heights *N* (2-D spectral domain) and *h* (1-D spatial domain)
- filter correction accounting for systematic differences between 1-D and 2-D filtering
- Topex & ERS-2 for common period 05/1995 – 07/2002 ≈ 7.1 years

Combined T/P&ERS2 DOT (after local Crossover Adj.)

Tide gauges North to South)	DOT ± stdev
Santana	0.75 ± 0.16
Belém	0.69 ± 0.13
Salinópolis	0.50 ± 0.11
Fortaleza	0.53 ± 0.04
Recife	0.53 ± 0.03
Salvador	0.57 ± 0.04
Rio de Janeiro	0.59 ± 0.06
Imbituba (Datum)	0.52 ± 0.05



Differences: Levelling – Geoid



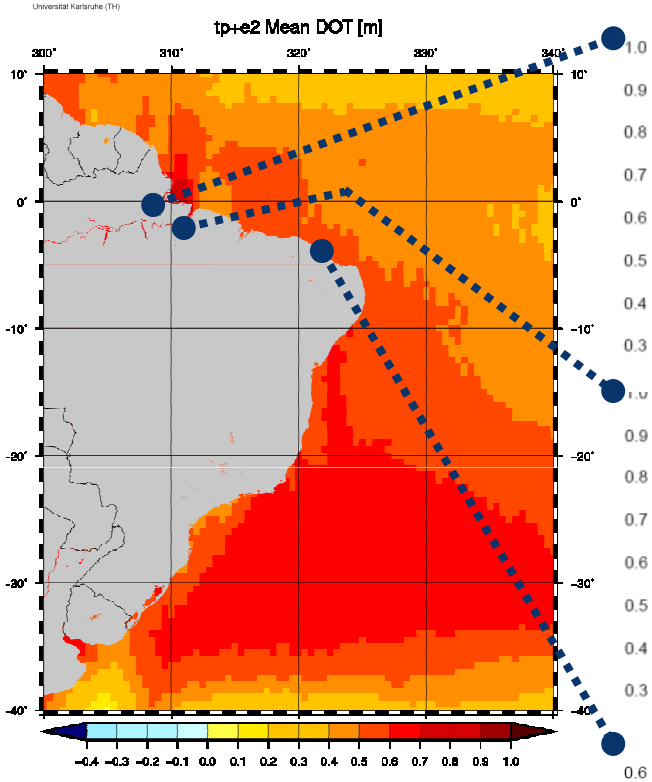
Preliminary Results

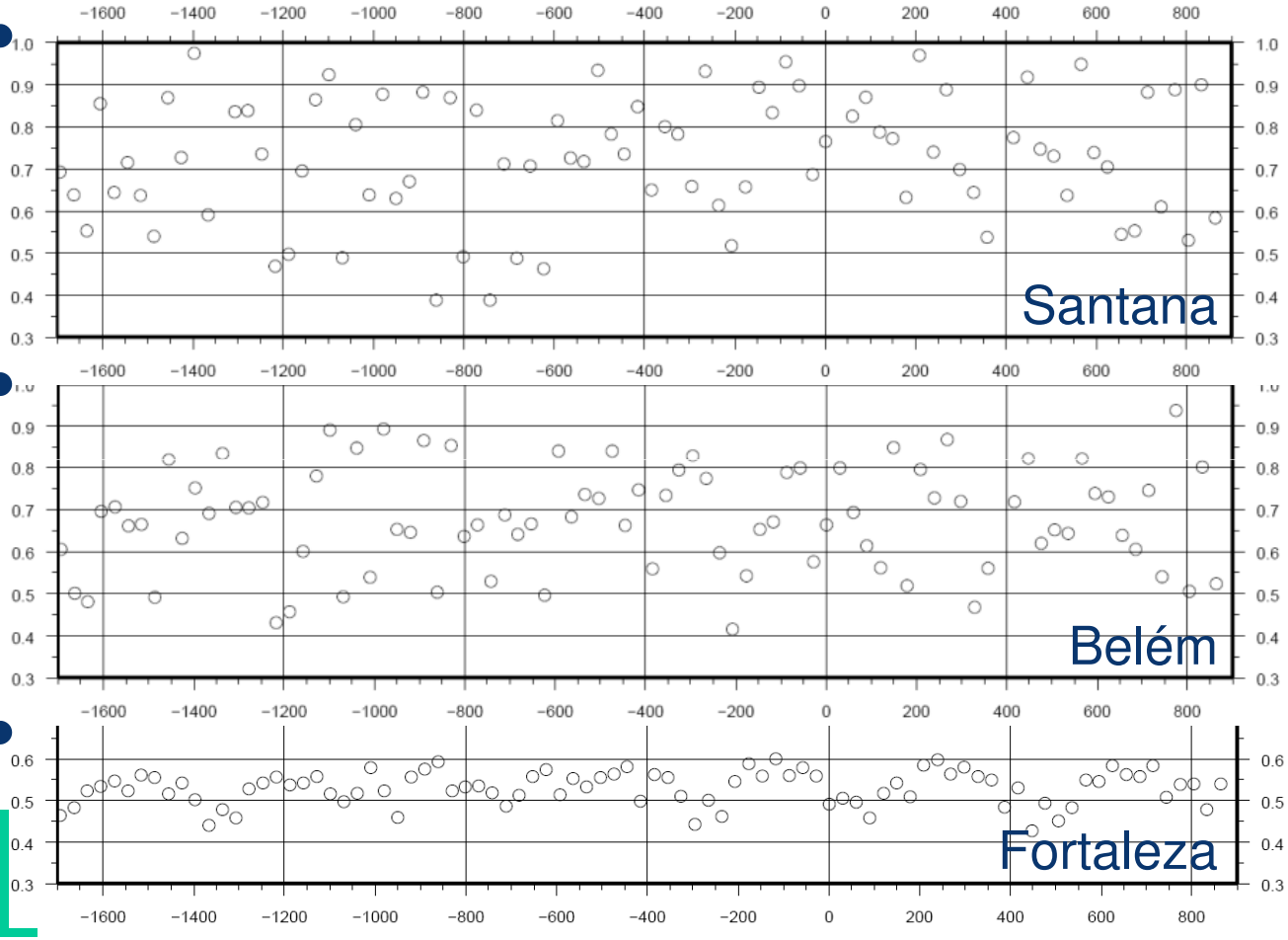
