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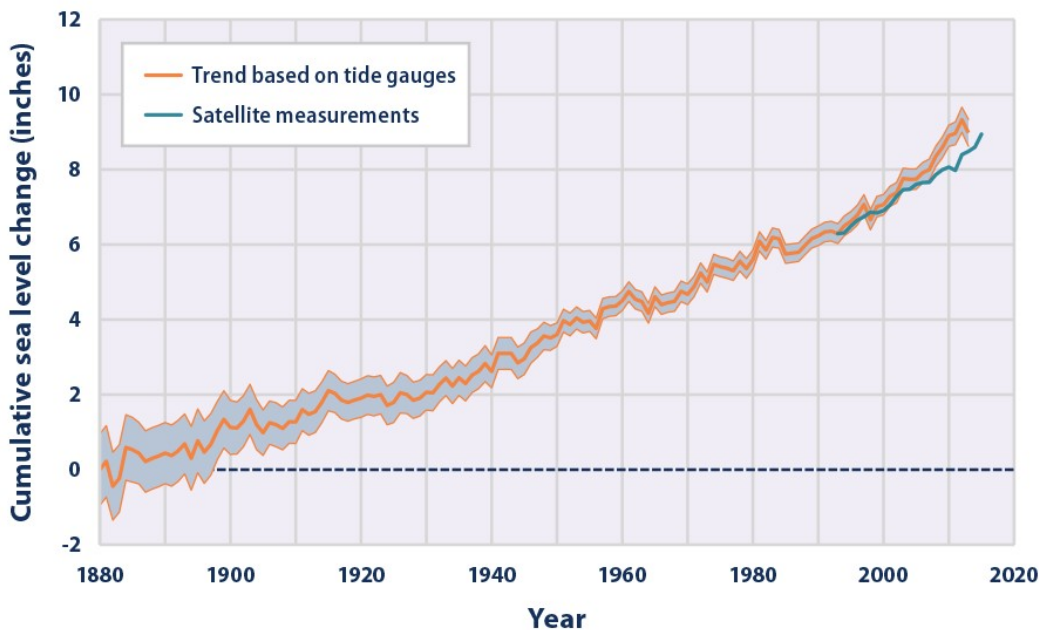


## Climate Change Indicators: Sea Level

This indicator describes how sea level has changed over time. The indicator describes two types of sea level changes: absolute and relative.



**Figure 1.** Global Average Absolute Sea Level Change, 1880–2015

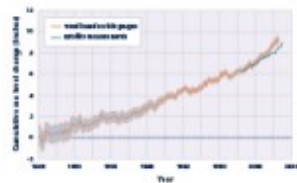


This graph shows cumulative changes in sea level for the world's oceans since 1880, based on a combination of long-term tide gauge measurements and recent satellite measurements. This figure shows average absolute sea level change, which refers to the height of the ocean surface, regardless of whether nearby land is rising or falling. Satellite data are based solely on measured sea level, while the long-term tide gauge

data include a small correction factor because the size and shape of the oceans are changing slowly over time. (On average, the ocean floor has been gradually sinking since the last Ice Age peak, 20,000 years ago.) The shaded band shows the likely range of values, based on the number of measurements collected and the precision of the methods used.

Data sources: CSIRO, 2015;<sup>3</sup> NOAA, 2016<sup>4</sup>

Web update: August 2016



**Figure 1.** Global Average Absolute Sea Level Change, 1880–2015



**Figure 2.** Relative Sea Level Change Along U.S. Coasts, 1960–2015

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## Key Points

- After a period of approximately 2,000 years of little change (not shown here), global average sea level rose throughout the 20<sup>th</sup> century, and the rate of change has accelerated in recent years.<sup>1</sup> When averaged over all of the world’s oceans, absolute sea level has risen at an average rate of 0.06 inches per year from 1880 to 2013 (see Figure 1). Since 1993, however, average sea level has risen at a rate of 0.11 to 0.14 inches per year—roughly twice as fast as the long-term trend.
- Relative sea level rose along much of the U.S. coastline between 1960 and 2015, particularly the Mid-Atlantic coast and parts of the Gulf coast, where some stations registered increases of more than 8 inches (see Figure 2). Meanwhile, relative sea level fell at some locations in Alaska and the Pacific Northwest. At those sites, even though absolute sea level has risen, land elevation has risen more rapidly.
- While absolute sea level has increased steadily overall, particularly in recent decades, regional trends vary, and absolute sea level has decreased in some places.<sup>2</sup> Relative sea level also has not risen uniformly because of regional and local changes in land movement and long-term changes in coastal circulation patterns.

## References

- <sup>1</sup>. Titus, J.G., E.K. Anderson, D.R. Cahoon, S. Gill, R.E. Thielert, and J.S. Williams. 2009. Coastal sensitivity to sea-level rise: A focus on the Mid-Atlantic region. U.S. Climate Change Science Program and the Subcommittee on Global Change Research. <https://downloads.globalchange.gov/sap/sap4-1/sap4-1-final-report-all.pdf>.
- <sup>2</sup>. University of Colorado at Boulder. 2016. Sea level change: 2016 release #2—trend map. Accessed June 2016. <http://sealevel.colorado.edu>.
- <sup>3</sup>. CSIRO (Commonwealth Scientific and Industrial Research Organisation). 2015 update to data originally published in: Church, J.A., and N.J. White. 2011. Sea-level rise from the late 19<sup>th</sup> to the early 21<sup>st</sup> century. *Surv. Geophys.* 32:585–602. [www.cmar.csiro.au/sealevel/sl\\_data\\_cmar.html](http://www.cmar.csiro.au/sealevel/sl_data_cmar.html).
- <sup>4</sup>. NOAA (National Oceanic and Atmospheric Administration). 2016. Laboratory for Satellite Altimetry: Sea level rise. Accessed June 2016. [www.star.nesdis.noaa.gov/sod/lisa/SeaLevelRise/LSA\\_SLR\\_timeseries\\_global.php](http://www.star.nesdis.noaa.gov/sod/lisa/SeaLevelRise/LSA_SLR_timeseries_global.php).
- <sup>5</sup>. NOAA (National Oceanic and Atmospheric Administration). 2016 update to data originally published in: NOAA. 2009. Sea level variations of the United States 1854–2006. NOAA Technical Report NOS CO-OPS 053. [www.tidesandcurrents.noaa.gov/publications/Tech\\_rpt\\_53.pdf](http://www.tidesandcurrents.noaa.gov/publications/Tech_rpt_53.pdf).

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