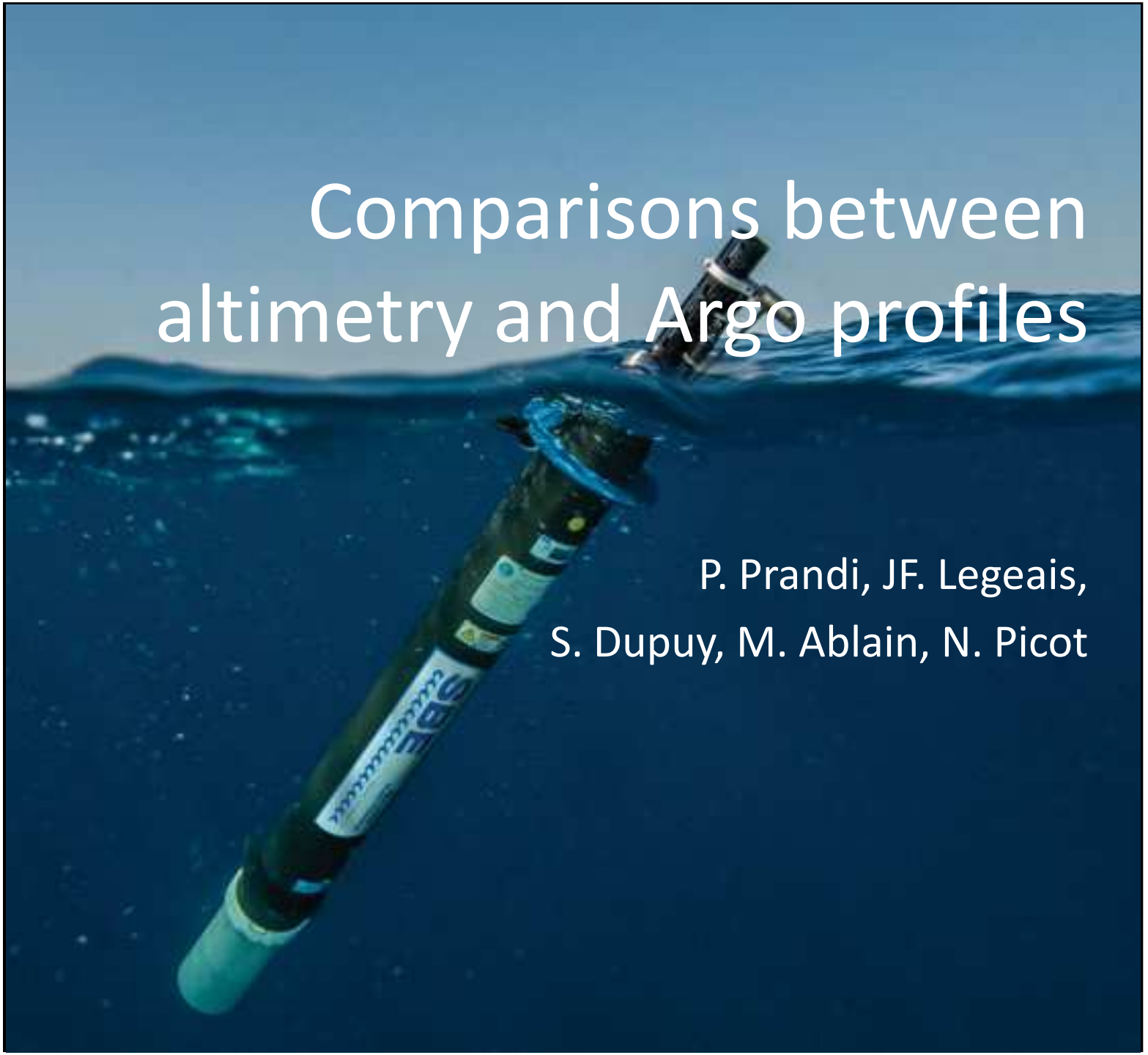

Comparisons between altimetry and Argo profiles

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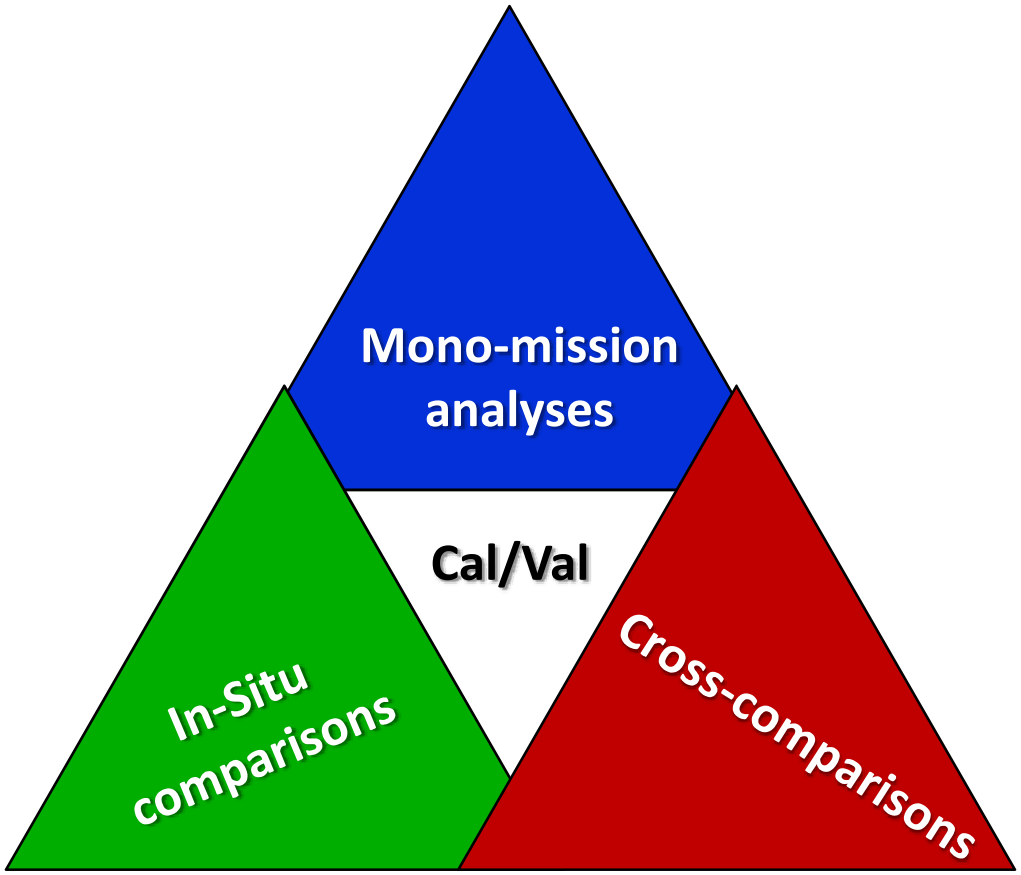
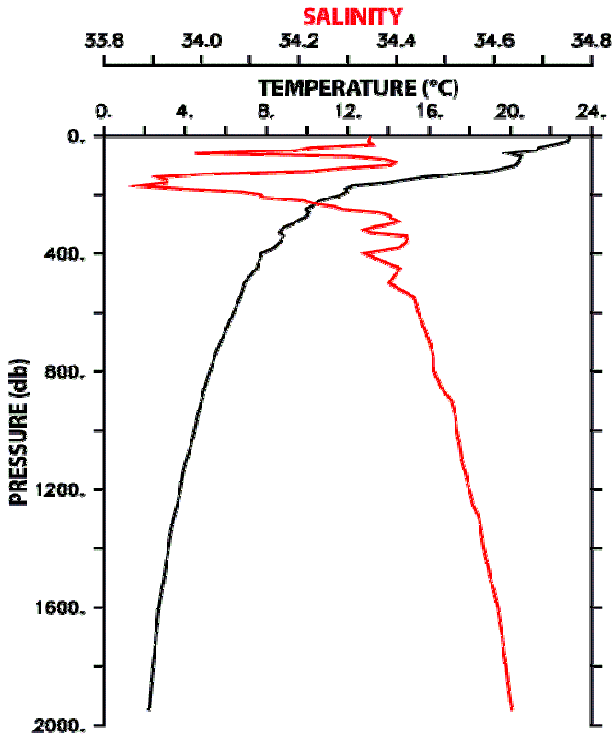
Introduction

- Internal consistency of one system,
- Consistency between two or mode altimetry systems,
- Consistency between altimetry and in-situ data:
  - Tide gauges
  - Argo T/S profiles



From T/S profiles to steric height

- Argo measurements: T/S = f(P)
- To be converted to a height



$$\eta_{steric} = \int_{z_{ref}}^{0} \frac{\Delta\rho}{\rho_{ref}} dz$$

Comparison methodology

- Based on the MSL closure budget:

$$SSH = \eta_{steric} + \eta_{mass}$$

Depending on the analysis, estimation of the mass component is needed or not

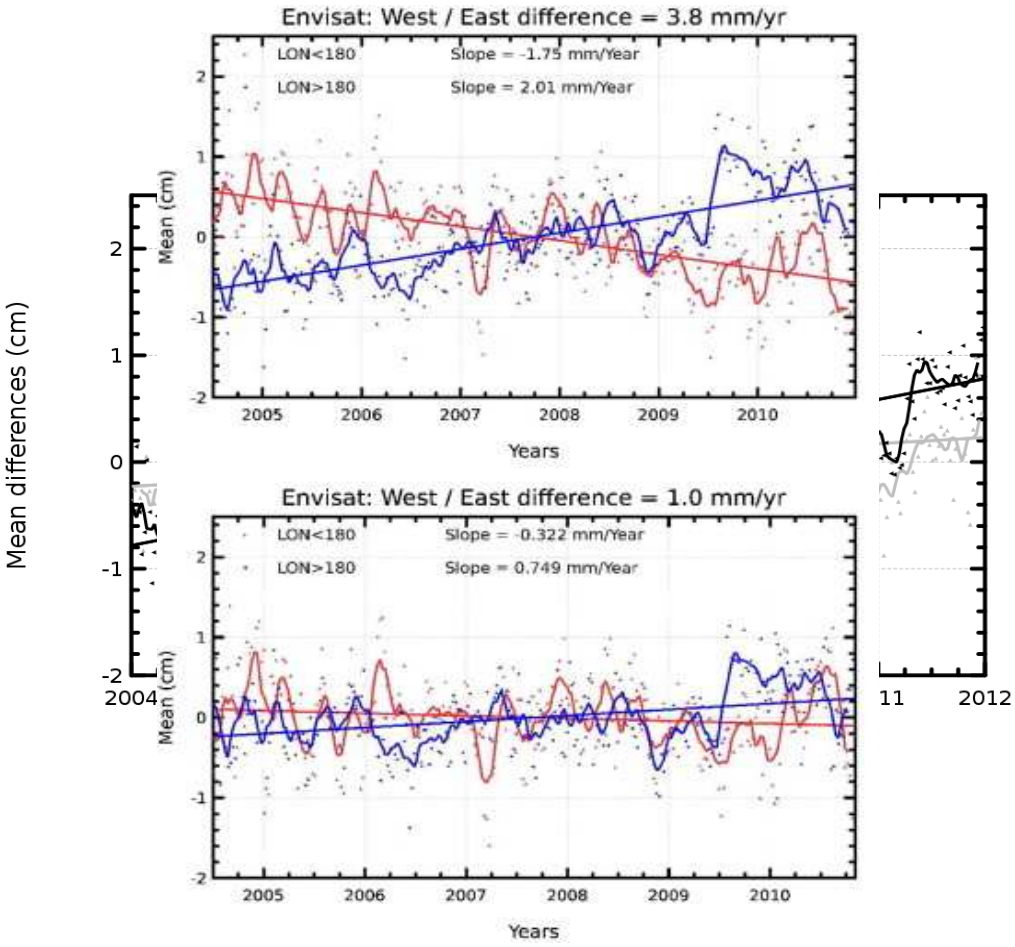
- Metrics are drawn from the set of *co-located* heights

$$(\eta_{steric}, \eta_{alti}, \eta_{mass})_i$$

Achievements

Used for

- Global altimeter drifts detection
  - Ex: J1/EN global MSL
- Validation of altimeter standards
  - Ex: Envisat GDR-D vs GDR-C orbits