DOT does not explain the large differences between Levelling and Mean Sea Level

Differences Levelling – Geoid are most likely caused by error propagation of levelling network including the absence of a true gravity correction

DOT Interpolation at TG´s Belém and Santana are critical – but uncertainty less than the discrepancies to levelling

Additional issue: Temporal Evolution of DOT@TG's





Tide gauges	DOT ± stdev
Santana	0.75 ± 0.16
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There is no significant drift during the 7.1 year period analyzed

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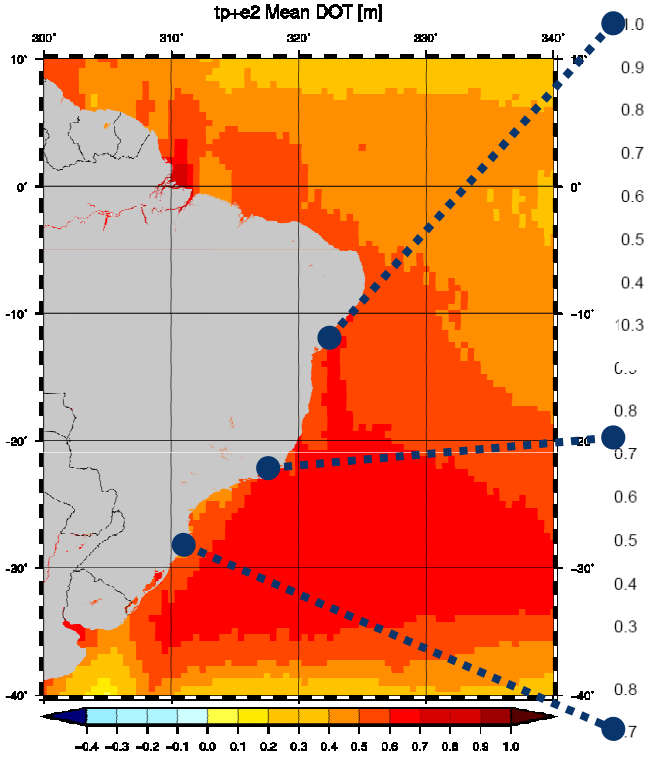

