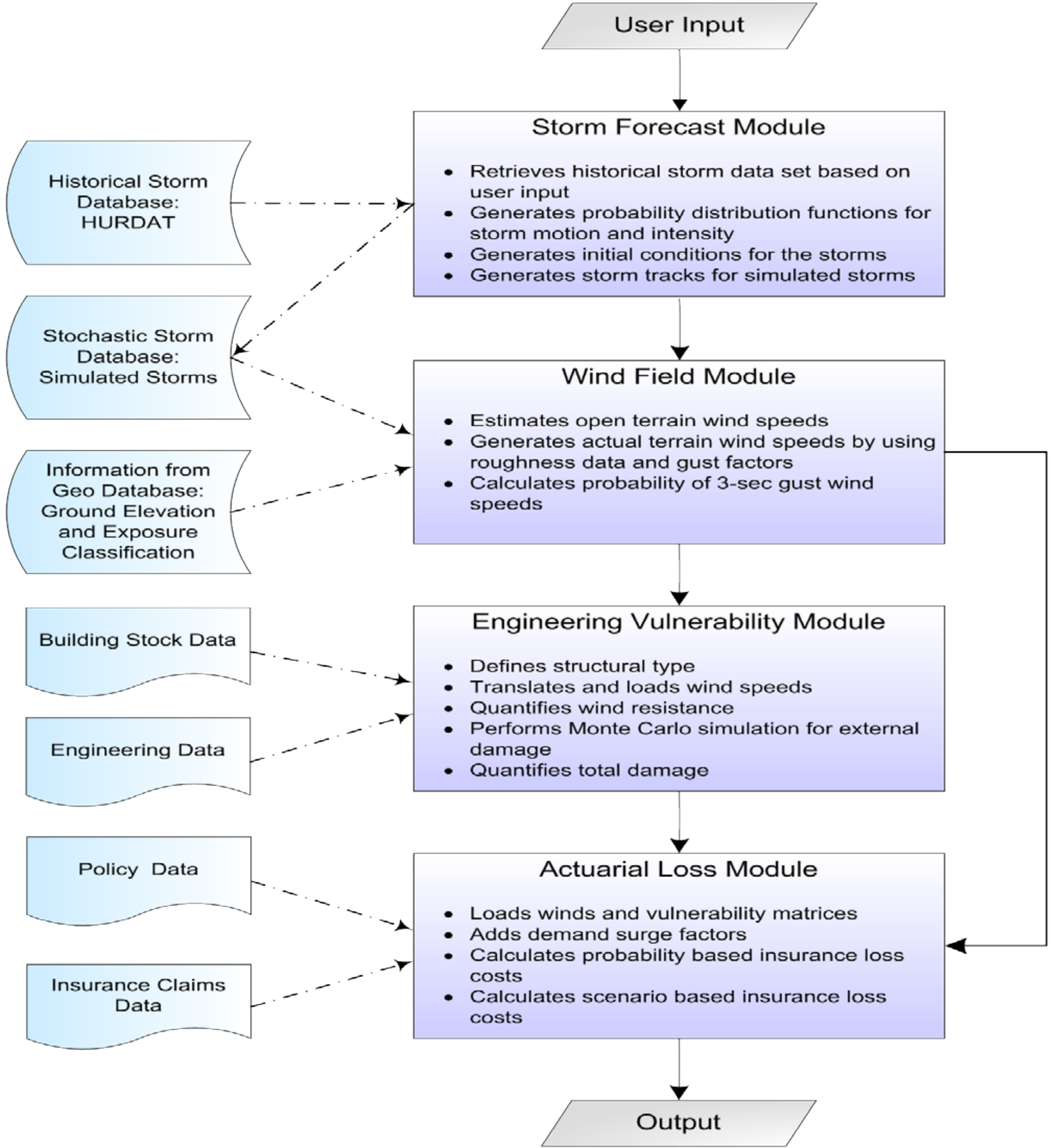
Florida Public Hurricane Loss Model V 5.0

General standards

G-1 Scope of the Computer Model and Its Implementation

A. *The computer model shall project loss costs and probable maximum loss levels for residential property insured damage from hurricane events.*

- The Florida Public Hurricane Loss Model estimates loss costs and probable maximum loss from hurricane events for personal and commercial lines residential property. The losses are estimated for building, appurtenant structure, content and ALE.
- The model name is Florida Public Hurricane Loss Model. The current version is 5.0 and the release date is July12, 2013.
- A comprehensive summary of the model is provided in the overview.


