

→ OCEAN WARMING

ESA's Climate Change Initiative (CCI) is monitoring five variables that give an important view of the evolving state of the Earth's oceans

Knowledge of the evolution of sea surface temperature over time is essential to climate science. Most of the energy gained within Earth's climate is 'used' to warm the oceans; therefore, oceans regulate the pace of global warming. Sea surface temperature changes modify weather patterns and influence the seasonal weather, such as droughts, from year to year. Under a dedicated CCI project, sea surface temperature measurements from space have provided a crucial and sensitive verification of measurements of ocean surface warming.

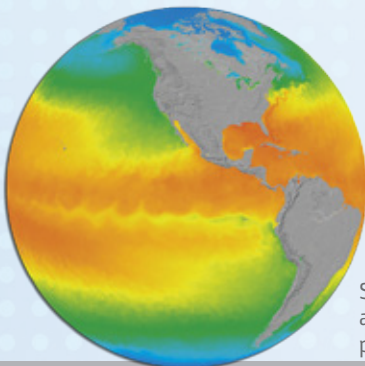
Sea levels are rising at around 3.5 cm per decade, and this can be detected from space. About 1 cm of this comes from thermal expansion caused by the warming oceans, i.e. as the oceans warm they expand. Around 1.9 cm comes from melting land ice, such as ice sheets and glaciers, whilst the rest is from changes in the amount of water stored on land.

Measurements from space give a picture of the geographical variation of sea-level rise around the world, which otherwise would not be clear from the sparse measurements of tide gauges. This level of detail helps scientists to confirm their ideas about the different contributions to recent sea-level rise, which in turn can be used to predict future change. This is of particular importance to low-lying coastal populations.

Wave patterns or roughness across the ocean surface, known as sea state, can also contribute to coastal flooding. Sea state plays a role in climate too, influencing ocean-atmosphere exchange of heat and gases and also the ocean surface albedo. Using satellite observations, the CCI is generating multidecadal data records to help study changing sea state trends and inter-annual variability in response to long term climate patterns.

Ocean colour measurements detect subtle changes in the colours present in light scattered from the ocean. These changes can be linked to the chlorophyll (green pigment) of microscopic plants floating in the near-surface waters. These plants are at the bottom of the food chain, and play a crucial role in the oceans' absorption of the greenhouse gas carbon dioxide.

The saltiness, or salinity, of the sea surface affects the circulation of our oceans and its capacity to store heat and carbon. Unlike sea surface temperature, which have been measured from space for over 3 decades, the technology to measure sea surface salinity from space has only recently emerged. The CCI is now starting to generate global data records to help interpret the response of sea surface salinity to the long term warming of climate.



Sea Surface Temperature (SST) as produced by the SST CCI project.

