Ocean acidification

Ocean carbon uptake and acidification

Anthropogenic carbon dioxide (CO₂) emissions and ocean uptake of CO₂ cause ocean acidification. The latter term refers to the decreasing pH of seawater due to the formation of carbonic acid. pH measurement is critical to understanding the ongoing impact of anthropogenic CO₂ emissions on the ocean. Data can provide evidence that CO₂ emissions are leading to increasing ocean acidity.

Ocean acidification is identified by climate models as a Global Climate Indicator - one of the key parameters used to determine the effects of climate change. Observations show that the ocean pH is decreasing at an accelerating rate. This mandates measurement of pH and other biogeochemical variables in order to determine future projections of climate change impacts. The ocean is “saturated’ with CO₂ industrially, and the future is expected to be constantly monitored through sustained measurements, helping to sustain and expand our understanding of the ocean’s changing chemistry, including decreases in seawater pH, as well as decreases in carbonate ion concentrations.

Ocean acidification observations, following agreed guidelines and best practices, are used to report on the Ocean Acidification Global Climate Indicator, as well as to support nation commitments to the United Nations Framework Convention on Climate Change. The Ocean Acidification Indicator serves as an early warning to nations and the Sustainable Development Goal (SDG) 14 to ensure the conservation and sustainable use of the oceans, seas, and marine resources. Ocean acidification has been recognized as detrimental to sea life and ocean services, needs to be constantly monitored through sustained measurements, helping to sustain and expand our understanding of the ocean’s changing chemistry, including decreases in seawater pH, as well as decreases in carbonate ion concentrations.

The Argo vision for a global full-depth and high-resolution ocean observing system has been achieved through an unprecedented, multi-agency collaboration of scientists as a Global Climate Indicator - one of the key parameters used to determine the effects of climate change. Ocean pH and other biogeochemical variables are monitored by an extensive array of autonomous profiling floats and gliders, providing in situ ocean carbonate chemistry measurements, multidisciplinary moorings, and in-situ observations on climate change. Several JCOMM projects allow the collection of ongoing ocean acidification measurements, including the World Ocean Monitoring (WOM) effort, the GOA-ON, the Ocean Acidification Research and Observing Network (OAR), and the Global Ocean Survey (GOS).

Partnerships

Scientific collaborations

The Argo program exemplifies international scientific cooperation, with more than 150 international partners from 60 countries. The Argo Global Ocean Data Analysis Office (GOA-ON) provides strategic and technical advice to the Global Ocean Observing System (GOOS) and the Intergovernmental Oceanographic Commission (IOC). The GOA-ON is responsible for the strategic organization of the Argo Program, ensuring that the data generated by the program is of the highest quality and available to the scientific community. In 2019, a new initiative, the Ocean Carbon and Nitrogen Assimilation (OCN) project, was launched with the aim of better understanding the carbon cycle and its role in climate change.

In 2018, an international group of meteorologists and oceanographers, the Global Ocean Forecast System (GOF) team, provided observations during the NASA GOES-17 launch through the Global Ocean Data Analysis Office (GOA-ON). In addition, information on ocean acidification was provided by the Intergovernmental Oceanographic Commission (IOC).

Private sector and citizens

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Scientific collaborations, including the Ocean Carbon and Nitrogen Assimilation (OCN) project, allow for the provision of timely, high-quality data to the scientific community, which can be used to better understand the role of the ocean in the global carbon cycle and its impact on climate change. The OCN project aims to enhance the understanding of the carbon cycle and its role in climate change. The OCN project is an example of the success of scientific collaborations in the field of ocean acidification and climate change.

The Ocean Acidification Information System (OAIS) is a comprehensive platform for sharing information on ocean acidification, including data on ocean pH and other biogeochemical variables. The OAIS provides a means for scientists, policy makers, and the public to access and use the latest data and information on ocean acidification.

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IN SITU AND SATELLITE OBSERVING SYSTEM STATUS

In 2018, marine weather and climate observations affected about 50 million people with every $1 US invested in observing systems generating $6 in economic output. This impact is recognized by the international community as the observing systems are having a significant positive impact on science, society, and the economy. Over the last decade, significant improvements have been confirmed as the four warmest years on record and with an unprecedented increase of carbon dioxide levels part of the globe impacted by climate change.

Observations enhance quality of weather forecasts and support societal decisions. This year – adding to our knowledge on record and with an unprecedented increase of carbon dioxide levels, the four warmest years on record and with an unprecedented increase of carbon dioxide levels. With the current climate change trend, we face challenges to take decisions related to the complexity of the marine environment and the state of the ocean observing systems to reduce the impacts of climate change. The impact of climate change is a growing concern and the observing system is a key role in reducing risks, providing better information in real-time, and long duration high-resolution monitoring. This is why it is crucial to have in situ observations of the high-resolution monitoring. A more efficient protection of ecosystems. To better understand the ocean, we need more accurate and high-quality data needed for detection of ocean surface variability and change as well as the marine ecosystem health. Deep ocean variability.

The global ocean observing system networks are fundamental in providing critical data to support marine science, operations. They are also crucial for providing quantifiable measurements to support ocean management and marine scientific research. The ocean observing system is a key role in reducing risks, providing better information in real-time, and long duration high-resolution monitoring. This supports operational and research applications along with improved understanding of global climate. The current increase of carbon dioxide levels is crucial for providing scientific assessments to support marine science, operations, and improving emergency response planning for extreme events. They are also crucial for providing operational measurements to support ocean management and marine scientific research. The ocean observing system is a key role in reducing risks, providing better information in real-time, and long duration high-resolution monitoring. This supports operational and research applications along with improved understanding of global climate. The resources available for sustained ocean monitoring are insufficient. In particular for biological and biogeochemical components of the ocean. It is essential to ensure the continuity of satellite missions in the future. It is also imperative to reinforce the international cooperation and collaborative working groups on ocean assimilations.