

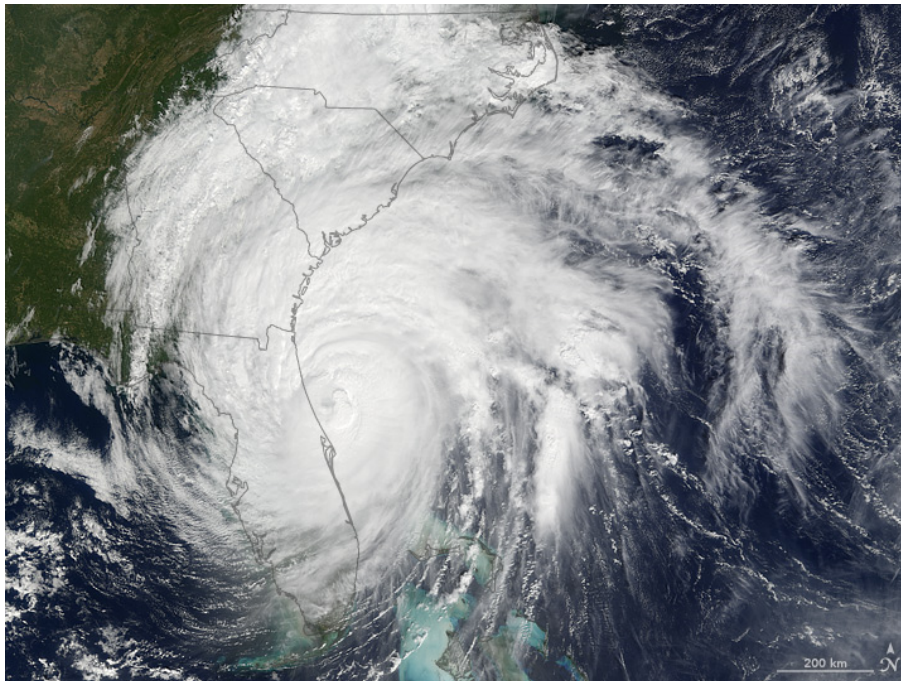
# Florida Commission on Hurricane Loss Projection Methodology

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**Lorilee A Medders, PhD**  
**Florida State University**