Valladeau *et al.,* 2012

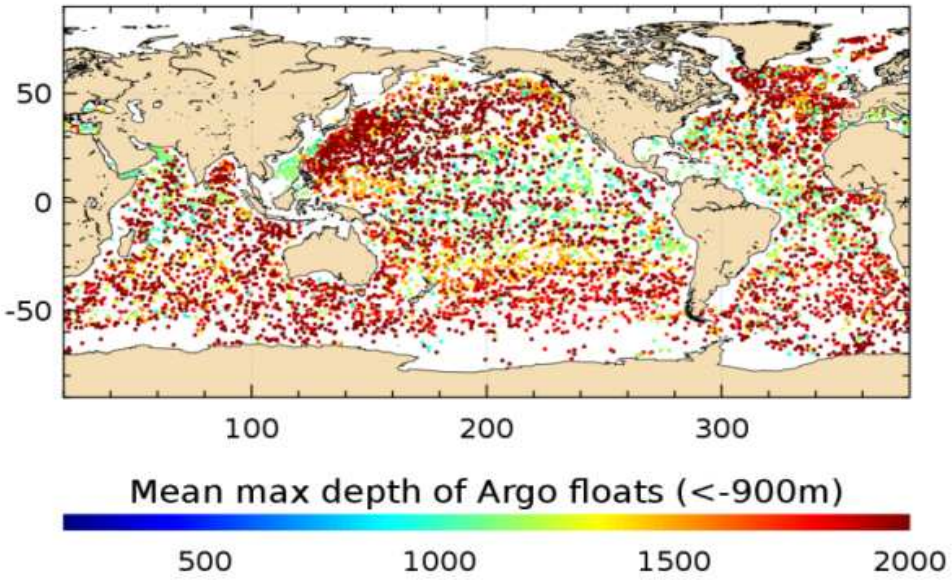
Couhert *et al.,* 2014

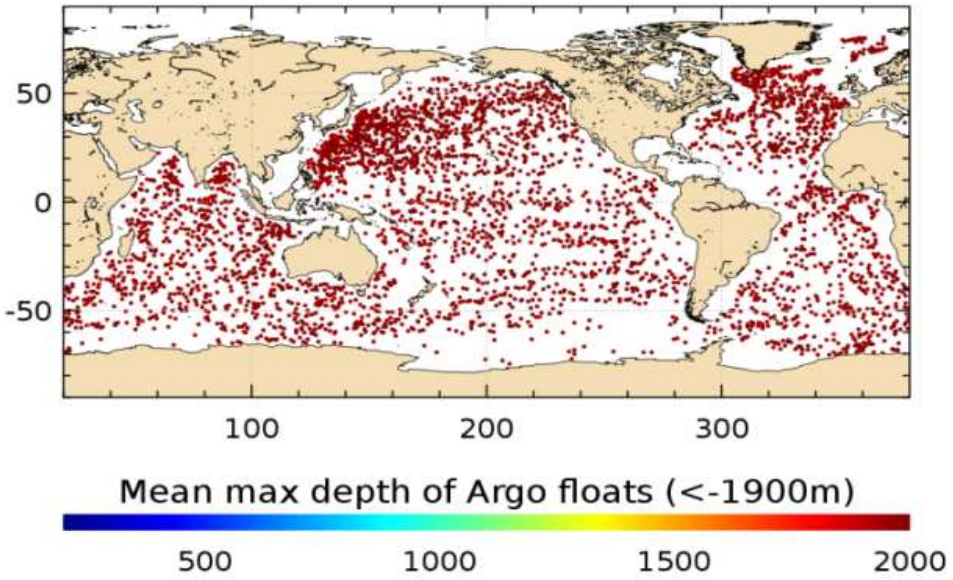
Outline

- Sensitivity estimation
  - Altimeter processing,
  - GRACE solution,
  - Argo processing
    - Spatial/temporal sampling,
    - Reference depth

Impact on spatial sampling

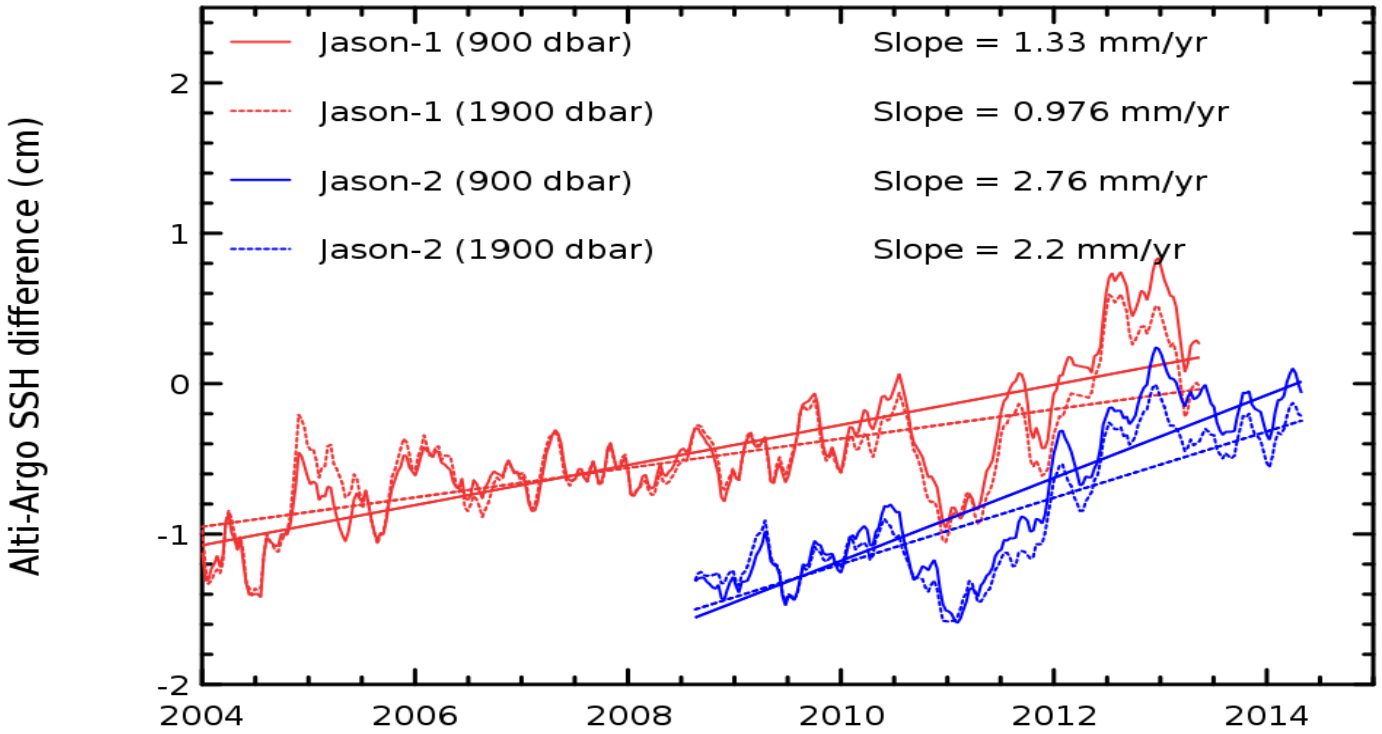
- No height estimates from profiles shallower than the reference level
- Balance between horizontal/vertical sampling





