There is little room left to doubt that CO$_2$-induced global warming will NOT lead to increases in the frequency and magnitude of storms.
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Among the highly publicized changes in weather phenomena that are predicted to attend CO₂-induced global warming are increases in the frequency and severity of various types of storms. Storms are a concern of the residents of any coastal city, as high winds, water surges and high-energy waves carry the potential for damage via flooding and erosion. It is therefore important to examine the historical records of storms for trends, to see if the so-called unprecedented rise in atmospheric CO₂ and temperature of the late-20th and early 21st century has had any measurable effect on such records. The present review addresses this issue as it pertains to the region of Australia and New Zealand.

Starting with a paper published at the turn of the millennium, De Lange and Gibb (2000)¹ analyzed trends in sea level data from several tide gauges located within Tauranga Harbor, New Zealand over the period 1960-1998. In an examination of seasonal, inter-annual and decadal distributions of storm surge data, the two researchers identified a considerable decline in the annual number of storm surge events in the latter half of the nearly four-decade-long record. A similar trend was also noted in the magnitude of storm surges; and maximum water levels, including tides, also declined over the past two decades. Additionally, the authors found that decadal variations in the data were linked to both the Inter-decadal Pacific Oscillation (IPO) and the El Niño-Southern Oscillation (ENSO), such that La Niña events were associated with more storm surge days than El Niño events, while wavelet analyses of annual storm surge frequency data suggested that before 1978 the frequency "was enhanced by the IPO, and subsequently it has been attenuated."

Similar findings were reported a decade later by Page et al. (2010)² who, working with sediment cores extracted from Lake Tutira on the eastern end of New Zealand's North Island, developed a much longer 7200-year history of the frequency and magnitude of storm activity, based on analyses of (1) sediment grain size, (2) diatom, pollen and spore types and concentrations, plus (3) carbon and nitrogen concentrations, together with (4) tephra and radiocarbon dating.

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¹ http://www.co2science.org/articles/V4/N5/C1.php
² http://www.co2science.org/articles/V13/N28/C1.php
Based on their analysis, the ten New Zealanders plus one U.S. researcher report that "the average frequency of all storm layers is one in five years," but that "for storm layers ≥ 1.0 cm thick, the average frequency is every 53 years." And in this regard, they say that over the course of their record, "there are 25 periods with an increased frequency of large storms," the onset and cessation of which stormy periods "was usually abrupt, occurring on an inter-annual to decadal scale." They also note that the duration of these stormy periods "ranged mainly from several decades to a century," but that "a few were up to several centuries long," while "intervals between stormy periods range from about thirty years to a century." In addition, they find that millennial-scale cooling periods tend to "coincide with periods of increased storminess in the Tutira record, while warmer events match less stormy periods."

In commenting on their findings, Page et al. write that in today's world there is growing concern – driven by climate models – that there may be abrupt changes in various short-term meteorological phenomena caused by global warming, "when either rapid or gradual forces on components of the Earth system exceed a threshold or tipping point." However, as is demonstrated by the results of their work in the real world, the sudden occurrence of a string of years – or even decades – of unusually large storms is something that can happen at almost any time on its own, or at least without the necessity of being driven by human activities such as the burning of fossil fuels.

Also concentrating their efforts on a large portion of the Holocene, while focusing on Australia, Hayne and Chappell (2001)\(^3\) studied a series of storm ridges at Curacoa Island on the central Queensland shelf (18°40'S; 146°33'E), which were deposited there over the past 5,000 years, in an attempt to create a history of major cyclonic events that have impacted that area. The primary finding of their study was that "cyclone frequency was statistically constant over the last 5,000 years." Secondarily, they say there was "no indication that cyclones have changed in intensity," while noting that isotopic and trace element evidence from ancient corals indicates that sea surface temperatures were about 1°C warmer about 5,000 years ago, and that pollen spectra from lake sediments suggest that rainfall at that time was about 20% higher than today. These results clearly indicate, at least for this particular location, that cyclone frequency and intensity do not respond to changes in temperature as predicted by climate alarmists who base their claims on the output of state-of-the-art climate models. Hence, there is little reason to believe that tropical storms will respond to global warming in the ways they claim, i.e., that they will intensify and become more frequent.

\(^3\) http://www.co2science.org/articles/V4/N40/C2.php.
These results clearly indicate that cyclone frequency and intensity do not respond to changes in temperature as predicted by climate alarmists who base their claims on the output of state-of-the-art climate models. Hence, there is little reason to believe that tropical storms will respond to global warming in the ways they claim, i.e., that they will intensify and become more frequent.

Additional evidence in support of the above conclusion is provided by Alexander et al. (2011), who introduced their study by stating that "understanding the long-term variability of storm activity would give a much better perspective on how unusual recent climate variations have been," and they note in this regard that "for southeast and eastern Australia some studies have been able to assess measures of storm activity over longer periods back to the 19th century (e.g., Alexander and Power, 2009; Rakich et al., 2008), finding either a decline in the number of storms or reduction in the strength of zonal geostrophic wind flow," although noting that these studies "were limited to the analysis of only one or two locations." Therefore, in an effort designed to significantly expand the database employed in their newest study of the subject, Alexander et al. analyzed storminess across the whole of southeast (SE) Australia using extreme (standardized seasonal 95th and 99th percentiles) geostrophic winds deduced from eight widespread stations possessing sub-daily atmospheric pressure observations dating back to the late 19th century.

The four researchers report that their results "show strong evidence for a significant reduction in intense wind events across SE Australia over the past century." More specifically, they say that "in nearly all regions and seasons, linear trends estimated for both storm indices over the period analyzed show a decrease," while "in terms of the regional average series," they say that "all seasons show statistically significant declines in both storm indices, with the largest reductions in storminess in autumn and winter." Thus, yet another paper illustrates that as the Earth warmed over the last century or more, the alarmist prediction of increased storminess is shown to be widely out of sync with reality.

In one final study, citing "unprecedented public concern" with respect to the impacts of climate change, Li et al. (2011) set out to examine the variability and trends of storminess for the region of the Perth, Australia metropolitan coast. To do so, they conducted an extensive set of analyses using observations of wave, wind, air pressure, and water level over the period 1994-2008. The results of their analysis, in their view, would serve "to validate or invalidate the climate change hypothesis" that rising CO₂ concentrations are increasing the frequency and severity of storms.

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4 http://www.co2science.org/articles/V14/N31/C1.php.
5 http://www.co2science.org/articles/V14/N38/C1.php.
As shown in the figure below, all storm indices showed significant inter-annual variability over the period of record, but "no evidence of increasing (decreasing) trends in extreme storm power was identified to validate the wave climate change hypotheses for the Perth region."

Annual storm trends defined by (a) stormy hours and (b) number of storm events, as determined by wind speed, significant wave height, non-tidal residual water level, and mean sea level pressure. Adapted from Li et al. (2011).

In light of these several observations, and in spite of what the Intergovernmental Panel on Climate Change has characterized as unprecedented global warming over the past two decades, Perth (Australia) has not experienced an increase in storm frequency or intensity. And when considering all of the above studies, there is little reason to believe that CO₂-induced global warming will lead to increases in the frequency and magnitude of storms. Such claims are ungrounded in the peer-reviewed scientific literature and have no basis in real-world observations.
REFERENCES


Cover photo of stormy skies provided by Microsoft.