Research Paper

Volume : 4 | Issue : 7 | July 2015 • ISSN No 2277 - 8179

Cyclones: Cause, Types & Impacts

Physics

KEYWORDS : cyclones, coriolis force, tropical, subtropical, hurricanes, storm surge

Ramanjeet Kaur Assistant Professor in Physics & R.S.D.College, Firozepur City,152002(Punjab)India.

ABSTRACT

In the review paper, cyclones are studied in detail. The main factor responsible for formation of cyclone is coriolis force. The naming of cyclones is done to make it easy for people to remember it and spread the information further. The various types of cyclones include tropical cyclone, extra-tropical cyclone, hurricane, typhoon, tornado, willy-willy and east coast lows. There are terrible impacts of cyclones on human health, human psychology and physical property.

INTRODUCTION

The word cyclone is believed to have come from the Greek word kyklon which means "moving in a circle" or "whirling around". This is because a cyclone contains high winds which rotate, or "whirl around" a central point. A cyclone is an area of closed, circular fluid motion rotating in the same direction as the Earth [1][2].

Tropical cyclones occur almost entirely in six distinct areas, four in the Northern Hemisphere and two in the Southern Hemisphere. Northern hemisphere include North Atlantic, Eastern North Pacific, Western North Pacific, North Indian Ocean whereas southern hemisphere includes South Indian Ocean, Southwest Pacific and Australian Area[3]. In India the states which are mainly effected by cyclones are Gujarat, Karnataka, Kerala, Maharashtra, Odisha, Tamil Nadu and bay of Bengal[4].

FORMATION OF CYCLONES:

Coriolis force is considered responsible for the rotation of cyclones. The coriolis Effect is caused by the rotation of the Earth and the inertia of the mass experiencing the effect. Only the horizontal component of the coriolis force is generally important. This force causes moving objects on the surface of the Earth to be deflected to the right with respect to the direction of travel in the Northern Hemisphere and to the left in the Southern Hemisphere.

In the Northern Hemisphere due to coriolis force air stream start whirling anticlockwise around low pressure region leading to formation of cyclone Similarly in the southern Hemisphere the sense of whirling of air stream is clockwise in the cyclone. However, no cyclones are formed at equator because coriolis force is zero at the equator. Coriolis force is quite small, and its effects generally become noticeable only for motions occurring over large distances and long periods of time, such as large-scale movement of air in the atmosphere or water in the ocean.

Above the warm ocean, water evaporates and forms clouds. If there is low air pressure where the clouds are formed, it pulls them in and they begin to rotate. It is the coriolis force that causes the cyclone's clouds to rotate. Clouds will continue to form and begin spinning more. This is the stage when it can develop into a mature cyclone or lose its momentum

Once cyclones arrive over land, their strength weakens and they begin to fade out. This is due to the lack of moisture and heat compared to the ocean over which it was formed.

NAMING OF THE CYCLONES:

The practice of naming cyclones began years ago in order to help in the quick identification of cyclones in warning messages because names are presumed to be far easier to remember than the numbers and technical terms. Many agree that appending names to cyclones makes it easier for the media to report on tropical cyclones, heightens interest in warnings and increases community preparedness. In the beginning, cyclones were named arbitrarily. Then the mid-1900's saw the start of the practice of using feminine names for cyclones. In the pursuit of a more organized and efficient naming system, meteorologists later decided to identify storms using names from a list arranged alphabetically.

TYPES OF CYCLONES:

Tropical cyclones

Tropical cyclone is in general a cyclone formed in the tropical areas. Typically, these areas are near the equator, including the East Pacific Ocean, Atlantic Ocean, Caribbean and Gulf of Mexico. However, the word "tropical" does not refer to the place of formation, and it actually refers to the structure of a cyclone. Tropical Cyclones develop over very warm tropical waters where the sea surface temperature is greater than 26°C. They have relatively long life cycles and severe tropical cyclones can produce significant property damage with wind speeds over 180km/h near the centre, heavy rainfall and coastal inundation through storm surge.

Hurricane

Hurricane is a tropical cyclone located in the north Atlantic, eastern north Pacific and central north Pacific, eastern south Pacific. A hurricane is a cyclone with winds exceeding 74 miles per hour.

