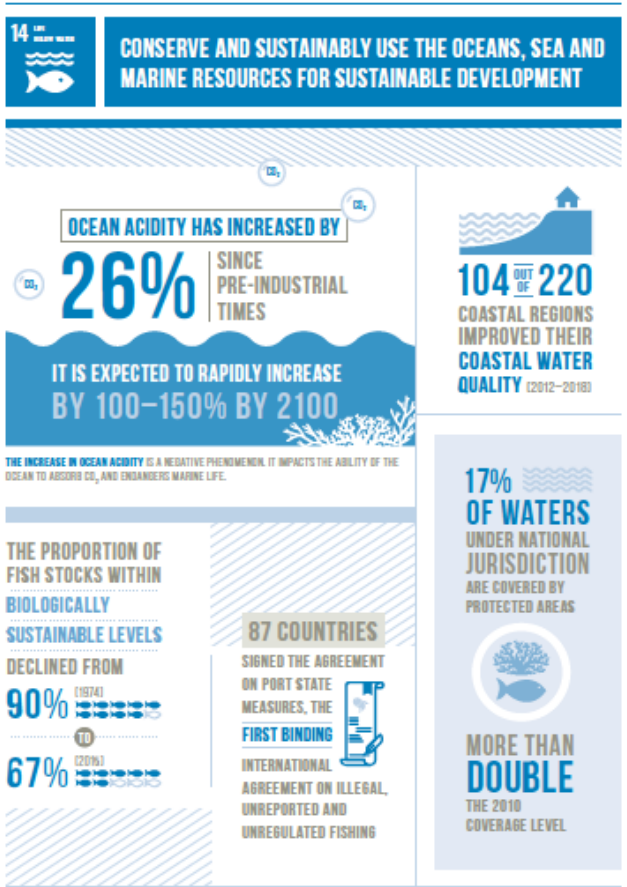
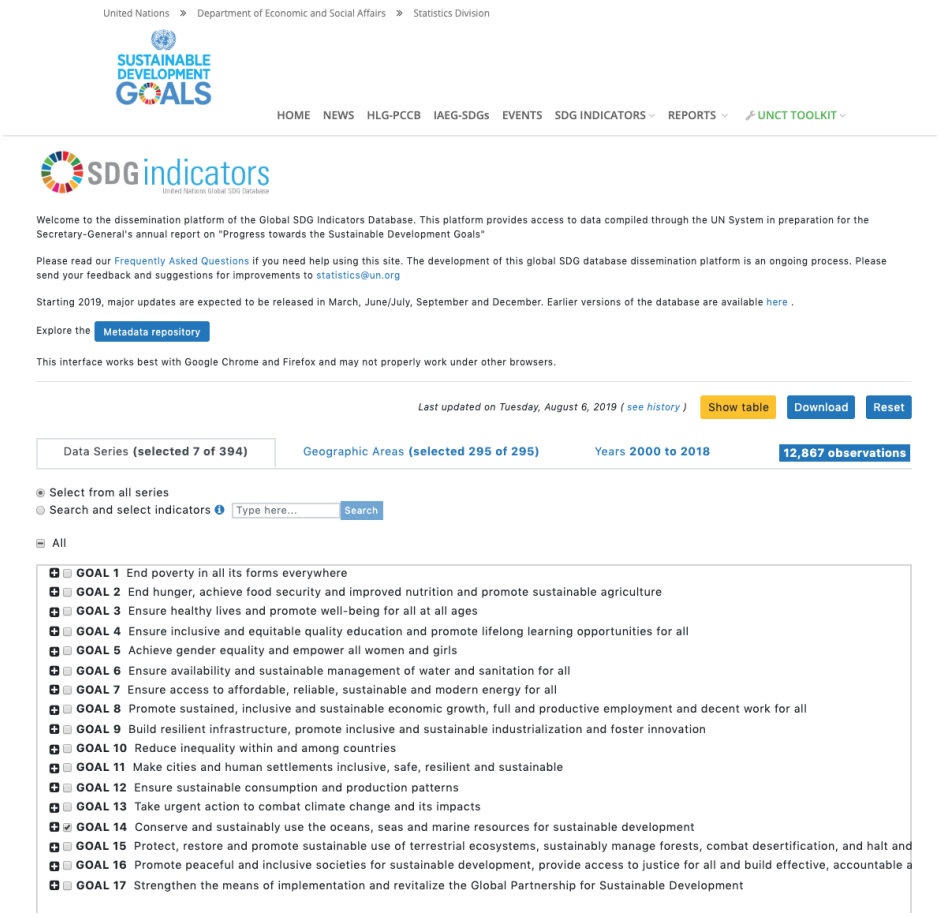
Outcome Documents/information