Effects on global trends

- Also impacts the Alti-Argo global differences (no mass here)



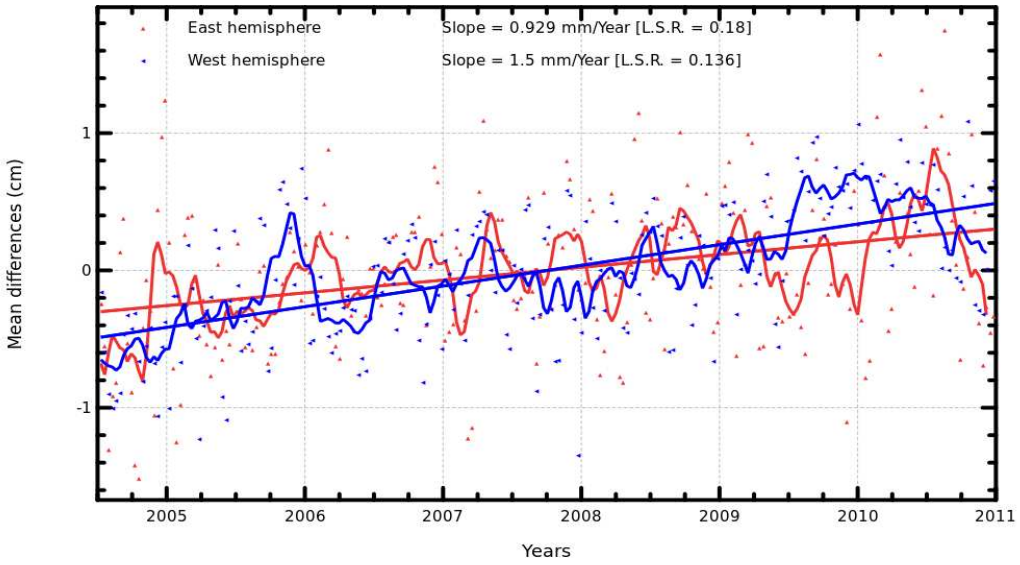
- ≈ 0.5 mm/yr on Jason-1 and Jason-2

Effects on regional trends

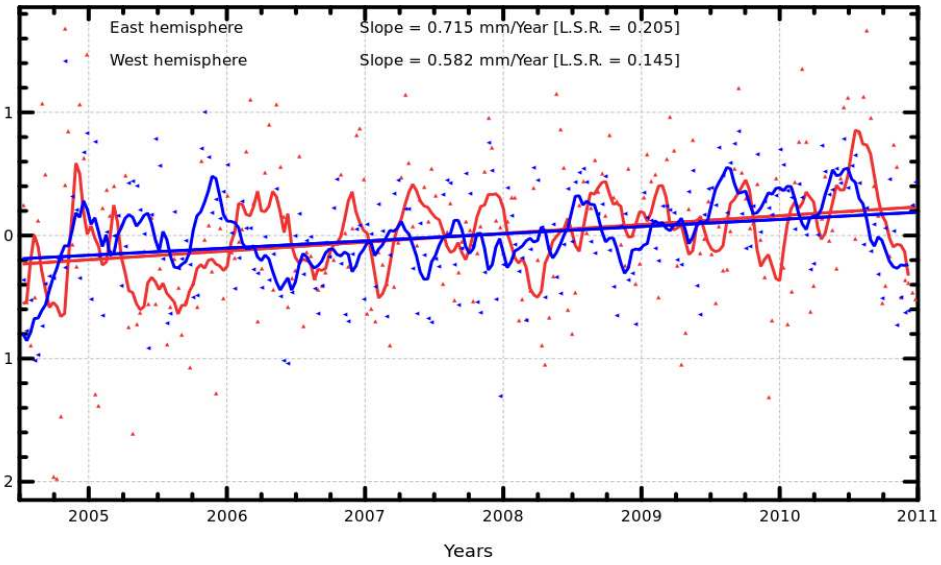
- Not evenly distributed (here hemispheric E/W analysis)

