

Sea Level Variability in Pemba, North of Mozambique

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1. Introduction

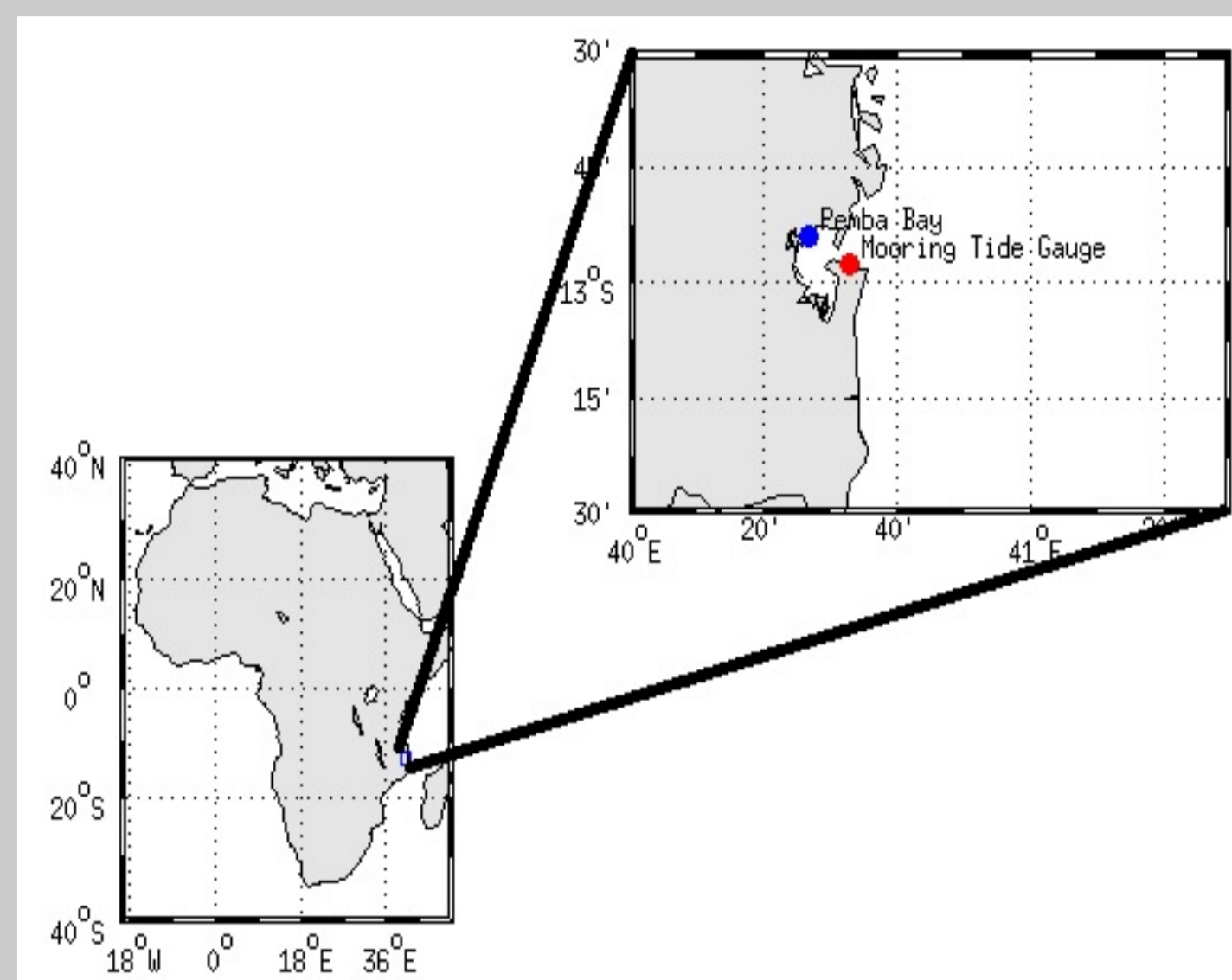


Figure 1- Map of Geographic localization of Pemba Bay

• Pemba Bay is a semi-closed sea located in northern coast of Mozambique, Figure 1.

• Astronomical tides are a dominant force in Pemba Bay occurring in a semi-diurnal regime, Figure 2

Objectives

• Analyse the Sea Level Variability in Pemba Bay

• Figures 2b and 3a shows that the sea level is higher in February and March. This could be due to the high rain and highest air temperature on these months

• The estimate of the trend in Figure 3b, is $5E-5$ mm per day that is 0.0183 mm per year.