User Input
Storm Forecast Module
Retrieves historical storm data set based on user input
Generates probability distribution functions for storm motion and intensity
Generates initial conditions for the storms
Generates storm tracks for simulated storms
Historical Storm Database: HURDAT
Stochastic Storm Database: Simulated Storms
Wind Field Module
Estimates open terrain wind speeds
Generates actual terrain wind speeds by using roughness data and gust factors
Calculates probability of 3-sec gust wind speeds
Information from Geo Database: Ground Elevation and Exposure Classification
Building Stock Data
Engineering Data
Engineering Vulnerability Module
Defines structural type
Translates and loads wind speeds
Quantifies wind resistance
Performs Monte Carlo simulation for external damage
Quantifies total damage
Policy Data
Insurance Claims Data
Actuarial Loss Module
Loads winds and vulnerability matrices
Adds demand surge factors
Calculates probability based insurance loss costs
Calculates scenario based insurance loss costs
Output

B. ***The modeling organization shall maintain a documented process to assure continual agreement and correct correspondence of databases, data files, and computer source code to slides, technical papers, and/or modeling organization documents.***

- The FPHLM group members follow the process specified in the flowchart below in order to assure continual agreement and correct correspondence of databases, data files, and computer source code to slides, technical papers, and FPHLM documents.

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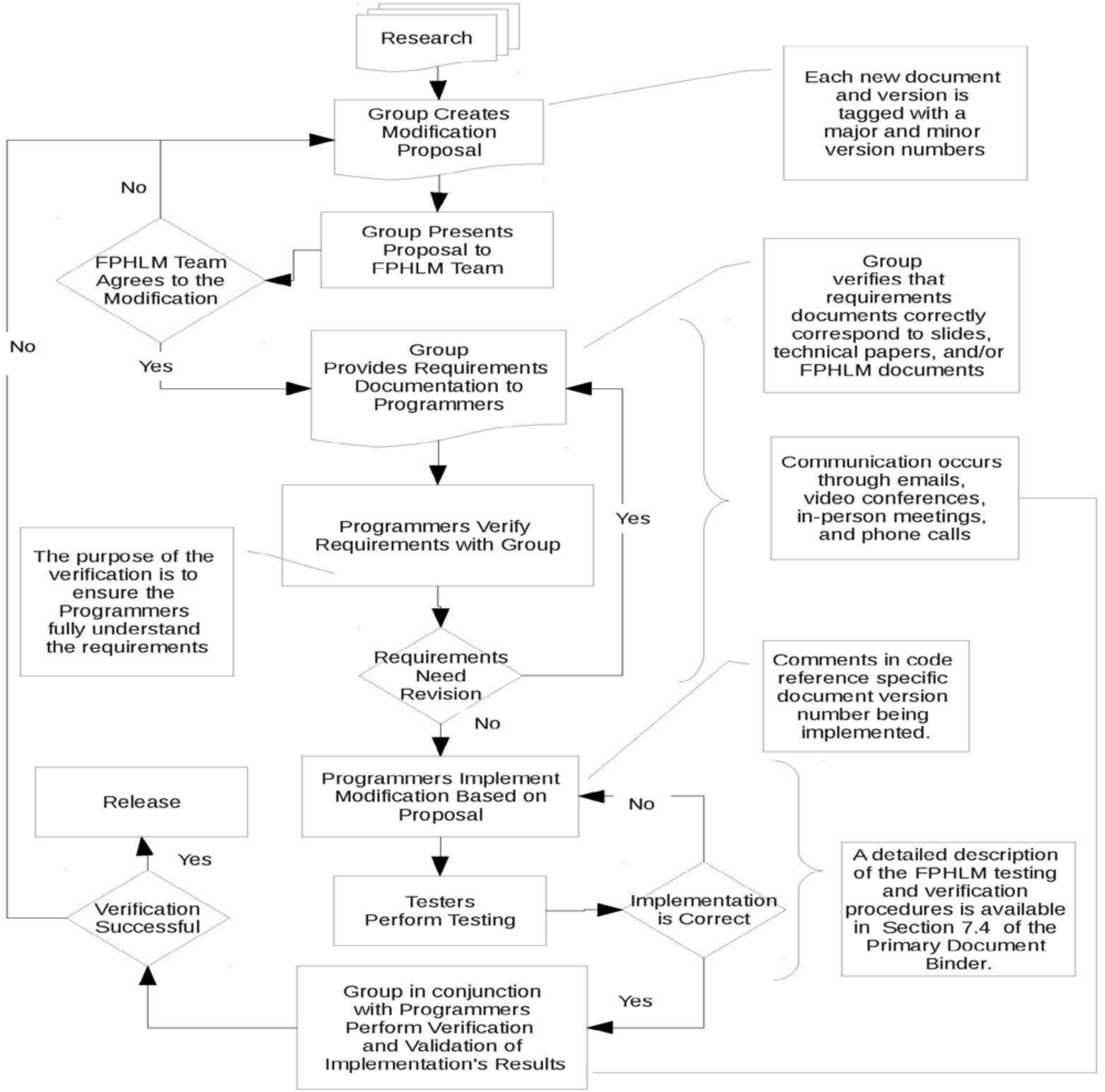


