

## REVIEW OF HURRICANE LOSS MODELS

**Parthiban Mohanasundaram and C.Vipulanandan PhD, P.E.**

**Texas Hurricane Center for Innovative Technology (THC-IT)**

**University of Houston, Houston, Texas 77204-4003**

**Telephone No: (713)-743-4291**

**E-Mail: cvipulanandan@uh.edu**

### Abstract

Hurricane Loss Models (HLM) is being widely used in determining the cost of losses due to hurricanes. In this study, a few public domain HLMs are reviewed and important parameters used in these models are identified. Population is factored into few of the models.

### 1. Introduction

Hurricanes affect large coastal areas and inland in a relative short span of time. The earliest hurricane report came 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. Since 1928, Hurricane Katrina in 2005 was the most expensive and deadliest natural disaster in the US causing \$81.2 billion in property damage with overall damage estimated exceed to \$100 billion. Hurricane Katrina made landfall in Louisiana and impacted four states directly including Mississippi, Alabama, Florida and Georgia. Two additional states, Kentucky and Ohio, were affected indirectly by flooding along the Mississippi River. The storms also wreaked havoc on the vital portion of US domestic energy infrastructure. Destruction of important pipelines and refineries together with reduced production resulted in high energy prices for several months after the hurricanes.

### 2. Objective

The Objective of this study was to identify the important parameters used in various hurricane loss models.

### 3. Overview of Models

A Hurricane Loss Model (Table 1) will include a wind model (WM), boundary layer model (BM), damage model (DM) and frequency of occurrence model (FM). Wind models range from the extremely simple Rankine Vortex to complex parametric models to full three-dimensional physics models. The models use simple storm parameters such as the minimum central pressure, radius of maximum winds and forward speed. The Boundary Layer model is used to adjust wind speeds due to surface affects. The damage function (also called the vulnerability or loss function) relates the wind deposited on a site to the damage expected at the site. The frequency of hurricanes per year is represented as the frequency of occurrence model and is used to estimate the losses annually. Based on the selection of component models, hundreds of hurricane models can be used for predictions

### 4. Conclusions

All the Hurricane Loss Models reviewed were GIS based and the major components were wind model, boundary layer model, damage model and frequency of occurrence model. A few models have considered the population factor.

**Table 1. Summary of Hurricane Loss Models**

S.No	Hurricane Loss Models	Components of HLM						Reference
		Input Database	Wind Model	Boundary layer Model	Damage/ Vulnerability model	GIS	Population Factor	
1	HURLOSS Hurricane Model	Limited	YES	YES	YES	YES	NO	INTRA RISK Applied Research Associates www.intratrisk.com
2	HAZUS Software Model	YES	YES	YES	YES	YES	YES	HAZUS-MH FEMA http://www.fema.gov/plan/prevent/hazus/
3	Hurricane Loss Estimation Model	YES	YES	YES	Limited	YES	NO	Watson, C.C., and Johnson M.E., 2004: Hurricane Loss Estimation Models: Opportunities for Improving the State of the Art. Bull. Amer. Meteor. Soc., 85, 1713–1726.
4	RMS Hurricane Model	YES	YES	YES	YES	YES	YES	Risk Management Solutions (RMS) www.napcollc.com/articles/JuneReview RMSHurricane.pdf
5	State of Florida Loss Projection Model	YES	YES	YES	YES	YES	NO	J.-P. Pinelli, C. Subramanian, J. Murphee, K. Gurley, S. Hamid and S. Gulati, "Florida Public Hurricane Loss Projection Vulnerability Model," Proceedings of the 10th American Conference on Wind Engineering, Baton Rouge, Louisiana, USA, June 2005.