

Long-Period Mean Sea Level Oscillations in Magueyes Island (1955-2012)

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Abstract

Empirical Mode Decomposition (EMD) analysis was performed on monthly mean sea level data recorded between years 1955-2012 by NOAA/NOS/CO-OPS tide gauge located in Magueyes Island, southwest of Puerto Rico. The analysis revealed that the first intrinsic mode function (IMF), named C1, shows a 90-120 days' time scale; this physical signal time scale corresponds to the period of Rossby waves moving to the west along the Caribbean Sea (Hughes C. W. et al., 2016). The third IMF, C3, shows an annual time scale corresponding to the annual tides, with maximum amplitudes occurring between September and November. The fourth IMF, C4, shows 2-3 years oscillations, with an average of 30 ± 7 months. This time scale is comparable with the one observed in tropical stratospheric winds (Newman P. A. et. al., 2016). The fifth IMF, C5, shows 5-8 years oscillations. The main influence of the 8.85 year cycle of lunar perigee on high tides occurs as a quasi-4.4 year cycle. About every 4.4 years, the Sun is coincident with the line of apsides. But C5's oscillation is much longer than 4.4 years and shorter than 8.85 years. Then C5 are not long term tidal oscillations. The last IMF, C6, shows 12-18 years oscillation in MSL. At this time we can't associate any physical phenomena to C5 and C6 IMFs.

Note: The amplitude was expressed in meters.

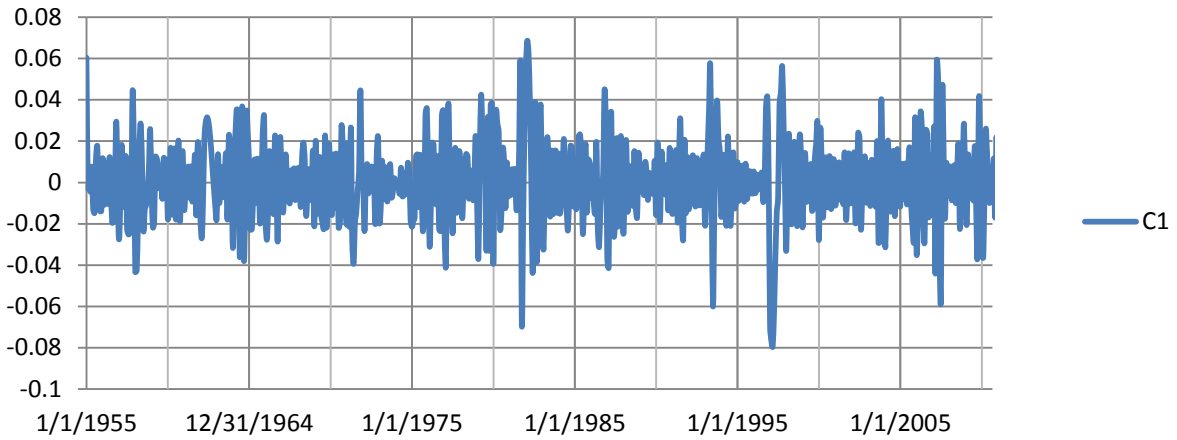
References

Hughes, Chris W.; Williams, Joanne; Hibbert, Angela; Boening, Carmen; Oram, James (2016). "A Rossby whistle: A resonant basin mode observed in the Caribbean Sea". *Geophysical Research Letters*. **43** (13): 7036–7043. doi:[10.1002/2016GL069573](https://doi.org/10.1002/2016GL069573)

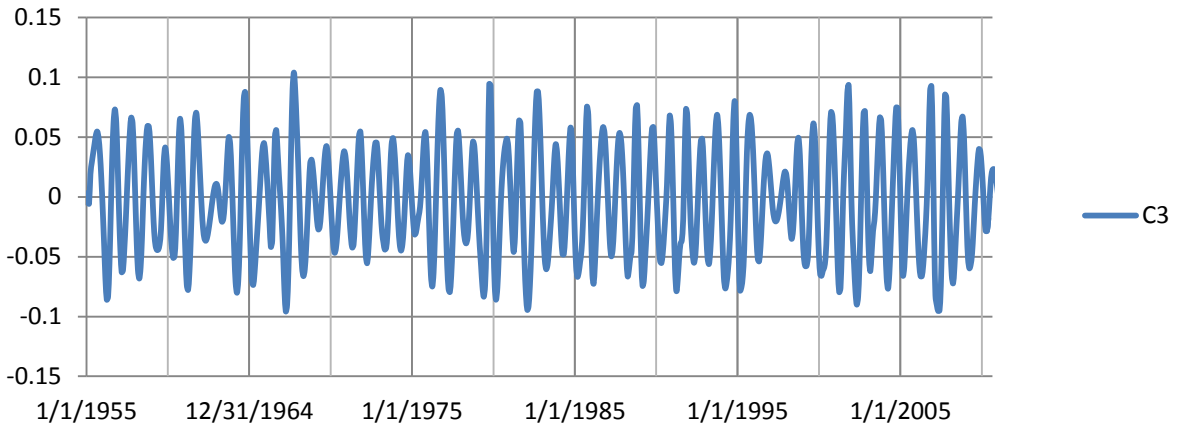
P. A. Newman, L. Coy, S. Pawson, L. R. Lait. **The anomalous change in the QBO in 2015-2016**. *Geophysical Research Letters*, 2016; DOI:[10.1002/2016GL070373](https://doi.org/10.1002/2016GL070373)