• Figure 4 shows a global mean sea level in inter-annual variability. Pemba area (dashed rectangle) has values within -0.5 and -1.5 mm per year. This range fits well with observed data results showed in Figure 3b.

2. Data

• The data used in this study are obtained from tide gauge at Pemba harbour that is located in Pemba Bay at a position: Latitude -12.96 S and longitude 40.55 E;

• Monthly Mean Sea Level (MSL) values from 1970 to 2015, with some years missing in between

• The data used are in a millimeter and where not adjusted in “revised local reference”

3. Methodology

• A stochastic dynamical method was used to obtain the linear trend at Pemba station

5. Main Conclusions

• High monthly MSL in Pemba usually occur in February- March whereas low monthly MSL occur in September- October

• The used data show a Mean Sea Level rise of 0.0183 mm per year.

Acknowledgements

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References

• G.B. Brundrit (1995) Trends of Southern African sea level: statistical analysis and interpretation, South African Journal of Marine Science, 16:1, 9-17, DOI:10.2989/025776195784156449

• Parker A. & Ollier C. 2017. *Is the Sea Level stable at Aden, Yemen?*. Earth Syst Environ (2017) 1:18.

• Sete C. Ruby J. and Dove V., 2002. *Seasonal variation of Tides, Currents, Salinity and Temperature along the Coast of Mozambique*. UNESCO 2002

• Woodworth, P L, Aman A and Aarup T. 2007. Sea level monitoring in Africa. African Journal of Marine Science 2007, 29(3): 321–330

