
Spatial Variability of Relative Sea Level Rise in the Texas Coastal Bend

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ABSTRACT

Eustatic SLR has been extensively measured and discussed. Rates of SLR have been estimated at 1.7 +/- 0.2 mm/yr for the 20th century based on tide gauge measurements and at 3.3 mm/yr +/- 0.4 mm/yr for the period 1993–2015 based on satellite altimetry. While rates of global SLR are important, local rates of relative sea level rise (RSLR), combining vertical land motion and SLR, are more relevant to coastal communities. RSLR varies along the Texas Coast with rates estimated by the National Oceanic and Atmospheric Administration (NOAA). They are higher in North Texas, e.g., 6.3 +/- 0.2 mm/yr for Galveston Pier 21, and lower in South Texas, e.g., 3.8 +/- 0.4 mm/yr for Port Isabel. RSLR can also vary at a smaller spatial scale. The Texas Coastal Bend has been home to over 12 tide gauges from NOAA's National Water Level Observation Network (NWLON) and the Texas Coastal Ocean Observation Network (TCOON) from Port Mansfield to the south of the Coastal Bend to Copano Bay to the north. For most of these tide gauges the time series are shorter than the 30 years used by NOAA to estimate RSLR with sufficient precision. On the shorter time scales of days to months to a few years RSLR variability is caused by atmospheric and steric variability as well as potential fluid extraction. Given their relative proximity the Coastal Bend Tide gauges experience similar weather and ocean current variability allowing to correlate their water level variability, discuss it in the context of changes in climatic indexes, such as the Multivariate ENSO Index (MEI), and compare their RSLR. RSLRs are estimated for the Coastal Bend locations and range from 2.8 mm/yr to 7.2 mm/yr when computed over the 1993–2015 time span. The differences are discussed in the context of their local coastal geological setting.