Sea Levels Online

http://tidesandcurrents.noaa.gov/sltrends/sltrends.shtml

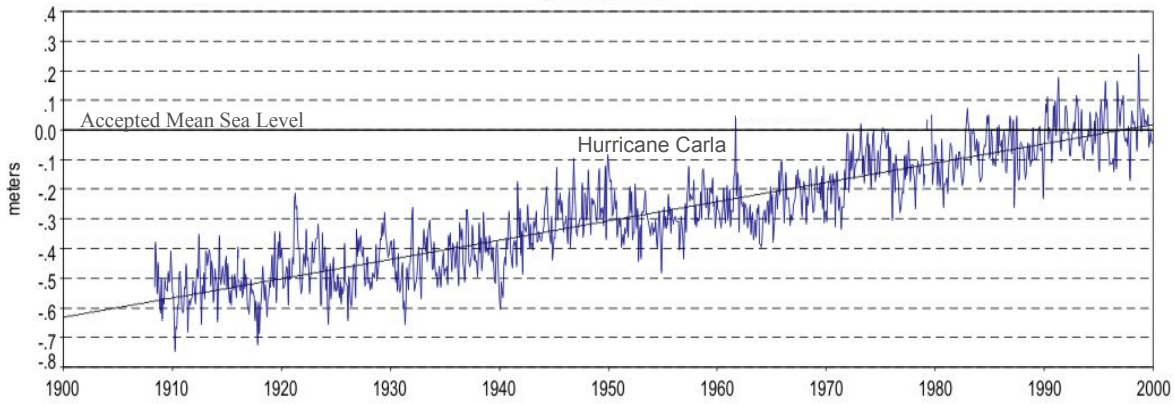

Figure 1. Sea Level Variations and Trend for Galveston Pier 21, Texas
where the Mean Sea Level Trend is 6.5 mm/yr (2.13 ft/century).

The NOAA's National Ocean Service (NOS) Center for Operational Oceanographic Products and Services (CO-OPS) is providing a creative new web-based product to disseminate the latest information on nationwide sea level variations and trends. This product provides information on the long-term trends and the monthly, seasonal, interannual, and decadal variations of mean sea level (MSL) at 117 coastal water level stations which have at least 25 years of data. These new web pages contain graphics and analyses that provide timely information to many diverse users such as coastal zone managers and engineers who have a vested interest in the future health and safety of our coastal environment.

Sea level rise is an extremely important issue to humanity because of its potential to negatively alter the habitability of coastal regions and the ability of coastal ecosystems to function. On a global scale, an estimated 37% of the world's population in 1994 lived within 70 miles of a coast. In the United States alone, approximately 50% of the population lives within 50 miles of a coast. The effects of sea level rise include inundation of low-lying areas and coastal wetlands, increased coastal flooding due to storms, salt water intrusion into aquifers, higher water tables and the erosion of beaches and shoreline. The consensus of the science community is that the present global rate of sea level rise is about 2.0 mm/yr. However, the current global climate models predict global warming and a resulting increased rate of sea level rise in the next century. The economic and social problems could be significant requiring expensive mitigation strategies for beach re-nourishment, marsh restoration, protection of coastal cities and infrastructure, and potential population re-location. Along with the long-term trends in sea level, the variations in monthly mean sea level due to events such as the El Niño /La Niña cycle are also indicators of climate change. Changes in the frequency and intensity of these events, and the ability to predict them, are subjects of scientific research.

When long-term changes in coastal water level are measured from a fixed point on land, one is observing the difference between two independent variables – the level of the ocean and the level of the land. Long-term changes in sea level can be caused by changes in ocean temperatures, salinity, and currents and in atmospheric pressure and winds. Sea level also varies with changes in the total amount of water in the ocean basins due to melting of the ice masses. Long-term changes in land elevation can be caused by vertical tectonic motions due to glacial rebound or

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plate boundary interactions, volcanic processes, deposition and compaction of sediments, or the extraction of oil, gas, or water. Figure 1 shows the sea level trend for Galveston Pier 21, Texas, which has been rising at a rate of 6.5 mm/yr due to land subsidence from oil, gas, and water extraction.

Once a station is chosen in this new web-site, the user is provided with the calculated MSL trend, its standard error, the period of data on which the trend is based, and a plot showing the MSL time series with the average seasonal cycle removed. Links to additional plots can then be accessed displaying the average seasonal cycle, the interannual variations which are updated each month as new monthly MSL data becomes available, and the decadal variations of 50-year trends at the stations with the longest data sets.

