Hurricane Frequency and Damage in Texas

Meng Liu and C. Vipulanandan, PhD., P. E.
Texas Hurricane Center for Innovative Technology (THC-IT)
Department of Civil and Environmental Engineering
University of Houston, Houston, TX 77204-4003
Tel: (713)743-4278
Email: mliu17@uh.edu, cvipulanandan@uh.edu

Abstract: Frequency of hurricane along the Texas coast was represented by using the Poisson distribution based on the data collected from last 100 years. Data on hurricane damage have been collected and analyzed.

1. Introduction

Hurricanes affect large coastal areas and inland in a relative short span of time. The earliest hurricane report comes from Christopher Columbus, who encountered a tropical storm near Hispaniola, on one of his voyages to the New World. According to statistics published by the Munich Re Group for the year 2001, windstorms were responsible worldwide for 55 % of the $36 billion in economic losses and 88% of the $11.5 billion in insured losses due to all natural disasters combined. (Parthiban Mohanasundaram, CIGMAT-2008)

Hurricane Ike was the third most destructive hurricane to ever make landfall in the United States. It was the ninth named storm, fifth hurricane and third major hurricane of the 2008 Atlantic hurricane season. Hurricane Ike was blamed for at least 195 deaths. In the United States, 112 people were killed, and 34 are still missing. Damages from Ike in US coastal and inland areas were estimated at $24 billion, with additional damage of up to $4 billion in Cuba, $200 million in the Bahamas, and $60 million in the Turks and Caicos, amounting to a total of $28.26 billion in damages. Ike was the third costliest U.S. hurricane of all time, behind Hurricane Andrew of 1992 and Hurricane Katrina of 2005. ("Hurricane Ike Tropical Cyclone Report", National Hurricane Center)

2. Objectives

The Objective of this study was to determining the hurricane frequency along Texas coast and related damage.

3. Data Collection

Information for this study was collected from NOAA data base (http://www.nhc.noaa.gov) and was summarized in Table 1. In the past fifty years, the highest death was during hurricane Rita in 2005 and the highest damage of $24 billion was after hurricane Ike in 2008.

4. Analyses

The hurricane frequency has been parametrically modeled using Poisson distribution, $f(h)=\exp(-\lambda)*\lambda^h/h!$; (h=0,1,2,…), where h is the number of hurricane per year, λ is the expected number of hurricanes during a year. By analyzing 100 data from NOAA, the parameter λ for Texas was 0.54. (Table 2)

Table 1. History of Hurricanes in Texas Coast with Death & Damage

Hurricane	Time	Influenced Counties & Area	Death in Texas	US Damage (Millions US $)	Category	Ref.
Audrey	06/27/1957	Cameron, Louisiana and Sabine Pass	9	150	4	NOAA
Debra	07/24/1959	Freeport, Galveston	0	7	1	NOAA
Carla	09/10/1961	Port Lavaca	31	400	4	NOAA
Cindy	09/17/1963	High Island	3	13	1	NOAA
Beulah	09/20/1967	Padre Island	58	0	2	NOAA
Celia	08/03/1970	Corpus Christi	0	454	3	NOAA
Fern	09/09/1971	Freeport, Matagorda	0	30	1	NOAA
Allen	08/10/1980	Brownsville	7	300	3	NOAA
Alicia	08/18/1983	Galveston	21	2 billion	3	NOAA
Bonnie	06/26/1986	High Island	3	2	1	NOAA
Chantal	08/01/1989	High Island	13	100	1	NOAA
Jerry	10/15/1989	Galveston	3	70	1	NOAA
Claudette	07/15/2003	Matagorda	1	180	1	NOAA
Rita	09/21/2005	Jasper	113	10 billion	3	NOAA
Dolly	07/23/2008	South Padre Island	0	0	1	NOAA
Ike	09/13/2008	Galveston, Houston	81	24 billion	2	NOAA

Table 2. Frequency of Hurricane (1900-1999)

Number of Hurricanes in a year (h)	Count	Hurricane Frequency (Real date)	Hurricane Frequency (Poisson distribution)
0	59	59.00%	58.29%
1	36	36.00%	31.46%
2	5	5.00%	8.49%
Total	100	100.00%	98.24%

5. Hurricane Ike Survey

A survey was undertaken (http://www.egr.uh.edu/hurricane/files/assessment.pdf) and data was collected related to evacuation, losses and recovery. Of the responding, 6.3% had over $10,000 in damage and 3.6% had major structural damage. Power loss was the major hindrance to recovery.

6. Reference

Le Xu, Richard E. Brown. “Hurricane Simulation for Florida Utility Damage Assessment” Transmission and Distribution Conference and Exposition, 2008. T&D. IEEE/PES 21-24 April 2008:1 – 6.

7. Acknowledge

The study was supported by the THC-IT (http://egr.uh.edu/hurricane).