September 2022

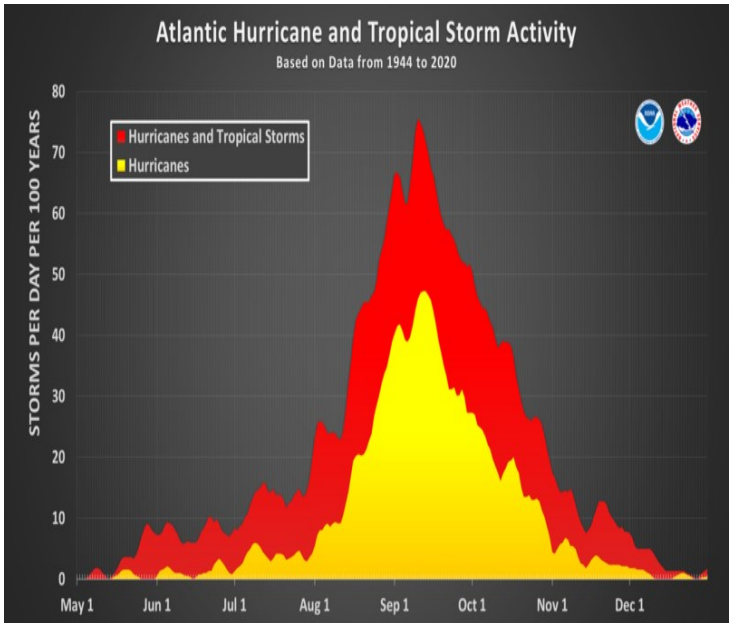
CliSciPol

Climate Science and Policy for Nonscientists

Good policy must be based on good science.

Hurricane Frequency -

The Atlantic hurricane season (June-November) is now more than half over. September historically is the busiest hurricane month. (see graph at right). The US government (NOAA) predicted this would likely be an above-normal hurricane season. But now with Fiona we are having the first real hurricane of the season. Obviously, so far, we are way, way below the expected number of hurricanes. Scientists have never been able to predict accurately the number of hurricanes, even just a few months in advance.



Coral Bleaching -

The coral reef around Palmyra Atoll in the central Pacific has been the subject of a recently published ten year study. The reef was hit with massive bleaching from 2014-2016 with up to 90% of the reef affected. Dead? Not at all. The reef has restored itself. Over the decade of the study there was only a small net change in the reef's coral and algae populations.

Reefscape on Palmyra featuring an abundance of reef-building corals and other calcifying organisms such as crustose coralline algae (pink crust).

Comments on Hurricanes

The first weather satellites went up in 1979. Since 1980 satellites have provided high quality data on the number and strength of hurricanes. Dr. Ryan Maue is one of the world's leading hurricane experts. His dataset on the left below shows that over the last 42 years there has been a slight decrease in the frequency of hurricanes and perhaps a very slight decrease in the frequency of major (Cat 3+) hurricanes. The Colorado State University dataset on the right below shows no increase in the number of hurricanes from 1980 to 2021.

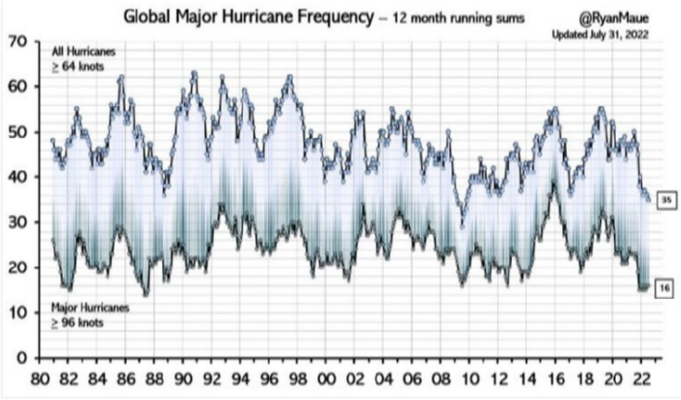
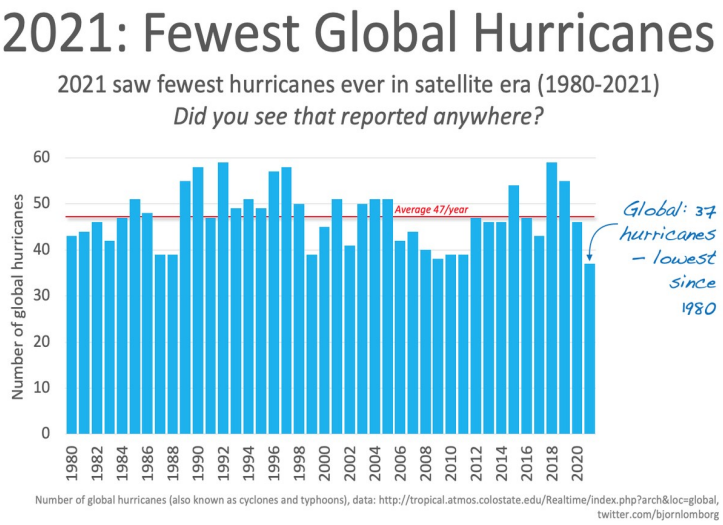