FPHLM Team: All members of the FPHLM
Groups: Meteorology, Engineering, Statistics, Actuarial, and Computer Science

Changes to the meteorology component include:

1. Change made to update to the latest HURDAT (5/14/2012) and to take advantage of new observations of *Rmax* that have recently become available for storms that have occurred up to the 2010 hurricane season
   – The estimated change in statewide loss costs due to the updated probability distribution functions in the storm track generator (updated *Rmax* and HURDAT) is a 2.35% increase.

2. Updated zip code centroid locations as per Standard G-3.
   – The estimated change in statewide loss costs due to updated ZIP code centroids is a 0.63% decrease.

3. Changed hurricane marine PBL height in terrain conversion model to be the same as in the wind model.
   – The estimated change in statewide loss costs due to the modification of the hurricane PBL height is approximately a 2.37% decrease.

- The overall change in loss costs resulting from meteorological component is -.73%.

Changes to the vulnerability component include:

<u>Personal Residential Model Changes:</u>

- Personal residential model in version 5.0 is essentially the same as the previous submission, with additional refinements .
- Additional refinements include:
  - Wind Borne Debris Region boundaries were updated
  - new components were added as an option for all strength models: metal roof, metal shutters
  - Gradation of strong models was implemented
  - window capacities were increased for strong models
  - footprint options for physical damage model were consolidated into a single timber frame and single masonry footprint
  - life cycle duration for roof replacement was changed from 20 to 30 years

Low Rise Commercial Residential Model Changes:

- LR Commercial residential model in version 5.0 is essentially the same as the previous submission, with additional refinements .
- Additional refinements include:
  - Wind Borne Debris Region boundaries were updated
  - new components were added as an option for all strength models: soffits; metal roof, metal shutters
  - items were modified:
    - window protection in the presence of metal shutters;
    - debris impact model;
    - rain adjustment factors;
    - wind speed variation with height in rain model;
    - costing scheme;
    - wall sheathing capacities; window capacities for strong model;
    - pressure coefficients c_p for hip roof models;
    - relationship between ASCE vs. model pressure coefficients c_p;
    - roof to wall connection capacities;
    - roof to wall failure connection algorithm;
    - masonry wall capacity.

High-Mid Rise Commercial Residential Model Changes:

- MH Commercial residential model in version 5.0 is essentially the same as the previous submission, with additional refinements .
- Additional refinements include:
  - Wind Borne Debris Region boundaries were updated
  - new components were added:
    - debris impact zones;
    - option with no sliders;
    - differentiation between damaged and breached openings
  - items were modified:
    - opening pressure capacities;
    - external damage costing scheme;
    - interior damage cost coefficient;
    - number of windows in open layout.