Typhoon

Typhoon is a tropical cyclone located in the western north Pacific basin. Among tropical cyclones in the world, the typhoon is the most frequent and the strongest tropical cyclone.

Willy-Willy

Willy-Willy is often introduced as the name of a tropical cyclone around Australia, but it seems that it actually means something like a dust devil, and has little relationship with a tropical cyclone.

Tornado

The tornado and tropical cyclone share the same feature as the low-pressure vortex of atmosphere, but other features, such as formation, structure, scale and duration, are totally different. A tornado is created from thunderstorms and the wind tunnel is much narrower. In some cases, however, a tropical cyclone spawns a tornado due to the severe weather and produces irregularly strong winds beyond expectation [5].

Extra-tropical cyclones

Extra-tropical cyclone literally means a cyclone outside of the tropical areas. The fundamental difference between a tropical cyclone and this type is that the former consists of warm air only, while the latter consists of both cold air and warm air. This difference also leads to the different source of energy for intensification. A tropical cyclone is often transformed into an extra-tropical cyclone, but the inverse is rare.

East Coast Low:

East Coast Lows generally have much shorter lifetimes than Tropical Cyclones. They develop over the Tasman Sea close to the NSW coast and can intensify rapidly in the 24 hour period. East Coast Lows are driven by the temperature gradient between the Tasman Sea air and cold air in the high levels of the atmosphere over the continent.

IMPACTS OF CYCLONES:

Physical impact

The loss of property from tropical cyclones has increased substantially over recent years [6]. Tropical cyclones often affect a lager geographic area than other disasters. The area of destruction in tropical cyclones varies from about 25 km in small systems to 500 km or more in large systems [6]. **Strong winds** caused by tropical cyclones heavily damage infrastructure and buildings [7]. High buildings are vulnerable to winds caused by hurricanes, especially as wind speeds tend to increase with height. Wind can disrupt telephone lines, antennae and satellite disks [8]. High voltage wires can be damaged by wind, causing power cuts [9]. Winds can cause splitting and falling of trees [10]. Uprooted trees can lead to damage to underground utility lines. **A storm surge** following from cyclones can lead to loss of life through drowning, inundation of low-lying coastal areas, erosion of coastline, loss of soil fertility due to intrusion by ocean saltwater and damage to buildings and transport networks. **Flooding** can be caused by either freshwater (due to heavy rains) or saltwater (due to storm surges). Each presents specific problems as freshwater carries suspended solids, which leave mud and soil behind when the floodwaters recede, and saltwater can make water sources unsuitable for use, because of the salinity of the floodwaters.

Impact on population

Loss of lives from tropical cyclones has significantly decreased over recent years, primarily due to improvement in early warning systems, emergency preparedness and building of storms shelters [11]. **Injury** represents the major cause of death and the primary cause of morbidity for tropical cyclones [12]. The top three cyclone-related injuries are lacerations, blunt trauma, and puncture wounds [13]. Prominent causes of death and injury are electrocutions from downed power lines, flying debris and motor vehicle fatalities. An increased incidence of animal and insect bites following tropical cyclones has also been noted [14-15].

Outbreaks of infectious diseases following tropical cyclones are rare [16-17]. In developed nations, post-hurricane infectious disease spread has been occasionally detected after the hurricane. There has been find an increase in respiratory infections after the cyclones. There have been a few reports of isolated outbreaks associated with vector-borne illness in developing nations. For example, interruption of health services including an anti-malaria campaign may have contributed to a malaria outbreak in Haiti following Hurricane Flora in 1963[18].

Water, sanitation and health are major issues after cyclones and floods. Studies show the risks of disease are greatest where there is overcrowding and where standards of water and sanitation have declined. This often happens in situations of massive population displacement away from the flooded area and prolonged stay in flood shelters. Major population movements are rare, but may occur in heavily damaged urban areas, due to storm surges [9].

Psychological consequences

Behavioral health effects are among the most long-term and debilitating outcomes of tropical cyclones [19]. Some persons experience persistent distress, post-traumatic stress disorder (PTSD), major depression, or other psychiatric outcomes. An elevated prevalence of PTSD was specifically apparent in hurricane survivors in developing nations. Rates of suicide [20] and child abuse [21] appear to rise following natural disasters. The National Institute of Mental Health (NIMH) has been quite proactive in seeking to address mental-health issues of those disaster victims affected by Hurricane [22].