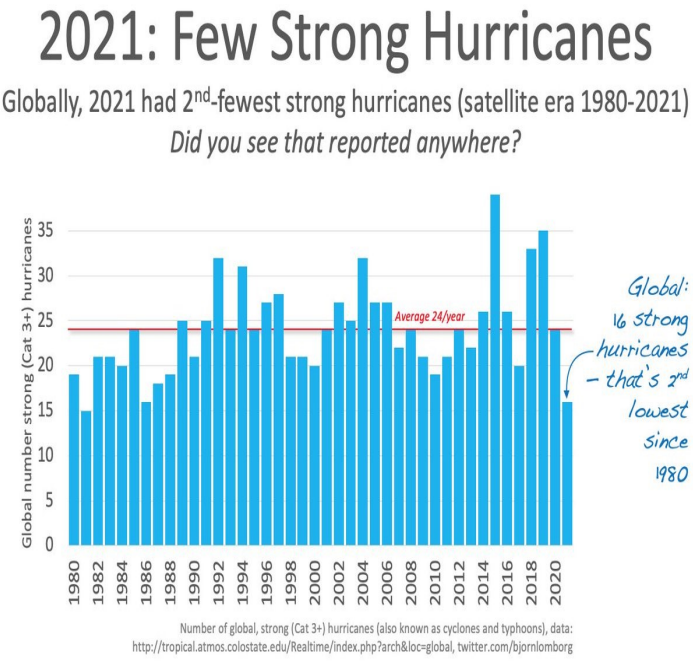
Figure: Global Hurricane Frequency (all & major) -- 12-month running sums. The top time series is the number of global tropical cyclones that reached at least hurricane-force (maximum lifetime wind speed exceeds 64-knots). The bottom time series is the number of global tropical cyclones that reached major hurricane strength (96-knots+). Adapted from Maue (2011) GRL.

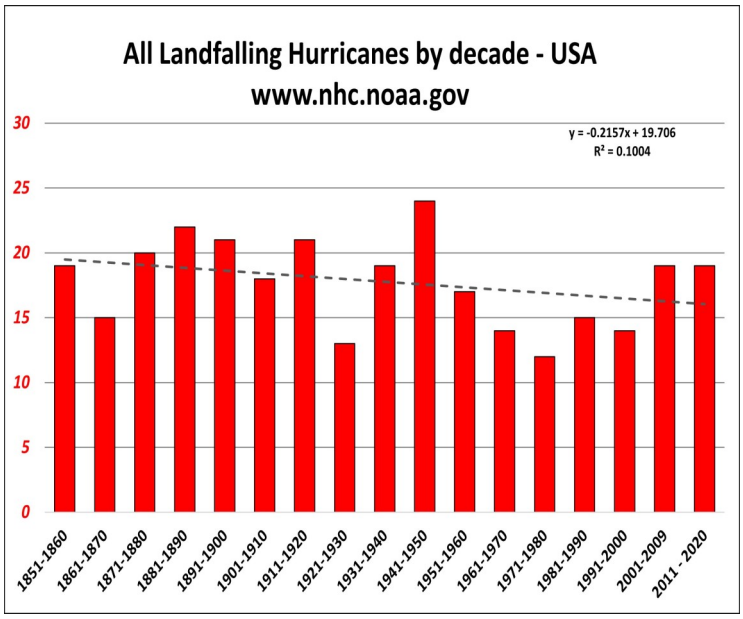


The Sixth Assessment Report of the Intergovernmental Panel on Climate Change (AR6) says that there is low confidence in long-term trends in the frequency of all-category hurricanes, and also that the total number of hurricanes is expected to decrease or remain unchanged. (Fn. 1).

