Updates on The Hurricane Risk Calculator 9B.8 App Capabilities, Risk Messaging, and Pilot Testing

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Meteorology /	Structural	Ocean / Surge /	Emergency	Social Science /	Political	Bio-
Atmos. Sci.	Engineering	Waves / Coastal Engineering	Management	Human Dimension	Science	geochemistry

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Software

Engineering

Economics

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ResilientResidence Partnerships





















Some specific things people need to know



The answers depend on each person's specific vulnerability and situation



Hurricane Risk Calculator Concept

Approach

- Intersect modeled wind hazard at user's specific location with the structural vulnerability of their dwelling
 - Key wind thresholds:
 - tree damage/power outages
 - minor damage (e.g, fences, outbuildings)
 - water ingress
 - major structural damage
 - complete failure of structure
- Calculate probability of each consequence
- Translate into a format that is both understandable and actionable for the user
 - Risk of damage, habitability
- Disseminate directly to user through decision support tools and alerts via a mobile app





App Capabilities



Web App Development Status

- Administrative / Legal
 - Research licenses in place with our partners
 - Privacy Policy
 - Terms of Use
- Logistics
 - Sign-up
 - Password-less login
 - Geocoding of addresses
 - Location / profile management
 - Email communications preferences
 - User feedback
- Back-end
 - Serverless architecture Amazon Web Service lambda functions
 - Fully scalable

- Vulnerability assessment
 - API integration with ResilientResidence (James Cook University)
- Location-based Services
 - Storm map
 - Wind hazard
 - Risk of Damage output
- Data
 - Tropical Cyclone Guidance Project
 - Forecasts of Hurricanes using Large-Ensemble Outputs*

*The data incorporated herein is generated from the use of the Massachusetts Institute of Technology (MIT)'s Forecasts of Hurricanes Using Large-ensemble Outputs (FHLO) version 1.3, © MIT, used with permission. All Rights Reserved.

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Hurricane Risk Calculator®

Resilient Residence



Complete the ResRe structural vulnerability assessment to get personalized risk outputs

Storm Map



View current storms locations



View wind hazard at your home



HurricaneRiskCalculator® is a registered trademark of the University Corporation for Atmospheric Research, in the United States and/or other countries worldwide.

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The Hurricane Risk Calculator web app





Hurricane Risk Calculator™

THIRTY-ONE - 2020 Nov 15 18z 248 miles from Puerto Cabezas



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Risk Messaging



From Hazard to Damage

- Homeowner / resident takes ResRe questionnaire
- Fragility ids of structure are coded and passed to the Hurricane Risk Calculator web app
- Whenever a storm threatens, ~1000 realizations of projected wind hazard at user's location are intersected with fragility curves for user's fragility ids







- Probability of each damage level is computed
- Appropriate output is displayed to user
- Output updated every
 6 h



Hurricane Risk Calculator® DE

YOUR ELEVATION IS 9 FT ABOVE MEAN SEA LEVEL; YOUR RISK OF DAMAGE FROM SURGE LIKELY EXCEEDS YOUR WIND RISK.

This screen does not provide any information about safety. Follow all evacuation orders.

Projected risk: Minimal

- Risk of gusts greater than 50 mph is less than 10%
- Risk of gusts greater than 75 mph is less than 0.1%
- Blown lawn furniture possible
- No damage expected



Risk of Wind Damage

Select property from list Airport Location

EXPERIMENTAL - DO NOT USE FOR DECISION MAKING

This screen shows risk of damage for wind only. Risks from storm surge, tornadoes, flood inundation, or other hazards are NOT included and may be substantially higher than from wind.

This risk is calculated for your specific address and structure. Because structural vulnerability varies by building, your neighbors may have a different risk of damage than you.

YOUR ELEVATION IS 9 FT ABOVE MEAN SEA LEVEL; YOUR RISK OF DAMAGE FROM SURGE LIKELY EXCEEDS YOUR WIND RISK.

This screen does not provide any information about safety. Follow all evacuation orders.

Extreme Severe Elevated Low Minimal

Projected risk: Minimal

- Risk of gusts greater than 50 mph is less than 10%
- Risk of gusts greater than 75 mph is less than 0.1%
- Blown lawn furniture possible
- No damage expected

Severe

Minimal

Nov

Elevated

Hurricane Risk Calculator® DE

YOUR ELEVATION IS 9 FT ABOVE MEAN SEA LEVEL; YOUR RISK OF DAMAGE FROM SURGE LIKELY EXCEEDS YOUR WIND RISK.

This screen does not provide any information about safety. Follow all evacuation orders.