United Nations Educational, Scientific and Cultural Organization

Intergovernmental Oceanographic Commission





14 LIFE BELOW WATER

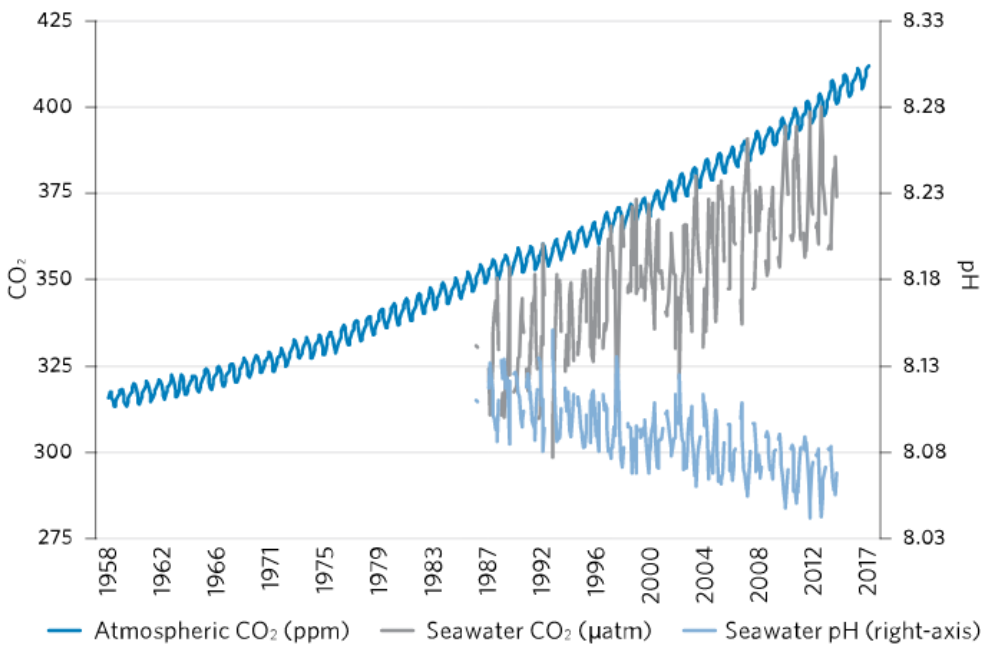
Conserve and sustainably use the oceans, seas and marine resources for sustainable development

Increasing acidification is threatening marine life and hampering the ocean's role in moderating climate change

The uptake of atmospheric CO_2 by the ocean changes the chemical composition of seawater, altering its carbonate chemistry and resulting in a decrease of pH (and growing ocean acidification). Observations of ocean pH over the past 30 years have shown a decrease in surface pH of 0.1 units. This is equivalent to a 26 per cent increase in acidity from pre-industrial times. At the current rate of CO_2 emissions, an increase in acidity of 100 to 150 per cent by the end of this century is predicted.

Ocean acidification threatens organisms as well as ecosystem services, including food security, by endangering fisheries and aquaculture. It also impacts coastal protection (by weakening coral reefs, which shield the coastline), transportation and tourism. As the acidity of the ocean rises, its capacity to absorb CO_2 from the atmosphere decreases, hampering the ocean's role in moderating climate change.

Atmospheric and seawater CO_2 concentrations, and seawater pH in the North Pacific, 1958–2017 (parts per million (ppm), micro-atmospheres [µatm] and pH)



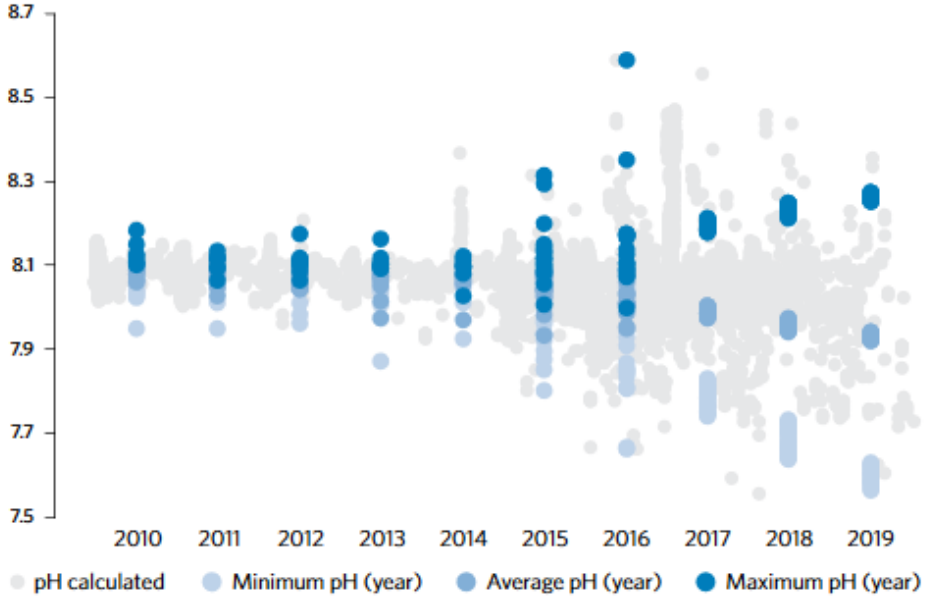
Note: Atmospheric CO_2 measured at Mauna Loa, Hawaii. Seawater CO_2 and pH measured at Station Aloha, Hawaii. Data from NOAA PMEL Carbon Program, available from www.pmel.noaa.gov/co2.

