



RMS[®] U.S. Hurricane Model

Presentation to
Florida Commission on
Hurricane Loss Projection
Methodology

May 12, 2004

Presentation Outline

- ❑ Hurricane model component overview

- ❑ Description of changes to model components
 - Update of hurricane rates
 - Update of ZIP Code data vintage
 - New and updated secondary modifier options

- ❑ Impacts on output ranges

Overview of the Hurricane Model



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- ❑ Basin-wide track and parameter simulation and calibration (including extra-tropical transition)
- ❑ Pressure history simulation and calibration
- ❑ Importance sampling of simulated tracks

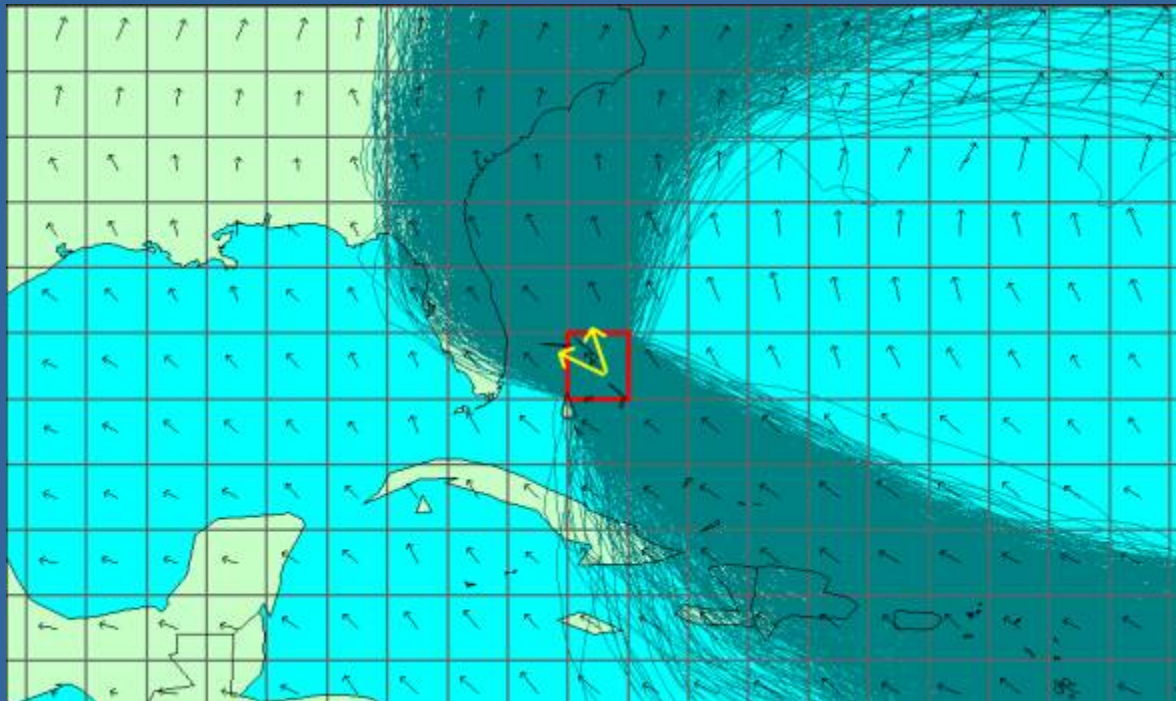
- ❑ Time-stepping wind field calculation of over-water gradient wind
- ❑ Directional factors for surface roughness upstream of over-land location
- ❑ ZIP Code data resolution

- ❑ Engineering CVM calibrated with historical claims
- ❑ 26 vulnerability classes based on material, height, and occupancy
- ❑ Mitigation measures
- ❑ County inventory to infer material/height if unknown

Part 1: Basin-Wide Hurricane Track Set Simulation

[Unchanged from 2002 Submission]

- Use random-walk model to simulate storm track
 - Calibrate model over water based on historic crossings in $2^{\circ} \times 2^{\circ}$ cells
 - Calibrate model at coastline based on historic crossing rates and forward speed distributions along linear coastal segments



Part 2: Pressure History Model for Each Track

[Unchanged from 2002 Submission]

- Use random-walk model to add pressure histories along length of each simulated track
 - Overland filling rates follow functional form of Kaplan and DeMaria (1995)
 - Minimum pressures constrained by sea surface temperature
 - Calibrate model at coastline based on historic pressure distributions along linear coastal segments

Part 3: Importance Sampling of Simulated Storms

[Unchanged from 2002 Submission]

- ❑ 100,000 years of hurricane activity for Florida is reduced to 20,394 events
- ❑ Total rate of occurrence in model equals observed mean annual rate of occurrence of historic storms

Change to Stochastic Module

□ Update of Hurricane Event Rates

- Accounts for each new year of historic hurricane activity

$$\text{Annual rate (2003)} = \text{Annual rate (2002)} * (102/103)$$

- Results in very minor changes in annual loss costs for all Florida counties (~1% decrease in each county)