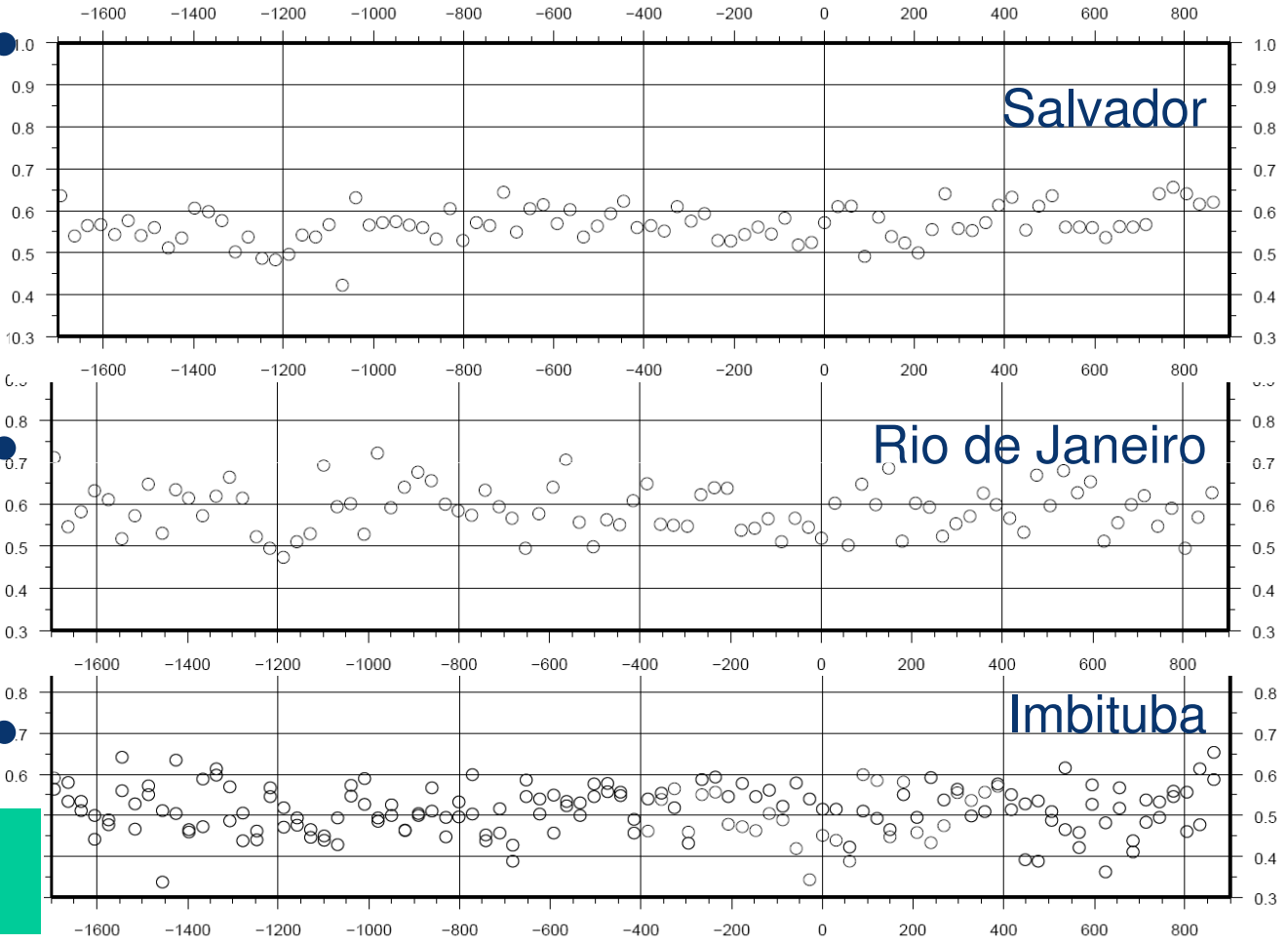

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