14 LIFE BELOW WATER

Continuing ocean acidification threatens the marine environment and ecosystem services

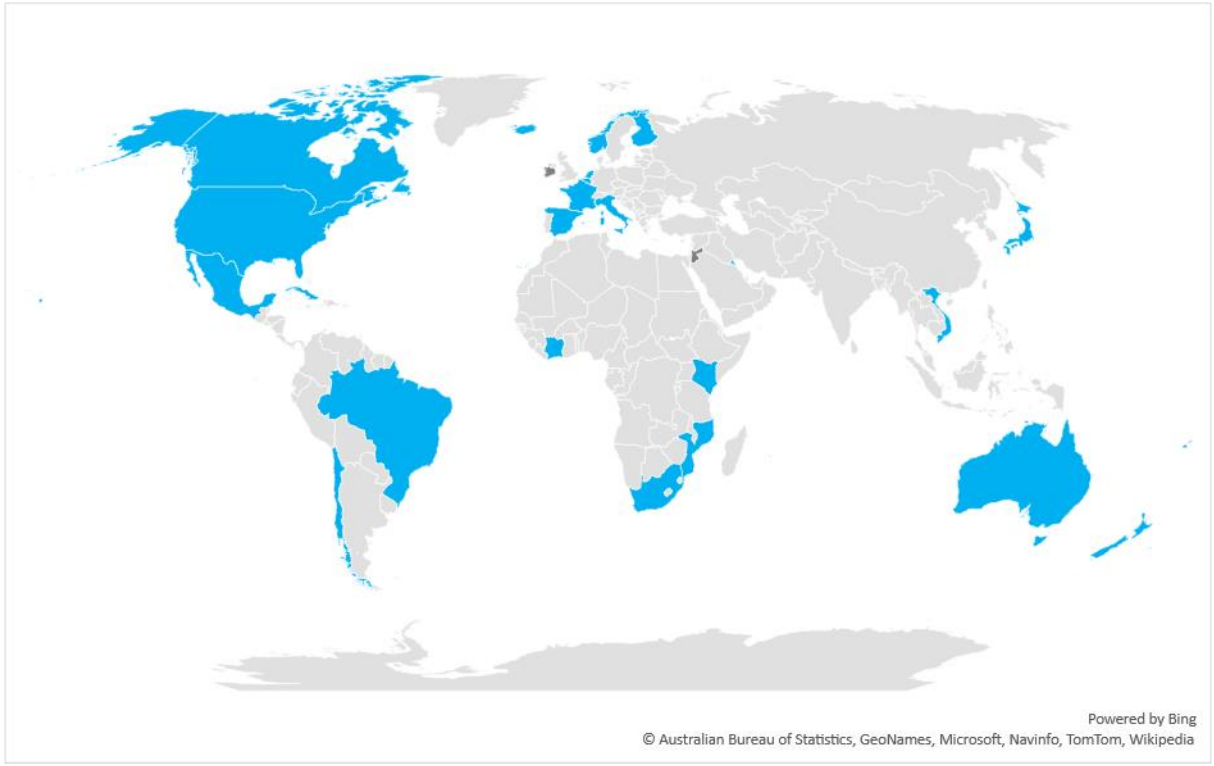
The ocean is the planet's largest carbon sink, absorbing around 23 per cent of annual CO_2 emissions generated by human activity and helping to mitigate the impacts of climate change. However, the absorbed CO_2 has caused seawater to become more acidic, evidenced by a 26 per cent drop in pH levels since pre-industrial times. Ocean acidification endangers coral reefs and other key species that are the base of the marine food chain, and has negative effects on marine ecosystem services, including fisheries and aquaculture, coastal protection, transportation and tourism. The more acidic the ocean becomes, the lower its capacity to absorb CO_2 from the atmosphere and to moderate climate change. Information drawn from a new ocean acidification data portal shows an increase in pH variability (up to 10–30 per cent in the past five years) and in ocean acidity. By the end of this century, a 100–150 per cent rise in acidity is projected, affecting half of all marine life.

Calculated ocean surface pH values (minimum, average and maximum) for the period 1 January 2010 to 8 January 2020 from global measurements