Part 1: Wind Field Calculation Over Water

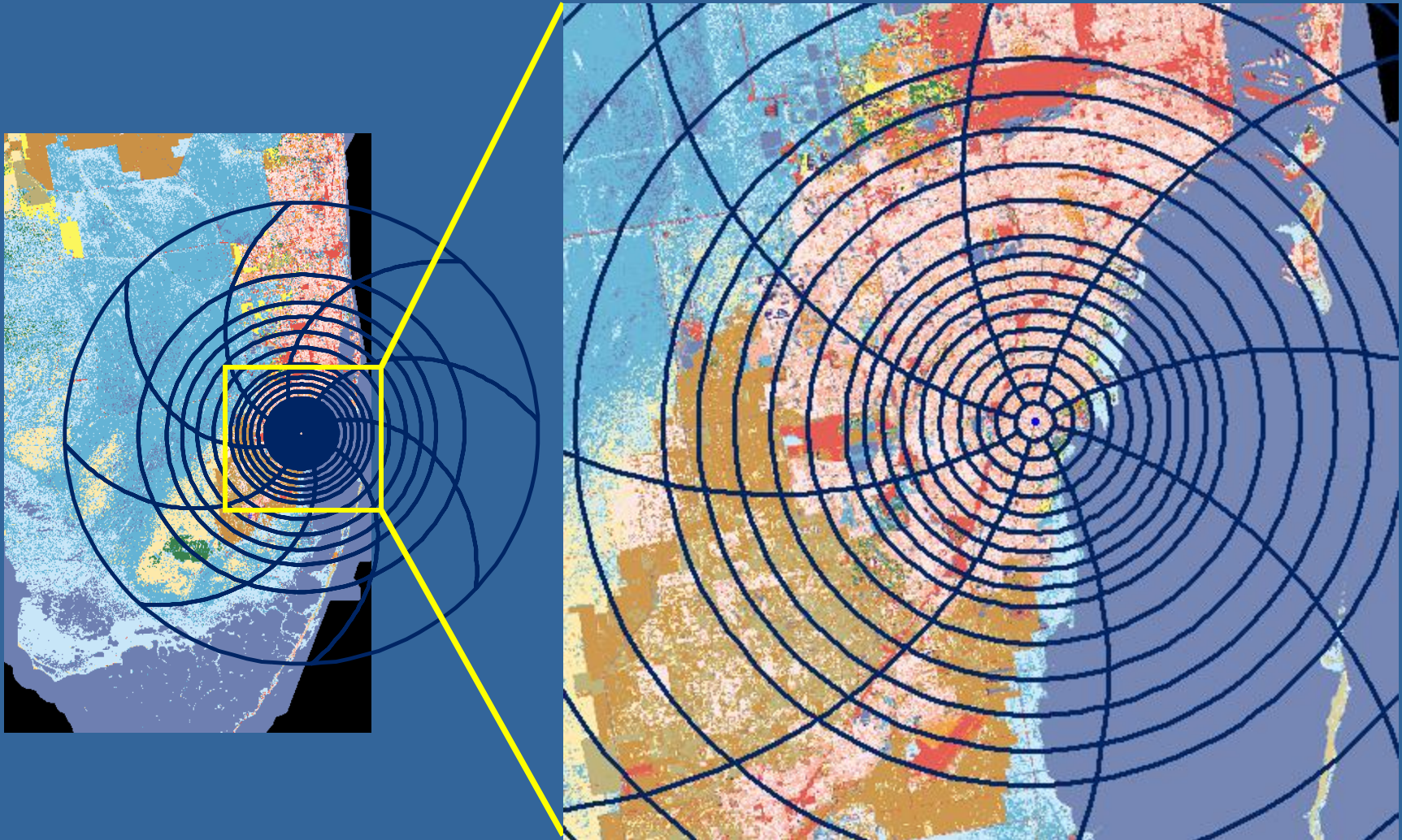
[Unchanged from 2002 Submission]

- ❑ Based on the work of Georgiou (1983; 1985), the model calculates the gradient wind field
- ❑ Wind field at 10 m height is calculated as a function of the gradient wind speed

Part 2: Sampling Surface Roughness

[Unchanged from 2002 Submission]

South Miami



Part 3: Variable Resolution Grid

[Unchanged from 2002 Submission]

- ❑ Variable Resolution Grid (VRG) makes it possible to model wind at a higher resolution than ZIP Code
- ❑ Highest resolution cells are in areas of high exposure (major metropolitan areas) and high hazard gradient (e.g., coastal regions)



Miami: ZIP Code vs. VRG cell sizes

Change to Data Compilation at ZIP Code Level

- ❑ Changes to ZIP Code boundaries require recompilation of wind hazard from the **unchanged** VRG data
- ❑ Model ZIP Code data was updated to August 2003 USPS vintage

Base Vulnerability Curves

[Unchanged from 2002 Submission]

- ❑ 26 vulnerability functions developed separately for building and contents based on a combination of:
 - Construction class
 - Occupancy
 - Building height

- ❑ Additional Living Expenses (ALE) are a function of building damage and occupancy

New Modifiers in RiskLink 4.32a

- ❑ Roof Geometry
 - Braced Gable, Medium pitch
 - Braced Gable, High pitch
 - ❑ Roof Covering
 - Rated Shingle (110 mph)
 - Rated Shingle with SWR
 - ❑ Roof Anchor
 - Above Average Strength Metal Strap
 - ❑ Wind Resistance Windows
 - Laminated Glass
 - Impact Glass
 - Pressure rated Shutter
 - ❑ Architectural Elements
 - Skylights
 - Skylights with cover
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- ❑ Impact of modifiers is presented in Form V-2

Summary of Changes to All Model Components

- ❑ Update of hurricane rates
 - Accounts for 1 new year of hurricane activity

- ❑ Update of ZIP Code data vintage
 - August 2003 USPS vintage

- ❑ New and updated secondary modifier options

Impact of Changes on County Loss Costs

- Net impact on county level loss costs
 - 56 of 67 counties have net absolute change of less than 2 %
 - Only two counties Santa Rosa and Osceola have changes of > 4 %