- The overall change in loss costs resulting from meteorological component is -.73%.
- The combined statewide percentage change in loss costs due to all the changes in the personal residential model is an approximate 3.69 % decrease.
- The combined statewide percentage change in loss costs due to all the changes in the commercial residential model is an approximate 19.07% decrease.
- The overall change in loss costs resulting from the vulnerability component is -6.6%.
- The overall statewide percentage changed in loss cost from all the model changes is a decrease of -7.35%.

- **G-2 Qualifications of Modeler Personnel and Consultants**

A) Model construction, testing, and evaluation shall be performed by modeling organization personnel or consultants who possess the necessary skills, formal education, and experience to develop the relevant components for hurricane loss projection methodologies.

- The model was developed, tested, and evaluated by a multi-disciplinary team of professors and experts in the fields of meteorology, wind and structural engineering, computer science, statistics, finance, economics, and actuarial science.

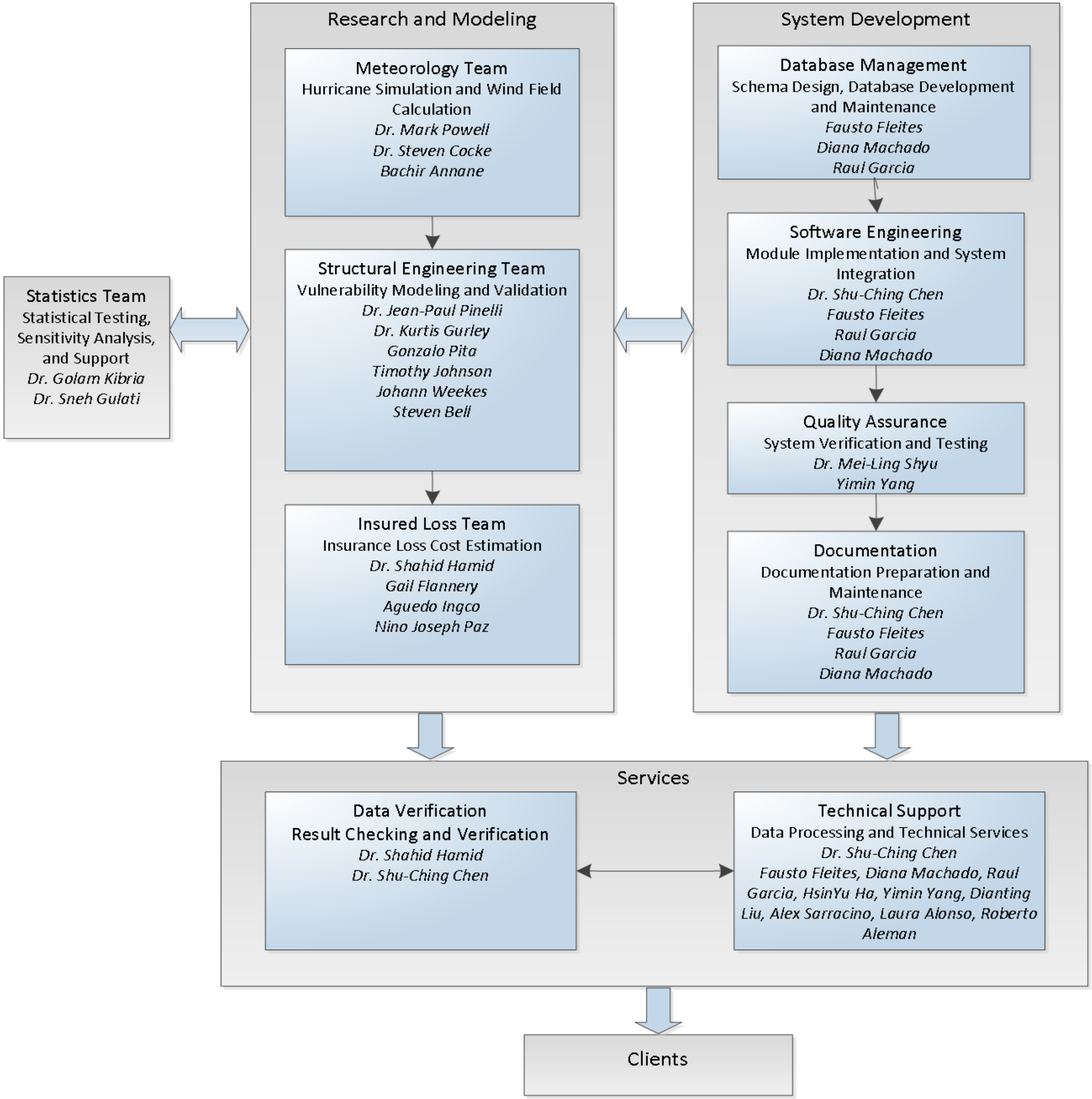
- The experts work primarily at Florida International University, Florida Institute of Technology, Florida State University, University of Florida, Hurricane Research Division of NOAA, University of Miami, and AMI Risk Consultants.