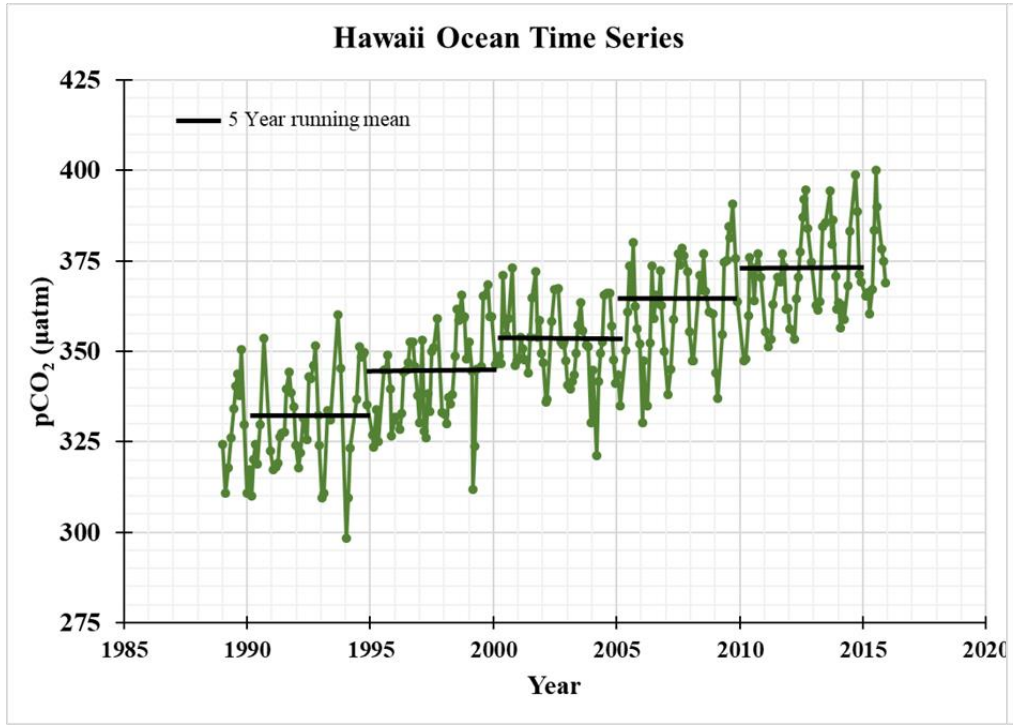
Figures submitted for the Sustainable Development Goals Report 2021

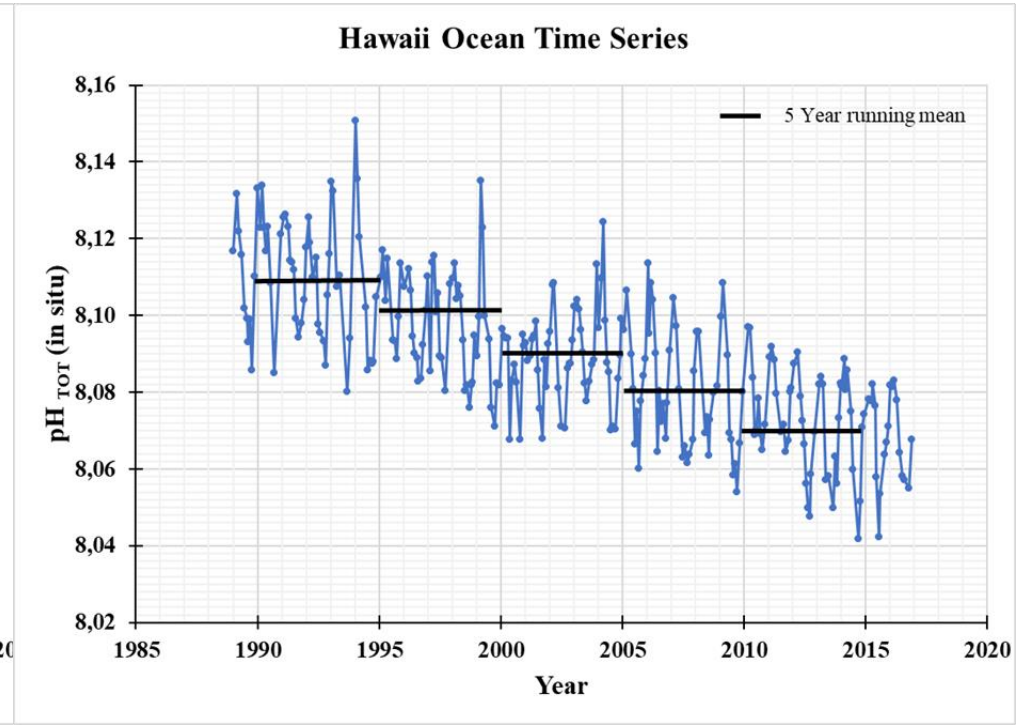
Calculated surface pH values based on ocean acidification data submitted to the 14.3.1 data portal (http://oa.iode.org). Blue crosses – average annual pH reported from quality assured measurements; orange diamonds – annual minimum pH values reported for each station; green circles – annual maximum pH values reported for each station.



Map illustration surface ocean carbonate chemistry measurement locations received for the 14.3.1 ocean acidification reporting. Blue – countries whose data was reported in accordance with the SDG 14.3.1 Indicator Methodology; dark grey – countries reporting ocean acidification observation data not collected in accordance with the SDG 14.3.1 Indicator Methodology.

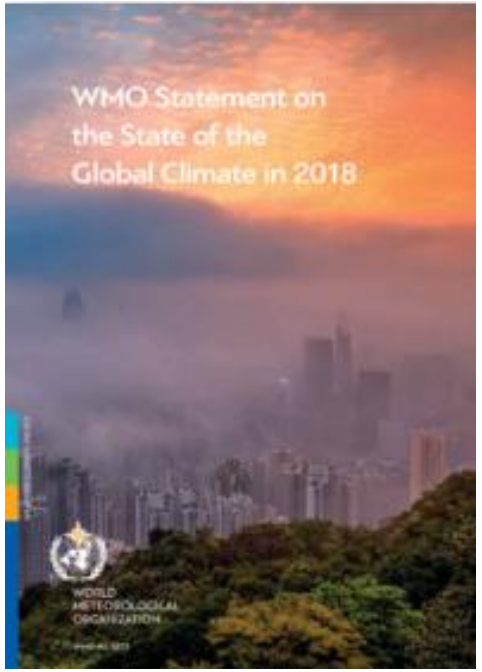
WMO '**The Global Climate in 2015-2019**'





pCO_2 and pH record for the Hawaii Ocean Time-Series in the Pacific Ocean, with five-year running average pCO_2 and pH indicated by black bars.

