Thoughts on Data Quality, Advancements in Modeling

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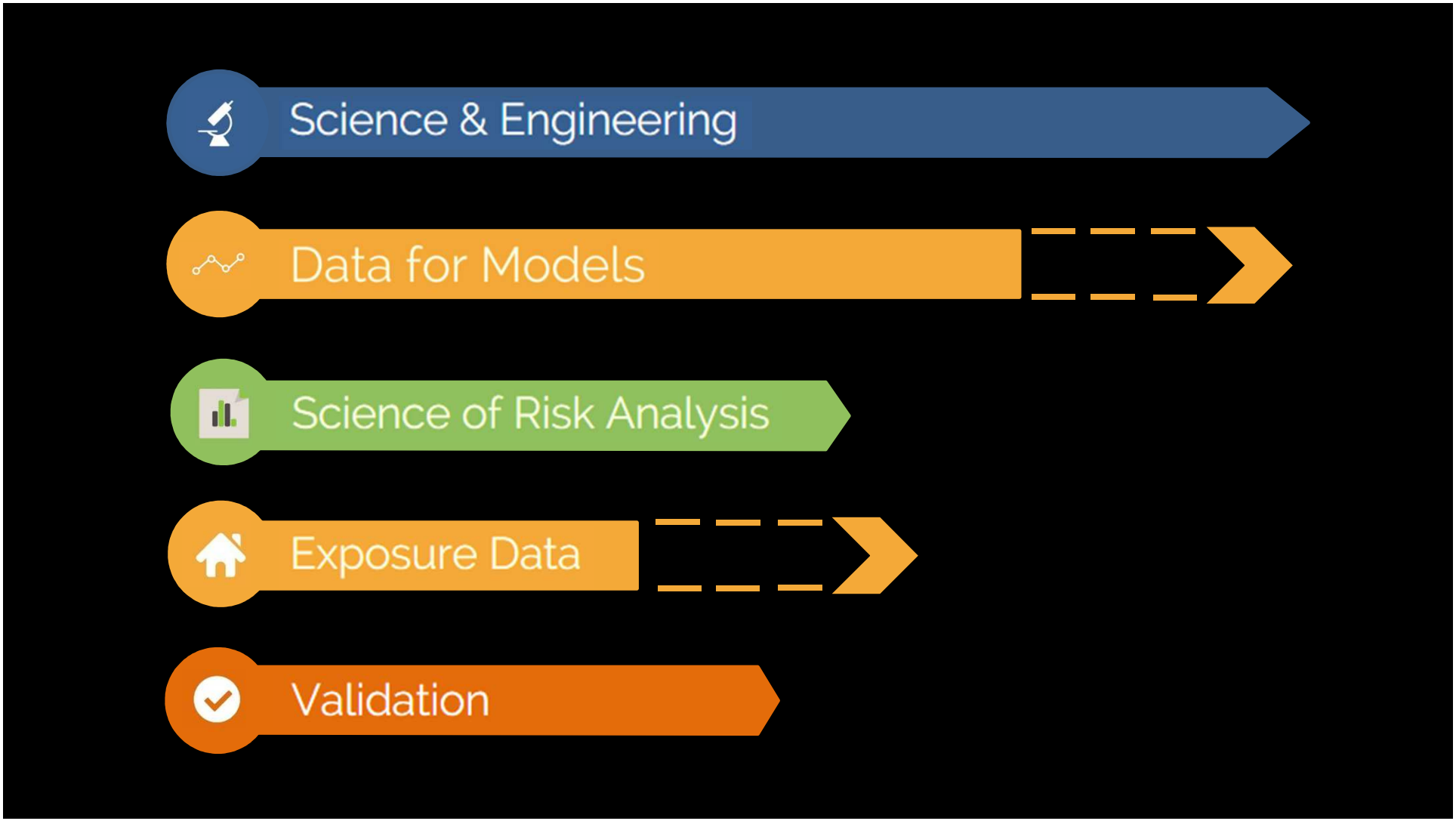
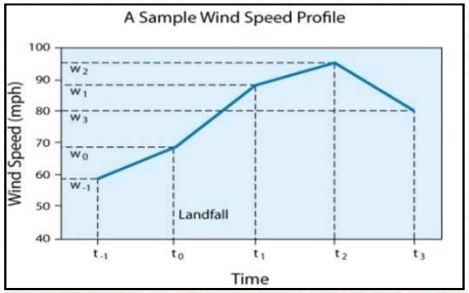
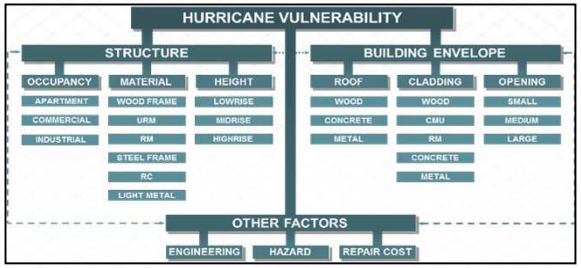
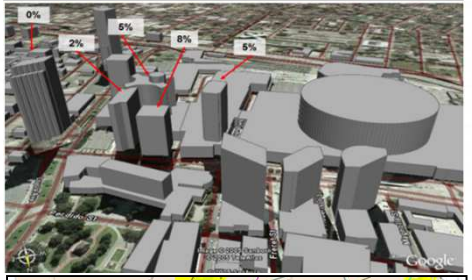

