

Regional Specialised Meteorological Centre

(RSMC) - Tropical Cyclones, New Delhi



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Introduction

The loss of life, property and human suffering caused by tropical cyclones in coastal areas in various parts of the globe are well known. These disasters are, on occasion, particularly severe in the Bay of Bengal region. The northern part of the Bay of Bengal is known for its potential to generate dangerous high storm tides, a major killer when associated with cyclonic storms. In the past, out of 10 recorded cases of very heavy loss of life (ranging from about 40,000 to well over 200,000) in the world due to tropical cyclones, 9 cases were in the Bay of Bengal and the Arabian Sea (5 in Bangladesh and 3 in India and 1 in Myanmar). The world's highest recorded storm tide of 45 feet occurred in this region (1876, Bakherganj cyclone near Meghna Estuary, Bangladesh). These facts amply illustrate the importance of an efficient cyclone warning service in this region.

Recognizing the above facts, the World Meteorological Organization (WMO) and the Economic and Social Commission for Asia and the Pacific (ESCAP) jointly established the Panel on Tropical Cyclones in 1972 as an intergovernmental body. Its membership comprises countries affected by tropical cyclones in the Bay of Bengal and the Arabian Sea. Originally, its member countries were Bangladesh, India, Myanmar, Pakistan, Sri Lanka and Thailand. Later Maldives joined this Panel in 1982 followed by Sultanate of Oman in 1997.

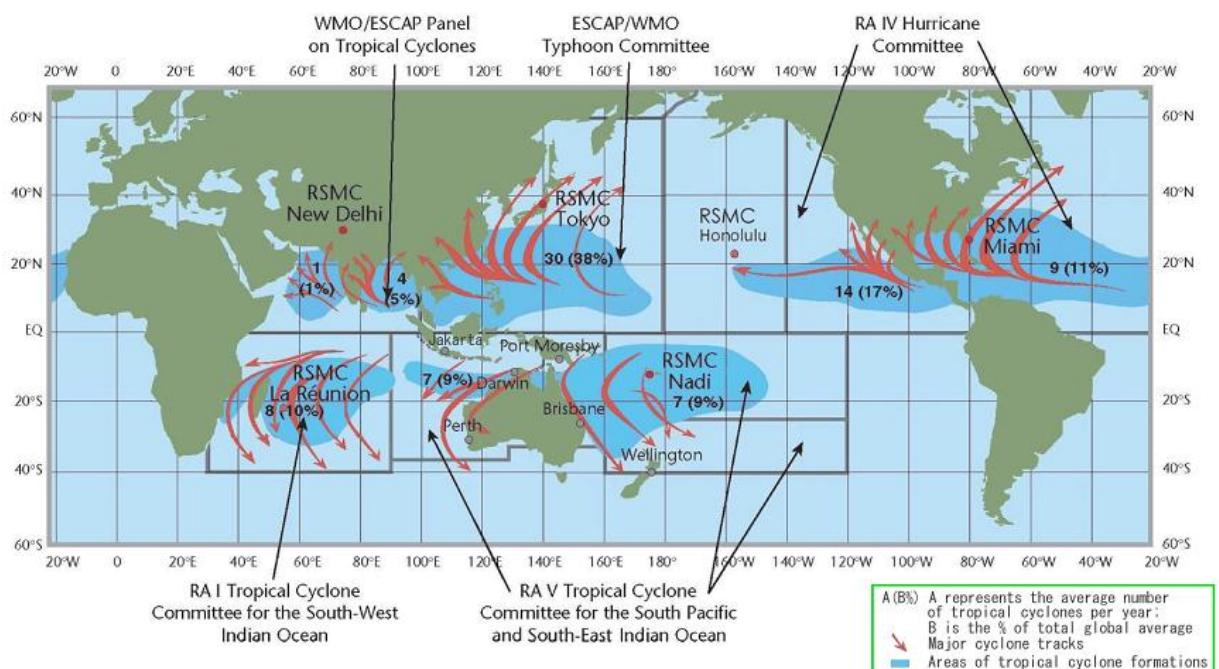
WMO/ESCAP Panel on Tropical Cyclones

The Panel is one of the five regional tropical cyclone bodies established as part of the WMO Tropical Cyclone Programme (TCP) which aims at promoting and coordinating the planning and implementation of measures to mitigate tropical cyclone disasters on a worldwide basis. The main objective of the WMO/ESCAP Panel on Tropical Cyclones is to promote measures to improve tropical cyclone warning systems in the Bay of Bengal and the Arabian Sea. The basic purpose of the operational plan is to facilitate the most effective tropical cyclone warning system for the region with existing facilities. The plan records the agreed arrangements for standardization of operational procedures, efficient exchange of various data related to tropical cyclone warnings, issue of cyclone advisories from a central location having the required facilities for this purpose, archival of data and issue of a tropical weather outlook and tropical cyclone advisories as agreed by consensus at the WMO as part of the World Weather Watch for the benefit of the region. For this purpose, there are **Regional Specialized Meteorological Centre (RSMC)- Tropical cyclone** and **Tropical Cyclone Warning Centres (TCWC)** for different regions.

