environment, forestry & fisheries

Department:
Environment, Forestry and Fisheries
REPUBLIC OF SOUTH AFRICA

South African Weather Service

The ocean, our climate and weather

World Meteorological Organization

WORLD METEOROLOGICAL DAY

23 MARCH 2021

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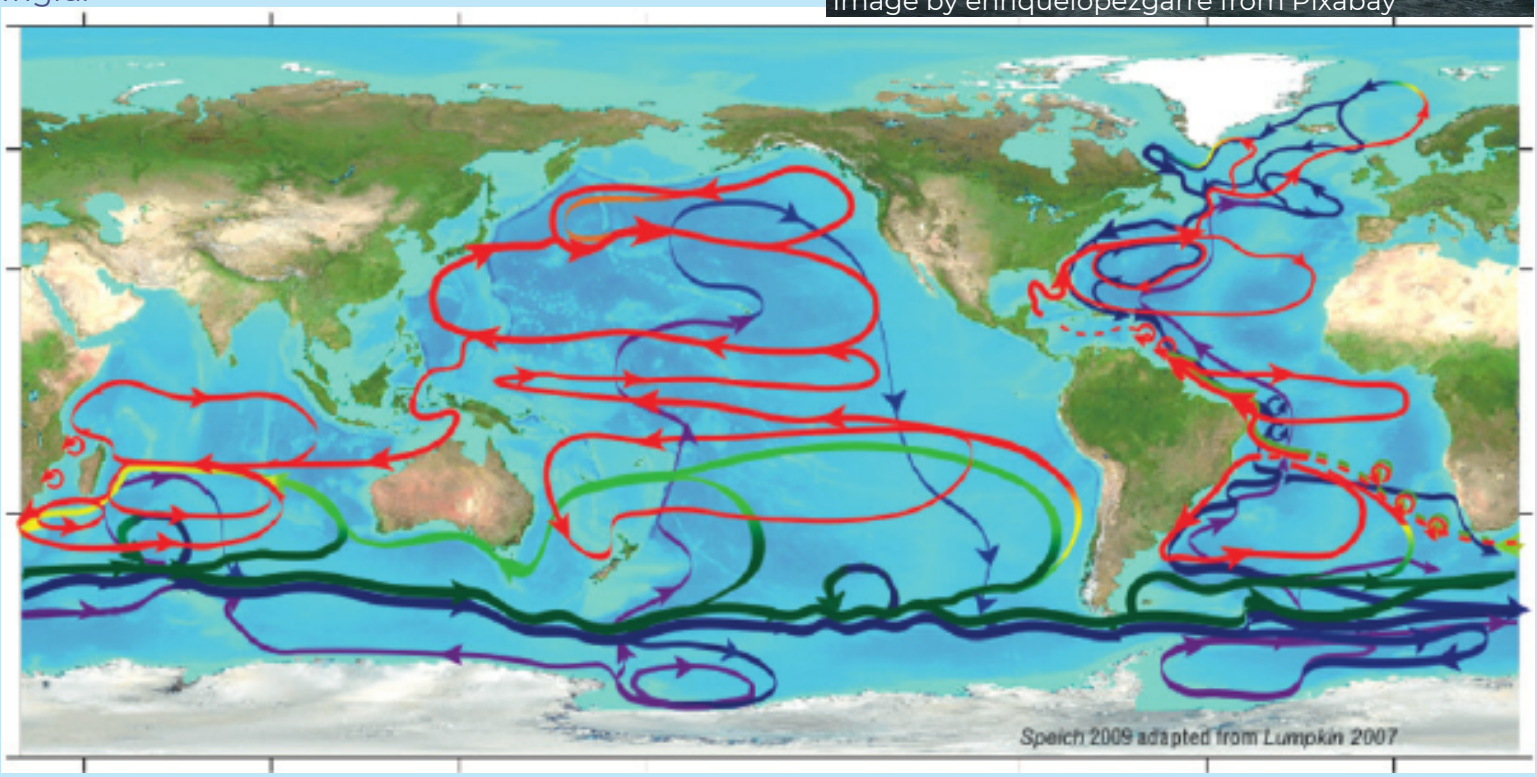
How do the oceans contribute to our weather?