Science & Engineering
Data for Models
Science of Risk Analysis
Exposure Data
Validation

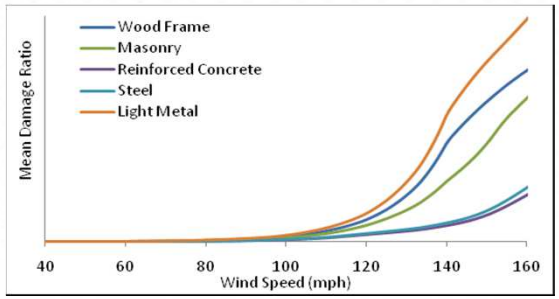
Science and Engineering

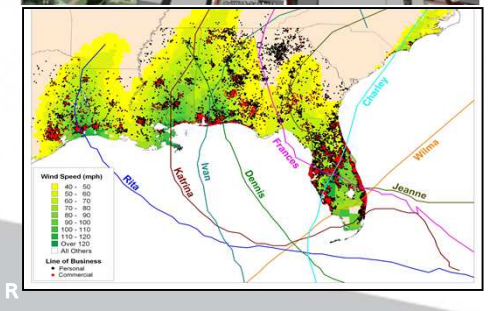
Dependable Vulnerability Module Requires Many Data Sources











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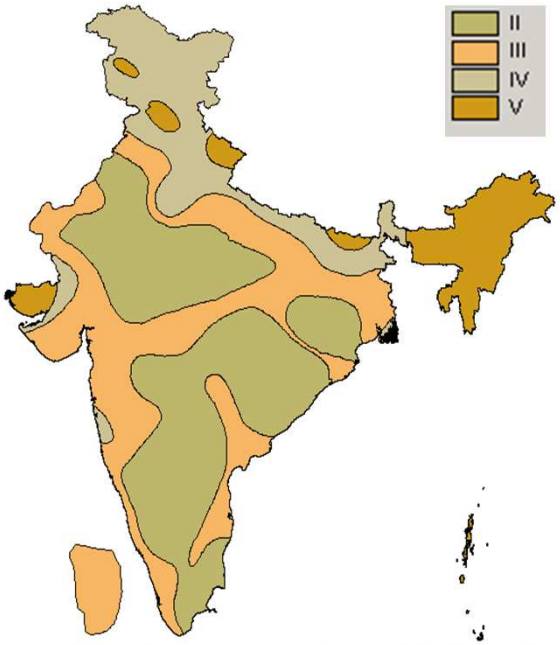
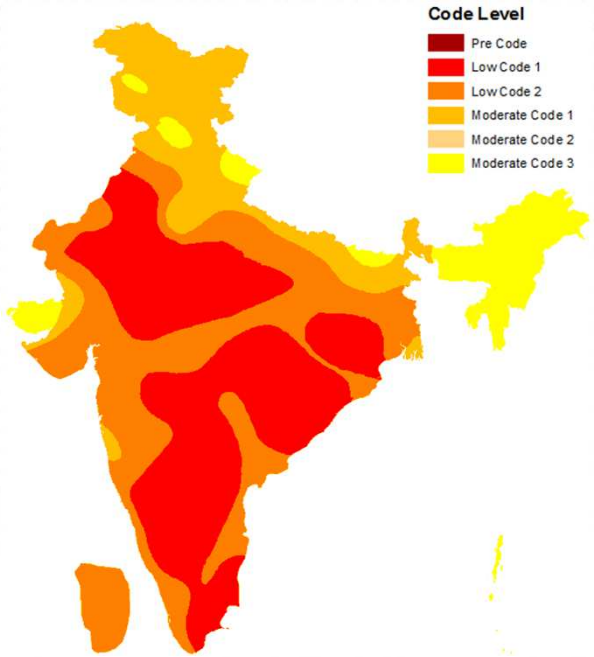
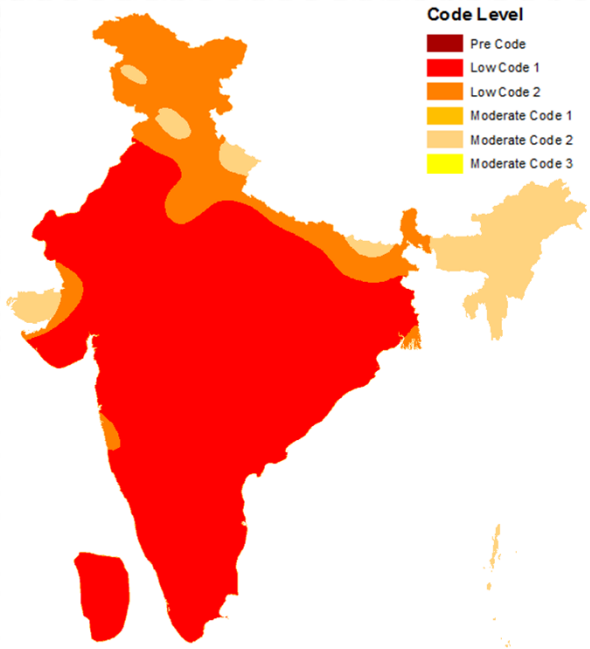
Detailed Study of the Building Code and Local Expert Feedback Are Important



