

Sea-Level Rise IQuest



Figure 1: Sentinel-6 Michael Freilich mission Image credit: NASA

Did you know that global sea level has been rising over the past century, and the rate of increase has accelerated in recent decades? In this IQuest, you will learn about sea level rise and better understand how it is impacting us around the world. We will focus on the many ways in which NASA and other satellite observations are being used to help us better understand sea-level rise. We will also share information on a few of the NASA “Super Heroes” who are working day in the day out to help us understand and potentially mitigate some of the dangers posed by sea-level rise.

In the five years since NASA’s last sea level rise communications campaign, continuing satellite and other observations show with increasing certainty that global sea level rise is accelerating. Ice sheet loss in Greenland and Antarctica is a major contributor to accelerating global sea level rise. NASA is studying Antarctic and Greenland ice sheet loss along with ocean warming and mountain glacier melt to inform sea level rise projections and climate models.

Sea level rise is beginning to creep up on the U.S. West Coast, which, until about five years ago, had remained relatively stable for the last few decades, while rising waters continue to transform life in regions such as the southern and eastern coasts of the United States. The sinking and uplift of Earth, changes in land water storage, ocean currents and ocean-atmosphere climate variability, and changes in ice mass due to melting ice sheets contribute to the geographic variability of sea level rise. Rising sea levels cause nuisance flooding, worsen the impact of coastal flooding from storms, and are disrupting economies and otherwise rewriting life in population centers as well as destroying coastal habitat in the United States and around the world.

NASA is co-developing the latest in a series of satellites set to launch in November that measures ocean surface height and is also partnering with organizations of all stripes on a broad swath of sea level rise initiatives. NASA is partnering with the European Space Agency, NOAA and EUMESTAT on the [Sentinel-6 Michael Freilich](#) satellite, set to launch in November, to continue 28 years of ocean height measurements.

NASA is building models that will show how particular cities may be impacted by ice sheet melt from different regions and is developing tools to assess regional nuisance and other flooding. With the support of local partners, NASA is in the field in the Mississippi River Delta to better understand why sea level rise is causing some parts of the delta to disappear while others remain untouched. As we will learn in this IQuest, we need to look at the underlying causes for both global sea level rise and for the changes that occur at regional levels as well.

So, let's get started and learn about sea-level rise. Go to the [NASA Climate Change and Global Warming](#) website. Note the five "vital signs" which we use to determine the overall health of our planet. Click on "SEA LEVEL" to open up additional information. On the left, you see a graph which uses historical data derived from ground observations which shows the rate of global sea-level rise from 1870 through 2013. This historical data was from coastal tide gauge records. To the right of this graph, you will see the satellite data from 1993 to the present time which have been obtained from satellite data. Both of these graphs are showing us the rate of change over the years, which helps us to understand how quickly the global sea-level is rising.

Watch "[Sea Level Rise](#)" (1:30) to learn more about sea level rise and how NASA satellites are helping us better understand the impacts we will face. As you have learned, the main causes of sea level rise are ice melt and the heat-driven expansion of ocean water. We can look at both global sea level as well as regional sea level to better understand the contributing factors.

How will sea level rise impact us? Go to NASA's [Rising Waters website](#) and scroll down to "Four Impacts of Sea Level Rise" and read over the information that helps explain the wide range of factors which contribute to sea level rise. Earth's system is composed of many interacting spheres, and thus it truly takes a multidisciplinary approach. Have you experienced "sunny day flooding" where you live?

Another way of looking at sea level rise is to examine the factors that come into play at both the global and the regional scales. We will start with [global sea level rise](#). The causes of global sea level rise include [ice melt](#), [thermal expansion](#), and [land water storage](#). Looking at sea level rise only from the global perspective will not provide the finer models to help us gauge how specific regions will be impacted by rising seas in the future.

Therefore, we also look at the factors which are resulting in [regional sea level](#) rises as well. When ice sheets and glaciers melt, or when the water cycle changes, sea level changes may vary greatly from one location to another. Due to the loss of ice, water is being re-located around our home planet. As a result, Earth's shape, our gravity field, and how it is rotating are all changing. These factors; water mass change, subsidence, sterodynamics, and short-term effects; can play a role in determining how much regional sea levels may change.

Watch “[New U.S.- European Satellite Tracking Sea Level Rise](#)” (2:14) and see how we plan to work together internationally to track and understand sea level rise like never before. Meet the amazing STEM “Super Heroes” behind this spacecraft [here](#).

[This infographic](#) about sea level rise helps synthesize how we know sea level rise is occurring and the many ways which NASA missions are contributing to our better understanding and responding to the challenges we will face ahead of us.