J1 – Argo differences

at 900 dbar



at 1900 dbar

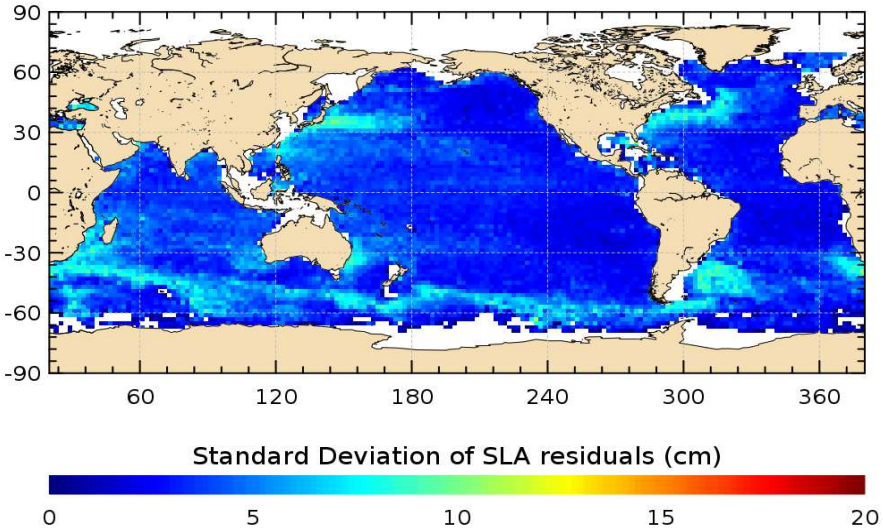


- Hemispheric impact ≈ 0.5 mm/yr

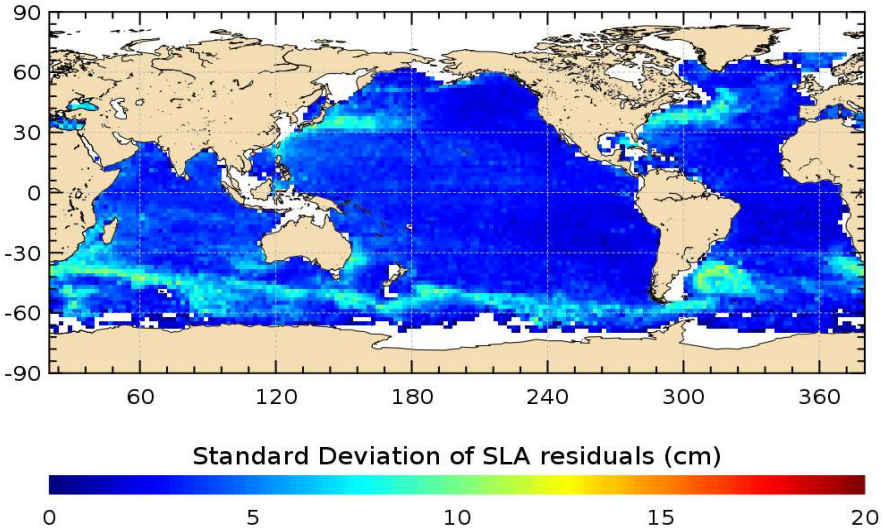
Impact on Argo/in-situ consistency

- Comparing optimally interpolated altimetry grids to Argo (AVISO mono and multi mission products)
- Differences are larger in high variability areas

