Long term regional sea level variability and total relative sea level rise in Tropical Pacific, Caribbean Sea, South China Sea and Indian Ocean : An overview

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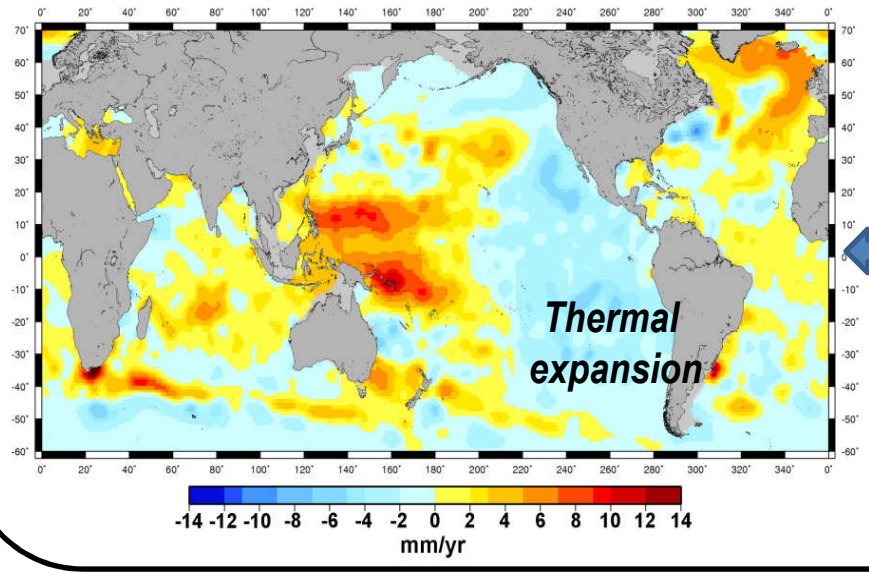
Why REGIONAL and LONG TERM sea level change and variability?

Sea level rise is not uniform. It is mostly due to non uniform thermal expansion..

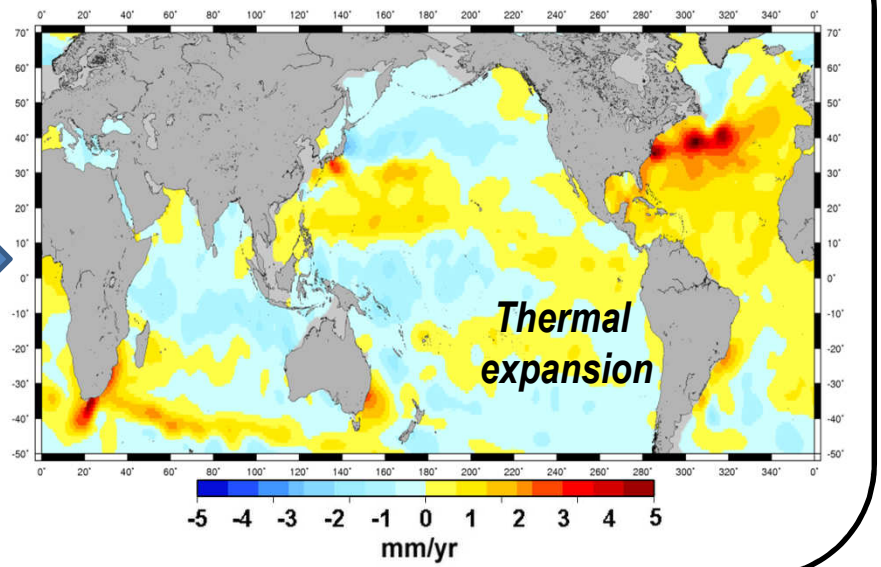
Lombard et al. 2009
Kohl & Stammer 2008
Wunsch et al. 2007