B) The model or any modifications to an accepted model shall be reviewed by either modeling organization personnel or consultants in the following professional disciplines: structural/wind engineering (licensed Professional Engineer), statistics (advanced degree), actuarial science (Associate or Fellow of Casualty Actuarial Society), meteorology (advanced degree), and computer/information science (advanced degree). These individuals shall certify Forms G-1 through G-6 as applicable and shall abide by the standards of their profession.

- The model has been reviewed by modeler personnel and consultants in the required professional disciplines. These individuals abide by the standards of professional conduct as adopted by their profession.
- The model was developed independently by a multi-disciplinary team of professors and experts. The lead university is the Florida International University. The model was commissioned by the FL-Office of Insurance Regulation.

- The Florida Office of Insurance Regulation contracted and funded Florida International University to develop the Florida Public Hurricane Loss Model.
- The model is based at the Laboratory for Insurance, Financial and Economic Research, which is part of the International Hurricane Research Center at Florida International University.
- The OIR did not influence the development of the model.
- The copyright for the model belongs to OIR, but Florida International University has long term license to operate the model for research and commercial purposes.
- FL-OIR is the major client for the model.
- Since January 2009 model services are available to the insurance and reinsurance firms. The model has been used by about 30 insurance companies.

- The model was first activated in March 2006. This version was used to process the insurance company data on behalf of the Florida Office of Insurance Regulation.
- In Summer 2007 a revised and updated version 2.6 of the model was accepted by the Florida Commission on Hurricane Loss Projection Methodology and put to immediate use.
- Another revised and updated version 3.0 was accepted by the Commission in June 2008.
- Another revised and updated version 3.1 was accepted by the Commission in June 2009.
- Version 4.1 was accepted by the Commission in August 2011 and has been used since.



Florida Public Hurricane Loss Model Workflow

G-3 Risk Location

A. ZIP Codes used in the model shall not differ from the United States Postal Service publication date by more than 24 months at the date of submission of the model. ZIP Code information shall originate from the United States Postal Service.

- Model uses ZIP Code data exclusively from a third-party developer, which bases its information on the ZIP Code definitions issued by the United States Postal Service. The version used has a USPS vintage of December 2011. The ZIP Code data have been changed in the current release of the model from the 4.1 version.

B. ZIP Code centroids, when used in the model, shall be based on population data.

- ZIP Code centroids used in the model are population centroids and are updated at least every 24 months.

C. ZIP Code information purchased by the modeling organization shall be verified by the modeling organization for accuracy and appropriateness.

- ZIP Code information is checked for consistency by experts developing our model.

G-4 Independence of Model Components

The meteorological, vulnerability, and actuarial components of the model shall each be theoretically sound without compensation for potential bias from the other two components.

- The meteorology, vulnerability, and actuarial components of the model are theoretically sound and were developed and validated independently before being integrated. The model components were tested individually.

G-5 Editorial Compliance

- ***The submission and any revisions provided to the Commission throughout the review process shall be reviewed and edited by a person or persons with experience in reviewing technical documents who shall certify on Form G-7 that the submission has been personally reviewed and is editorially correct.***
- Expert Certification Forms were submitted upon completion of all editorial changes.
- The current submission document has been reviewed and edited by person who is qualified to perform such tasks.
- Several Word tools are utilized to automate the process of formatting and editing the document.
- Word processing software with track change capability is used to prepare the document.