IS 1893: 2002 Zones



AIR Theoretical Code Levels



AIR Final Code Levels Considering Code Compliance

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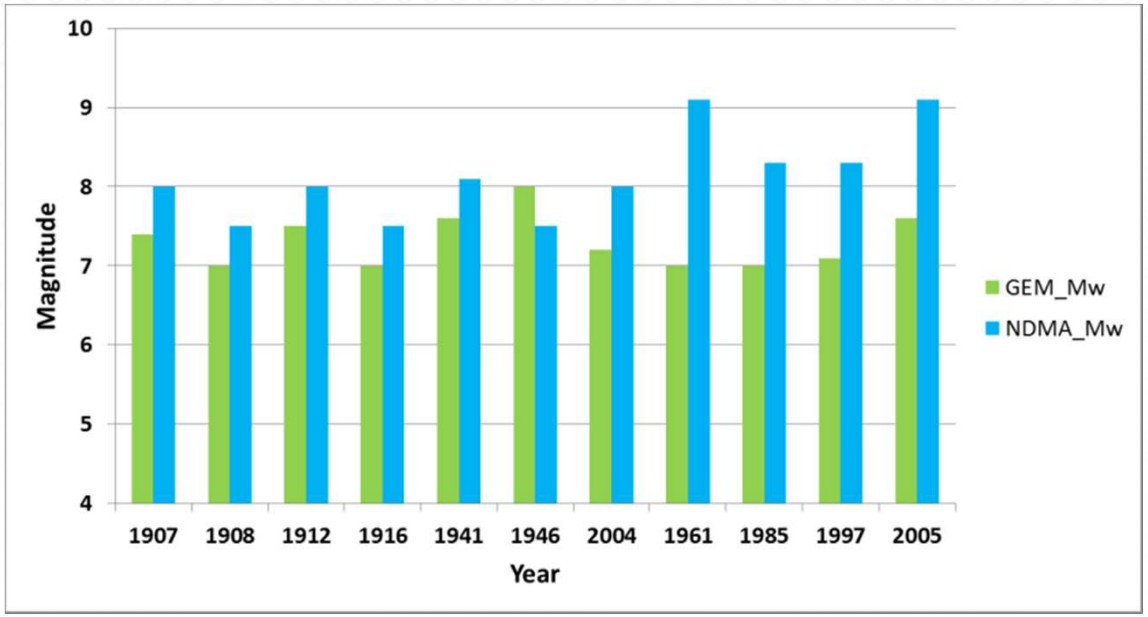
Even Good Data Can (and Should) Be Improved On



- AIR model incorporates comprehensive data from the NDMA and other important hazard studies

- Significant improvements
  - Historical catalog
  - Active fault model
  - GPS data
  - GMPE