Global mean trend removed

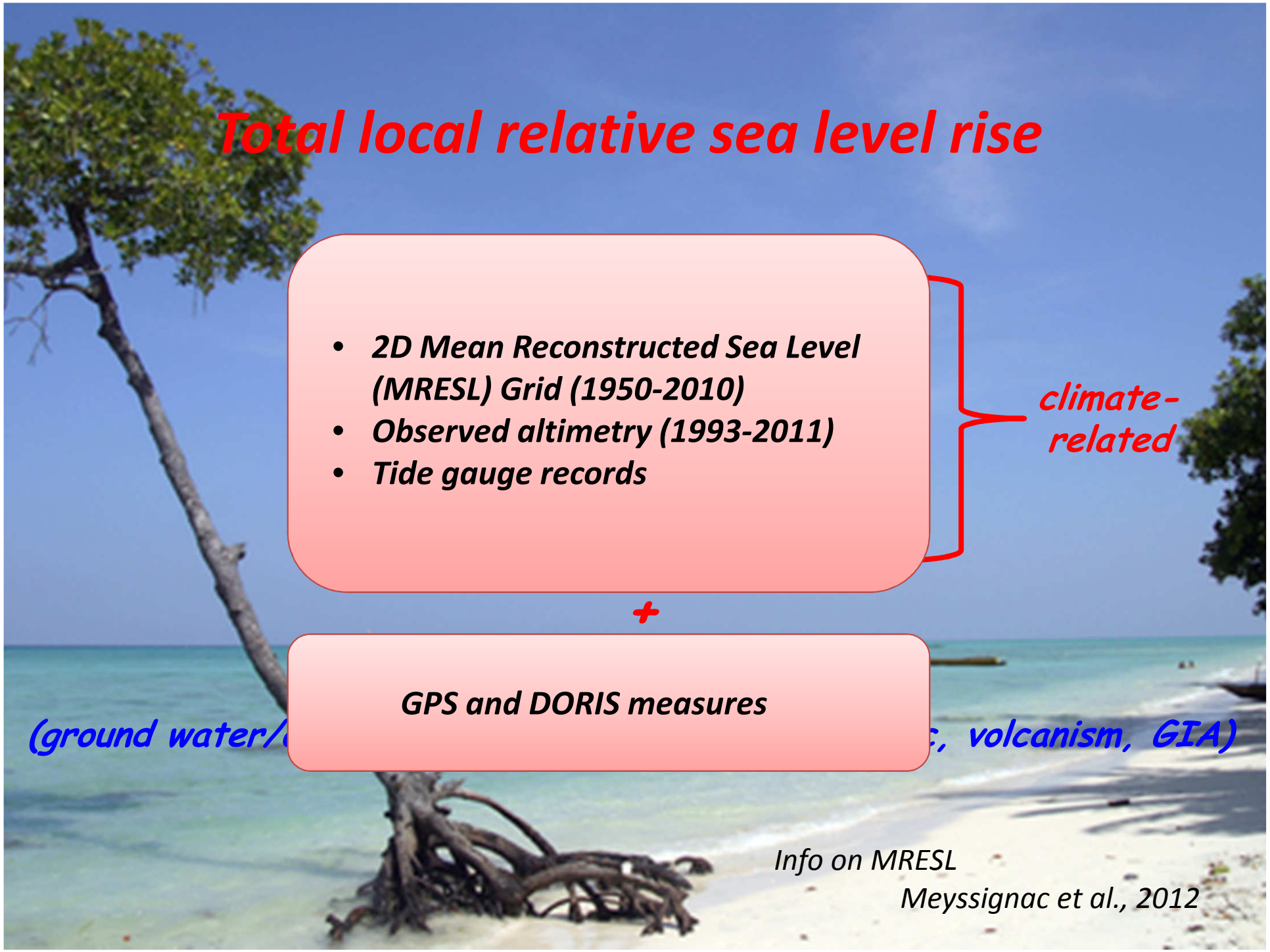
1993-2011



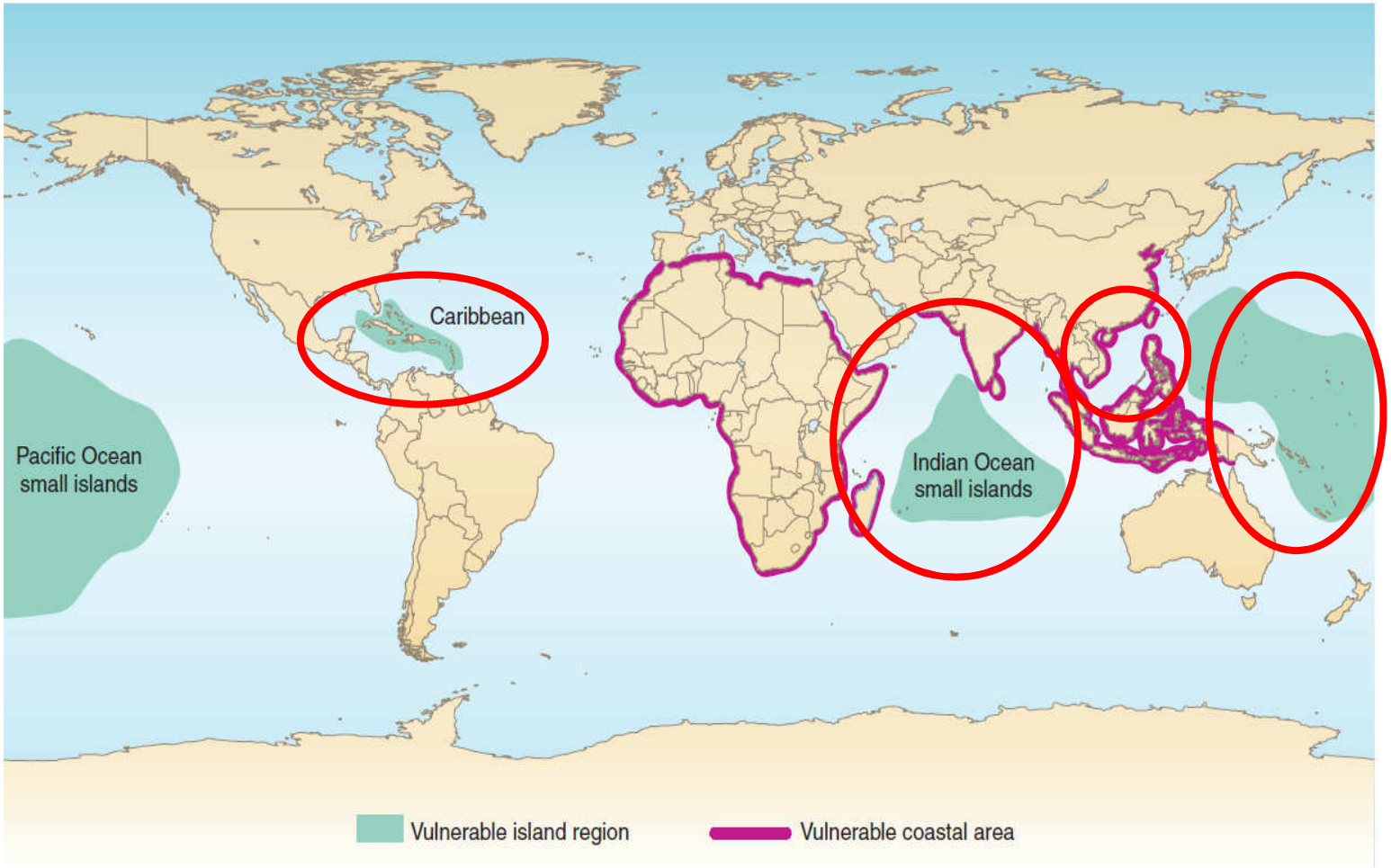
1955-2011



The regional variability oscillate in space and time in response to natural climatic modes (ENSO, NAO, …)