Clearly visible increase in the pCO_2 and simultaneous decrease in pH



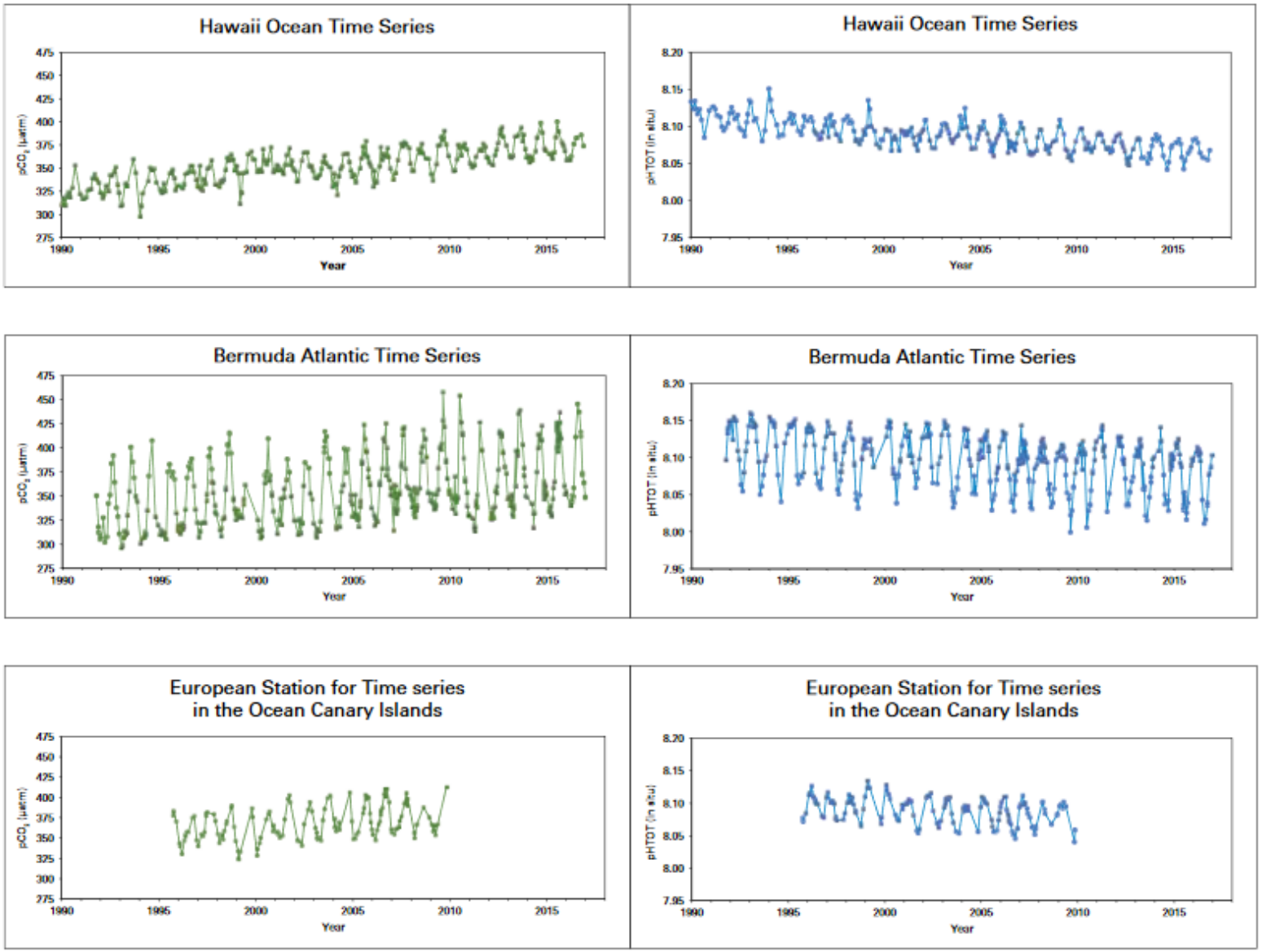
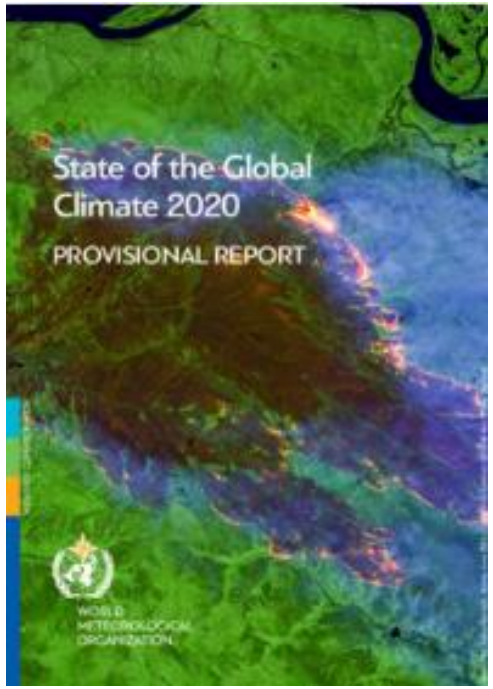