Regional Specialized Meteorological Centre (RSMC)- Tropical cyclone

There are six such meteorological centres and five regional Tropical Cyclone Warning Centres utilized for naming of tropical cyclones and the distribution of tropical cyclone advisories and warnings:

- Southwest [Pacific Ocean](#): RSMC Nadi-Tropical Cyclone Centre - [Fiji Meteorological Service \(Nadi, Fiji\)](#)
- Southwest [Indian Ocean](#): RSMC La Reunion-Tropical Cyclone Centre / [Météo France \(Réunion island, French Overseas Department\)](#)
- [Bay of Bengal](#) and [Arabian Sea](#): RSMC - Tropical Cyclones New Delhi / [India Meteorological Department \(New Delhi, India\)](#)
- Western North Pacific Ocean and [South China Sea](#) - RSMC Tokyo / [Japan Meteorological Agency \(Tokyo, Japan\)](#)
- Central North Pacific Ocean - RSMC Honolulu [Central Pacific Hurricane Center \(Honolulu, Hawaii, USA\)](#)
- Northeast Pacific Ocean, Gulf of Mexico, Caribbean Sea, and north [Atlantic Ocean](#) - RSMC Miami / [National Hurricane Center](#)



Tropical cyclone warning centers

There are six main Tropical Cyclone Warning Centres (TCWC) in the southern hemisphere which are:

- Southeast Indian Ocean (south of 10°S). TCWC - Perth / Bureau of Meteorology
- Arafura Sea and Gulf of Carpentaria. TCWC - Darwin / Bureau of Meteorology
- Coral Sea. TCWC - Brisbane / Bureau of Meteorology
- Solomon Sea and Gulf of Papua. TCWC - Port Moresby / National Weather

Service forecast office, Papua New Guinea

- Tasman Sea. TCWC - Wellington, New Zealand / Meteorological Service of New Zealand Limited[2]
- Southeast Indian Ocean (north of 10°S). TCWC - Jakarta / Meteorology and Geophysical Agency of Indonesia

Tropical Cyclone Basins and Regional Centres

The majors tropical cyclones basins and their respective centres are given below.

Basins and WMO Monitoring Institutions	
Basin	Responsible RSMCs and TCWCs
Northern Atlantic	National Hurricane Center
Northeastern Pacific	National Hurricane Center
North central Pacific	Central Pacific Hurricane Center
Northwestern Pacific	Japan Meteorological Agency
Northern Indian	Indian Meteorological Department
Southwestern Indian	Météo-France
South and Southwestern Pacific	Fiji Meteorological Service [†] Meteorological Service of New Zealand [†] Papua New Guinea National Weather Service [†] Bureau of Meteorology [†] (Australia)
Southeastern Indian	Bureau of Meteorology [†] (Australia) Meteorology and Geophysical Agency of Indonesia [†]
†: Indicates a Tropical Cyclone Warning Centre	

Traditionally, areas of tropical cyclone formation are divided into seven basins. These include the north [Atlantic Ocean](#), the eastern and western parts of the [North Pacific Ocean](#) (considered separately because tropical cyclones rarely form in the central Pacific), the southwestern Pacific, the southwestern and southeastern [Indian Oceans](#), and the northern Indian Ocean. The western Pacific is the most active and the north Indian the least active. An average of 86 tropical cyclones of tropical storm intensity form annually worldwide, with 47 reaching hurricane/typhoon strength, and 20 becoming intense tropical cyclones (at least of