Total local relative sea level rise
• 2D Mean Reconstructed Sea Level (MRESL) Grid (1950-2010)
• Observed altimetry (1993-2011)
• Tide gauge records
climate-related
+
GPS and DORIS measures
(ground water/
c, volcanism, GIA)
Info on MRESL
Meyssignac et al., 2012

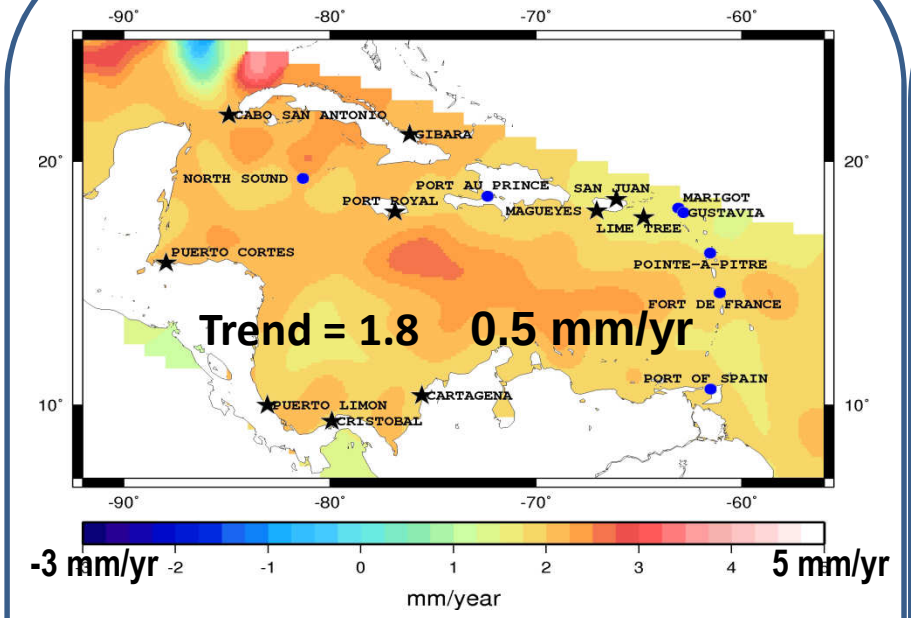
Regions vulnerable to changes in sea level

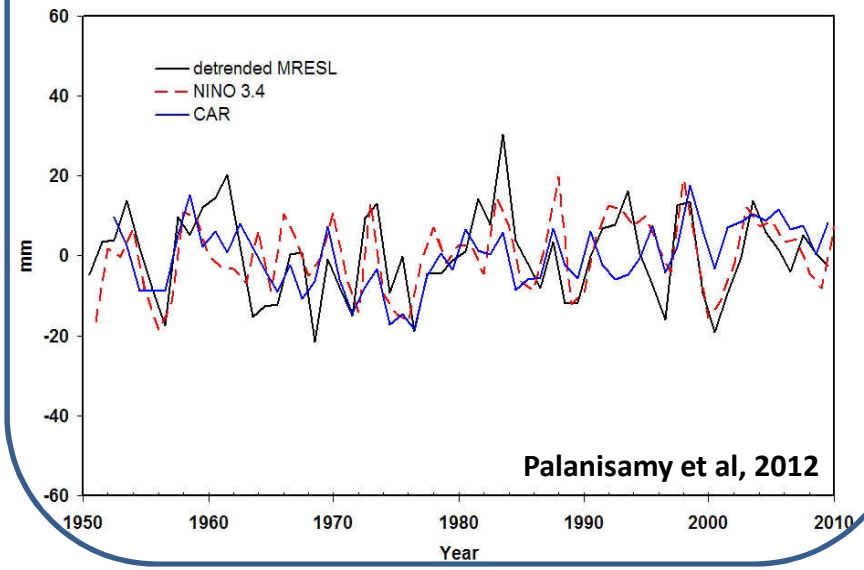


Nicholls and Cazenave 2010.

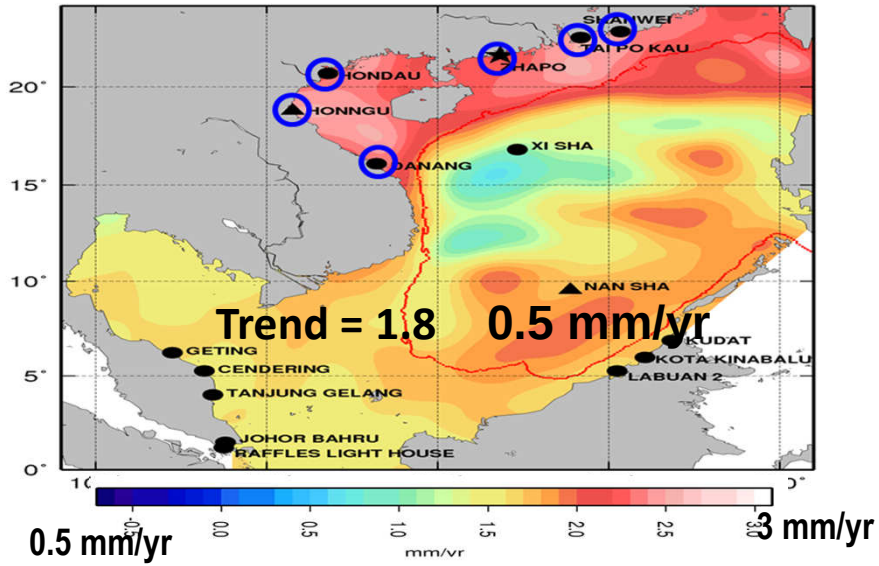
Climate-related sea level change 1950-2010

