





MARCH 4 - 6, 2019
COX CONVENTION CENTER
OKLAHOMA CITY

DELUGE: IMPACTS OF FLOODING

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AGENDA


- Hurricane Florence**
 - Storm History
 - Modeled Losses
 - Event Reconnaissance
- Hurricane Michael**
 - Storm History
 - Modeled Losses
 - Event Reconnaissance
- Current Status of NFIP**
 - Why was it created?
 - How has it evolved?
 - What are the next milestones?
- Evolution of Private Insurance Market**
 - How has this been developing?
 - What needs to happen next?
- Risk Analytics**
 - What exists today?
 - What's coming down the pipeline?

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HURRICANE FLORENCE

- Made landfall Friday September 14 near Wrightsville Beach, North Carolina
 - 90 mph winds (145 km/hr, Category 1)
- Previously achieved Category 4 status over open Atlantic




HURRICANE FLORENCE HI-RES WINDS
LATEST ANALYSIS
MAX WIND: 87 mph

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HURRICANE FLORENCE

- Many areas in the Carolinas received >15 inches (381 mm)
- Some received >30 inches (760 mm)
 - Max of 35.93 inches (867 mm) in Elizabethtown, North Carolina
- Set TC rainfall records in North Carolina (35.93 inches) and South Carolina (23.63 inches)



Rainfall RP
1000+
101 - 1000
51 - 100
11 - 50
1 - 10

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RMS HURRICANE FLORENCE INDUSTRY LOSS ESTIMATE

- Losses expressed in \$ billions

Wind	Surge and Inland Flood	NFIP	Total
1.3 - 2.6	0.7 - 1.2	0.8 - 1.2	2.8 - 5.0

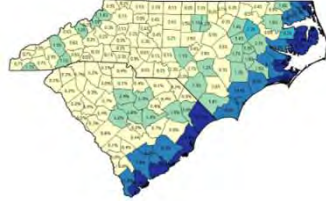
- Private flood losses include covered commercial/industrial storm surge losses, residential storm surge losses covered by private flood insurance, and insured all-lines inland flood
- Private *insured* loss will fall between \$2.0 and \$3.8 billion
- 65-70% of loss attributed to residential lines
- Vast majority of insured loss will occur in North Carolina
- Wind and surge equates to 10-15 yr RP in Southeast, inland flood 10 yr RP

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INSURANCE PROTECTION GAP

	Insured	Economic	% Uninsured
Wind	1.3 - 2.6	1.5 - 2.9	13% - 10%
Flood - Surge	0.3 - 0.8	0.9 - 2.5	67% - 68%
Flood - Inland	1.1 - 1.5	3.6 - 5.6	69% - 73%
Total	2.8 - 5.0	6.0 - 11.0	53% - 55%



NFIP take-up rates for residential properties by county, calculated by RMS (Policies in force / number of buildings)

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POST-EVENT LOSS AMPLIFICATION AND NON-MODELED EFFECTS

- Significant infrastructure damage, delaying resident return and business reopenings
- Flood contamination from coal ash and pig farms
- Shutting down of dozens of wastewater treatment plants
- High volume of claims: claims inflation
- Assignment of Benefits (AOB)
- Non-modeled factor of 20%-30% included in insured wind and storm surge loss

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FLOOD RECONSTRUCTION

INCLUSIVE OF STORM SURGE AND INLAND FLOOD

- Storm surge: MIKE21 hydrodynamical model and data from 33 NOAA tidal gauges
- Inland flood: Real-time precip data from Climate Prediction Center and meteorological forcing data

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DAMAGE TILES FLOOD DAMAGE

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DAMAGE TILES FLOOD DAMAGE

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HURRICANE MICHAEL

- Made landfall Wednesday October 10, near Mexico Beach, Florida as a strong Category 4 hurricane
- 155 mph (250 km/h) according to the NHC
- Minimum central pressure of 919 mb

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HURRICANE MICHAEL'S PLACE IN HISTORY

- Most intense hurricane since Hurricane Andrew (1992)
- The strongest October landfalling hurricane
- The lowest landfall pressure in the U.S. since Camille (1969)

Hurricane Michael 1800UTC 10 Oct 2018
 Labels include wind speed (mph) and RMS logo.

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RMS HURRICANE MICHAEL INDUSTRY LOSS ESTIMATE

Insured	Economic
\$6.8 - \$10.0 billion	\$8.5 - \$14.0 billion

- Version 18 of the RMS North Atlantic Hurricane Models
- Wind and storm surge damage across Florida, Southeast and Mid-Atlantic U.S. states
- Includes estimated losses to National Flood Insurance Program (NFIP)
- Property damage and business interruption across residential, commercial, industrial, and automobile lines of business
- Detailed Industry Loss Estimate report will be published on RMS Owl today

State	Percentage of Insured Loss
Florida	67%
Georgia	27%
Other	6%

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INSURANCE PROTECTION GAP

	Losses expressed in billions USD		
	Insured	Economic	% Uninsured
Wind	6.4 - 8.7	7.0 - 11	9% - 13%
Surge	0.4 - 1.3	1.5 - 4.0	65% - 73%
Total	6.8 - 10	8.5 - 14	20% - 33%

NFIP take-up rates for residential properties by ZIP, calculated by RMS

- 0 - 5%
- 5% - 10%
- 10% - 20%
- 20% - 30%
- 30% - 50%
- 50% - 100%

(Policies in force / number of buildings)

- Surge insured losses include NFIP
- NFIP losses drive about 60% of the total surge insured losses
- 70-75% of insured loss attributed to residential lines
- Total insured losses equate to 5-10 yr RP in Florida

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STORM SURGE RECONSTRUCTION VALIDATION

- Thousands of obs from 114 NOAA and USGS gauges
- Includes permanent and mobile gauges

