Australian Government
Bureau of Meteorology

Tropical Cyclone Trends

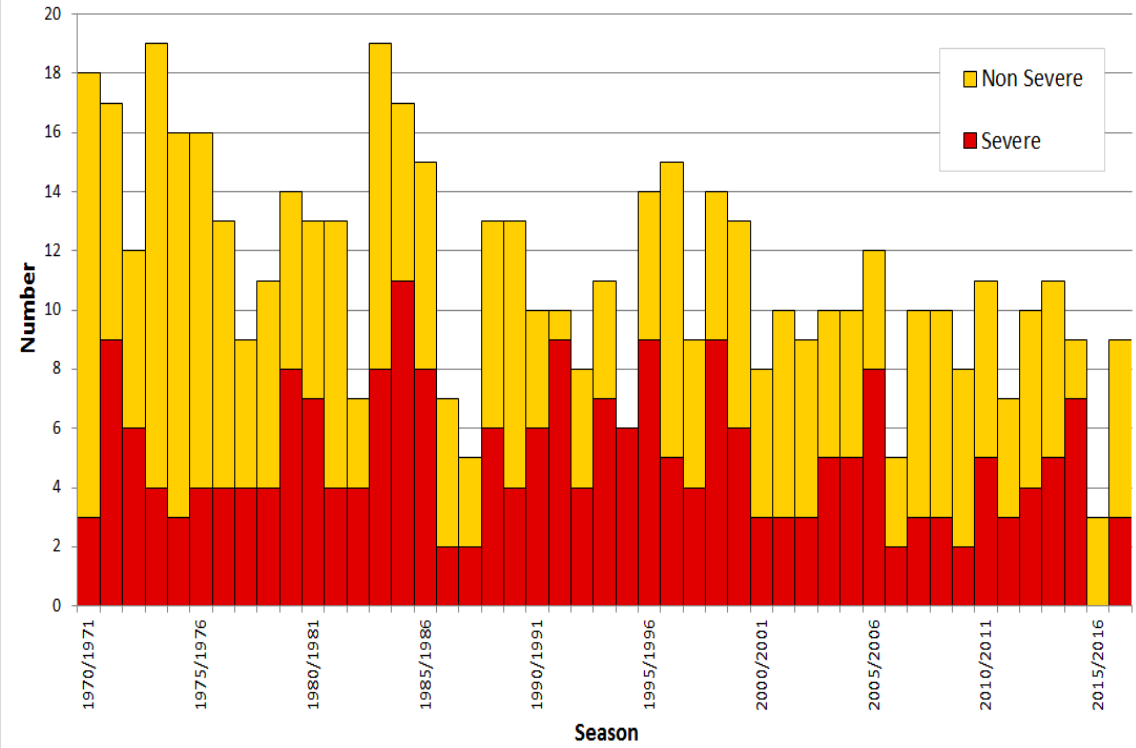
Tropical cyclones in the Australian region are influenced by a number of factors, and in particular variations in the El Niño – Southern Oscillation. In general, more tropical cyclones cross the coast during La Niña years, and fewer during El Niño years.

Analysis of historical tropical cyclone data has limitations due to a number of changes in observing practices and technology that have occurred over time. With new and improved meteorological satellites our ability to detect tropical cyclones has improved, as has our ability to differentiate tropical cyclones from other tropical weather systems such as monsoon depressions, which in the past may have been incorrectly named as tropical cyclones. A particularly important change occurred in the late 1970s when regular satellite images became first available from geostationary satellites above the Earth's equator.

The time series of analysed tropical cyclone activity in the Australian region (south of the equator; 90-160°E) show that the total number of cyclones appears to have decreased. However, there was a change to the definition for tropical cyclones in 1978 which led to some systems which would previously have been classified as tropical cyclones instead being considered sub-tropical systems. This contributes somewhat to the apparent decline in total numbers.

The number of severe tropical cyclones (minimum central pressure less than 970 hPa) is dominated by variability with periods of lower and higher frequencies of occurrence. There is less confidence in the earlier intensity data with continuous satellite coverage commencing in 1979.

Graph showing the number of severe and non-severe tropical cyclones from 1970-2017 which have occurred in the Australian region. Severe tropical cyclones are shown here as those with a minimum central pressure less than 970 hPa.



Potential changes in tropical cyclone occurrence and intensity (a measure of wind speed alone rather than the amount of precipitation or coastal flooding) are discussed in CSIRO and BoM (2015: see Sections 4.2.7 and 7.3.2). There is substantial evidence from theory and model experiments that the large-scale environment in which tropical cyclones form and evolve is changing as a result of global warming. Projected changes in the number and intensity of tropical cyclones are subject to the sources of uncertainty inherent in climate change projections. There remains uncertainty in the future change in tropical cyclone frequency (the number of tropical cyclones in a given period) projected by climate models, with

a general tendency for models to project fewer tropical cyclones in the Australia region in the future climate and a greater proportion of the high intensity storms (stronger wind speeds and heavier rainfall).

Wind speed is only one aspect of tropical cyclones and their impacts. The amount of heavy precipitation from all weather systems, including tropical cyclones, is likely to increase. Increased rainfall intensity from tropical cyclones is pertinent to Australia, since these storms have historically been associated with major flooding.

Additionally, increases in storm surges and extreme sea-levels are very likely to occur in association with tropical cyclones under future climate change. This change is independent of changes in tropical cyclone intensity and is directly related to increases in global mean sea-level due to global warming.

Projected changes in tropical cyclone characteristics are inherently tied to changes in large-scale patterns such as the El Niño - Southern Oscillation, changes in sea surface temperature and changes in deep convection. As global climate models improve, their simulation of tropical cyclones is expected to improve, thus providing greater certainty in projections of tropical cyclone changes in a warmer world.

Reference

CSIRO and Bureau of Meteorology (BoM), 2015: Climate Change in Australia Information for Australia's Natural Resource Management Regions: Technical Report, CSIRO and Bureau of Meteorology, Australia.

This page was created at **07:57 on Wednesday 24 April 2019 (AEST)**