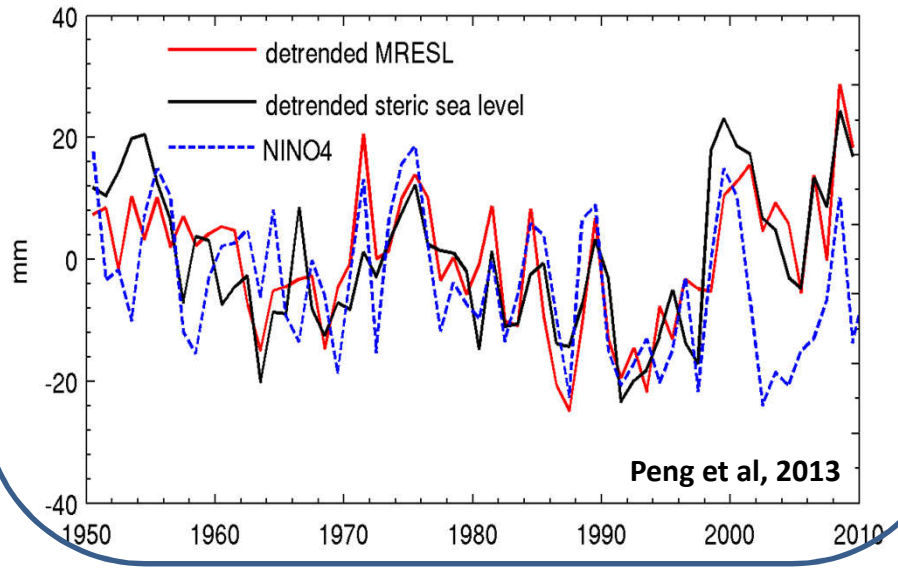
Caribbean Sea





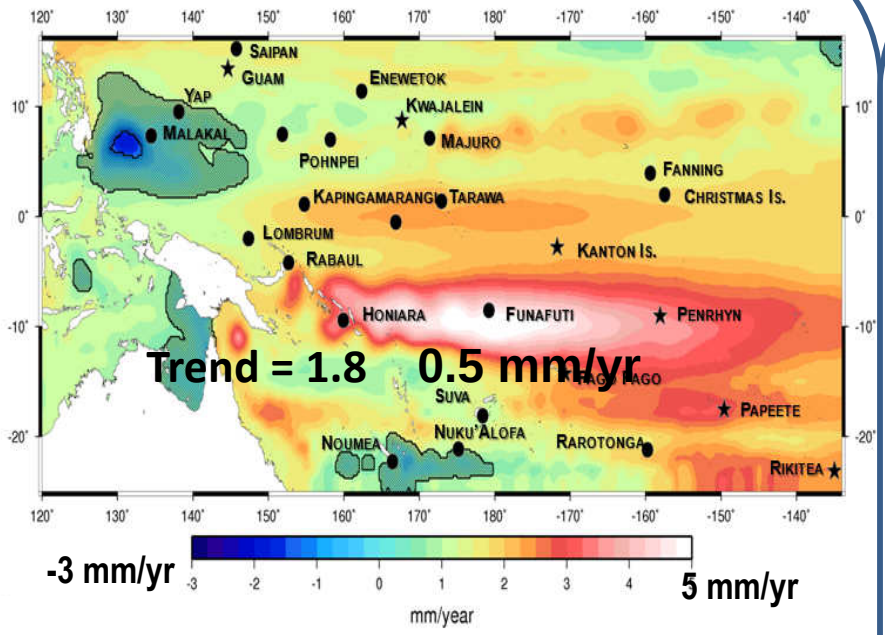
South China Sea

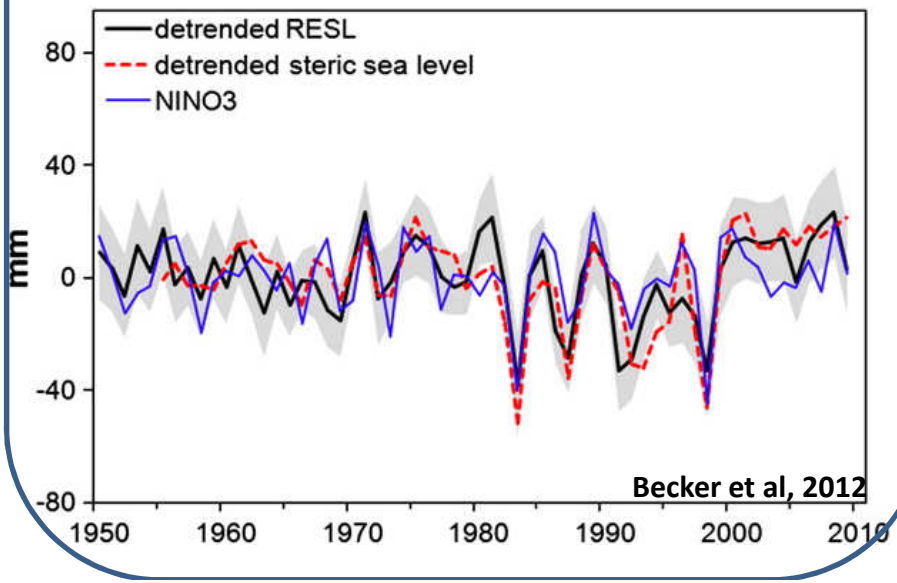