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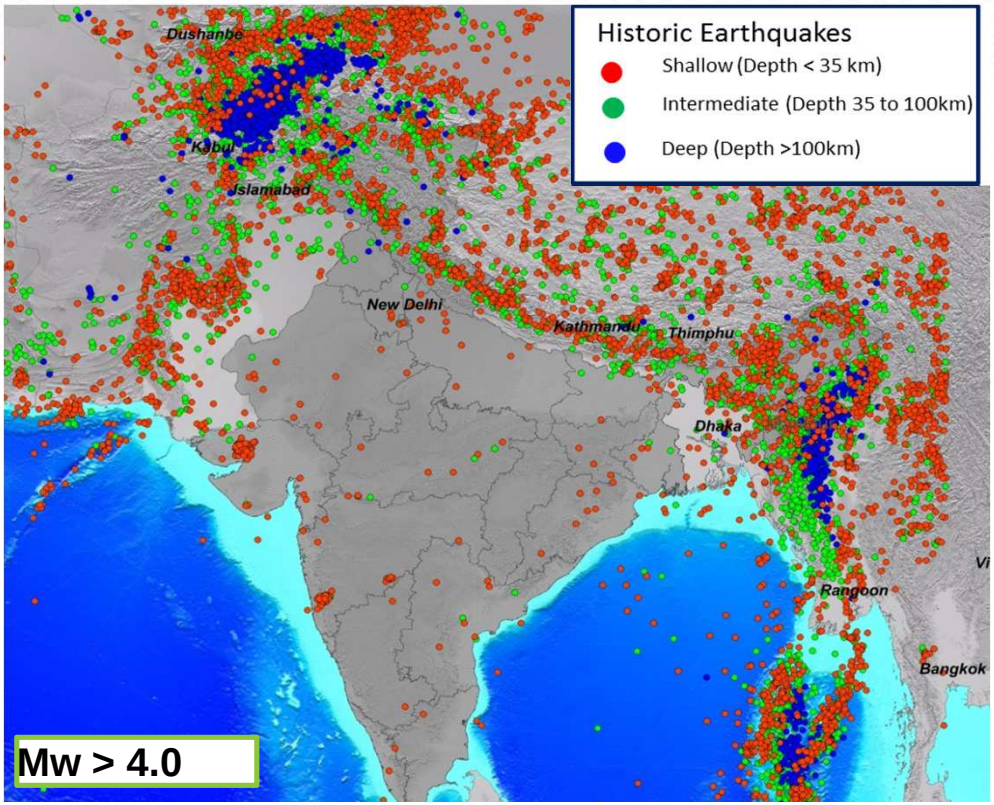
Sometimes There's a Lot of Data! Historical Seismicity Data Dating Back to 1500

Catalog	Years	Magnitude Scales
GEM Instrumental	1900–2009	M_w (5.1–9.3)
GEM Historical	1500–1903	M_w (6.3–8.8)
ISC Bulletin	1904–2009	M_w, M_s, mb, ML (3.0–9.0)
GCMT	1976–2014	M_w (4.0–9.3)
USGS	1900–2014	M_w, M_s, mb (2.5–9.3)
IMD	1819–2014	M_s, mb, ML (2.5–9.3)
NDMA	25–2008	M_w (3.9–9.3)