natgeokids.com/au/discover/science/nature/water-cycle

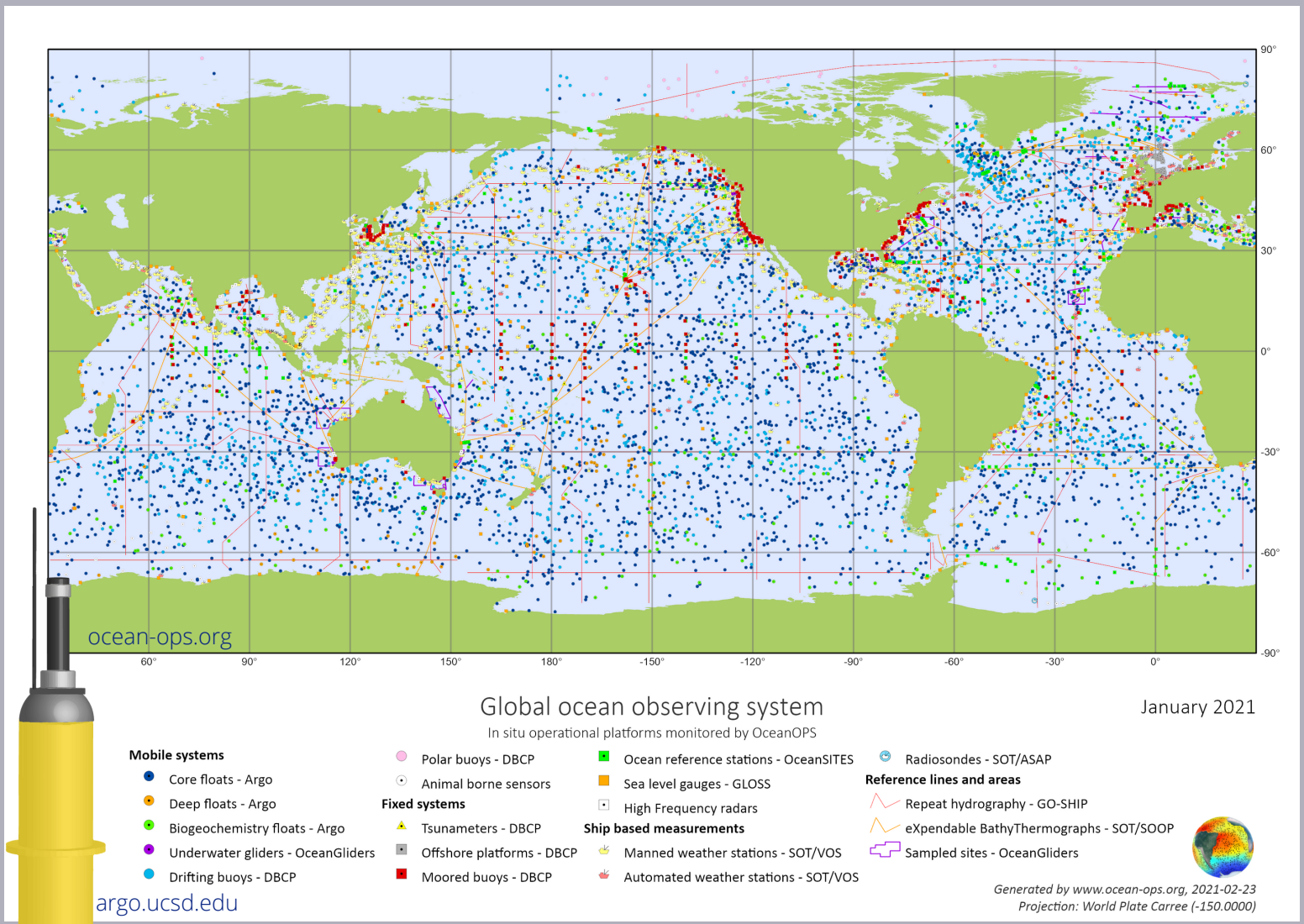
The water cycle starts and ends in the ocean. Water is evaporated to form clouds due to the Sun's energy (solar radiation). Clouds grow in size and density with continued evaporation and are transported over the land by wind systems or storms. Once the clouds are heavy enough with water vapour, rain (or snow) will fall, contributing fresh water to lakes, rivers and dams, thereby suppling the much needed freshwater required for humans and animals on earth.

The oceans' warm and cold water currents transport the solar radiation around the globe in a massive conveyer belt system (below, red for warm surface currents, blue for colder subsurface currents). These currents are driven by wind systems, temperature and salinity gradients in the ocean, Earth's rotation and tides. Without this flow of heat around the world, much of the land humans inhabit would be uninhabitable. The tropics would be unbearably warm and the regions closer to the poles would be frigid.