Climate-related sea level change 1950-2010

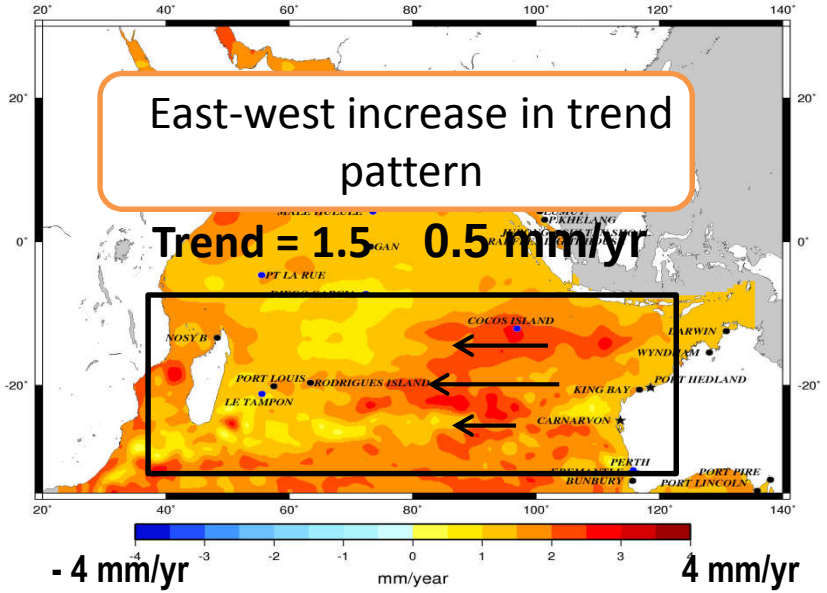
Tropical Pacific

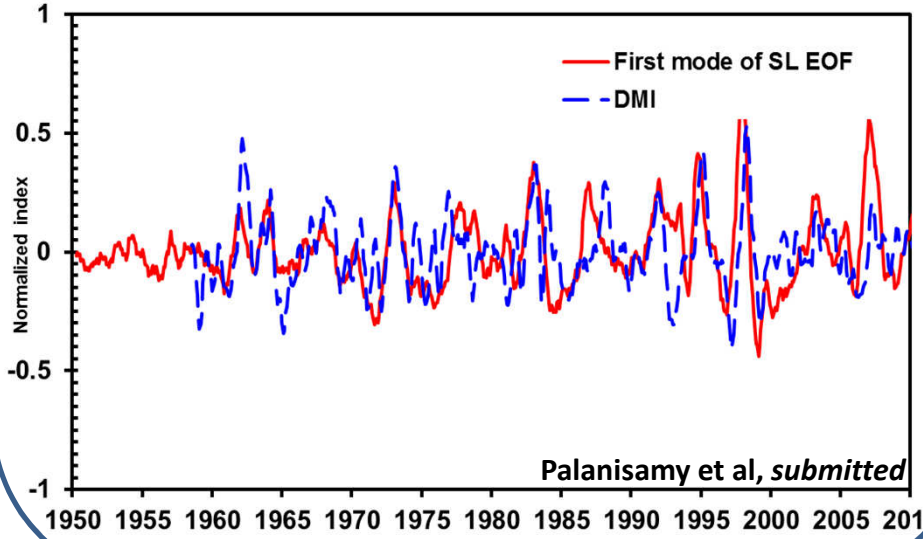




Indian Ocean

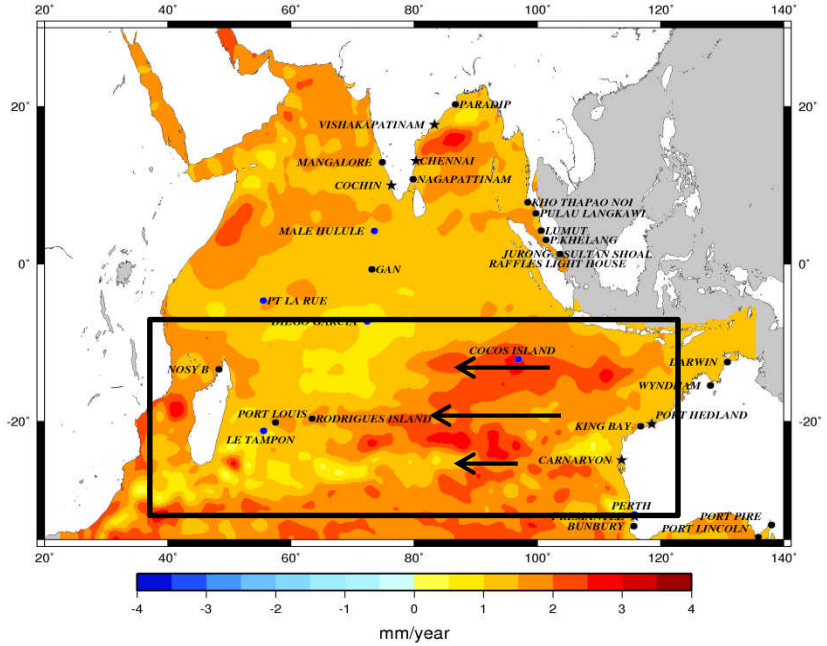