**Casualty Actuarial Society**  
**Annual Meeting**

November 15, 2016  
Orlando, Florida



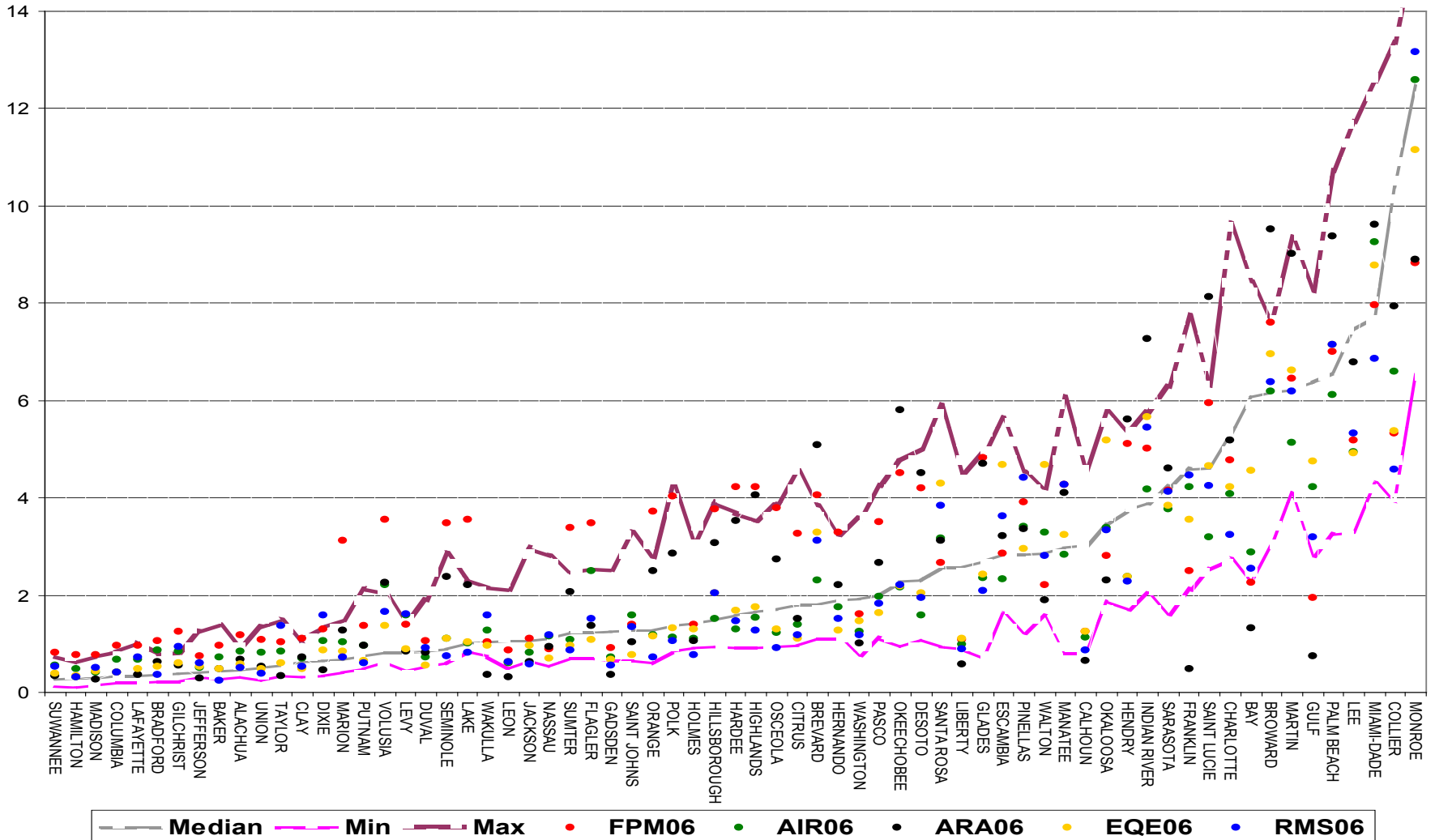


# Nature of Computer Models

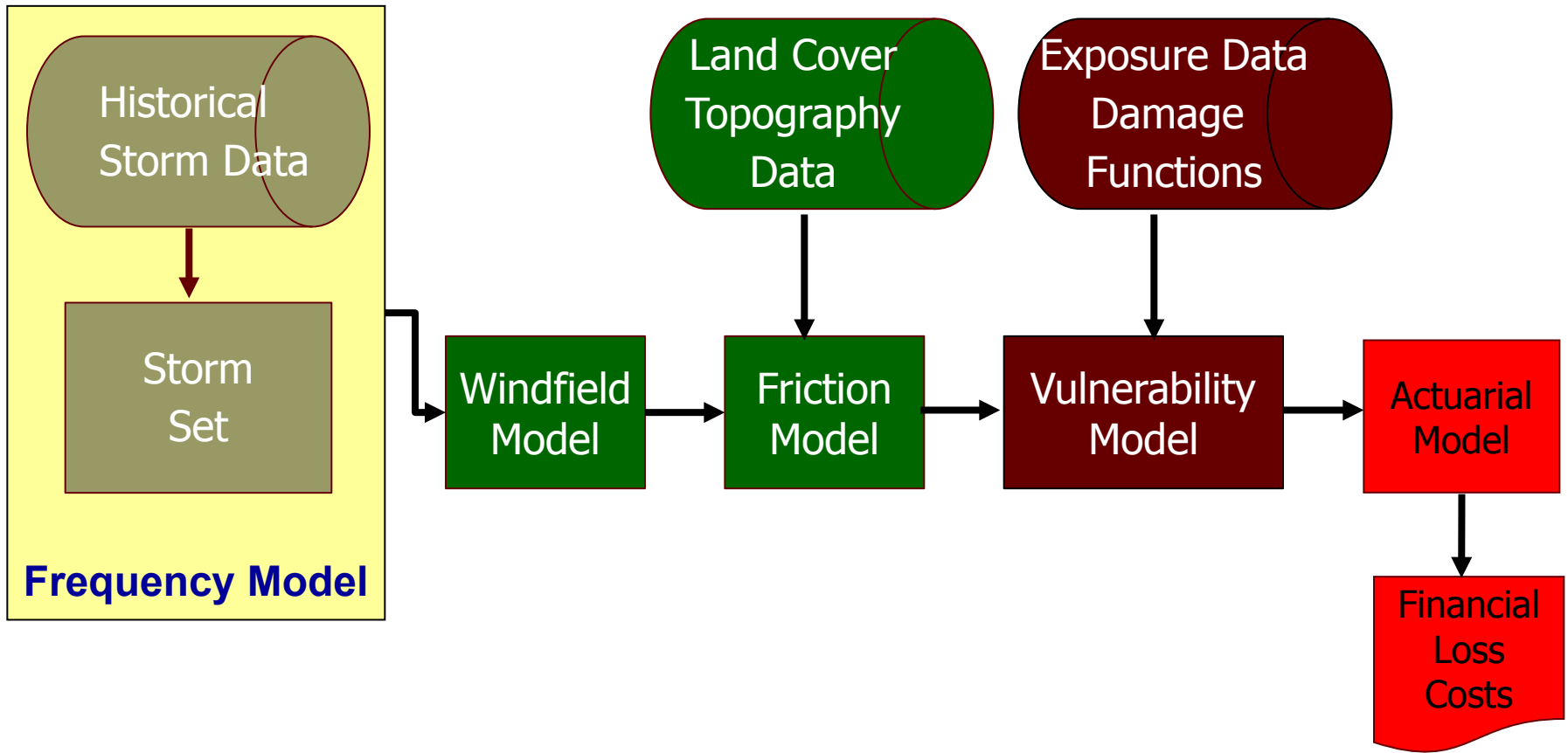
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- ❑ Hurricane loss projection computer models are complex
- ❑ The projection of loss cost and probable maximum loss levels is difficult and involves many scientific disciplines
- ❑ Variable results in scientific studies
- ❑ Hurricane modeling methods results differ widely
- ❑ There is no “right” answer - uncertainty in model input data causes significant uncertainty in loss costs
- ❑ A lot of work being done to understand variation

