Public Hurricane Loss Projection Model

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Project Funding and Timeline

• The project is currently funded for $2.55 million by the Florida Department of Insurance.
• Project started in Summer of 2001 and is expected to be completed by May 2004. However, the model will need to be maintained, updated and extended and will require annual funding in the future.
Goal of the Project

• The goal of the project is to develop and maintain a computer model to assess hurricane risk, and to project annual expected insured residential losses for specific sites, zip codes, counties and regions in Florida.

• These losses can be estimated for both individual property and for entire portfolios of residential properties.

• The proposed model shall also project insured losses for user defined scenarios and historical events.
The proposed model can be used to:

- provide assistance to the Florida Department of Insurance and the insurance industry in the rate making process
- provide a state of the art transparent wind hazard, vulnerability and insured loss models for public use
- provide a check on the assumptions, analysis and results generated by the proprietary models
- help evaluate reinsurance risk for, e.g., the Florida CAT Fund
- assess the efficacy of disaster mitigation strategies
General Comments

- While the project is funded by the state of Florida and sponsored by the Florida Department of Insurance, it is being developed predominantly by academic experts at the International Hurricane Center at FIU, and in the various universities, in accordance with the best available methodologies, techniques, theories and scientific principles.
• The model is being developed without bias and will be transparent.
• It is expected the model and its components will be available to the insurance and reinsurance industry.
• It will be subject to external review and will comply with the standards set by the Florida Commission on Hurricane Loss Projection Methodology (FCHLPM).
Project Design Flow Chat

WIND MODEL
Stochastic storms, Storm tracks and Wind fields

Vulnerability Model

Insured Loss Model

OUTPUT
Project Design

• The model consists of three major components: wind, vulnerability (damage), and insured loss.
• The components shall be developed and validated independently before being integrated.
• The computer platform is designed to accommodate future hookups of additional sub-components or enhancements.
Project Task Status

• There are over 65 major tasks and two hundred sub-tasks
• Currently 54 tasks are either completed or on going
# Project Tasks - Continued

<table>
<thead>
<tr>
<th>Task</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>• A1 Historical meteorological data collection</td>
<td>Completed</td>
</tr>
<tr>
<td>• A2 Define landfall segment (Alternative method adopted)</td>
<td>Completed</td>
</tr>
<tr>
<td>• A3a Met Input database development</td>
<td>Completed</td>
</tr>
<tr>
<td>• A3b Met Output database development</td>
<td>On going</td>
</tr>
<tr>
<td>• A4 Meteorology literature survey</td>
<td>Completed</td>
</tr>
<tr>
<td>• A5a Modeling/fitting hurricane parameter distributions</td>
<td>On going</td>
</tr>
<tr>
<td>• A5b Wind fields development</td>
<td>On going</td>
</tr>
<tr>
<td>• ** Storm track modeling</td>
<td>On going</td>
</tr>
<tr>
<td>• ** Storm frequency and time of genesis modeling</td>
<td>Completed</td>
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<tr>
<td>• A6 Climate Cycle model development</td>
<td>Completed</td>
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<tr>
<td>• A7 Zip code centroid database</td>
<td>Completed</td>
</tr>
<tr>
<td>• A8 Terrain coefficient database development</td>
<td>Completed</td>
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</tbody>
</table>
• A9  Inland decay model development  On going
• A11 Wind Speed Estimates  On going
• A12 Treatment of uncertainties for wind model  On going
• A13 Validation of the wind model  On going
• A14 Wind field comparisons  On going
• A15 Sensitivity analysis for wind model  On going
• A16 Documentation of wind model  On going
• B1  Vulnerability component data collection  Completed
• **  Field data analysis  Completed
• B2  Vulnerability (Engineering) literature survey  Completed
• B3  Structural classification survey  Completed
• B4  Vulnerability (damage) functions/matrix modeling for structures  On going
• **  Engineering component Monte Carlo simulation model develop  On going
• **  Engineering damage simulations for masonry home model  Completed
• ** Engineering damage simulations for non-masonry home models  On going
• B5  Vulnerability (damage) functions/matrix modeling for contents  On going
• B6  Vulnerability (damage) functions/matrix modeling for ALE  On going
• B8  Treatment of uncertainties for vulnerability model  Ongoing
• ** Sensitivity analysis of the vulnerability models  On going
• B12  Documentation of the model  On going
• C1  Insurance premium file and claims database development  On going
• C2  Insured loss modeling literature survey  Completed
• C3  Insured Loss distribution modeling  On going
• ** Modeling of deductibles  On going
• ** Modeling of other policy modifications  On going
• D1  Selection of computational architecture  Completed
• D2  Hardware and software purchase and setup  Completed
• D3  Computer Science graduate student training  Completed
• D4  Integrated database development for all components  On going
• D5  Wind model object oriented analysis  (**)
• D8  Wind model software development  (**)
• D6  Vulnerability model object oriented analysis  (**)
• D9  Vulnerability model software development  (**)
• D7  Insured loss model object oriented analysis  (**)
• D10  Insured model software development  (**)
• **  Requirement analysis and computer model design
  of user case one  Completed
• **  Requirement analysis and computer model design
  of user case two  Completed
• **  Requirement analysis and computer model design
  of user case seven  Completed
• **  Requirement analysis and computer model design
  of user case eight  On going
• E1  External review of the wind model  On going
• E2  External review of the vulnerability model  On going
• E4  External review of the computer platform/ software design  On going
• There are totally nine use cases in this project to run the model. Six are for meteorology computation, one for the engineering damage model and two for insured loss estimation. This system is prototyped as a Web-based system. All source data are stored in a database.
Participating Institutions