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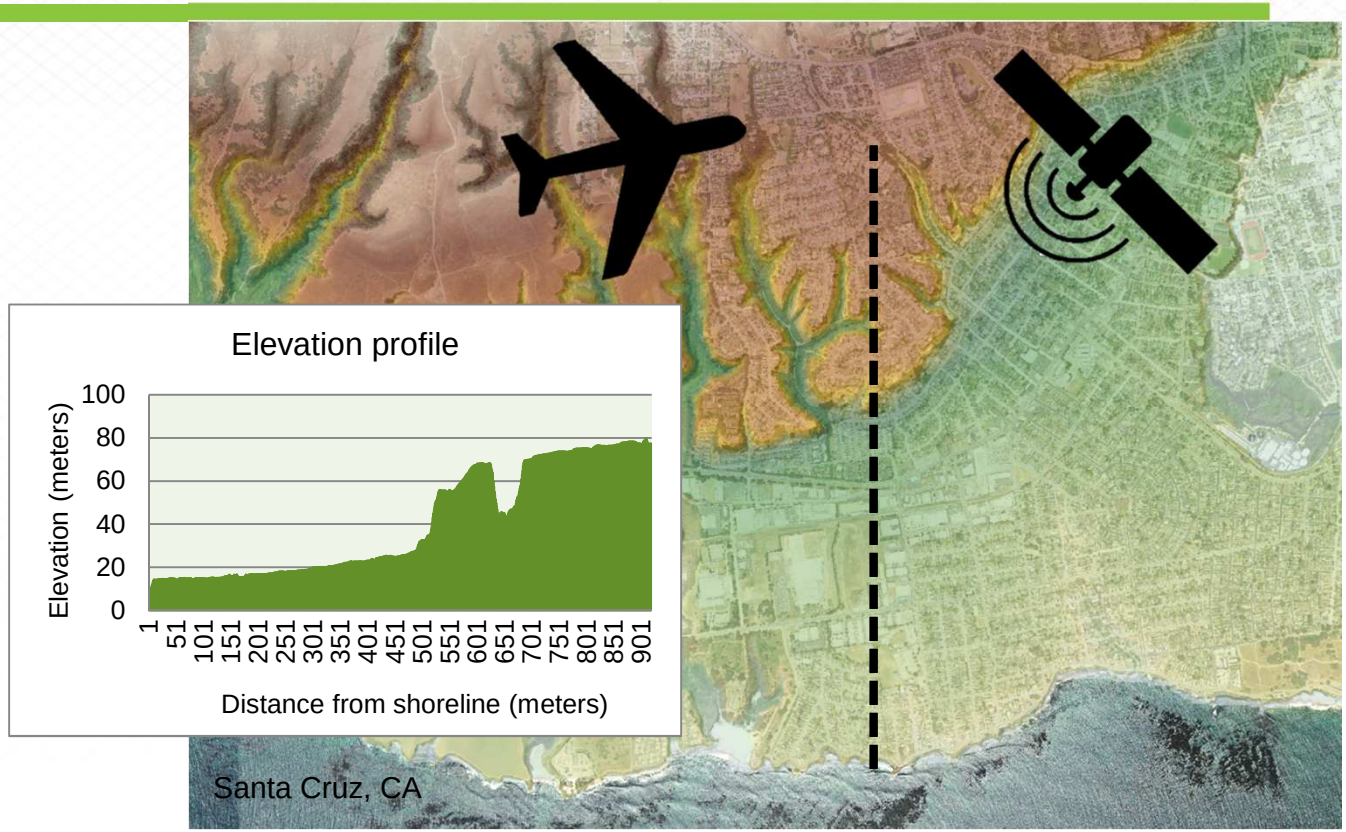
Data

New Technologies Provide Unprecedented Levels of Data for Detailed Model Development