# Nature of Computer Models



# Traditional Loss Models



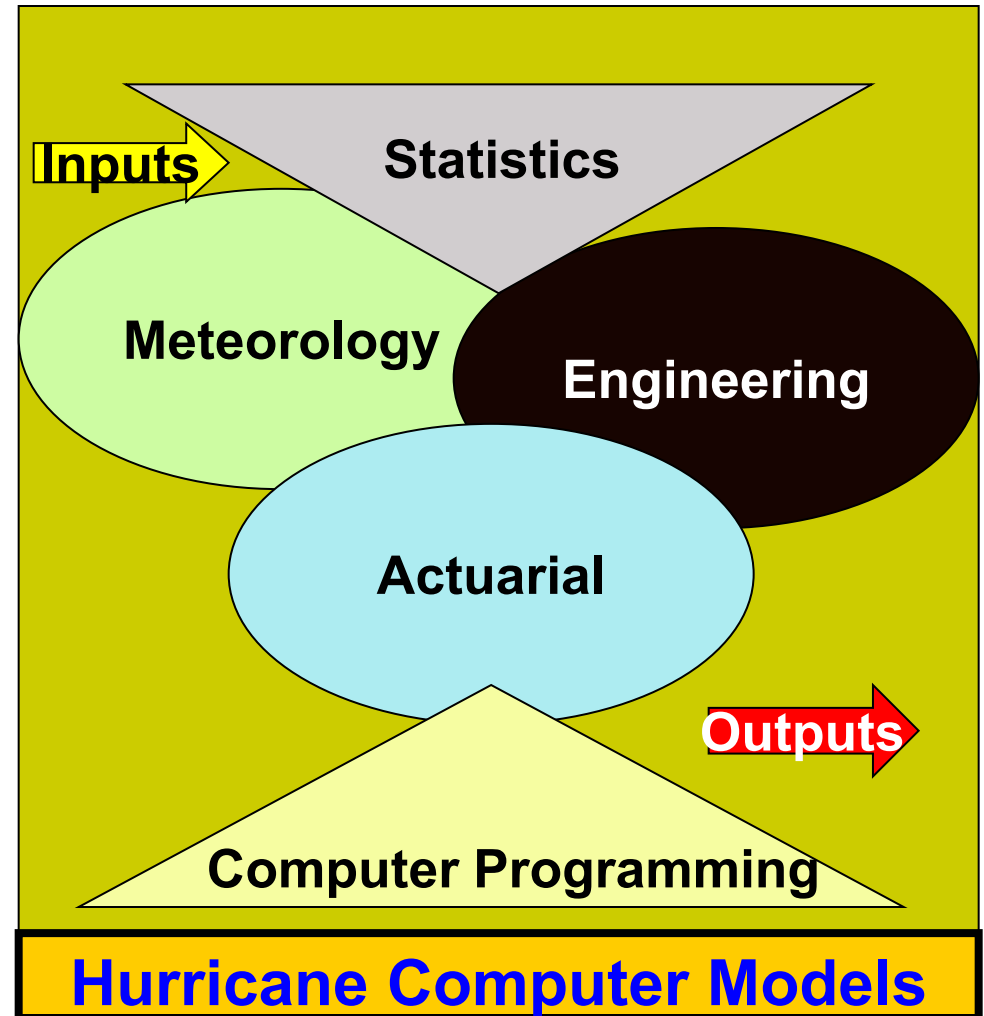
# Basic Components of a Hurricane Computer Model