- **Northwestern Pacific Ocean:** Tropical storms in this region often affect [China](#), [Japan](#), [South Korea](#), [Hong Kong](#), [Philippines](#), and [Taiwan](#), as well as countries in Southeast Asia such as [Vietnam](#) and parts of [Indonesia](#), plus numerous [Oceanian](#) islands. This is by far the most active basin, accounting for one-third of all tropical cyclone activity. The coast of [China](#) sees the most landfalling tropical cyclones worldwide. The Philippines receives an average of 6-7 tropical cyclone landfalls per year.
- **Northeastern Pacific Ocean:** This is the second most active basin and has the highest number of storms per unit area. Storms that form here often affect western [Mexico](#), and less commonly the [Continental United States](#) (in particular [California](#)), or northern [Central America](#). No hurricane included in the modern database has made landfall in California; however, historical records from 1858 speak of a [storm](#) that brought [San Diego](#) winds over 75 mph/65 kts (marginal hurricane force), though it is not known if the storm actually made landfall. Tropical storms in [1939](#), [1976](#) and [1997](#) brought gale-force winds to California.
- **Northern Atlantic Ocean:** This region includes the North [Atlantic Ocean](#), the [Caribbean Sea](#), and the [Gulf of Mexico](#). Tropical cyclone formation here varies widely from year to year, ranging from one to over twenty per year with an average of around ten. The [United States](#) Atlantic coast, [Mexico](#), [Central America](#), the [Caribbean Islands](#), and [Bermuda](#) are frequently affected by storms in this basin. Venezuela, the south-east of Canada and Atlantic [Macaronesian islands](#) also are occasionally affected. Many of the more intense Atlantic storms are [Cape Verde-type hurricanes](#), which form off the west coast of [Africa](#) near the [Cape Verde](#) islands. Occasionally, a hurricane that evolves into an [extratropical cyclone](#) can reach western [Europe](#), including [Hurricane Gordon](#), which spread high winds across [Spain](#) and the [British Isles](#) in September 2006. [Tropical Storm Vince](#), which made landfall on the southwestern coast of [Spain](#) as a tropical depression in September 2005, is the only known system to impact mainland Europe as a tropical cyclone.
- **Northern Indian Ocean:** This basin is divided into two areas, the [Bay of Bengal](#) and the [Arabian Sea](#), with the Bay of Bengal dominating (5 to 6 times more activity). This basin's season has a double peak: one in April and May, before the onset of the [monsoon](#), and another in October and November, just after the monsoon. The most deadly tropical cyclones have formed in this basin, including the [1970 Bhola cyclone](#) that killed 200,000 people. Nations affected include [India](#), [Bangladesh](#), [Sri Lanka](#), [Thailand](#), [Myanmar](#), [Pakistan](#) and [Oman](#).
- **Southwestern Pacific Ocean:** Tropical storm activity in this region largely affects [Australia](#) and [Oceania](#). Tropical storms rarely reach the vicinity of [Brisbane](#),

- **Southeastern Indian Ocean:** Tropical storm activity in this region affects [Australia](#) and [Indonesia](#). According to the Australian Bureau of Meteorology, the most frequently hit portion of Australia is between [Exmouth](#) and [Broome](#) in [Western Australia](#).
- **Southwestern Indian Ocean:** Despite nearly a half century of historical data, research at Reunion Island on tropical cyclones has been a priority only since [1999](#), when [Météo-France](#) began assigning additional personnel for research purposes.^[13] Cyclones forming in this area can affect [Madagascar](#), [Mozambique](#), [Mauritius](#), [Réunion](#), [Comoros](#), [Tanzania](#), and [Kenya](#).^[13]

RSMC- Tropical Cyclones, New Delhi

Regional Meteorological Centre (RMC) New Delhi has been redesignated as RSMC - Tropical Cyclones, New Delhi with effect from 1st July 1988 and assigned the responsibility of issuing Tropical Weather Outlooks and Tropical Cyclone Advisories for the benefit of the countries in the WMO/ESCAP Panel region bordering the Bay of Bengal and the Arabian Sea, namely, Bangladesh, Maldives, Myanmar, Oman, Pakistan, Sri Lanka and Thailand. The main activities of RSMC, New Delhi are listed below.

- 1) Round the clock watch over the entire North Indian Ocean.
- 2) Analysis and processing of global meteorological data for diagnostic and prediction purposes.
- 3) Detection, tracking and prediction of cyclonic storms in the Bay of Bengal and the Arabian Sea.
- 4) Running of numerical models for tropical cyclone track and intensity prediction.
- 5) Issue of Tropical Weather Outlook once daily (at 0600 UTC) and an additional outlook at 1700 UTC in the event of a depression, which is likely to intensify into a cyclonic storm.
- 6) Issue of cyclone advisories to the Panel countries 8 times a day.
- 7) Issue of storm surge advisories.
- 8) Implementation of the Regional Cyclone Operational Plan of WMO/ESCAP Panel.
- 9) Collection, processing and archival of all data pertaining to cyclonic storms viz. wind, storm surge, pressure, rainfall, satellite information etc.
- 10) Exchange of composite data and bulletins pertaining to cyclonic storms with Panel countries.
- 11) Preparation of comprehensive reports on each cyclonic storm.
- 12) Continued research on storm surge, track and intensity prediction techniques.