AR6 also says that it is likely that the proportion (not the number) of major storms (Cat 3+) has increased over the last 40 years. (Fn. 2). AR6 adds that there is low confidence in past trends in the number of the strongest storms over the Northern Hemisphere, and the frequency of intense storms is projected to decrease. (Fn. 3)

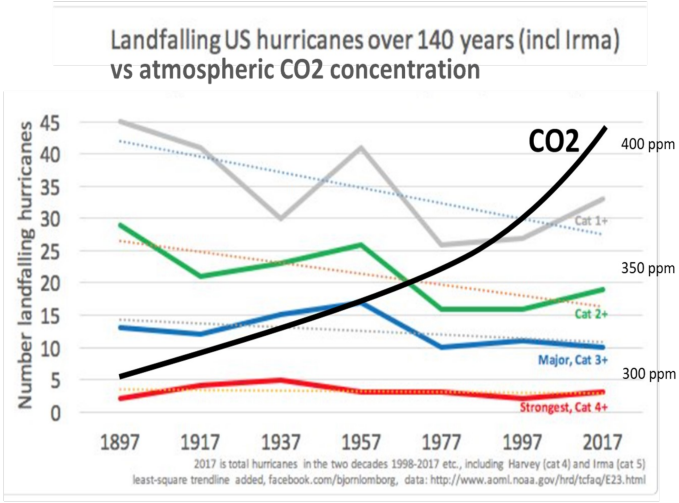
The Colorado State University dataset on strong (Cat 3+) hurricanes (to the right) agrees with Dr. Maue that the frequency of strong hurricanes is not increasing. If the total number of hurricanes decreases, and the number of major storms remains the same, then the proportion of major storms has increased, as the IPCC concludes.



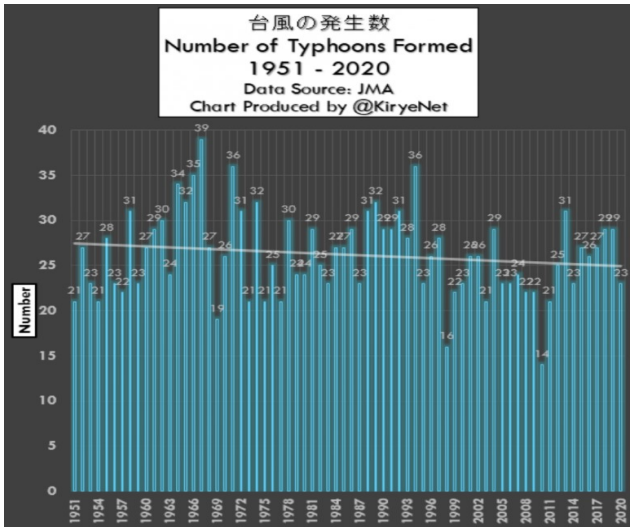


US government (NOAA) data shows that the number of hurricanes land-falling in the US has been declining over the last 120 years.

AR6 says that reliable data shows no trend in the frequency of US landfall events. (Fn. 4)

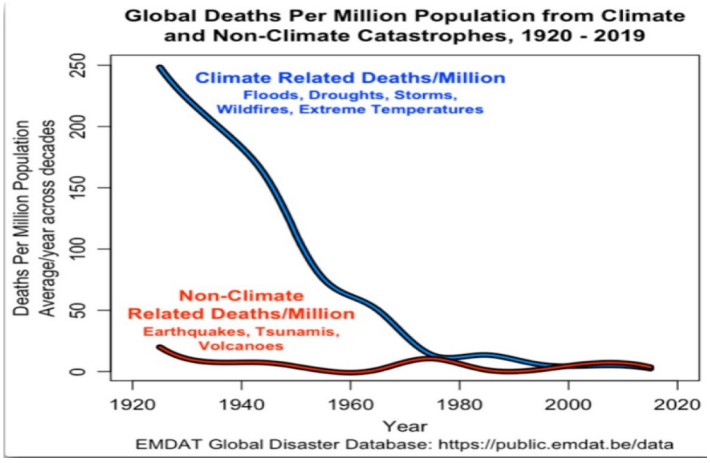


The frequency of Cat. 1+, Cat. 2+, and of Cat. 3+ hurricanes landfalling in the US has been significantly declining. The frequency of Cat. 4+ hurricanes landfalling has very slightly declined.



In the Western Pacific hurricanes are called ty-phoons. The Japanese Meteorological Agency data shows a declining frequency of typhoons over the 70 years 1951-2020.

We have been making extraordinary pro-gress over the last century in reducing the risk of death due to climate catastrophes. Unfortunately every year we can expect 40 or so hurricanes on average worldwide with-out any climate change. That's normal.