- Florida International University (lead institution)
- Florida State University
- Florida Institute of Technology
- Hurricane Research Division, NOAA
- University of Florida
- University of Miami
- National Institute of Science and Technology
List of current participants

(Excluding graduate students)

• Dr. Shahid Hamid  *  Dept of Finance and IHC, Florida International University
• Dr. Shu-Ching Chen  *  Dept of Computer Science, FIU
• Dr. Steven Cocke  Dept of Meteorology, Florida State University
• Howard Eagelfeld  Florida Department of Insurance
• Dr. Sneh Gulati  *  Dept. of Statistics, Florida International Univ
• Dr. Kurtis Gurley  Dept of Civil Engineering, Univ of Florida
• Dr. T.N.Krishnamurti  Dept of Meteorology, Florida State University
• Dr. Chris Landsea,  Hurricane Research Division, NOAA
• Dr. Steve Leatherman  Director, International Hurricane Center, FIU

* Team Leaders
- Nirva Morisseau  Database expert, Hurricane Research Division, NOAA
- Dr. Ali Parhizgari  Dept of Finance, Florida International Univ
- Dr. Jean Paul Pinelli *  Dept of Civil Engineering, Florida Institute of Technology
- Dr. Mark Powell *  Hurricane Research Division, NOAA
- Dr. George Soukop  Hurricane Research Division, NOAA
- Dr. Emil Simiu  National Institute of Standards & Tech and John Hopkins University
- Dr. George Soukup  Applied physicist, AOML/NOAA
- Dr. Mei-Ling Shyu  Dept. of Electrical and Computer Engineering, University of Miami
- Dr. Mani Subramaniam  Dept of Mech Engineering, Florida Institute of Technology
- Dr. Walter Tang  Dept of Civil Engineering, FIU
Insurance Data

• In February and March 2003, premium file and claims data were acquired for 1995-2002 from: Citizen’s Group, Prudential and All State. Data from State Farm, Nationwide etc have not been made available.
• Data prior to 1995, including for hurricane Andrew, has not been made available.
• The delay in data acquisition means significant delay in project timeline.