Complex

Multi-disciplinary

Based on scientific principles

Multi-use





# Modeling Background

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- Traditional methods used to project hurricane loss cost considered inappropriate after Hurricane Andrew
- Hurricane modeling offers a more scientific approach, but has been considered controversial due to the proprietary nature of models
- Legislature recognized need for expert evaluation of computer models to resolve conflicts among professionals and created the Commission



# The Commission

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- ❑ Created by the Legislature in 1995
- ❑ Independent Commission, not a Regulatory Body
- ❑ Housed within the State Board of Administration (SBA), staffed by the SBA and funded out of the Florida Hurricane Catastrophe Fund (FHCF)
- ❑ SBA annually appoints the Chair
- ❑ Historically charged with standards for hurricane wind losses, not flood losses, but since 2014, additionally charged with development of flood standards (although neither Citizens nor FHCF cover flood)



# Commission's Mission

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Assess the effectiveness of various methodologies which have the potential for improving the accuracy of projecting insured Florida losses and probable maximum loss levels resulting from hurricanes and floods

Adopt findings regarding the accuracy or reliability of these methodologies for use in residential rate filings (hurricane loss projections), personal lines residential rate filings (flood loss projections), and probable maximum loss calculations

History-New 9/21/95, rev. 11/30/95, rev. 9/15/09, rev. 10/13/15



# The Commission

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- Role, as defined in Section 627.0628(3)(a), Florida Statutes:

*The Commission shall consider any actuarial methods, principles, standards, models, or output ranges that have the potential for improving the accuracy of or reliability of hurricane loss projections used in residential property insurance rate filings and flood loss projections used in rate filings for personal lines residential flood insurance coverage.*

*The Commission shall adopt actuarial methods, principles, standards, models or output ranges for personal lines residential flood loss no later than July 1, 2017.*

*The Commission shall revise previously adopted actuarial methods, principles, standards, models, or output ranges every odd-numbered year.*

# Composition of the Commission

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- Twelve members defined in Section 627.0628(2)(b), F.S.
- Panel of experts to provide the most actuarially sophisticated guidelines and standards for the projection of hurricane and flood losses
- Created to independently exercise the powers and duties specified in the statute
  - Insurance Consumer Advocate – ***Sha`Ron James***
  - FHCF Chief Operating Officer – ***Anne Bert***
  - Executive Director of Citizens Property Insurance Corporation – ***Barry Gilway***
  - Director of the Division of Emergency Management – ***Bryan Koon***

# Composition of the Commission

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- Actuary member of the FHCF Advisory Council – *Floyd Yager, Vice Chair*
- Office of Insurance Regulation Actuary responsible for property insurance rate filings – appointed by the Director of the Office of Insurance Regulation – *Robert Lee*
- Five members appointed by the Chief Financial Officer:
  - Industry Actuary employed full time by a property and casualty insurer that was responsible for at least 1% of the aggregate statewide direct written premium for homeowner's insurance – *Minchong Mao*