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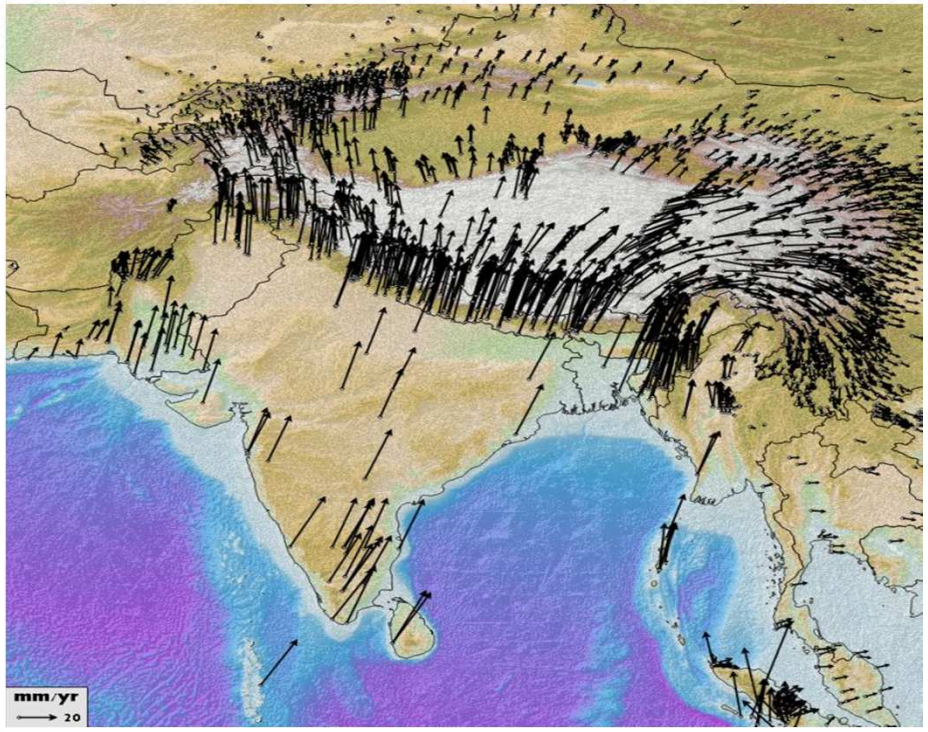
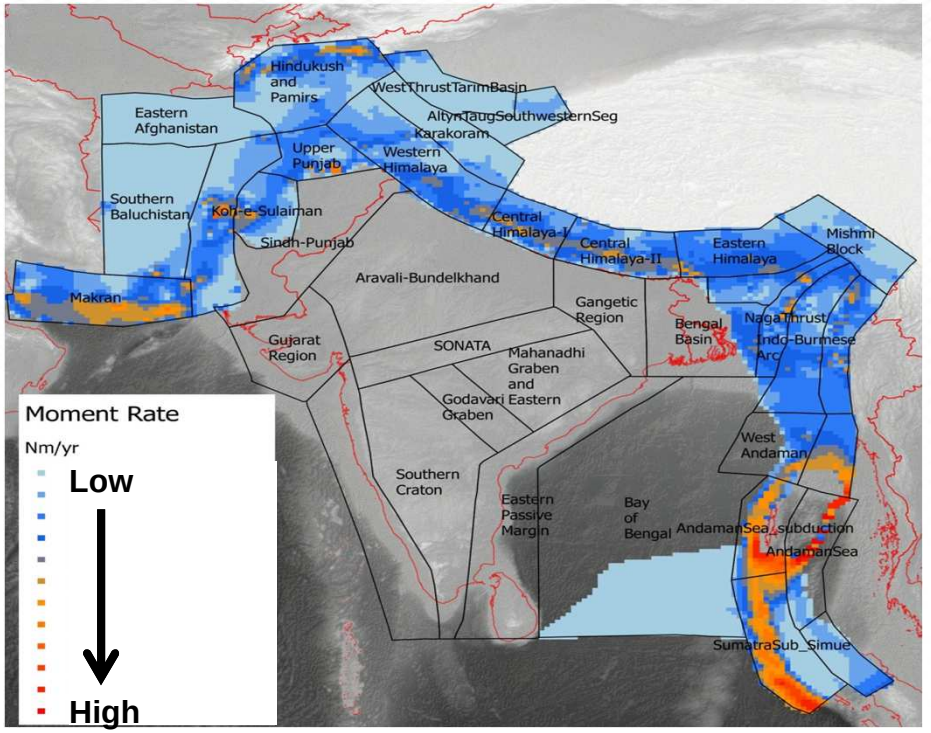
These New Data Improve Existing Modeling Methods