East-west increase in trend pattern

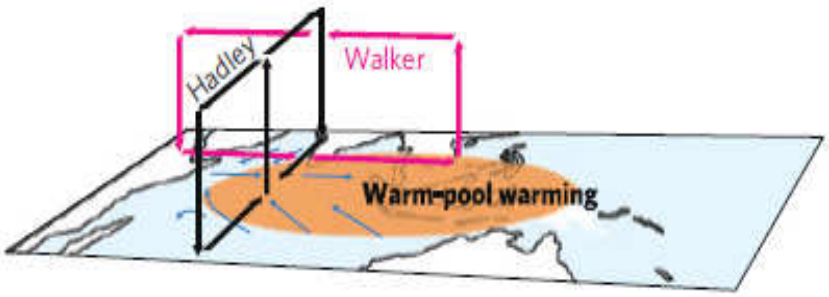




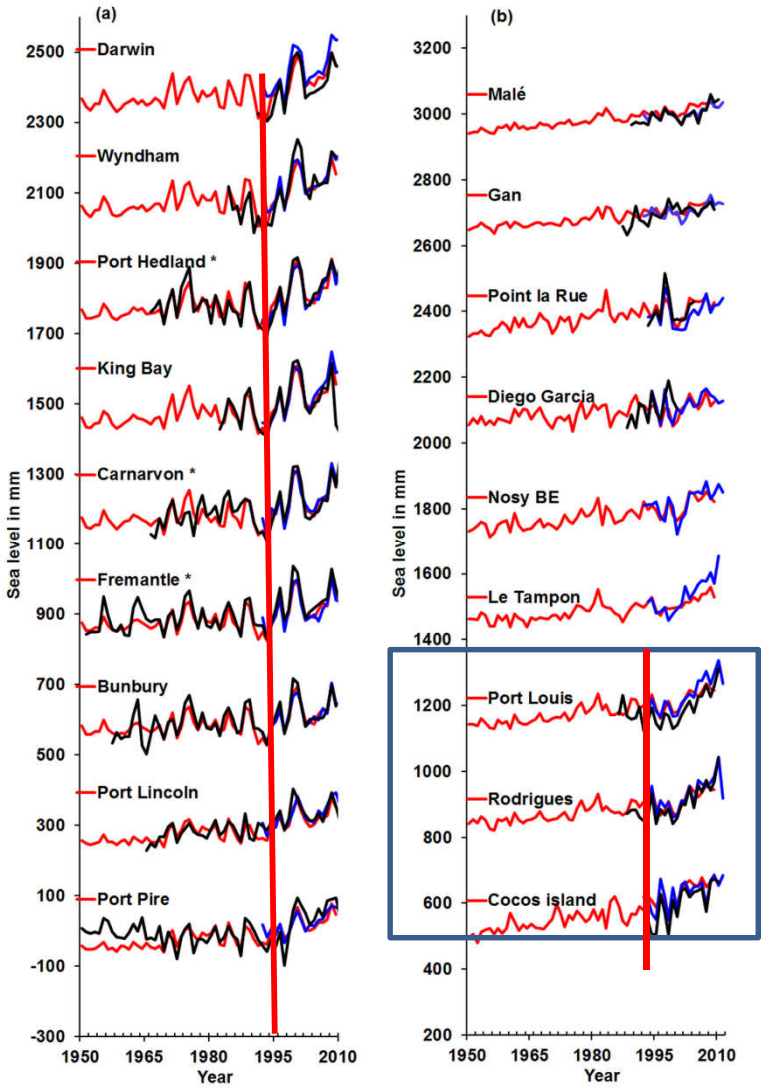
Climate-related sea level change 1950-2010