# Composition of the Commission

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- Insurance Finance Expert, full time member of the faculty of the State University System, background in actuarial science – ***Dr. Patty Born, Florida State University***
- Statistics Expert, full time member of the faculty of the State University System, background in insurance – ***Dr. Lorilee Medders, Florida State University, Chair***
- Computer System Design Expert, full time member of the faculty of the State University System – ***Dr. Jainendra Navlakha, Florida International University***

# Composition of the Commission

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- Meteorology Expert, full time member of the faculty of the State University System, specializes in hurricanes – *Dr. Hugh Willoughby, Florida International University*
- Licensed Professional Structural Engineer, full time member of the faculty of the State University System, expertise in wind mitigation techniques – appointed by the Governor – *Vacant*

# Commission's Findings & Implications

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- With respect to rate filing:

*An insurer shall employ and may not modify or adjust actuarial methods, principles, standards, models, or output ranges found by the commission to be accurate or reliable in determining hurricane loss factors and probable maximum loss levels for use in a rate filing under s. 627.062.*

*An insurer may employ a model in a rate filing until 120 days after the expiration of the commission's acceptance of that model and may not modify or adjust models found by the commission to be accurate or reliable in determining probable maximum loss levels.*

*An insurer is not prohibited from using a straight average of model results or output ranges for the purposes of a rate filing for personal lines residential flood insurance coverage under s. 627.062.*

# Commission's Findings & Implications

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- FHCF (“Cat Fund”) must use results of the Commission to the extent “feasible”

*In establishing reimbursement premiums for the Florida Hurricane Catastrophe Fund, the State Board of Administration must, to the extent feasible, employ actuarial methods, principles, standards, models, or output ranges found by the Commission to be accurate or reliable. Section 627.0628 (3)(c), Florida Statutes.*



# Commission's Findings & Implications

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- Commission thus far has reviewed exclusively hurricane wind computer simulation models
  
- Commission has found model process is reasonable
  - Models have been designed and constructed in a careful, sensible, and scientifically acceptable manner
  - Within-model results are consistent





# Commission's Findings & Implications

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- Scientific fields underlying loss projection models continue to evolve providing further insights into property damage and insurance implications
- Models driven based on science; uncertainty is inherent
- Commission continually strives to “raise the bar” and incorporate advances in science and technology



# Commission's Findings & Implications

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- Develops standards and guidelines
- Standards have gone through evolution over time
- Have impact on modeling catastrophic losses
- Allows a look at differences in the models and the areas of modeling that produce the most variation in output results
- Refines all standards and instructions given to modelers in order to achieve greater standardization



# Commission's Findings & Implications

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- ❑ Models considered less “black box” than in past
- ❑ Every detail of the model can be thoroughly reviewed
- ❑ Commission has full access to everything, through discussions directly with the modeler while on-site or during the closed trade secret meetings
- ❑ Professional Team – team of individuals that have professional credentials in Actuarial Science, Statistics, Meteorology, Computer Science, Structural and Coastal Engineering, and Hydrology



# Summary of Activities

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- Average 10 meeting days a year (total 201 meetings over 20 years)
- Average 7 on-site reviews/audits a year (total 101)
- Biannual Report of Activities published by December 31
- Rigorous public disclosure, on-site audits, and evaluation process (20 years of documentation)
- Reviewed eight (8) different models over 20 years
- Five (5) models acceptable under the 2015 Standards
- Total Cost to Date: over \$7.2 million



# Modeling Organizations

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- Models that have been evaluated by the Commission, to date:
  - AIR Worldwide
  - Applied Research Associates, Inc.
  - E.W. Blanch Company
  - CoreLogic (formally EQECAT, Inc.)
  - Florida Public Hurricane Loss Model
  - Risk Management Solutions, Inc.
  - Tillinghast-Towers Perrin



# Modeling Organizations

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- Modelers support and recognize the importance of the work of the Commission

*“AIR is a strong proponent of the Commission and sees great value in the submission process as it allows, among other benefits, transparency in the model building process while protecting modelers’ intellectual property. It also promotes and establishes the validity of catastrophe models in general.”*



# Commission Documentation

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- All Commission documentation available on Commission's website at [www.sbafla.com/methodology](http://www.sbafla.com/methodology)
  - Commission membership and structure
  - Commission reports
  - Professional Team reports
  - Report of Activities
  - Modeler submissions
  - Meeting materials including Modeler presentations
  - Flood Standards development materials



# Commission Principles

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- All models or methods shall be theoretically sound
- Models or methods shall not be biased to overstate or understate results
- Output of models or methods shall be reasonable and the modeler shall demonstrate reasonableness

\*See page 16 of the *Report of Activities* for the 20 Principles adopted by the Commission.