Comments on Coral Bleaching

The media regularly either states or implies that coral bleaching is equivalent to coral death. But more and more studies of reefs after bleaching incidents, such as the Palmyra Atoll study discussed on page one, show remarkable coral recovery after such incidents.

For example, a lengthy study of Jarvis Island in the Central Pacific shows that it has had periodic, roughly 5-year, bleaching events, including a number of severe events, and there has always been a reef recovery with the reef maintaining an overall healthy state over time. When coral recovers from bleaching, it shows that the cause was temporary, not global warming/climate change. Scientists do not understand bleaching enough to be able to predict when or how much of a reef will recover after a bleaching incident.

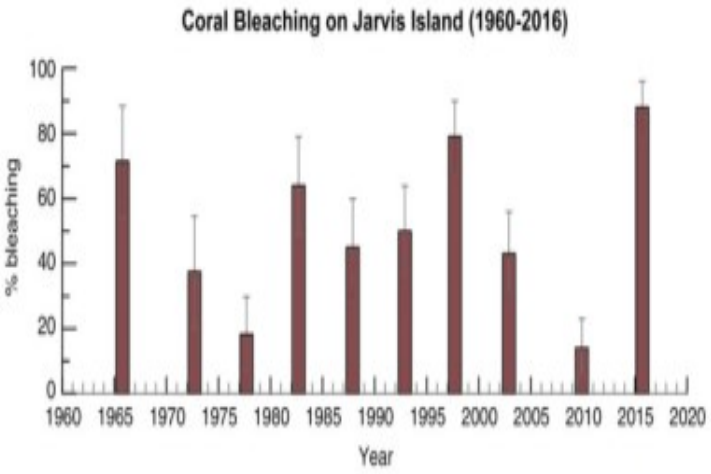


Figure 1. *Coral reef bleaching events on Jarvis Island (mean ± one standard error) over the period 1960-2016. Source: Barkley et al. (2018).*

Figure 1. Coral Reef Locations Worldwide

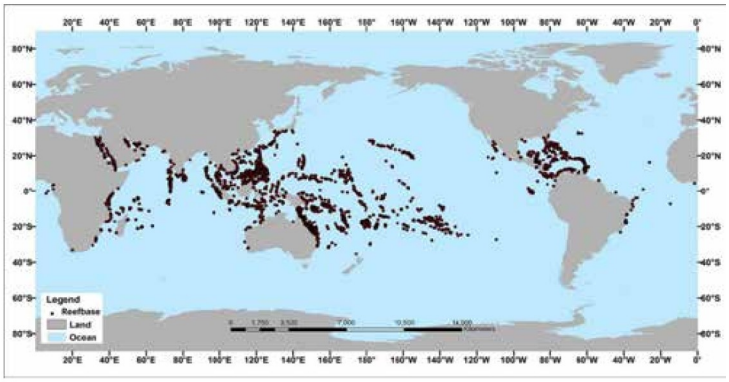


Figure 1. Corals thrive in the warmest of Earth's waters. *Source*: National Ocean Service, "Where Reef Building Corals Found," National Oceanic and Atmospheric Administration, accessed July 26, 2021, https://oceanservice.noaa.gov/education/tutorial_corals/media/supp_coral05a.html

Coral has existed for at least 240 million years and perhaps much longer. It has survived the coming and going of ice ages. It has not only survived, but thrived, in periods when world temperatures, CO2 levels, and ocean levels were much higher than today. There are over 2,000 different species of coral, widely dispersed in shallow tropical waters all around the world, and it has been estimated that there are over 500 billion coral colonies in the Pacific alone. There is evidence that mild warming will promote coral growth and the expansion of coral range.

AR6 comments that the scope and severity of coral bleaching and mortality events have increased in recent decades, but it does not provide any quantification or any explanation of the basis for those findings. (Fn.5) AR6 also says that coral reefs are suffering global declines, with abrupt shifts in community composition, and also that corals are at high risk, again without any quantification or any explanation. (Fn. 6). But mass coral mortalities have been reported since the 1870s, and, while the frequency and scale has increased since the late 1970s, it is unclear whether this is a result of a real trend or of a greater percentage of events being reported and counted.