Indian Ocean



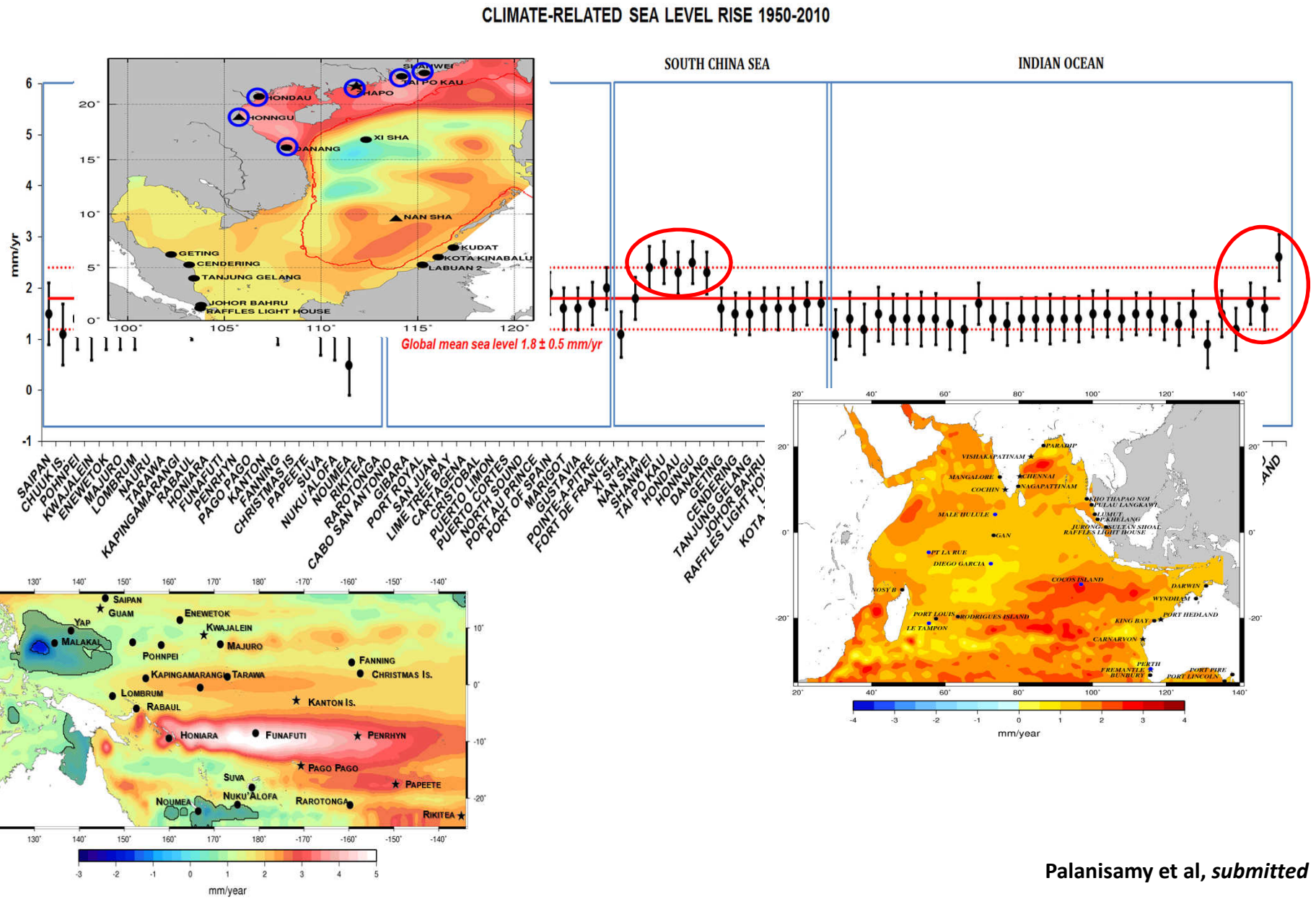


Han et al, 2010



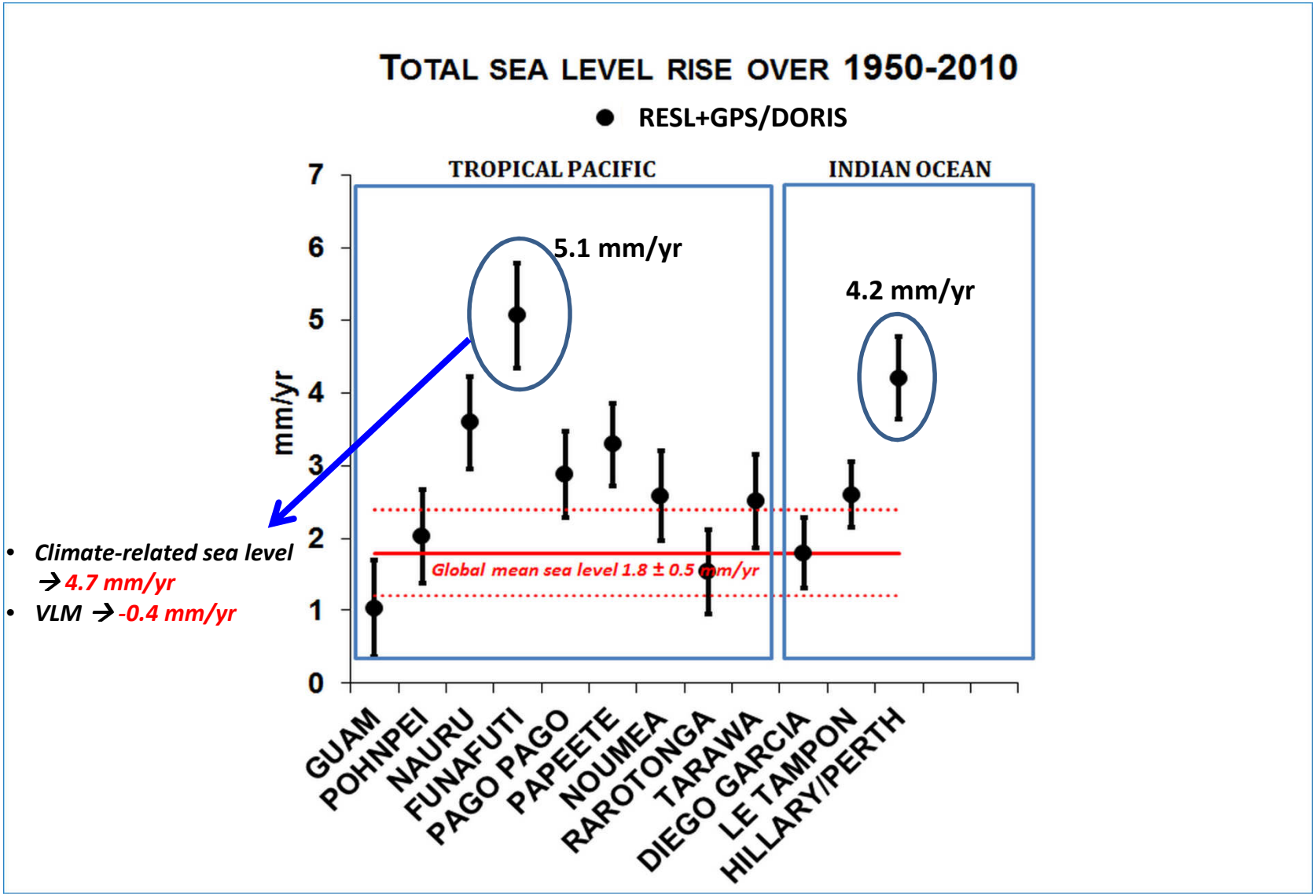
Palanisamy et al, *submitted*

Climate-related sea level change 1950-2010



Palanisamy et al, *submitted*

Total relative sea level change

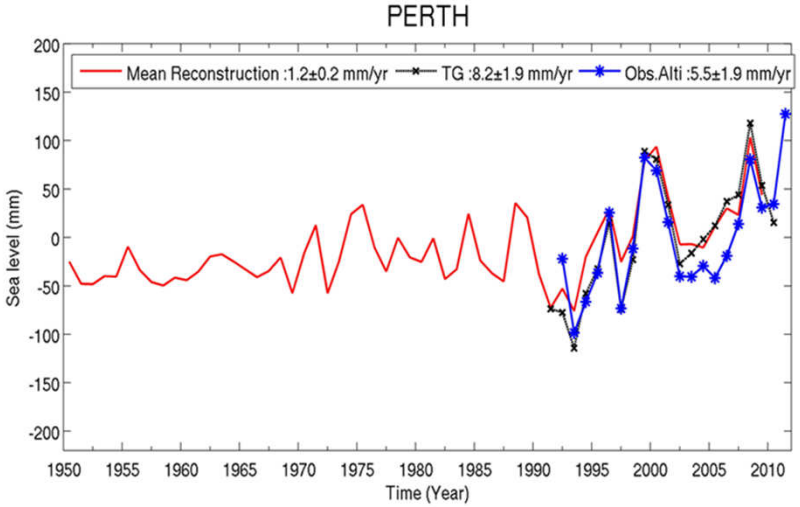


- *Climate-related sea level → 4.7 mm/yr*
- *VLM → -0.4 mm/yr*

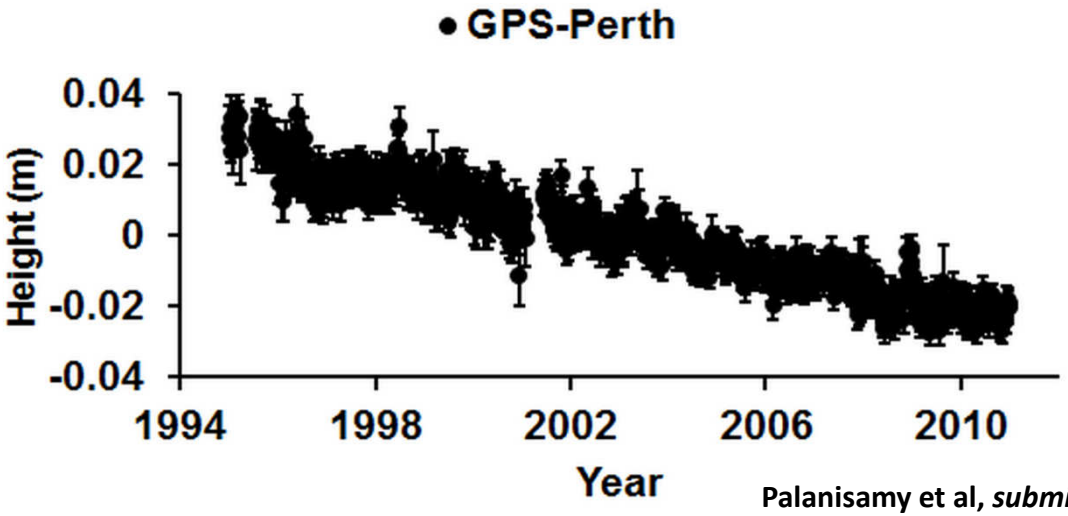
Palanisamy et al, *submitted*

Total relative sea level change

MRESL trend 1950 -2010 = **1.2mm/yr**



GPS VLM trend = **-2.98 mm/yr**



Around 70% of total relative sea level rise contributed by subsidence!!

Subsidence in Perth due to excessive ground water extraction.. (Featherstone, 2013)

Palanisamy et al, ***submitted***

Conclusions & Perspectives