# Requirements

Standards	<u>General</u>	<u>Meteorological</u>	<u>Vulnerability</u>	<u>Actuarial</u>	<u>Statistical</u>	<u>Computer/ Information</u>
33 103 subparts	5 12 subparts	6 14 subparts	3 14 subparts	6 30 subparts	6 7 subparts	7 26 subparts
Disclosures 173	37	37	31	37	23	8
Forms 27	7	3	3	8	6	0
On-Site Audit Requirements 196	33	35	33	29	30	36



# Example of a General Standard

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## G-1 Scope of the Model and Its Implementation\* (\*Significant Revision)

- A. The model shall project loss costs and probable maximum loss levels for damage to insured residential property from hurricane events.
- 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 modeling organization documents.
- C. All software and data (1) located within the model, (2) used to validate the model, (3) used to project modeled loss costs and probable maximum loss levels, and (4) used to create forms required by the Commission in the Report of Activities shall fall within the scope of the Computer/Information Standards and shall be located in centralized, model-level file areas.

# Example of a Meteorological Standard

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## M-3 Hurricane Probabilities

- A. Modeled probability distributions of hurricane parameters and characteristics shall be consistent with historical hurricanes in the Atlantic basin.
- B. Modeled hurricane landfall frequency distributions shall reflect the Base Hurricane Storm Set used for category 1 to 5 hurricanes and shall be consistent with those observed for each coastal segment of Florida and neighboring states (Alabama, Georgia, and Mississippi).
- C. Models shall use maximum one-minute sustained 10-meter windspeed when defining hurricane landfall intensity. This applies both to the Base Hurricane Storm Set used to develop landfall frequency distributions as a function of coastal location and to the modeled winds in each hurricane which causes damage. The associated maximum one-minute sustained 10-meter windspeed shall be within the range of windspeeds (in statute miles per hour) categorized by the Saffir-Simpson Scale.

# Example of a Vulnerability Standard

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## V-3 Mitigation Measures

- A. Modeling of mitigation measures to improve a building's hurricane wind resistance, the corresponding effects on vulnerability, and their associated uncertainties shall be theoretically sound and consistent with fundamental engineering principles. These measures shall include fixtures or construction techniques that enhance the performance of the building and its contents and shall consider:
  - Roof strength
  - Roof covering performance
  - Roof-to-wall strength
  - Wall-to-floor-to-foundation strength
  - Opening protection
  - Window, door, and skylight strength.The modeling organization shall justify all mitigation measures considered by the model.
- B. Application of mitigation measures that enhance the performance of the building and its contents shall be justified as to the impact on reducing damage whether done individually or in combination.



# Example of an Actuarial Standard

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## A-3 Coverages

- A. The methods used in the calculation of building loss costs shall be actuarially sound.
- B. The methods used in the calculation of appurtenant structure loss costs shall be actuarially sound.
- C. The methods used in the calculation of contents loss costs shall be actuarially sound.
- D. The methods used in the calculation of time element loss costs shall be actuarially sound.



# Example of a Statistical Standard

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## S-2 Sensitivity Analysis for Model Output

The modeling organization shall have assessed the sensitivity of temporal and spatial outputs with respect to the simultaneous variation of input variables using currently accepted scientific and statistical methods in the appropriate disciplines and shall have taken appropriate action.



# Example of a Computer/ Information Standard

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## CI-3 Model Architecture and Component Design

The modeling organization shall maintain and document (1) detailed control and data flowcharts and interface specifications for each software component, (2) schema definitions for each database and data file, (3) flowcharts illustrating model-related flow of information and its processing by modeling organization personnel or consultants, and (4) system model representations associated with (1)-(3). Documentation shall be to the level of components that make significant contributions to the model output.