No

<u>Elevated</u>

Projected risk: Low

- Minor damage to outbuildings/fences possible
- Damage to roof, shingles, vinyl siding and gutters possible
- Structure expected to be habitable after storm
- Little to no significant structural damage expected



Risk of Wind Damage

Select property from list					
Airport Location					

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Projected risk: Low

- Minor damage to out-buildings/fences possible
- Damage to roof, shingles, vinyl siding and gutters possible
- Structure expected to be habitable after storm
- Little to no significant structural damage expected

Severe

Hurricane Risk Calculator® DEN

YOUR ELEVATION IS 9 FT ABOVE MEAN SEA LEVEL; YOUR RISK OF DAMAGE FROM SURGE LIKELY EXCEEDS YOUR WIND RISK.

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• Damage to out-

Projected risk:

Elevated

buildings/fences likely

siding and gutters likely

damage possible

• Structure may be

services

Damage to roof, shingles, vinyl

Major roof damage and siding

Minimal



Risk of Wind Damage

Select property from list **Airport Location**

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This risk is calculated for your specific address and structure. Because structural vulnerability varies by building, your neighbors may have a different risk of damage than you.

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This screen does not provide any information about safety. Follow all evacuation orders.

Projected risk: Elevated

- Damage to out-buildings/fences likely
- Damage to roof, shingles, vinyl siding and gutters likely
- Major roof damage and siding damage possible
- Structure may be uninhabitable after storm due to water damage or loss of services
- Structural damage is possible

Structural damage is possible.

uninhabitable after storm due

to water damage or loss of



Minimal

No

Hurricane Risk Calculator®

YOUR ELEVATION IS 9 FT ABOVE MEAN SEA LEVEL; YOUR RISK OF DAMAGE FROM SURGE LIKELY EXCEEDS YOUR WIND RISK.

This screen does not provide any information about safety. Follow all evacuation orders.

Minimal

Projected risk: Severe

- Damage to roof, shingles, vinyl siding and gutters almost certain
- Major roof damage and siding damage likely
- Severe damage with loss of most of the roof structure and/or some exterior walls possible
- Structure likely to be uninhabitable due to extensive damage or loss of services



Risk of Wind Damage

Select property from list Airport Location

Minimal

Low

Elevated

Extreme

EXPERIMENTAL - DO NOT USE FOR DECISION MAKING

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Projected risk: Severe

- Damage to roof, shingles, vinyl siding and gutters almost certain
- Major roof damage and siding damage likely
- Severe damage with loss of most of the roof structure and/or some exterior walls possible
- Structure likely to be uninhabitable due to extensive damage or loss of services
- Structural damage is likely

Hurricane Risk Calculator® DE

YOUR ELEVATION IS 9 FT ABOVE MEAN SEA LEVEL; YOUR RISK OF DAMAGE FROM SURGE LIKELY EXCEEDS YOUR WIND RISK.

This screen does not provide any information about safety. Follow all evacuation orders.

Minimal

Projected risk: Extreme

- Major roof damage and siding damage almost certain
- Severe damage with loss of most of the roof structure and/or some exterior walls likely
- Total roof failure and wall collapse is possible
- Structure expected to be uninhabitable due to extensive damage

Risk of Wind Damage

Select property from list **Airport Location**

Minimal

Low

Elevated

Severe

EXPERIMENTAL - DO NOT USE FOR DECISION MAKING

This screen shows risk of damage for wind only. Risks from storm surge, tornadoes, flood inundation, or other hazards are NOT included and may be substantially higher than from wind.

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Projected risk: Extreme

- Major roof damage and siding damage almost certain
- Severe damage with loss of most of the roof structure and/or some exterior walls likely
- Total roof failure and wall collapse is possible
- Structure expected to be uninhabitable due to extensive damage
- Major structural damage up to a total loss is expected

Pilot Testing



Pilot Testing Plans

- U.S. pilot test
 - Begins ~01 July 2021
 - Ends 15 Dec 2021
- Goal enrollment
 - 10,000+ users across all hurricane-affected coastal states and territories
 - Seek diverse socioeconomic and racial backgrounds
- Goals of pilot
 - Calibrate risk of damage outputs against actual damage for all hurricane-affected users
 - Demonstrate the app technically under highuse conditions
 - Demonstrate commercial viability

- Australia pilot test
 - Begins 15 Oct 2021
 - Ends 30 Apr 2022
- Goal enrollment
 - Several hundred "friendly users" from disaster response and emergency management communities
 - Geographically diverse, including remote areas
- Goals of pilot
 - Get feedback from EM community
 - Demonstrate the app in Southern Hemisphere





Join the Researcher Collective

Structural Vulnerability Team	Wind Modeling Team	Technical Development Team	User Design / User Experience Team (COMET)				
Hazard Communication (Social Science) Team	Verification Team	Human Vulnerability Team	Utilities Modeling Team				
	Storm Surge Modeling Team	Emergency Management Team					
The Researcher Collective is open to all researchers who would like to contribute							

To join, e-mail riskcalculator@ucar.edu

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Ways to Partner with Us

The HurricaneRiskCalculator will be pilot testing in 2021



wxrisk.ucar.edu riskcalculator@ucar.edu