Image by enriquelopezgarre from Pixabay



How do we measure the ocean?



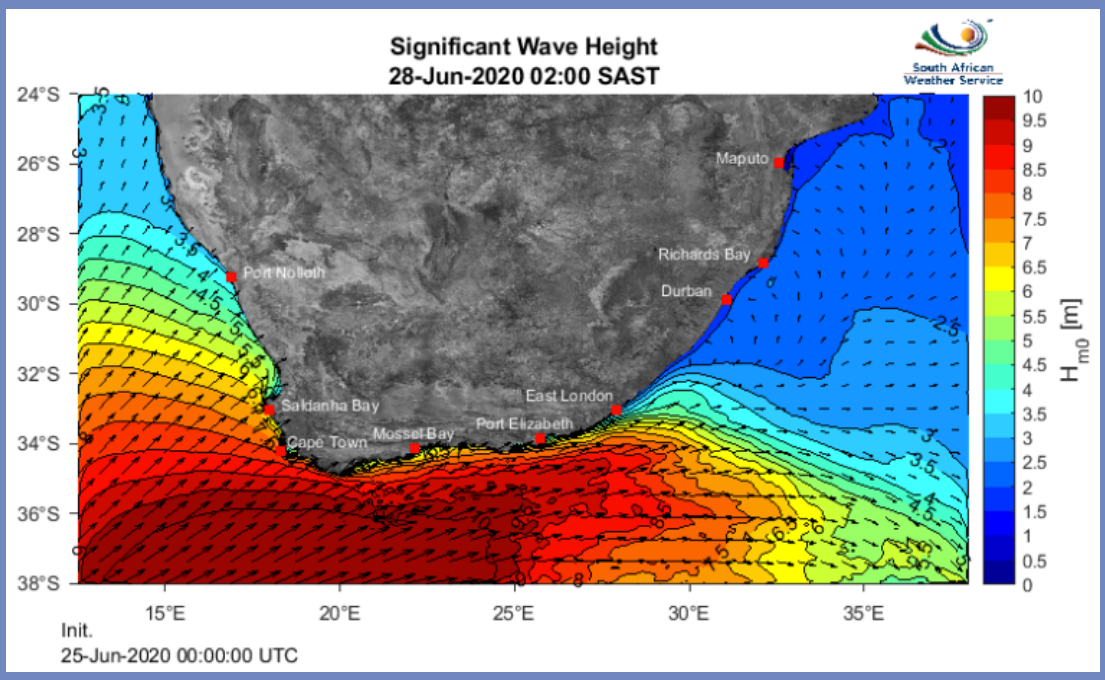
In order to understand our oceans, how the currents circulate around the world and their temperature and salinity dynamics, scientists deploy a number of ocean observing systems, some of them known as ocean robots! Instruments are deployed to track ocean surface currents, to profile the ocean from 2000 m to the surface, collecting data and carry payloads of instruments which contribute to knowledge of ocean health. Globally, these instruments effectively take the pulse of the ocean every day.

https://www.whoi.edu/what-we-do/explore/underwater-vehicles/auvs/slocum-glider

oceanmotion.org

Cole et al, 2019

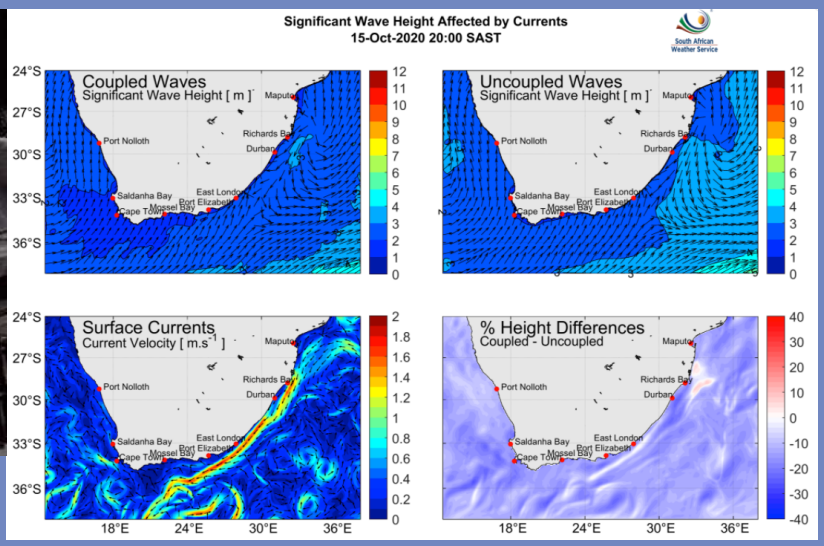
How do we forecast ocean parameters that could damage our coastline?