# Findings

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- Models Found Acceptable (Standards Year)
  - 1995: 0
  - 1996: 1 - AIR
  - 1997: 3 - AIR, EQE, RMS
  - 1998: 5 - AIR, EQE, RMS, Tillinghast, EWB
  - 1999: 5 - AIR, EQE, RMS, EWB, ARA
  - 2000: 5 - AIR, EQE, RMS, EWB, ARA
  - 2001: 4 - AIR, EQE, RMS, ARA
  - 2002: 4 - AIR, EQE, RMS, ARA
  - 2003: 4 - AIR, EQE, RMS, ARA
  - 2004: 4 - AIR, EQE, RMS, ARA
  - 2005: 4 - AIR, EQE, RMS, ARA

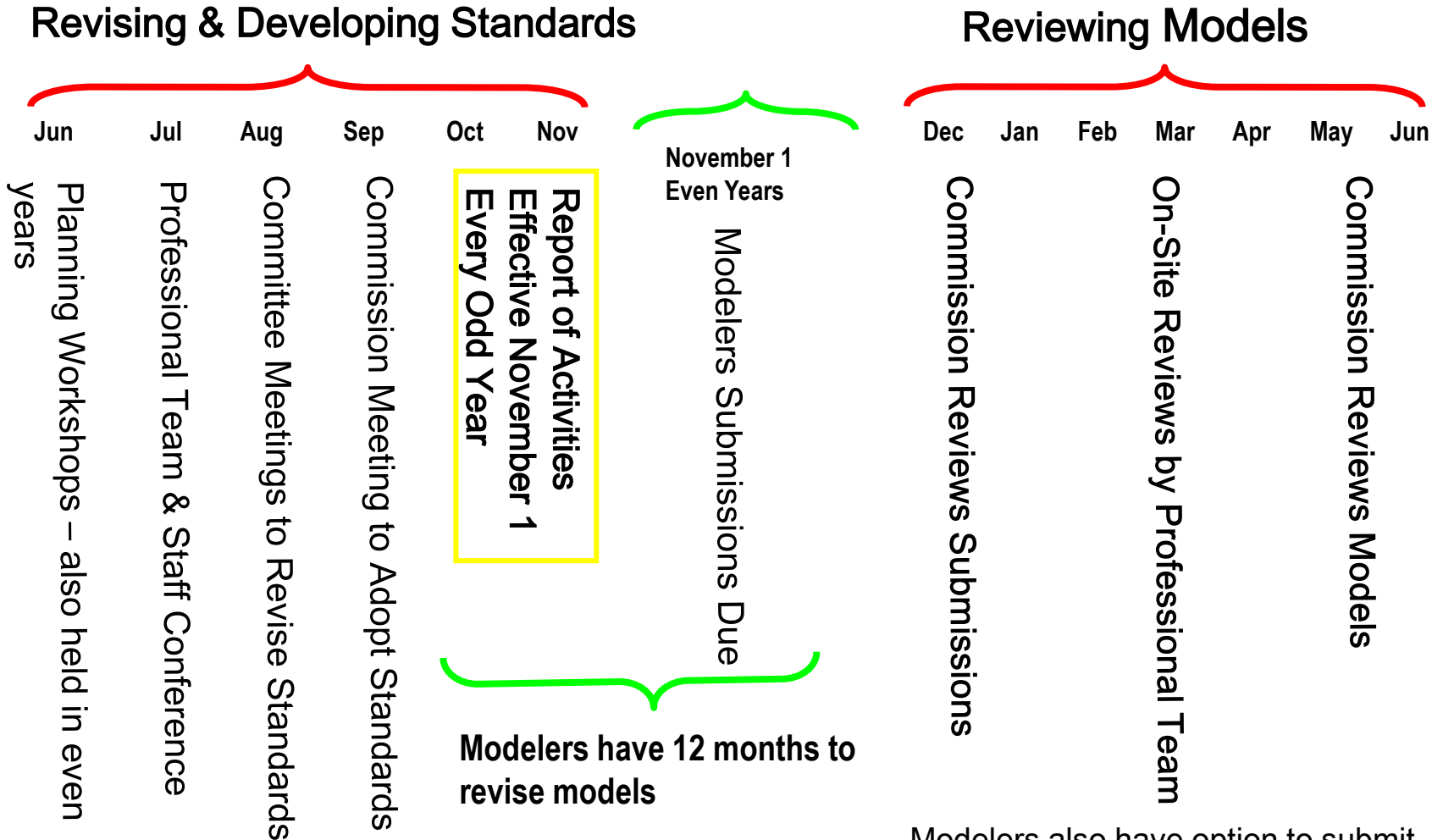


# Findings

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- Models Found Acceptable (Standards Year)
  - 2006: 5 - AIR, EQE, RMS, ARA, FPM
  - 2007: 5 - AIR, EQE, RMS, ARA, FPM
  - 2008: 5 - AIR, EQE, RMS, ARA, FPM
  - 2009: 5 - AIR, EQE, RMS, ARA, FPM
  - 2011: 5 - AIR, EQE, RMS, ARA, FPM
  - 2013: 5 - AIR, EQE, RMS, ARA, FPM
  - 2015: 5 - AIR, CoreLogic, RMS, ARA, FPM

# Commission Time Line



Modelers also have option to submit on March 1 in even years

# Commission Time Line – Flood Standards Development

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- Flood Standards to be adopted by July 1, 2017
- Flood Standards Development Committee formed in September 2014
  - September 2014 – organizational meeting
  - October 2014 – review of law, current status of flood models, identification of issues
  - November 2014 – General Flood Standards Discussion
  - December 2014 – General Flood Standards Development and Meteorological/Hydrological Flood Standards Discussion
  - January 2015 – Meteorological/Hydrological Flood Standards Development
  - February 2015 – Meteorological/Hydrological Flood Standards Development and Vulnerability Flood Standards Discussion

# Commission Time Line – Flood Standards Development

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- Flood Standards Development Committee meetings
  - March 2015 – Meteorological/Hydrological and Vulnerability Flood Standards Development
  - April 2015 – Meteorological/Hydrological and Statistical Flood Standards Development
  - June 2015 – Statistical, Computer, and Vulnerability Flood Standards Development
  - July 2015 – Meteorological/Hydrological, Statistical, Computer, Vulnerability Standards Development, Actuarial Flood Standards Discussion
  - August 2015 – Actuarial Flood Standards Development