GPS Velocity Data



Seismic Moment Rate

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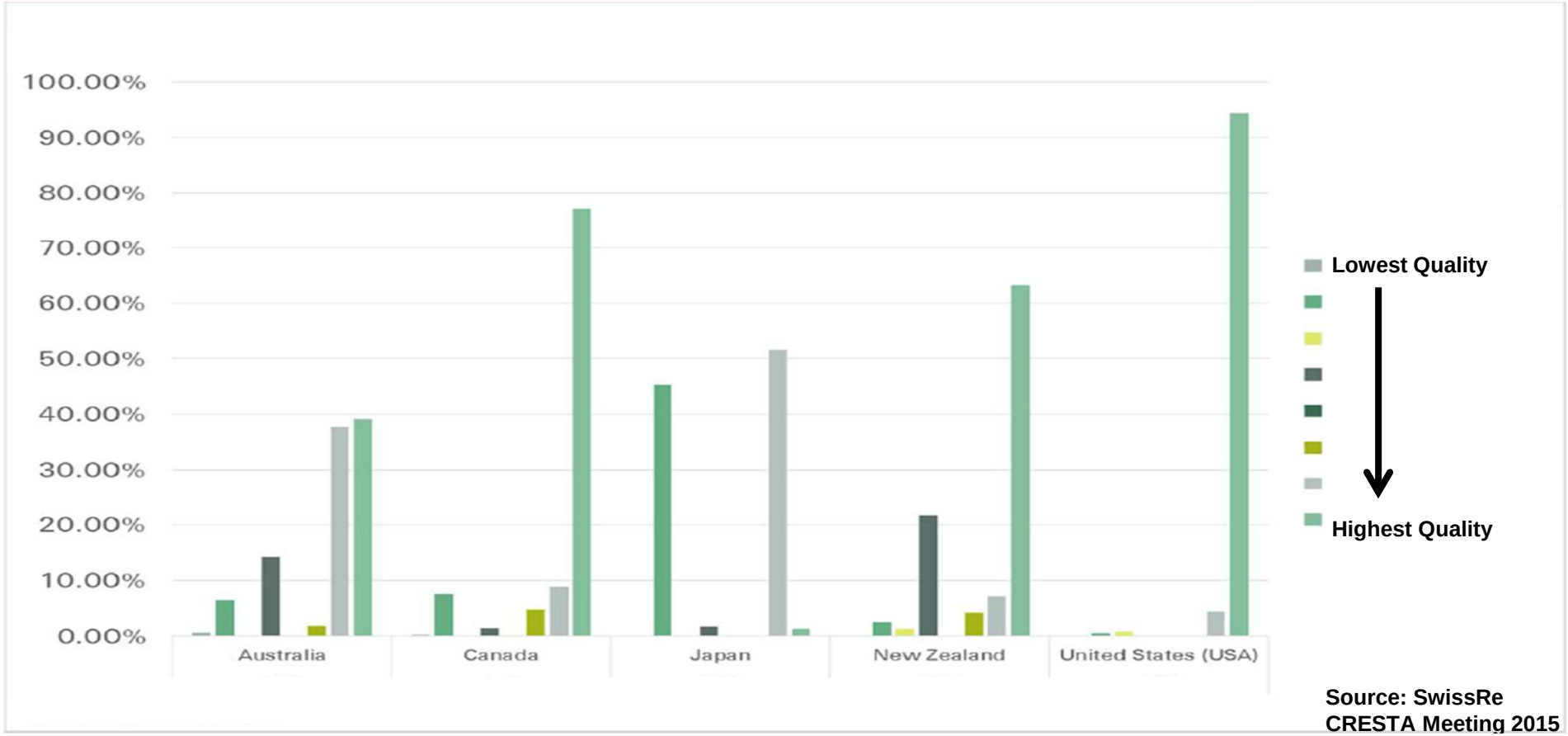
Exposure Data

Geocoding Information in Important Cat Markets



Source: SwissRe CRESTA Meeting 2015

Impact of Exposure Resolution on Modelling Results

	Peril	AAL ($B)	500 Yr ($B)
Exact Location Data	Earthquake	41.0	8,993.6
Exact Location Data	Wind	0.6	17.6
Exact Location Data	Flood	29.6	592.4

Percent Change From Exact Location Data:

	Peril	AAL	500 Yr
Postcode Data	Earthquake	2%	3%
Postcode Data	Wind	1%	5%
Postcode Data	Flood	-6%	-9%

	Peril	AAL	500 Yr
District Level Data	Earthquake	32%	22%
District Level Data	Wind	6%	9%
District Level Data	Flood	27%	75%

	Peril	AAL	500 Yr
Province Level Data	Earthquake	82%	28%
Province Level Data	Wind	-9%	-9%
Province Level Data	Flood	56%	133%

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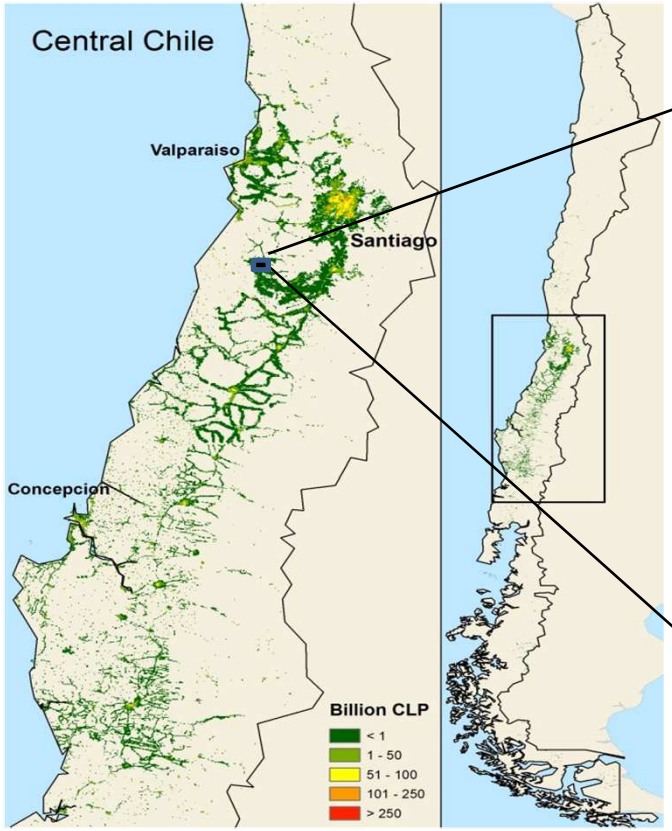
High Quality Industry Exposure Databases Improve Quality of Model and Data Augmentation