single mission



multi mission



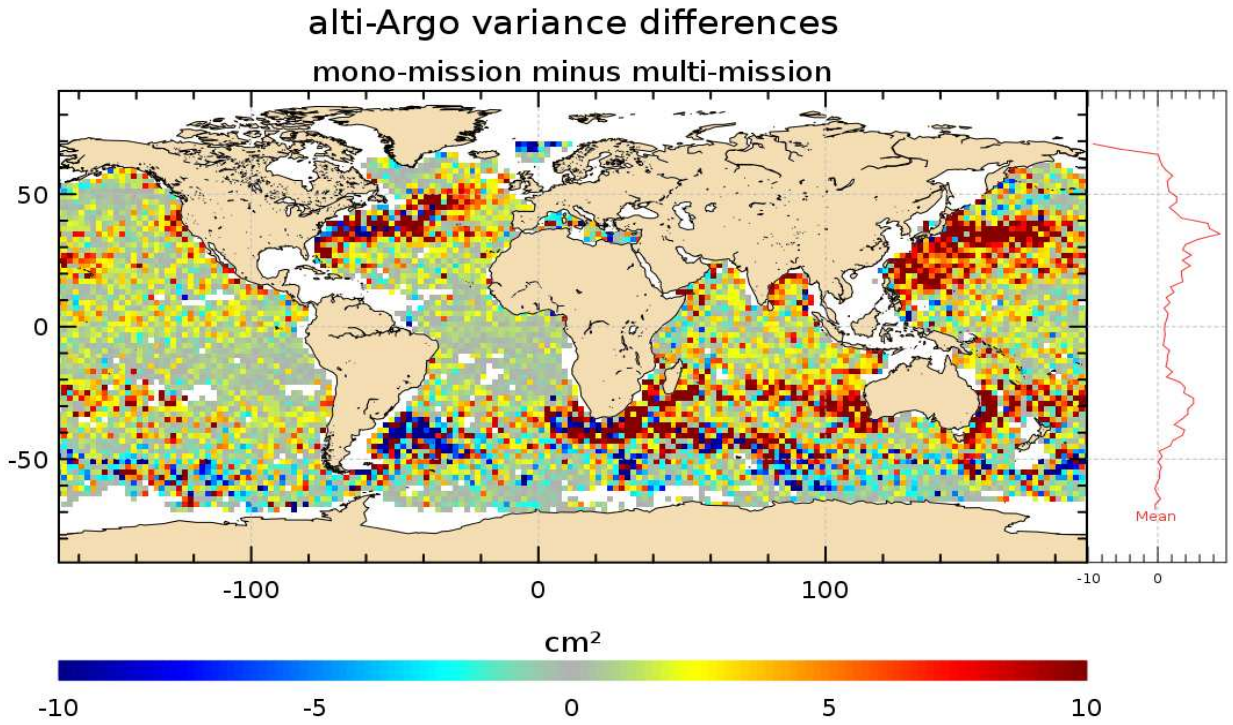
P_{ref} = 900 m

Impact on Argo/in-situ consistency

- Comparing optimally interpolated altimetry grids to Argo
- At 900m, adding missions reduces the alti/Argo consistency in some regions