The main web page has a link to a map showing different MSL trend ranges (Figure 2) which indicates the differing rates of vertical land motion. In general, the stations with MSL trends between 0 and 3 mm/yr are relatively stable with minimal vertical land movement; if the trend is greater than about 3 mm/yr, the land is sinking and if the trend is less than 0 mm/yr, the land is rising.

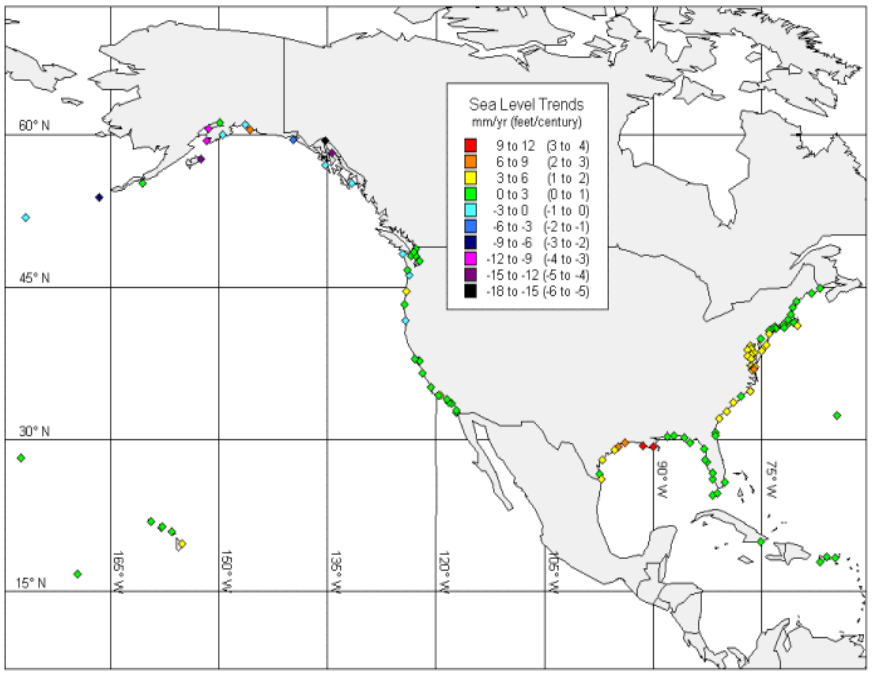

Figure 2. Mean Sea Level Trends for the U.S.

The main web page also has a link to a map showing the latest monthly MSL anomalies which displays the stations with a positive anomaly in red and the stations with a negative anomaly in blue revealing the regional extent of anomalous water levels. An animation shows the regional extent of the 1997-1998 El Niño and the 2000-2001 La Niña events. The interannual variation plots for each station and the anomaly map will be updated monthly providing users with online access to the latest mean sea level information. The latest interannual variation plot for San Francisco shows the onset of El Niño in December 2002 (Figure 3).

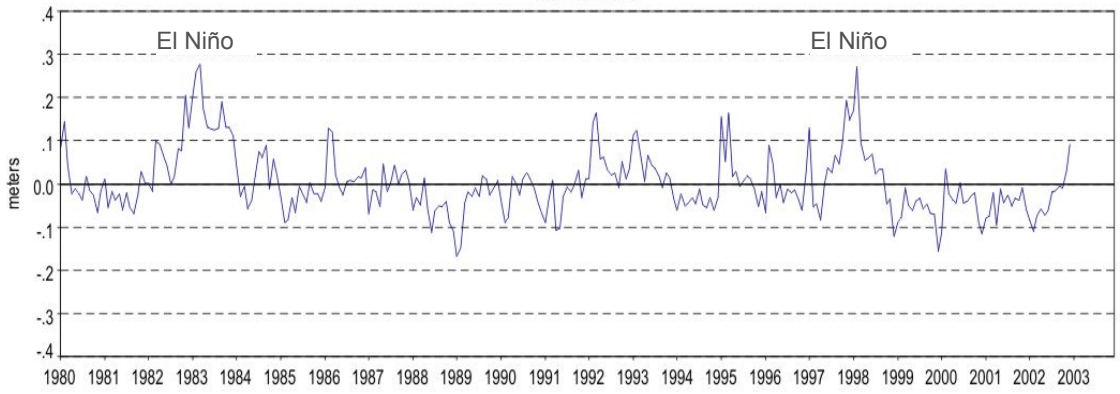

Figure 3. Interannual Variation of Mean Sea Level from 1980 to the Present at San Francisco, CA

CO-OPS collects, analyzes and distributes historical and real-time observations and predictions of water levels, coastal currents, and other meteorological and oceanographic data. The Center manages the National Water Level Program, the national network of Physical Oceanographic Real-Time Systems(PORTS ®) in major U.S. harbors, and the National Current Program.