Figure 9. Records of pCO_2 and pH from three long-term ocean observation stations. Top: Hawaii Ocean Time Series in the Pacific. Middle: Bermuda Atlantic Time Series. Bottom: European Station for Time Series in the Ocean, Canary Islands, in the Atlantic Ocean. *Source: Richard Feely (NOAA Pacific Marine Environmental Laboratory) and Marine Lebrec (International Atomic Energy Agency Ocean Acidification International Coordination Centre).*



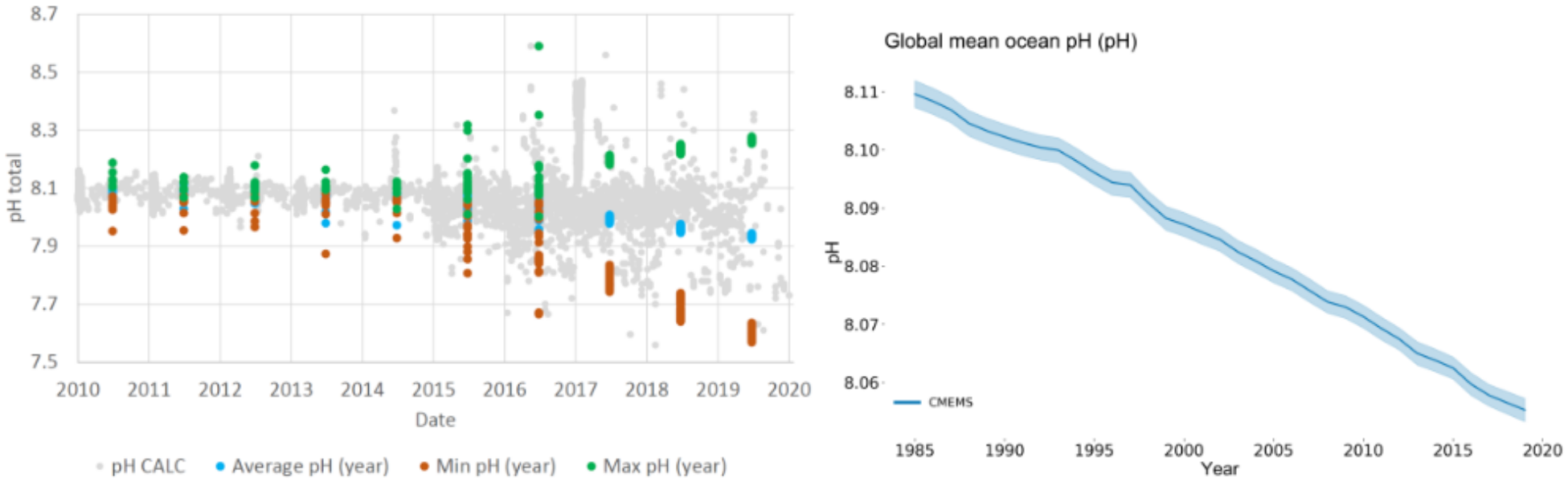
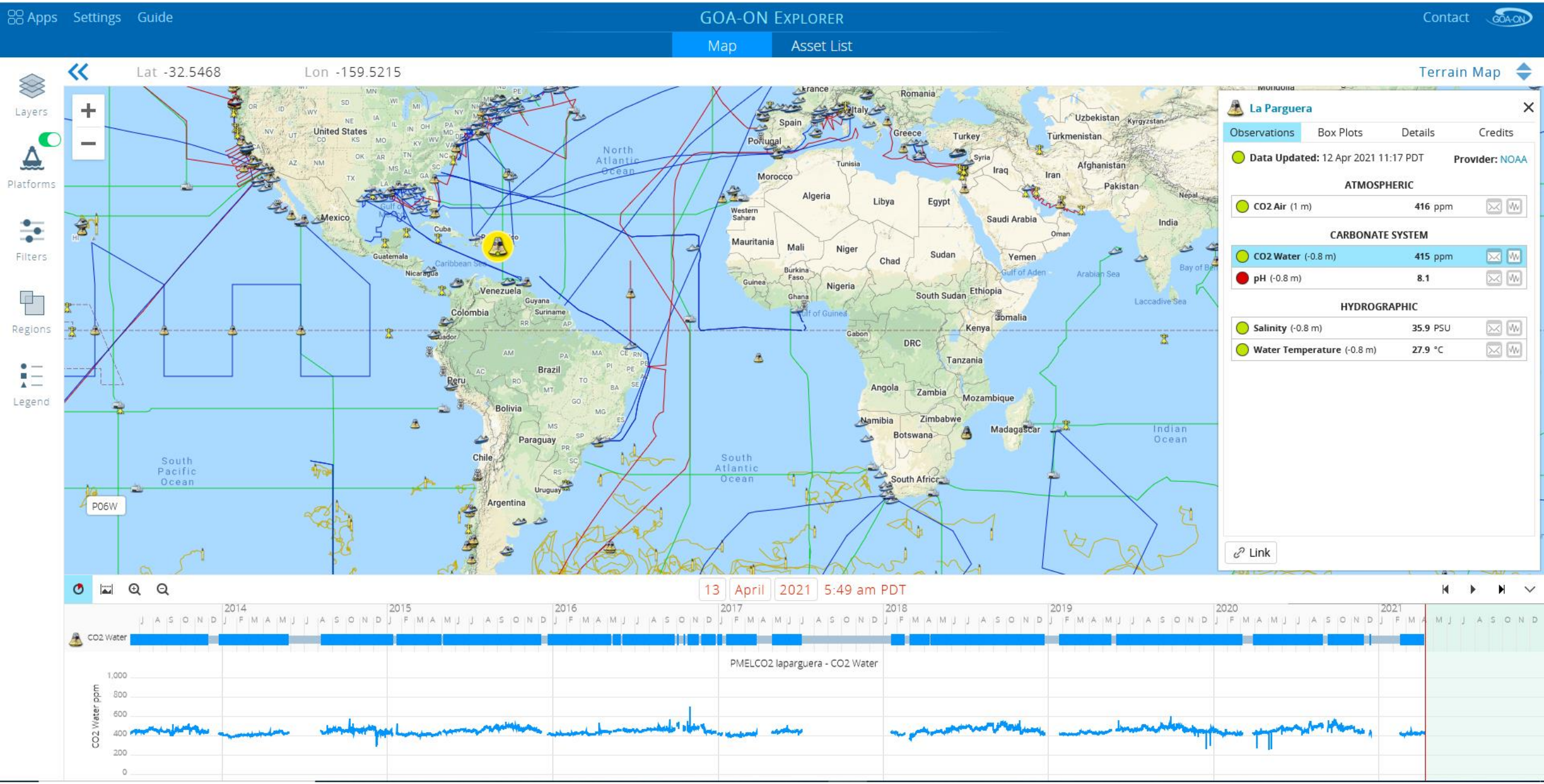


