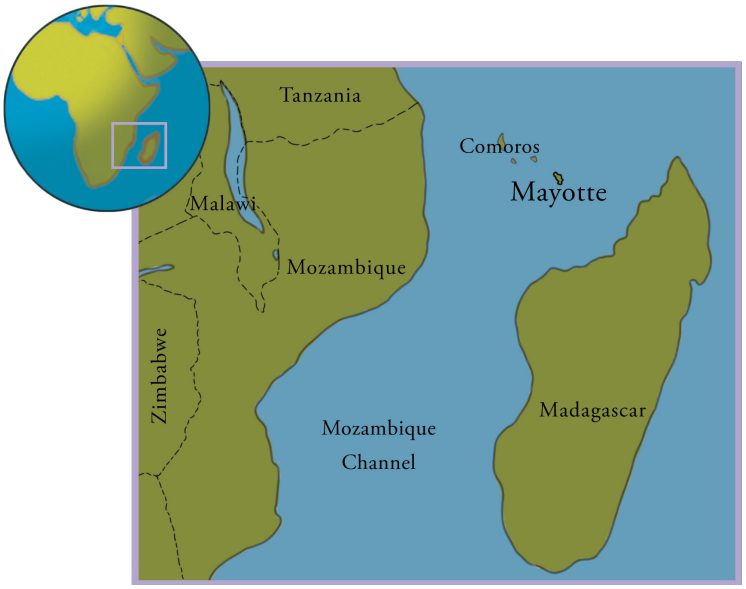
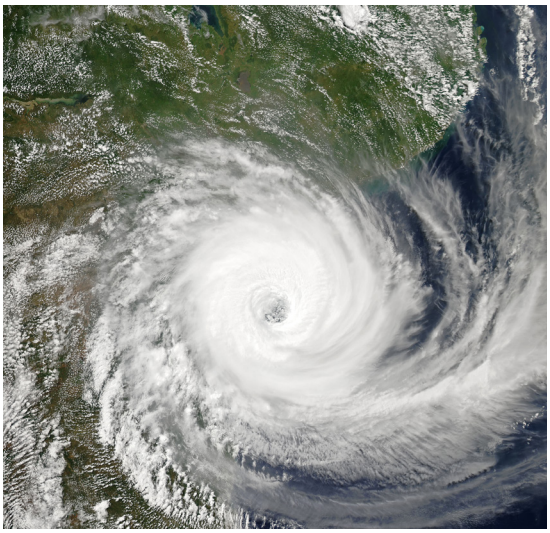
Climatic impacts of the

Climate has always changed throughout Earth's geological history. The present study is another investigation of a submarine volcanic eruption causing regional ocean warming as a cause of climate change over and above anthropogenic carbon dioxide, in true scientific tradition.



Map showing the location of Mayotte. The submarine volcano is located to the southeast of the island.



Source: MODIS image captured by NASA's Aqua satellite

Tropical cyclone Idai

Patches of abnormally hot seawater beneath the ocean surface, referred to as Blobs, are naturally generated by submarine volcanic eruptions. A recent example is the North Pacific Blob[1] which caused weird weather conditions accompanied by major ecological changes in the Pacific northeast including two years without winters in 2013 and 2014[2]. This was featured as a 'heat wave' in the September 2016 issue of National Geographic and was used to support the anthropogenic global warming alarm. However, based on the study of available information including satellite and ARGO data buoy records, the release of geothermal heat from the Nishinoshima volcanic eruption 940 km south of Tokyo[3] from March 2013 to August 2015 was identified by the present author instead to be the likely culprit[4,5].

