The linear trend (LT) is commonly used to quantify sea-level change, often over short periods due to data limitation. For example, since the launching of Topex/Poseidon altimeter which provides continuous near-global coverage of sea-level measurement, there are many studies examining sea-level LT over the available altimeter era (5~18 years). Nonetheless, there are also large-scale climate drivers of oscillatory nature which can also affect sea-level on decadal to inter-decadal time scales and make LT derivation over short period (<20 years) questionable. A simple mathematical prototype model is developed for better understanding the relationship between LT and background climate oscillations. Assume a time series is composed of two components: one is oscillatory, the other is linear. The sensitivity of LT of this time series to definition base period (starting and ending points, its length) is explored. Even if only the oscillatory component is kept, LTs can still be erroneously derived with various magnitudes. For the regional sea-level distribution (with global mean removed) in the Pacific Ocean, LT over 1993-2008 can be explained quite well by the LT of background climate driver, i.e., the Pacific Decadal Oscillation (PDO). Findings from above mathematical model indicate that sea-level data over at least 75~100 years are needed for regional sea-level LT can be confidently derived with negligible influences (±6~10% error) from the PDO. Consequently, although it’s tempting to use current-day altimeter-based regional sea-level LT as reference for future climate projections or historical reconstruction scenarios, such practice need to be treated with caution as conclusions drawn could be misleading.