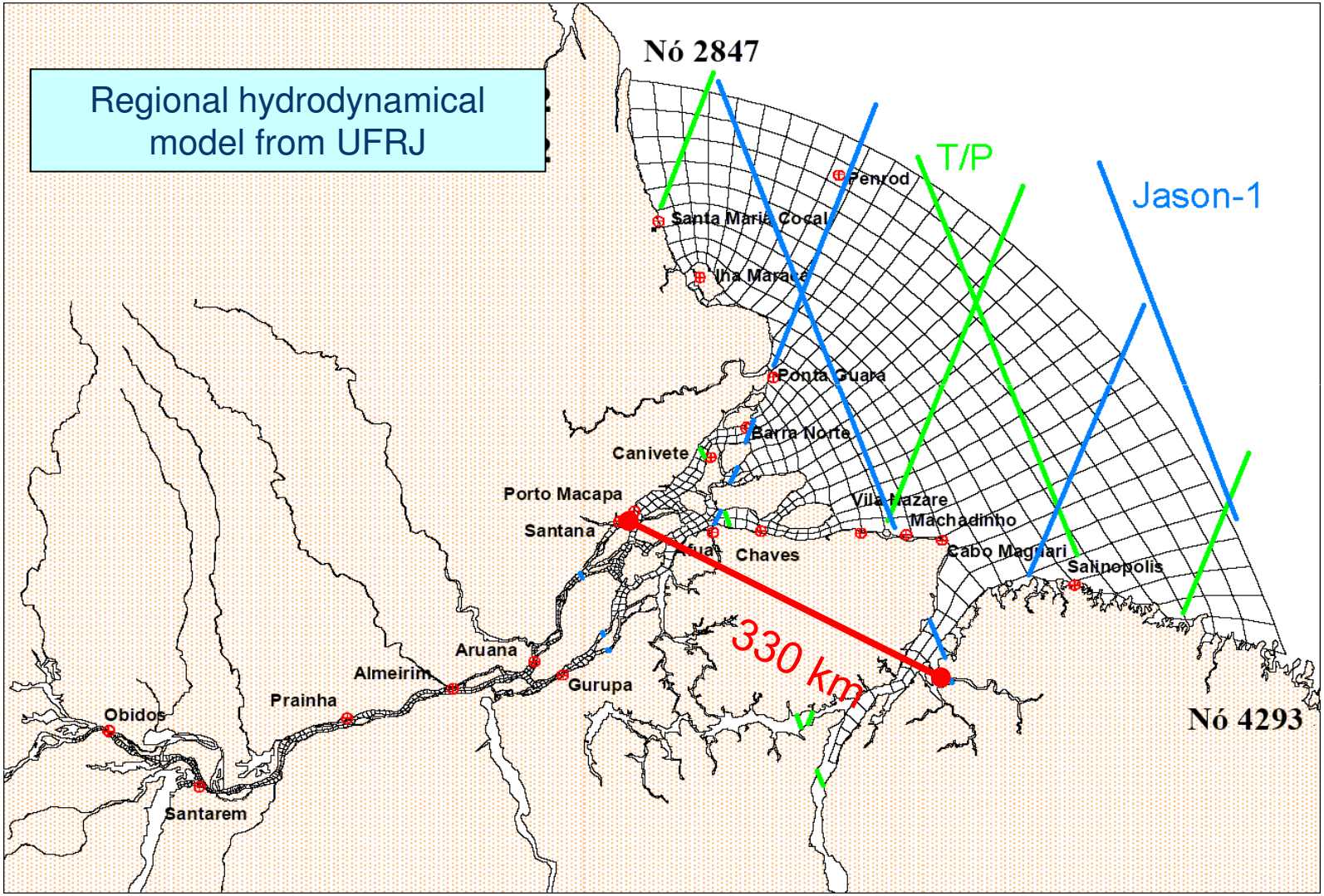
Future developments



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