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AERIAL IMAGERY ANALYSIS

High Damage
Medium Damage
Low Damage
No Damage / No Exposure

Wind
Wind and Storm Surge
Storm Surge

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STORM SURGE DAMAGE GULF COUNTY, FLORIDA

Pre-Event ArcGIS Base Map
Post-Event NOAA Image

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CONTRASTING PERFORMANCE OF STRUCTURES

Elevating First Floor Height mitigated surge damage to some degree

Surge Impacted area in Mexico Beach, Florida

Elevated properties survived in Mexico Beach, Florida. Only remnants left of non-elevated properties next door

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STATE OF THE INSURANCE MARKET

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FLOOD RISK

- Floods are the most common natural disaster in the United States and affect all 50 states
- 4.2 million homes representing \$1.1 trillion in property exposure are at risk of flooding from hurricane storm surge
 - Atlantic coast exposure: \$793 billion
 - Gulf coast exposure: \$354 billion
- Risk expected to grow due to climate change and more people living near the coast

Average Annual precipitation on CONUS

Source: Insurance Information Institute

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NATIONAL FLOOD INSURANCE PROGRAM (NFIP) & FEMA

1968: Flood Disaster Protection Act

1973: NFIP Established

1975: Ordinances Effective and Enforced

National Flood Insurance Program established to:

- Mitigate future flood losses nationwide through sound, community-enforced building and zoning ordinances
- Provide access to affordable, federally backed flood insurance protection for residential property owners

In support of NFIP, FEMA identifies flood hazard areas throughout the U.S. via:

- Flood plain communities
- Flood zone designations

Flood Insurance Rate Maps (FIRMS)

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BIGGERT-WATERS

- Biggert-Waters Flood Insurance Reform Act of 2012 (BW-12)
 - Enacted reforms to make the National Flood Insurance Program (NFIP) more actuarially sound (premiums only account for an 'average' year, not extremes)
 - Established timelines for scheduled 25% annual rate increases
 - Encouraged the private flood insurance market
- Primary residences in flood zones were grandfathered in until the property was sold, a flood loss occurred, or the policy lapsed
 - Expectation was to eventually phase-out grandfathering
- Rate increases and removal of subsidies proved unpopular

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BIGGERT-WATERS-PARTIAL REPEAL

- Homeowner Flood Insurance Affordability Act of 2014 (HIFAA)
 - Repealed and/or modified provisions of BW-12
 - Reinstated certain subsidies and lowered rate increases
 - Implemented surcharges on all policyholders
 - Repealed some rate increases that had not taken effect and authorized refund to policyholders who already had increases

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2017 & 2018 HURRICANE SEASONS


- 2018 - NFIP \$20 billion in debt to the U.S. Treasury
- 2017 losses added billions to the NFIP's debt
 - FEMA has paid \$8.7 billion in Harvey losses as of July 31, 2018
 - Total of over 120,000 NFIP claims were paid in 2017
- The NFIP did not have enough cash on hand, reinsurance, and borrowing authority to continue to pay claims
 - Congress responded by forgiving \$16 billion of NFIP debt, raising the NFIP's borrowing limits



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NFIP REAUTHORIZATION


- The NFIP must periodically be reauthorized
 - It was originally set to expire on September 30, 2017, but Congress has temporarily extended the program numerous times since then
 - Current expiration date is May 31, 2019
- Congress's appetite for reforms to the program is unclear in the wake of the 2018 Hurricane Seasons
- What needs to happen:
 - Lift subsidies so that private insurance carriers can compete and that homeowners better understand their risk
 - Allow for more innovation in designating flood hazard areas
 - Continue to buy reinsurance cover



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PRIVATE FLOOD INSURANCE MARKET

- Florida has led the way in encouraging private market participation
 - Legislation in 2014 established the definition of flood, along with four main flood policies
 - The Florida Commission on Hurricane Loss Projection Methodology will create standards for reviewing flood catastrophe models (beginning late 2019)
 - Drafting a paper to provide guidance for other states
- Banking community easing restrictions on private flood insurance use and policies from surplus lines markets
- Insurance carriers using advanced tools to build flood portfolios and to compete with NFIP



Rivers


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EVOLUTION OF FLOOD ANALYTICS

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WHERE ARE WE COMING FROM?

- What flood analytical tools have been used historically?
 - FEMA FIRMs for underwriting
 - Geospatial techniques for accumulation management
- What are the drawbacks of these approaches?
 - Inconsistent vintage
 - Technical fit for purpose



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WHERE ARE WE TODAY?

Data Layers

- Examples: Flood depths, basement likelihood, distance to flooding
- Used for risk screening, risk selection, accumulation management
- Delivered via vendor application or API

Catastrophe Models

- Examples: Loss costs, scenario losses, return period losses
- Used for pricing, portfolio management, reinsurance, regulatory compliance
- Delivered via vendor application

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RESOURCES AVAILABLE TO THE U.S. FLOOD INSURANCE MARKET RMS

NATIONAL TORNADO SUMMIT
A Climate Solutions Summit

- USGS/NOAA Gage Data -
- HUD Codes -
- Watershed Boundaries -
- Geospatial Hazard Data
- Flood Hazard Mapping
- DFIRMs
- Vendor Maps
- Historical Claims -
- Elevation Certificates -
- Rating Guidelines -
- FEMA/NFIP
- \$15 – \$25 BN**
- Probabilistic Models
- Storm Surge
- Inland Flood
- USGS/NOAA Forecast Maps -
- Vendor Maps -
- Real-time Analytics
- Advanced Analytics
- Accumulations
- Historic Reconstructions
- Underwriting Strategy
- Broker Ratios/Indices

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NATIONAL TORNADO SUMMIT RMS

Q&A

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