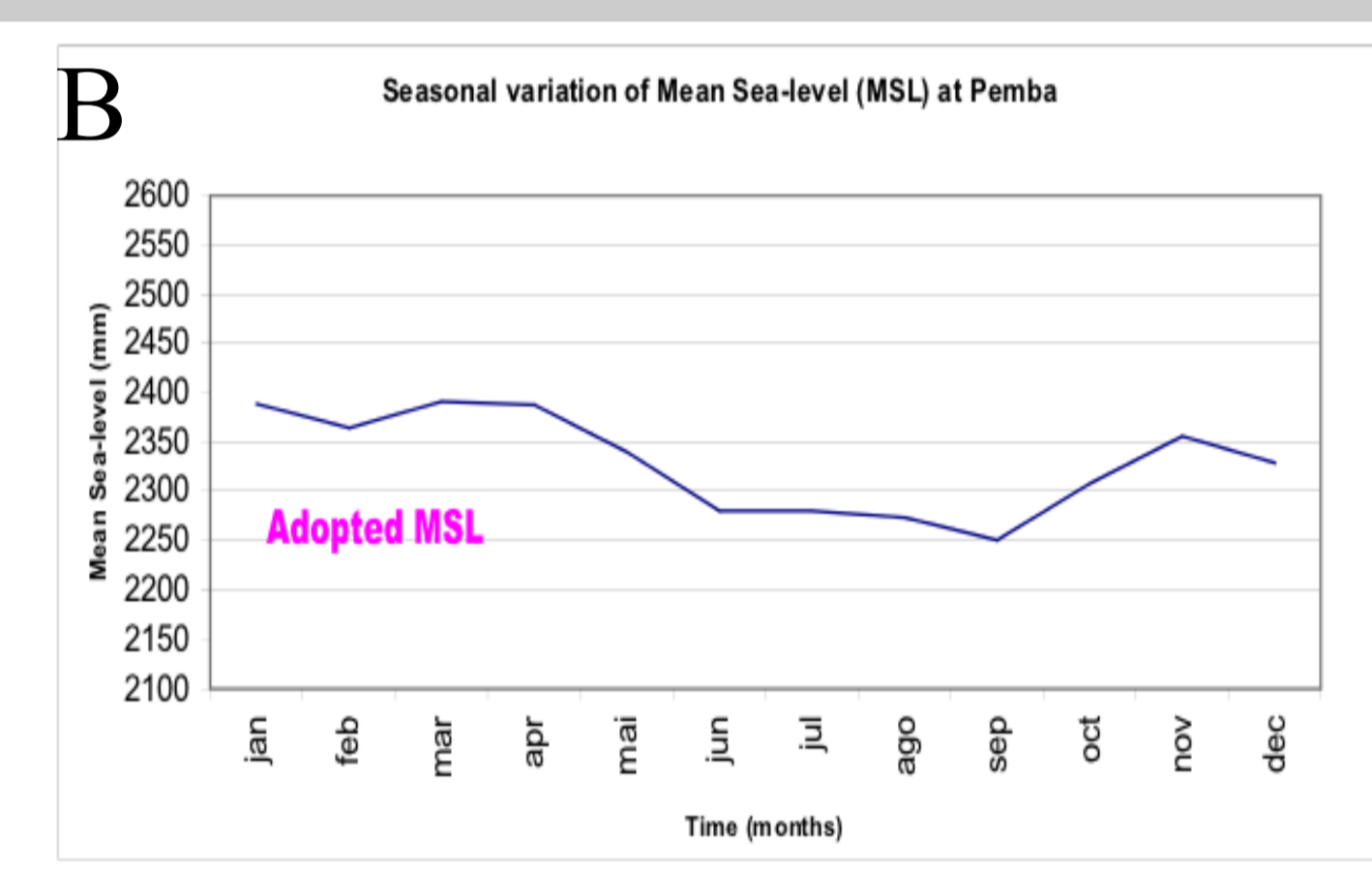
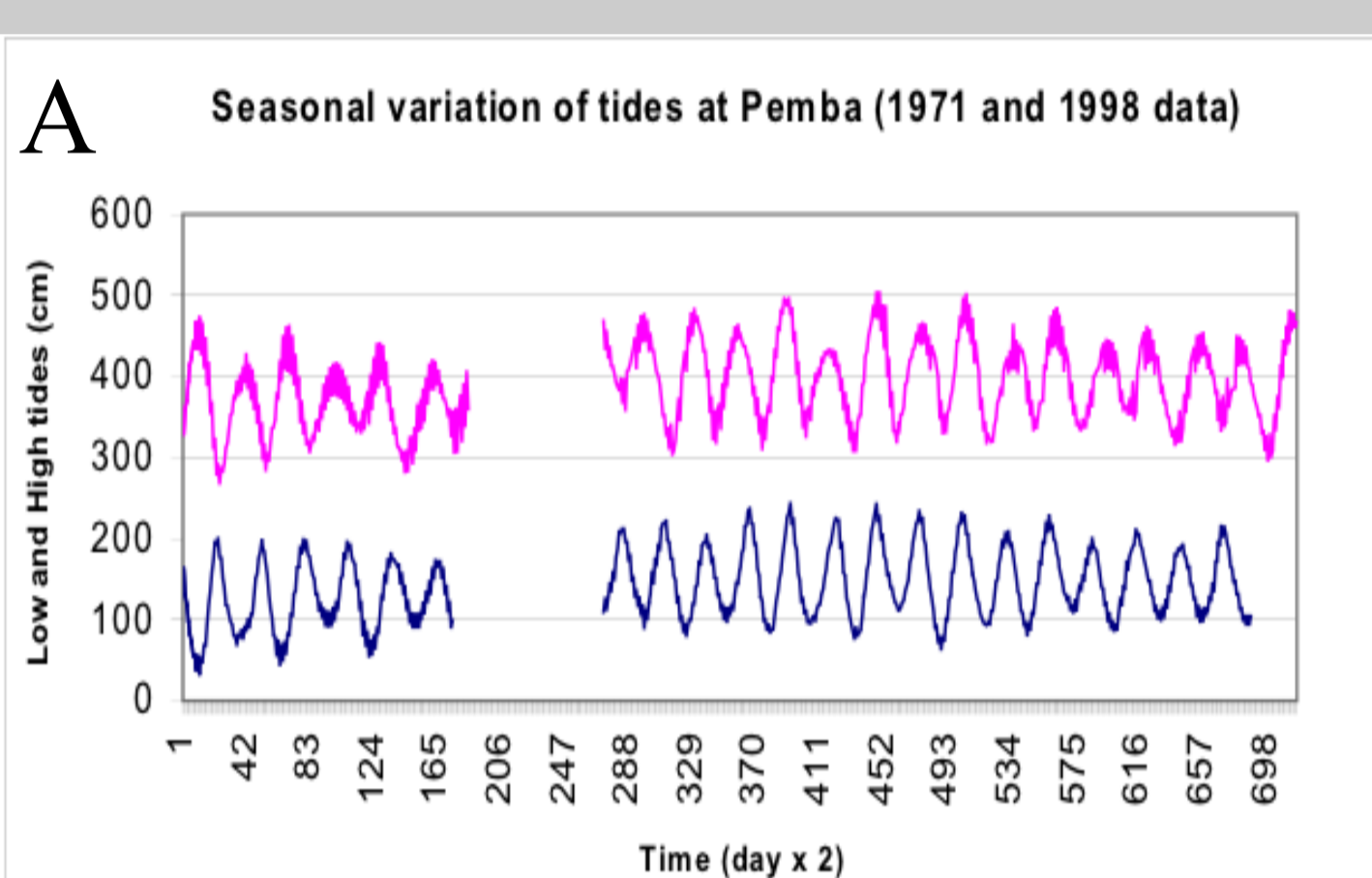


Figure 2- Tidal height at Pemba harbor in 1971 and 1998 (A). Mean Sea Level obtained from about 5 years (B).