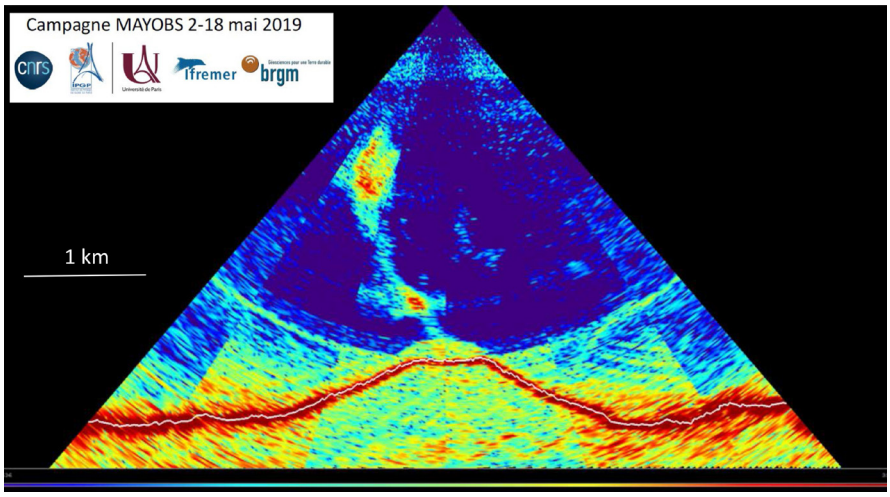
This study examines the climatic impacts of another Blob, created by a new submarine volcanic eruption on the floor of southwest Indian Ocean, off Mayotte in the Comoros.

Subsequent ocean circulation changes led to the development of an exceptionally strong positive phase of the Indian Ocean Dipole (IOD)[6]. Regional climatic impacts in the southwest Indian Ocean included torrential rainfall and the establishment of a new record of 10 intense tropical cyclones during the 2018-2019 season. In the east of the Indian Ocean, the corresponding cooling of sea-surface waters gave rise to severe drought conditions in the land areas of Indonesia and Australia.

Marc Chaussidon, director of the Institute of Geophysics, in Paris, was responsible for the discovery of the new as yet unnamed submarine volcano off the southeast coast of Mayotte[7]. Through looking at seafloor maps and a recently concluded mission, Chaussidon identified a new submarine volcano 800 meters high and 5 kilometers across, rising above the ocean floor in 6 months since November 2018 between Africa and Madagascar.

Multibeam sonar mapping of the sea floor indicated as much as 5 cubic kilometers of magma had erupted onto the seafloor. Based on the Volcanic Explosivity Index measurement scale for terrestrial eruption, the scale is 5, which is moderately strong. The sonar was able to detect plumes of gas-rich water rising from the flanks and central part of the volcano.

An examination of NOAA satellite sea-surface anomalies map archives has revealed that this Blob was already well developed in early December 2018, the beginning of the southern hemisphere summer. This hot seawater was responsible for setting the new



Source: MAYOBS Team (CNRS/IPGP-Université de Paris/Ifremer/brgm)

Multibeam sonar waves, reflecting off the sea floor southeast Mayotte, showing an 800-m-tall volcane (red profile), with a 5 km diameter and a rising gas-rich plume

SW Indian Ocean Blob

record of 10 intense tropical cyclones during the 2018-2019 season. Of the 10 cyclones, the most severe was intense tropical cyclone Idai. The total cost of damage caused by Idai was estimated to exceed US$2 billion and the minimum death toll given as 1007, many bodies not having been recovered. Storm surge flooding was the worst on record with the destruction of numerous homes.