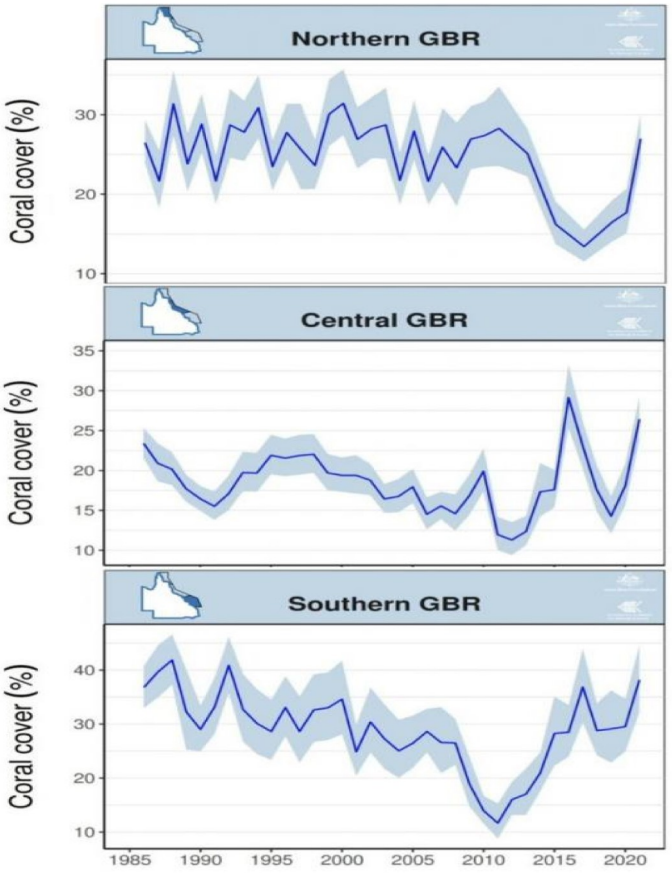
The amount of data on coral populations, bleaching, and mortality that has been collected by scientists in past periods is small in relation to the massive amounts of coral that exists around the world. Therefore any conclusions as to decline, or as to an increasing trend of bleaching, are arguably premature and subject to dispute.

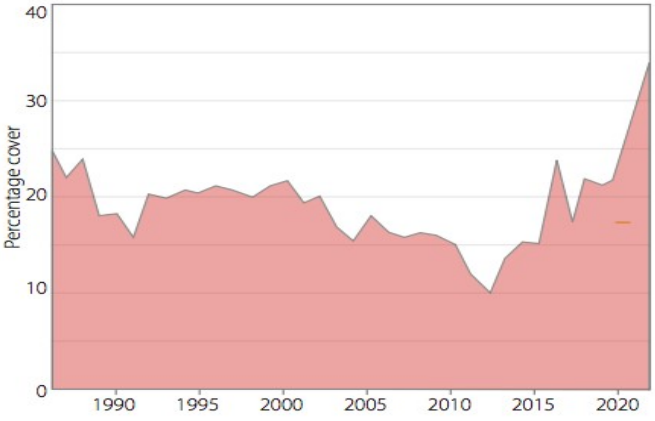
All the studies showing coral recoveries from bleaching contradict both the existence of any coral decline and the existence of any trend of increased mortality.

The Great Barrier Reef, over 1,400 miles long, is probably the most studied major reef system in the world. The Australian Institute of Marine Science has been collecting extensive data on the coral coverage on the reef since the mid-1980s. The AIMS reports its data divided into 3 sections, Northern, Central, and Southern. (see at right).

The major bleaching incident on the Central and Southern sections of the reef in 2011 was caused by major storms. Storms are probably the most common cause of coral death followed by various runoffs from the land.

The major bleaching on the Northern section in 2015-6 was caused by the strong (hot) El Nino while the Central and Southern sections of the reef were not affected. Reduction of GBR coral coverage is commonly followed by recovery. These varying patterns of fluctuating coral coverage suggest that the cause or causes of the fluctuations are not only temporary, but also regional. Hence the cause is not general global warming/climate change.





The AIMS data for the reef as a whole (to the left) shows that the GBR is presently at the highest percentage of coral coverage for the entire period of the dataset, 1986-2022. Nevertheless studies and reports of significant coral death continue to appear. UNESCO has commenced proceedings to determine whether the GBR should be designated as endangered. The Australian government opposes such a designation. The proceeding is ongoing.

Thus there is significant disagreement about the current status of the world's coral reefs.

All footnote citations are to the Intergovernmental Panel on Climate Change's publication, Climate Change 2021 The Physical Science Basis, the first part of the Sixth Assessment Report (AR6).

1. Id at 9,70.
2. Id at 9, 16, 132
3. Id at 71
4. Id at 1585
5. Id at 47
6. Id at 55, 128

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