CONCLUSIONS

A cyclone contains high winds which whirl around a central point. Coriolis force caused by the rotation of the Earth and the inertia of the mass are responsible for the rotation of cyclones. The naming of cyclones helps in the quick identification of cyclones. The two types of cyclones are tropical cyclones and extra-tropical cyclone. Like other natural disasters, cyclones cause huge damage to humanity in the form of diseases spread, death, destruction of property and also psychological depressions.

REFERENCE

[1] Glossary of Meteorology (June 2000),"Cyclonic circulation" American Meteorological Society. Retrieved 2008-09-17. | [2] Glossary of Meteorology (June 2000), "Cyclone", American Meteorological Society. Retrieved 2008-09-17. | [3]http://msi.nga.mil/MSISiteContent/StaticFiles/NAV_PUBS/APN/Chapt-36.pdf | [4]http://en.wikipedia.org/w/index.php?title=List_of_tropical_cyclones_that_affected_India&oldid=662907763 | [5]http://agora.ex.nii.ac.jp/digital-typhoon/help/world.html.en | [6] CDMP (2001)," Impact of tropical cyclones", Carribean Disaster Mitigation Project. | http://www.oas.org/cdmp/hazmap/taos/impacts.htm | [7]Bryant, E. (2005), "Natural Hazards (second edition)", Cambridge University Press. | [8] IFRC (2000)," Disaster Emergency Needs Assessment", http://www.ifrc.org/Global/Disemnas.pdf | [9] PAHO (2002)," Humanitarian Assistance in Disaster Situations" http://www.paho.org/english/Ped/pedhumen.pdf | [10] ECLAC (2003)," Handbook for Estimating the Socio-economic and Environmental Effects of Disasters", http://www.proventionconsortium.org/themes/default/pdfs/ECLAC_handbook.pdf | [11] WHO (2002)," Climate Change and Human Health". | [12] Meredith, J.T., and S. Bradley(2002)," Hurricanes", Disaster Medicine, 179-186. | [13] Noji, E.K. (1993),"Analysis of medical needs during disasters caused by tropical cyclones: Anticipated injury patterns." Journal of Tropical Medicine and Hygiene, 96,370–376. | [14]CDC (1996)," Surveillance for Injuries and Illnesses and Rapid Health-Needs Assessment Following Hurricanes Marilyn and Opal, September–October 1995", Morbidity and Mortality Weekly Report, 45(04), 81–85. | [15] CDC (2000), "Morbidity and mortality associated with Hurricane Floyd—North Carolina, September–October 1999", Morbidity and Mortality Weekly Report 49(17), 369–372. | [16]Toole, M.J. (1997)," Communicable disease and disease control." The Public Health Consequences of Disasters, E.K. Noji, ed. Oxford University Press, New York, NY, 79-100. | [17]World Health Organization (WHO) (1979), "The risk of disease outbreaks after natural disasters." World Health Organization Chronicle, 33, 214–216. | [18]Mason, J., and P. Cavalie (1965), "Malaria epidemic in Haiti following a hurricane." American Journal of Tropical Medicine and Hygiene 14,533–539. | [19]Ursano, R.J., C.S. Fullerton, and B.G. McCaughey (1994)," Trauma and disaster, Individual and Community Responses to Trauma and Disaster: The Structure of Human Chaos, R.J. Ursano, B.G. Mc- Caughey, and C.S. Fullerton, eds. University Press, Cambridge, United Kingdom, 3-27. | [20] Krug, E.G., M. Kresnow, J.P. Peddicord, L.L. Dahlberg, K.E. Powell, A.E. Crosby, and J.L. Annest (1998),"Suicide after natural disasters." New England Journal of Medicine, 338, 373–378. | [21] Keenan, H.T., S.W. Marshall, M.A. Nocera, and D.K.Runyan (2004)," Increased incidence of inflicted traumatic brain injury in children after a natural disaster." American Journal of Preventive Medicine, 26,189–193. | [22] Insel, T. (2005)," Coping with Hurricanes Katrina and Rita: Update from the Director." National Institute of Mental Health. |