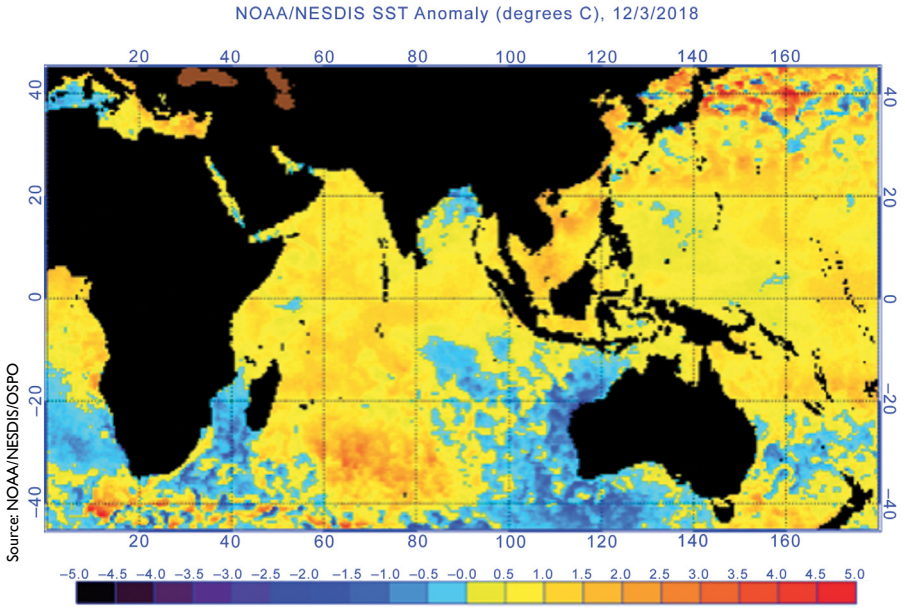
In late May, 2019, as a result of an extremely dry summer, Sydney Water, Australia announced the enforcement of water restrictions throughout the greater Sydney area. As of May 29, 2019, Greater Sydney water supply levels are 53.4%, which is significantly lower than in May 2018, during which supply levels were 73% in major catchments. These water restrictions began on June 1, 2019.

In conclusion, severe weather events including tropical cyclones, droughts and floods may be caused by blobs formed by the natural release of geothermal heat through submarine volcanic eruptions acting, in combination with the sun, to warm the surface waters of regional oceans. The warming in the west Indian Ocean was responsible for the development of an exceptionally strong positive phase of the Indian Ocean Dipole. The warm sea-surface water was responsible for oceanic and atmospheric circulation changes regionally which cannot be accounted for by carbon dioxide variations.

The release of geothermal heat into oceans is currently underestimated by the scientific community and may represent a significant proportion of the missing heat in oceans proposed to explain the post-1998 pause in global temperature rise.

Name	Date	Wind speed km/hr	Pressure hPa	Countries affected	Damage&Death toll
Alcide	5-12 Nov	165	965	Agaléga, Madagascar, Tanzania	–
Kenanga	16-22 Dec	185	942	–	–
Cilida	16-24 Dec	215	940	Mauritius	Minimal
Funani	3-10 Feb	195	940	Rodrigues	Minimal
Gelena	4-14 Mar	205	942	Madagascar, Mauritius, Rodrigues	US$ 1 million
Haleh	28 Feb - 7 Mar	175	945	–	–
Idai	14-16 Mar	195	940	Mozambique, Malawi, Madagascar, Zimbabwe	≥ US$ 2 billion & 1007
Savannah	17-19 Mar	165	962	–	–
Joanina	18-30 Mar	185	939	Rodrigues	–
Kenneth	21-29 Mar	215	934	Seychelles, Madagascar, Comoros, Mozambique, Tanzania, Malawi	≥ US$ 100 million & 52

Summary table of the 10 intense tropical cyclones during the record breaking 2018-19 season in southwest Indian Ocean[8]



Sea surface temperature anomalies showing the development of a hot Blob southeast of Madagascar, on 3 December, 2018

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7. http://bit.ly/IE31-MAYOBS
8. http://bit.ly/IE31-Cyclones

Professor Wyss Yim DSc PhD DIC FGS was at Imperial College, in the Department of Geology, from 1971-1974. After that, he spent thirty-five years, until retirement, at the University of Hong Kong where he taught civil engineering, geosciences and environmental management students, and helped found the Department of Earth Sciences. He was awarded the DSc by the University of London in 1997.
Wyss served as the deputy Chairman of the Climate Change Science Implementation Team of UNESCO's International Year of Planet Earth 2007-2009.