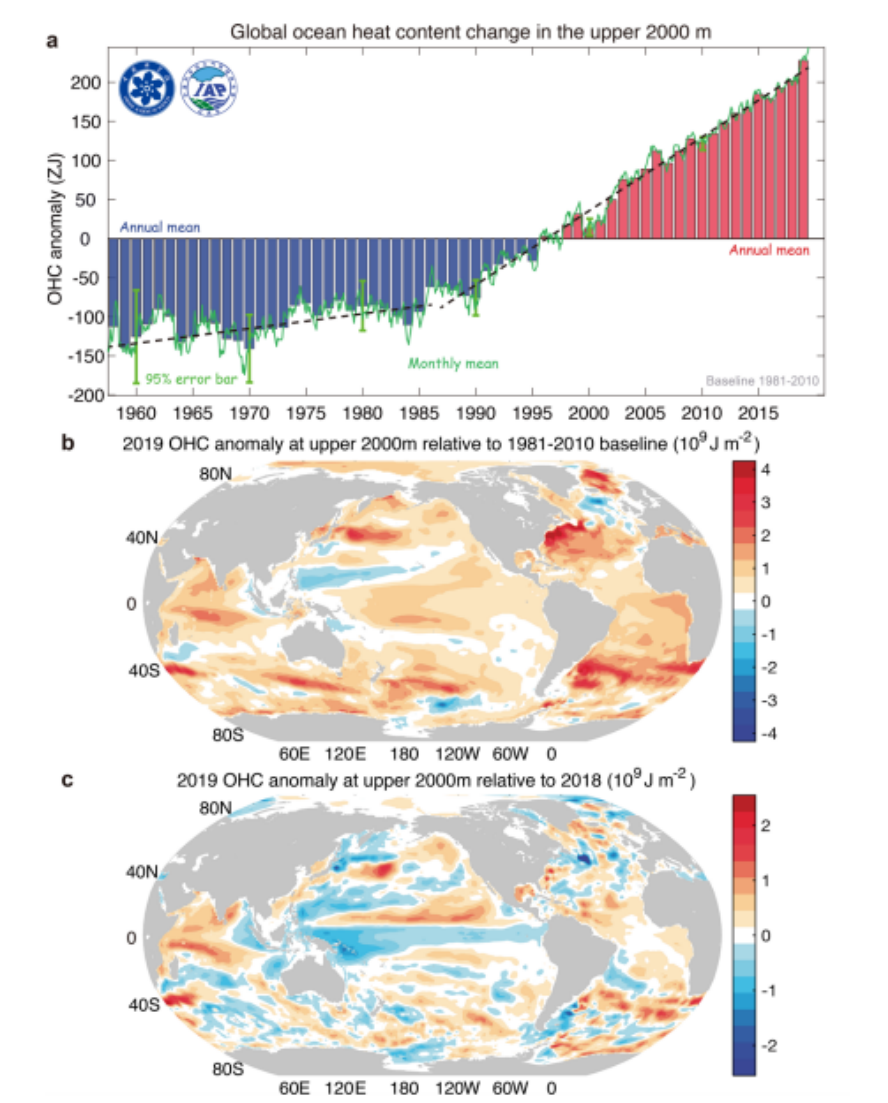
Scientists at the South African Weather Service have developed high-resolution marine models around our coastline in order to forecast waves (and when these occur at extreme levels), storm surge and the interaction of waves against ocean currents offshore. The latter contribute to the formation of rogue waves which can be deadly to ships sailing around our coast.

Storm surge is the increase in sea level as a result of wind and atmospheric pressure, and is usually associated with a storm. These increases in sea level can cause significant flooding along our coastline, damaging buildings and roads. The risks become greater when storms occur at the same time as high tides, thus monitoring these phenomena and preparing the public become critical.

BBC Horizons 2002



Why are the oceans important?