<http://www.geo.fu-berlin.de/en/met/ag/strat/produkte/qbo/>

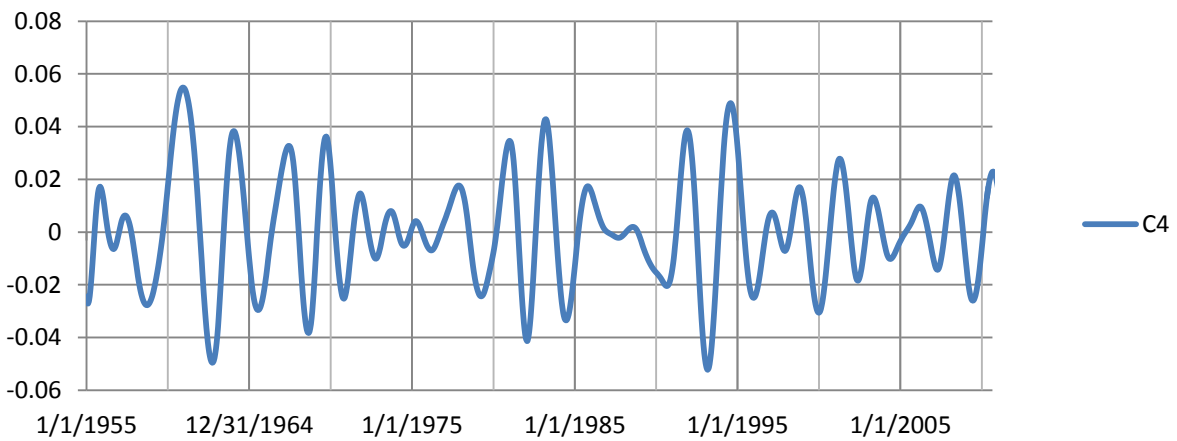
90-120 Days Water Level Oscillations at Magueyes Island



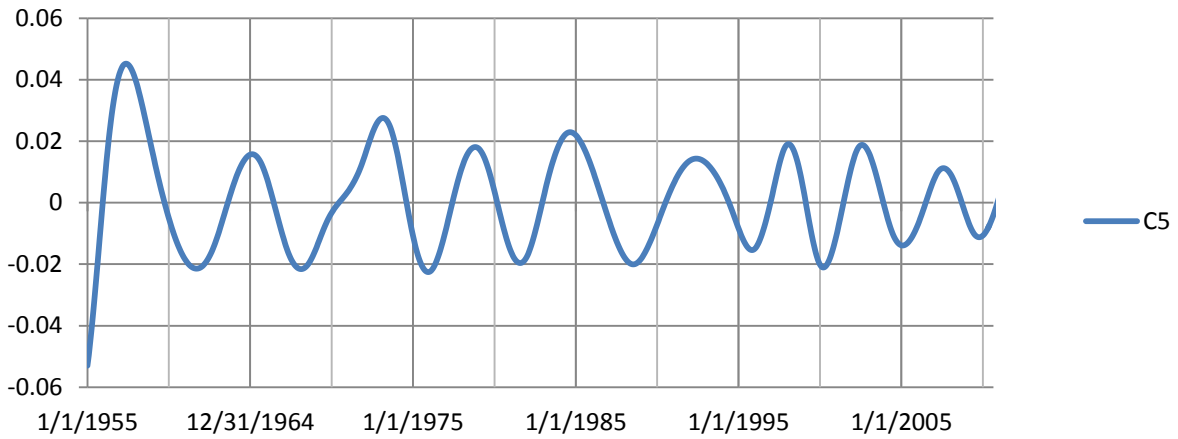
Annual Water Oscillations at Magueyes Island



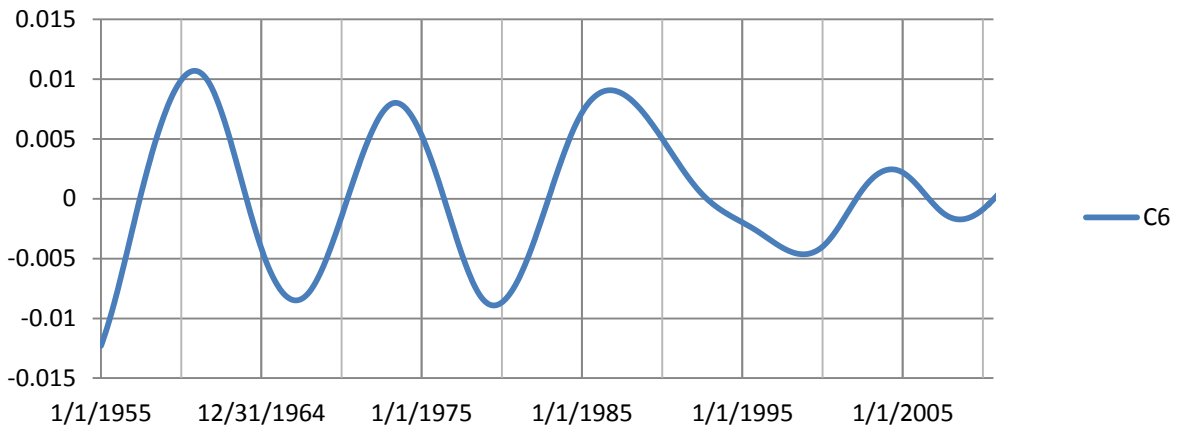
2-3 Years Water Oscillations at Magueyes Island



5-8 Years Water Oscillations at Magueyes Island



12-18 Years Water Oscillations at Magueyes I.



Magueyes I. MSL Trend 1955-2012