Figure 8: (left) Surface pH values based on ocean acidification data submitted to the 14.3.1 data portal (http://oa.iode.org) for the time period from 1 January 2010 to 8 January 2020. Grey circles – calculated pH of data submissions (including all data sets with data for at least two carbonate parameters); blue circles – average annual pH (based on data sets with data for at least two carbonate parameters); red circles – annual minimum pH; green circles – annual maximum pH. Note that the number of stations is not constant with time. (right) Global mean surface pH from E.U. Copernicus Marine Service Information (blue). The shaded area indicates the estimated uncertainty in each estimate.


Apps
Settings
Guide
GOA-ON Explorer
Contact
Map
Asset List
Lat -32.5468
Lon -159.5215
Terrain Map
Layers
Platforms
Filters
Regions
Legend
La Parguera
Observations
Box Plots
Details
Credits
Data Updated: 12 Apr 2021 11:17 PDT
Provider: NOAA
ATMOSPHERIC
CO2 Air (1 m) 416 ppm
CARBONATE SYSTEM
CO2 Water (-0.8 m) 415 ppm
pH (-0.8 m) 8.1
HYDROGRAPHIC
Salinity (-0.8 m) 35.9 PSU
Water Temperature (-0.8 m) 27.9 °C
Link
P06W
13 April 2021 5:49 am PDT
CO2 Water
PMELCO2 laparguera - CO2 Water
CO2 Water ppm
1,000
800
600
400
200
0
2014
2015
2016
2017
2018
2019
2020
2021
North Atlantic Ocean
South Pacific Ocean
South Atlantic Ocean
Indian Ocean
United States
Mexico
Cuba
Guatemala
Nicaragua
Caribbean Sea
Venezuela
Colombia
Guyana
Suriname
Ecuador
Peru
Brazil
Bolivia
Paraguay
Chile
Argentina
Uruguay
Spain
Portugal
France
Italy
Romania
Greece
Turkey
Syria
Iraq
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Egypt
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Mauritania
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Niger