  - September 2015 – Meteorological/Hydrological and Actuarial Flood Standards Development

# Commission Time Line – Flood Standards Development

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- Flood Standards Development Committee meetings
  - October 2015 – General, Meteorological/ Hydrological, Statistical, Vulnerability, Actuarial, Computer/Information, Definitions and Process for On-Site Visits for Feedback on Discussion Flood Standards
- November 2015 – Published Discussion Flood Standards



# Current Work of the Commission

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- Hurricane model submissions due November 1, 2016 for review under 2015 Standards
- Commission meeting December 13, 2016, 9:00 a.m. ET
  - Discuss model submissions received
  - Create list of issues to be addressed by each modeling organization during the review process
  - Request from Insurance Commissioner David Altmaier regarding Monroe County hurricane loss projection model results
  - Florida Building Code requirement for reinforcement of masonry systems
- Professional Team on-site reviews begin January 2017



# Current Work of the Commission

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- Commission meetings to review hurricane models for acceptability under the 2015 Hurricane Standards May-June 2017
- Flood Standards Committee meetings May 2017
- Commission meetings to adopt 2017 Flood Standards June 2017
- Hurricane Standards Committee meetings August 2017
- Commission meetings to adopt 2017 Hurricane Standards September 2017
- 2017 Report of Activities published November 1, 2017 containing both Flood and Hurricane Standards



# Contact Information

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- Lorilee A. Medders, Ph.D., Research Faculty III in Risk Management/ Insurance, Florida State University; Director, Florida Catastrophic Storm Risk Management Center; and Chair, Florida Commission on Hurricane Loss Projection Methodology
- Telephone: (850) 645-8393
- E-Mail: [Imedders@business.fsu.edu](mailto:Imedders@business.fsu.edu)
- Florida Catastrophic Storm Risk Management Center Website: [www.stormrisk.org](http://www.stormrisk.org)
- Commission Website: [www.sbafla.com/methodology](http://www.sbafla.com/methodology)
- Commission Telephone: (850) 413-1349