P_{ref} = 900 m

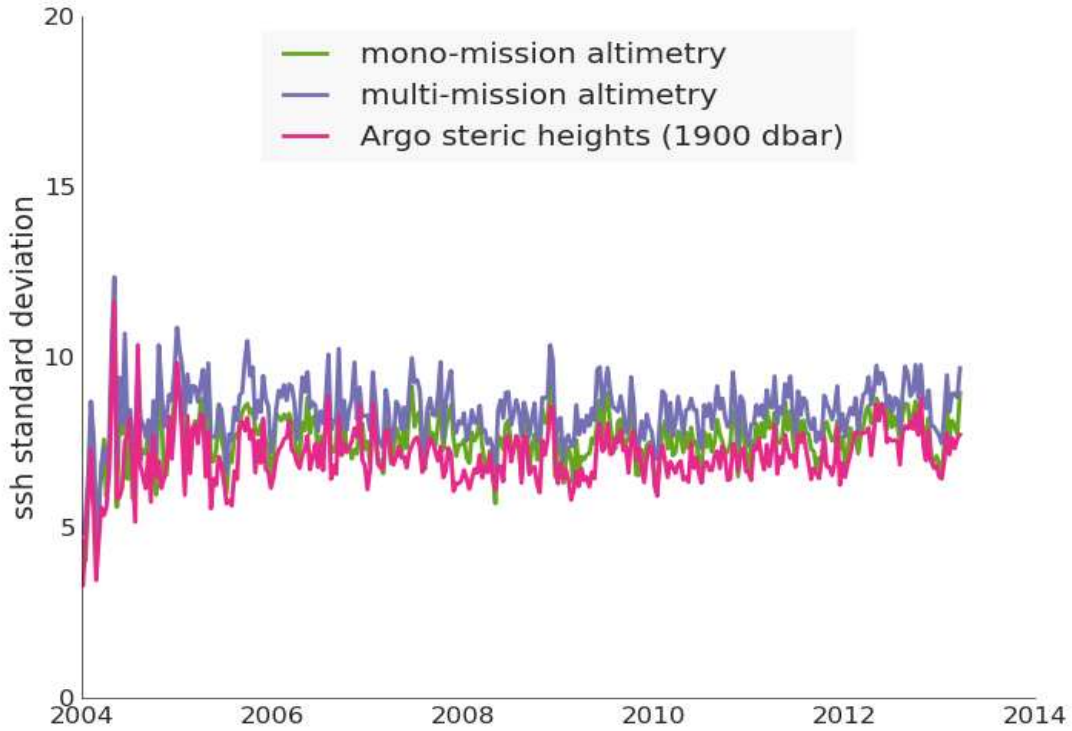
P_{ref} = 1900 m



- At 1900m, improves consistency

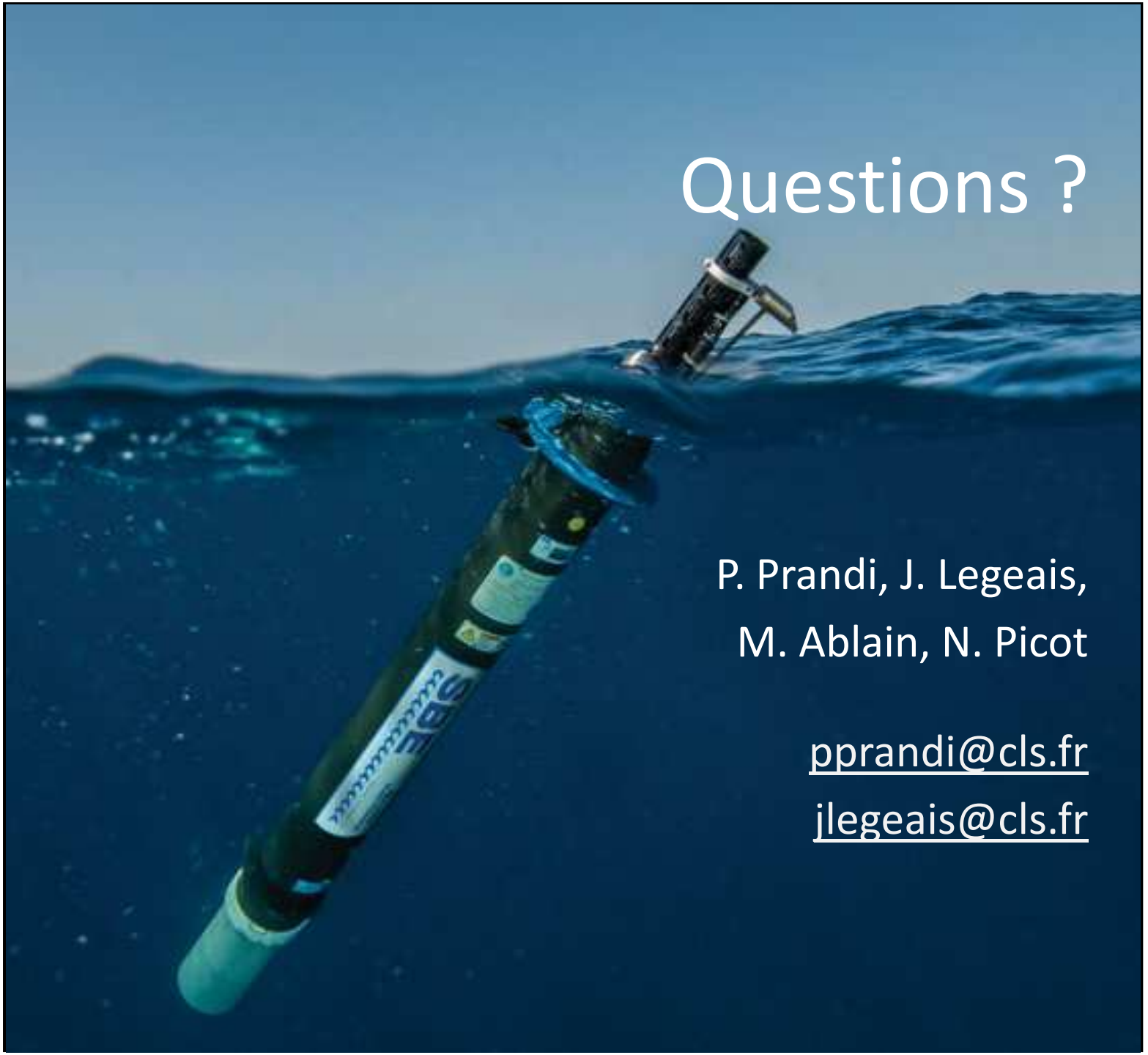
Integration depth & Energy level

- Depending on the region, may have large impact on the variance of alti-Argo differences
- Example in the ACC



Conclusions

- Successfully used for
  - Detecting global drifts and regional anomalies,
  - Validating standards,
- Synergy with tide gauges & cross calibrations increases confidence in results (poster 40)
- Sensitivity factors
  - Reference depth, choice may vary depending on studies,
  - GRACE solution
  - Co-location method
- Perspective: Argo network evolution with deep floats deployment (4 000 dbar)
- Better qualification of future altimetry missions:
  - AltiKa
  - S3, J3, J-CS…



Questions ?

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Propositions to be included on the sensitivity of the method (JF)?

- **Format of altimeter data**:
  - box-averaged versus optimal interpolation (section 3.2.4 du bilan annuel 2012)
  - If box-avreaged: test of 1x3° vs 1x1° => no impact on the global mean but reduction of 1.3cm2 on the variance differences

- **Impact of adding the mass contribution (GRACE data):**
  - Strong sensitivity of the dataset (GRGS V2, V3, Gobal mean from Chambers et al.): little impact on the variance of the differences but strong impact on the detection of altimeter absolute drift and inter annual signals => discussion on the « remaining » ~1mm/yr