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Saudi Arabia
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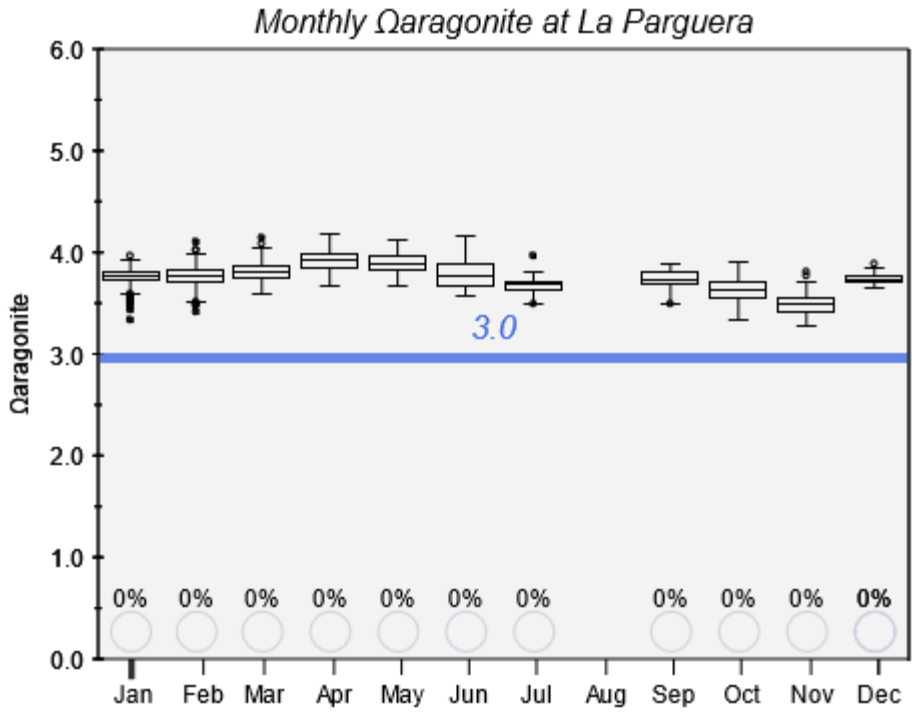
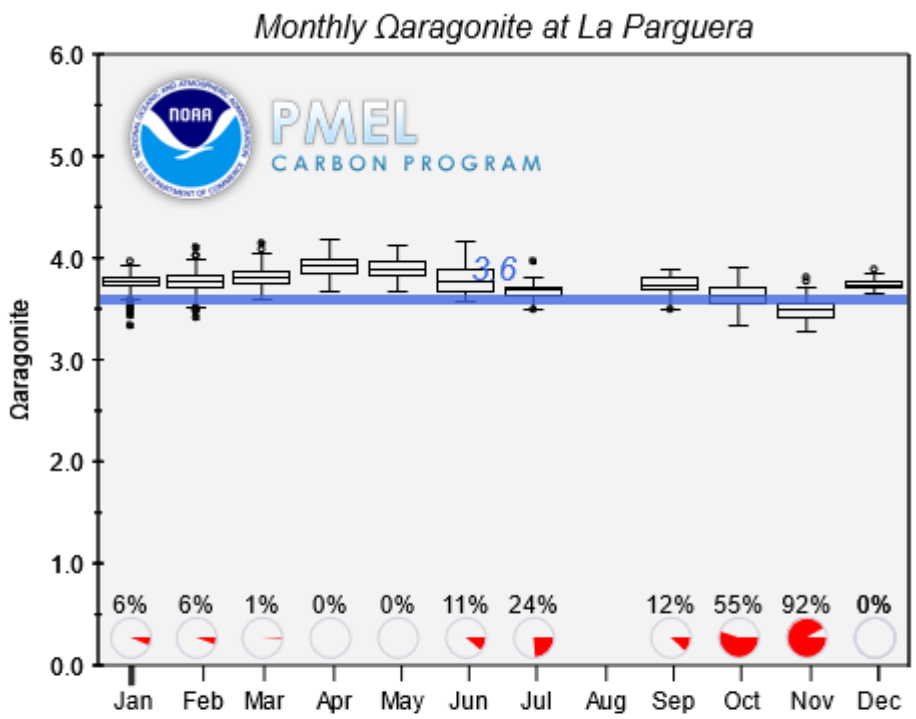
Madagascar
South Africa



Box plots: observations binned by month.

Pie charts: % of observations below blue line.

Full Record



Box plots: observations binned by month.

Pie charts: % of observations below blue line.

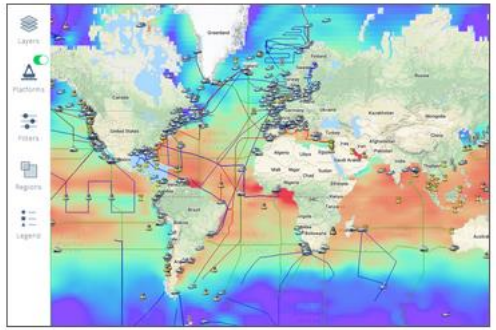
Full Record

Explorer

SDG 14.3.1

Welcome to the Global Ocean Acidification Observing Network (GOA-ON) Data Portal

GOA-ON works to improve our understanding of global ocean acidification conditions and ecosystem responses by making ocean acidification data easily accessible.



The GOA-ON Data Explorer provides access and visualization to ocean acidification data and data synthesis products being collected around the world from a wide range of sources, including moorings, research cruises, and fixed time series stations. Layers contain contoured world-wide data; Platforms include icons for various observing assets, some of which display real-time data and many of which include links to data and metadata. For a given asset measuring carbonate chemistry, metadata includes information on which parameters are measured, links to data providers, and other useful details. The inventory of GOA-ON assets can be searched interactively by region, platform type, and variables by using the Filters tool.

Would you like to add or modify a platform on the GOA-ON data portal?

Add or Modify a Platform

Anyone can become a member of the Global Ocean Acidification Observing Network.

Become a GOA-ON Member

For ocean acidification biological response data, visit the portal developed by the OA-ICC.

OA-ICC Biological Response Portal