Source: Sete C., et al, 2002

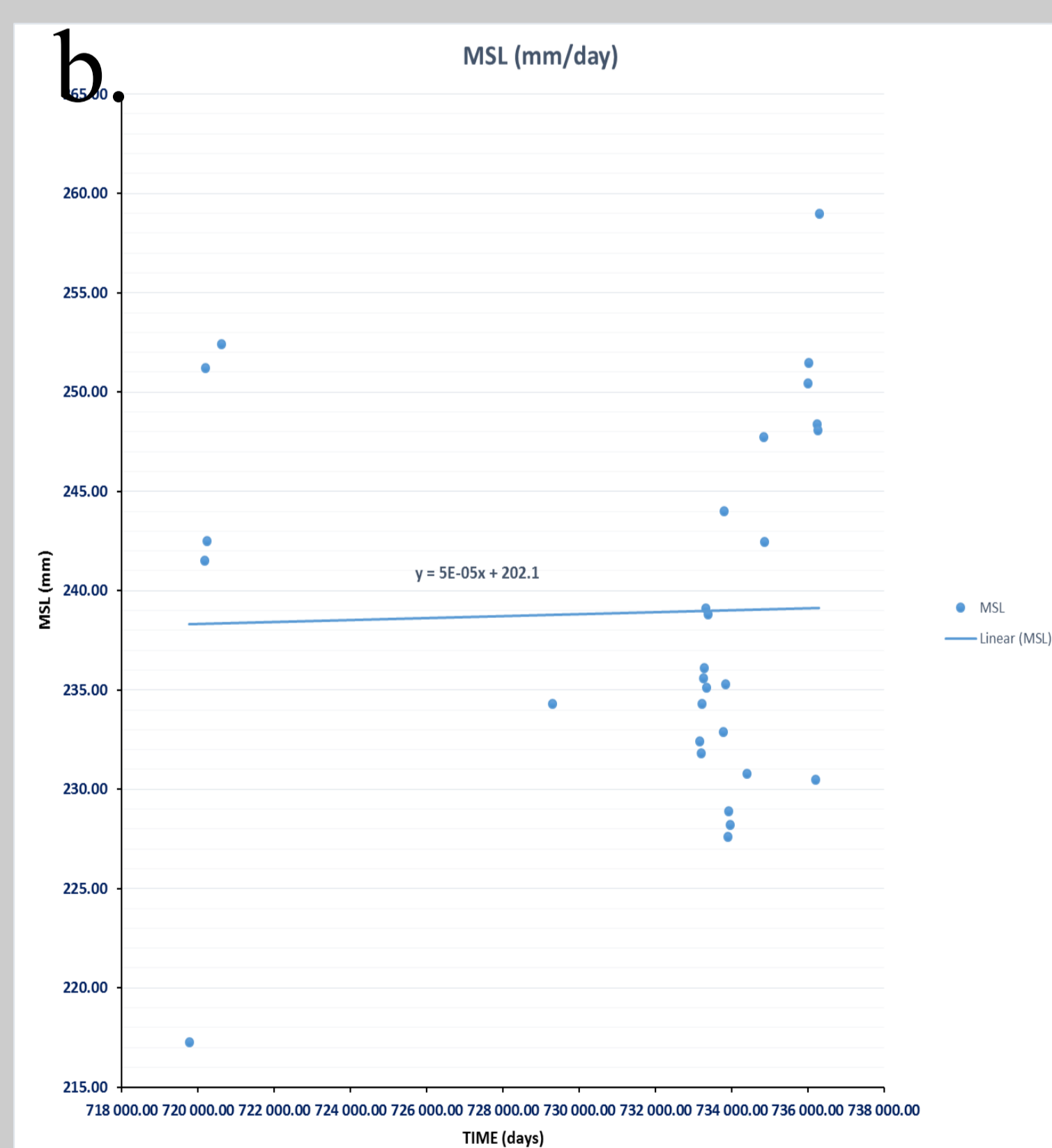
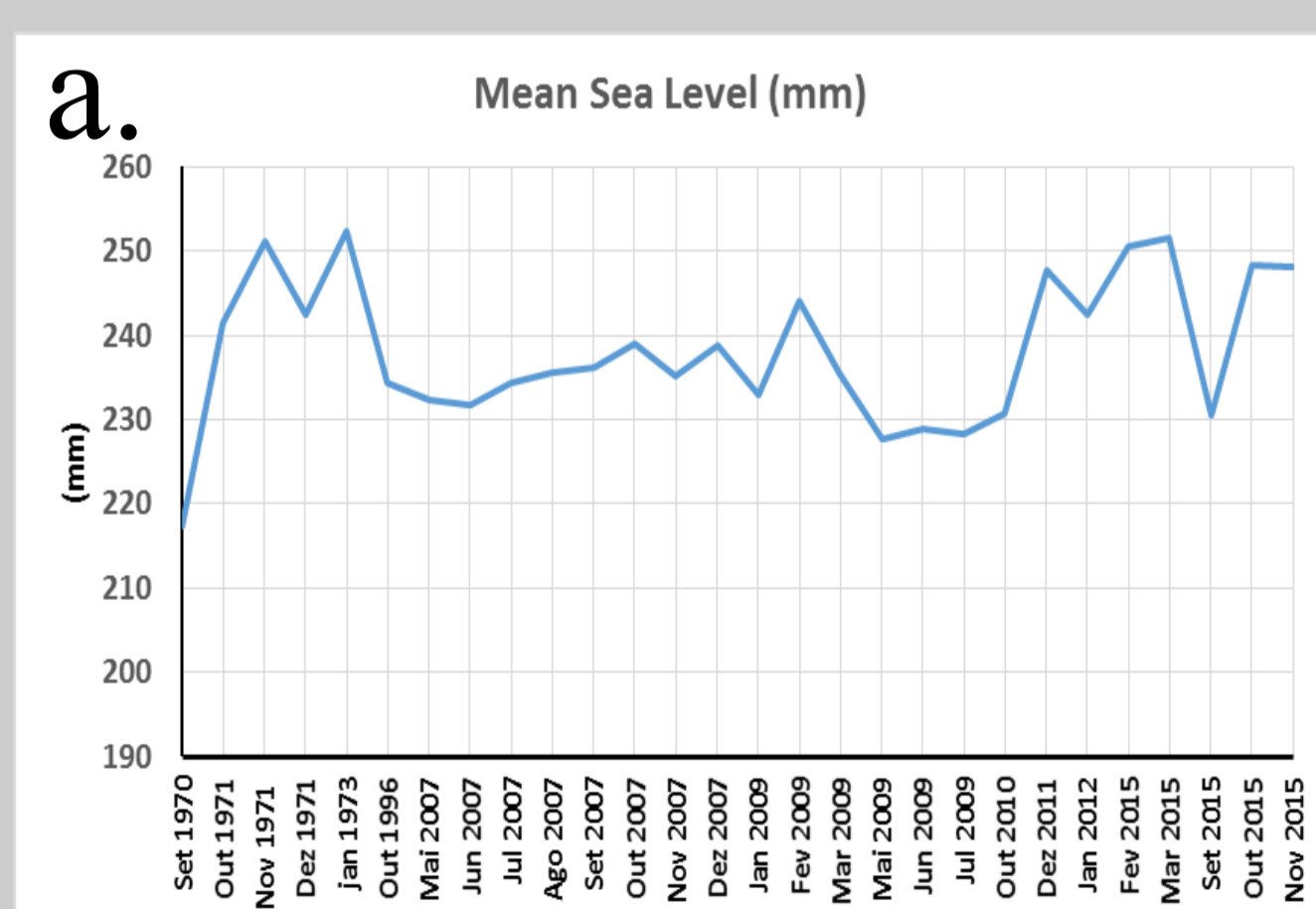


Figure 3- Graphic a. is a characteristic time series of monthly mean sea level at Pemba and graphic b. is inter-annual Mean Sea level with fitted linear trend

4. Results and Discussion

• The presented results has shown that Pemba Station exhibits annual and inter-annual variability of sea level

• Figure 3a shows that within the 3 months of 1971 (Oct, Nov and Dec) the trend has been increased to +10mm, from Oct to Nov and then decreased in -10mm from November to December