- *Sea level is rising but in order to determine the real impact of sea level rise on coastal and island zones, study on regional variability and vertical land motion becomes very important..*

  → Need for more GPS/DORIS measures

- *A new way to replace short term/erroneous/non-existent tide gauge records..*

  → 2D reconstructed sea level grids

- *Improving the accuracy of sea level reconstruction grids*

  → using more long, good quality tide gauges

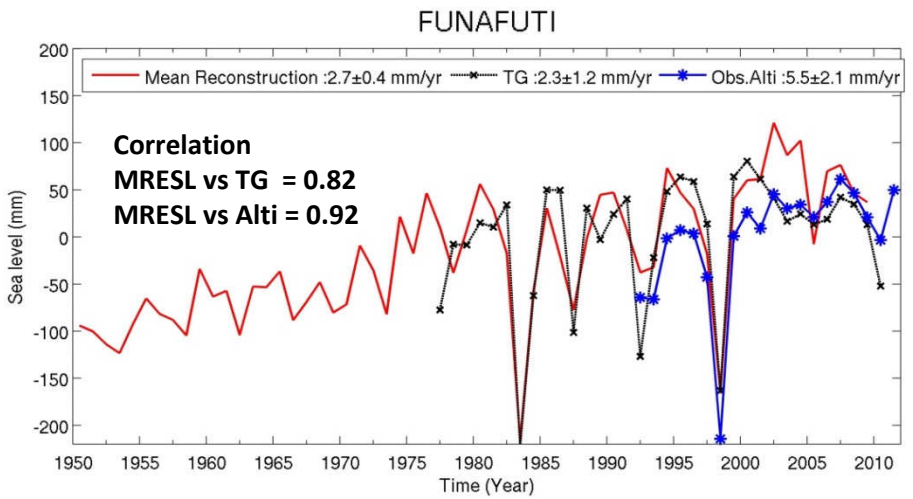
  → with more spatial grids as input

  → regional reconstructions

Synthetic tide gauge time-series

By product- Synthetic tide gauge time-series

- *Validation of MRESL time series at individual tide gauge locations.*



- *develop MRESL time series at vulnerable locations with no/short/erroneous TGs.*