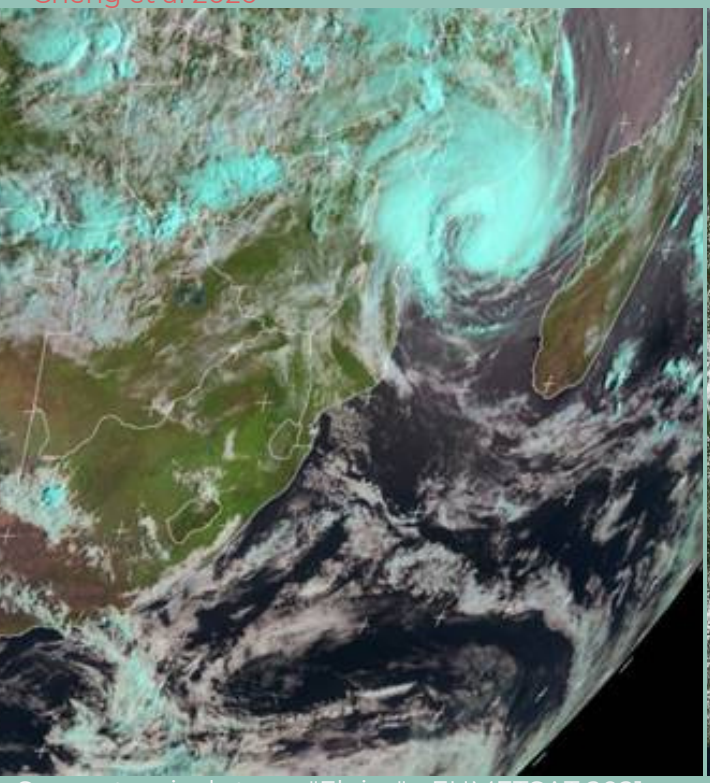


Cheng et al 2020

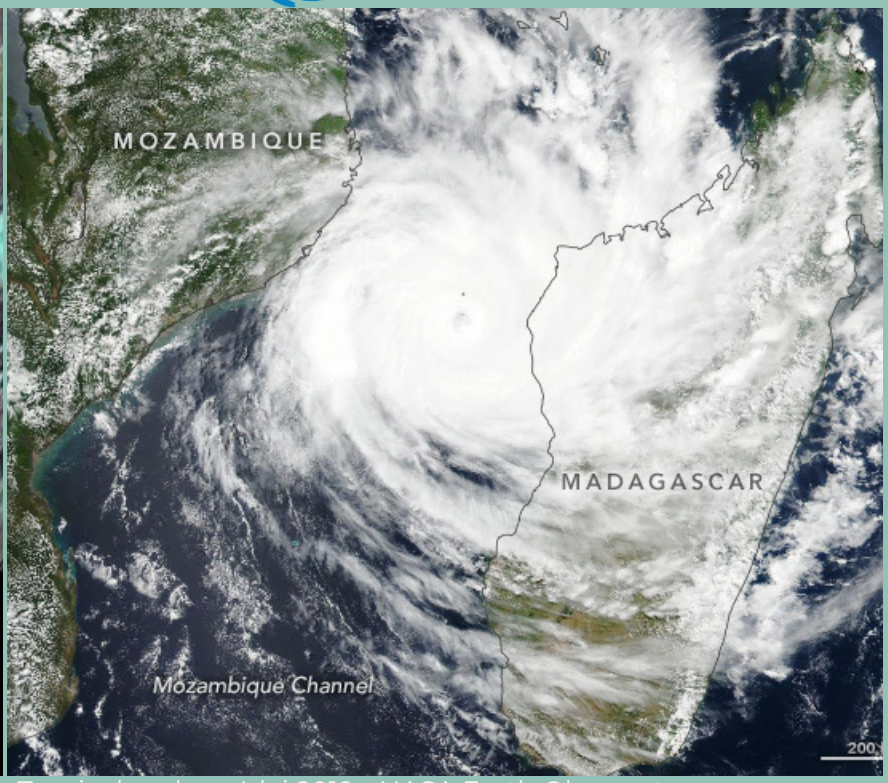
Over the last 25 years, the oceans have been absorbing heat at rates far exceeding what they should due to climate change. Over 90% of heat produced due to anthropogenic activities is absorbed by the oceans, which negatively impacts our weather and climate systems. This results in periods of more or less rain, causing droughts in certain regions of our country. It also contributes to tropical storms increasing in frequency and intensity.

The United Nations has declared 2021-2030 the Decade of Ocean Sciences for Sustainable Development. Through this initiative, the focus is on better understanding our oceans and how they impact our weather and climate. Critically, we need to reverse the impacts of climate change so far in order to ensure healthy, functional and safe oceans for everyone to enjoy!

2021 2030 United Nations Decade of Ocean Science for Sustainable Development



Severe tropical strom "Eloise" - EUMETSAT 2021



Tropical cyclone Idai 2019 - NASA Earth Observatory