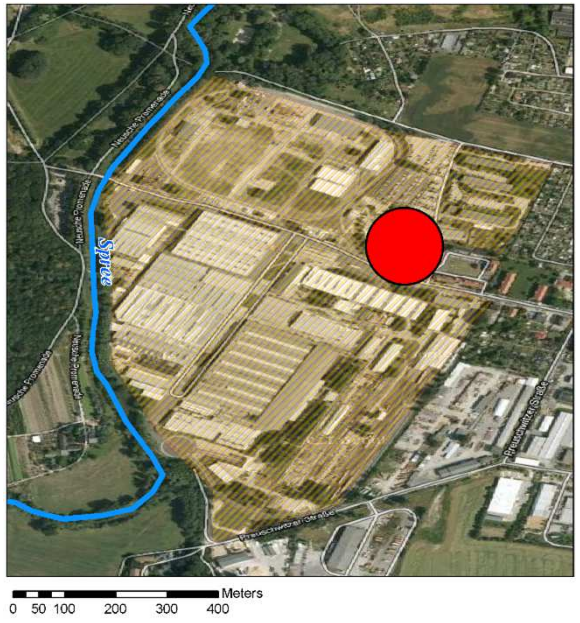


Residential values per km^2

Industrial Parks Are Incorporated from Satellite Imagery

A Realistic Value Distribution Can Avoid Over- or Under-Estimation of Losses

AAL based on Entrance Gate

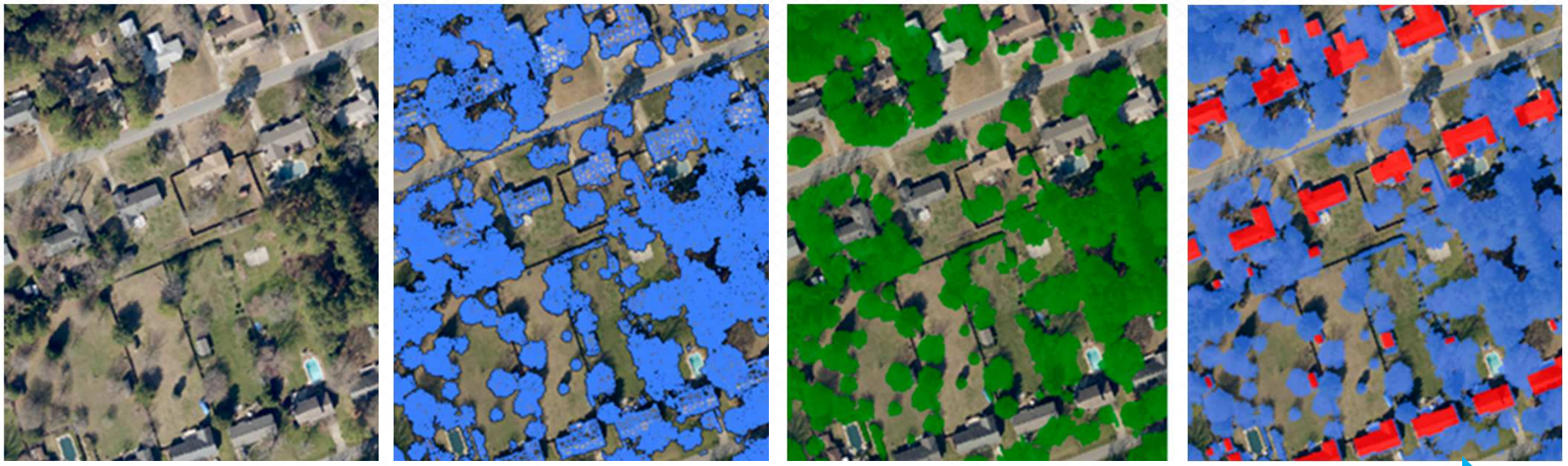


Loss Ratio: 2%

AAL based on Grid Geocoding

Loss Ratio: 6%

Using Land Cover Data to Automate Location and Extraction of Man-Made Features—Building Footprints



Additional Processing

Raw AVIRIS Satellite Image

Clustering of similar spectral signatures

Clusters fine tuned to determine trees

Trees cut from original clusters to generate building footprints

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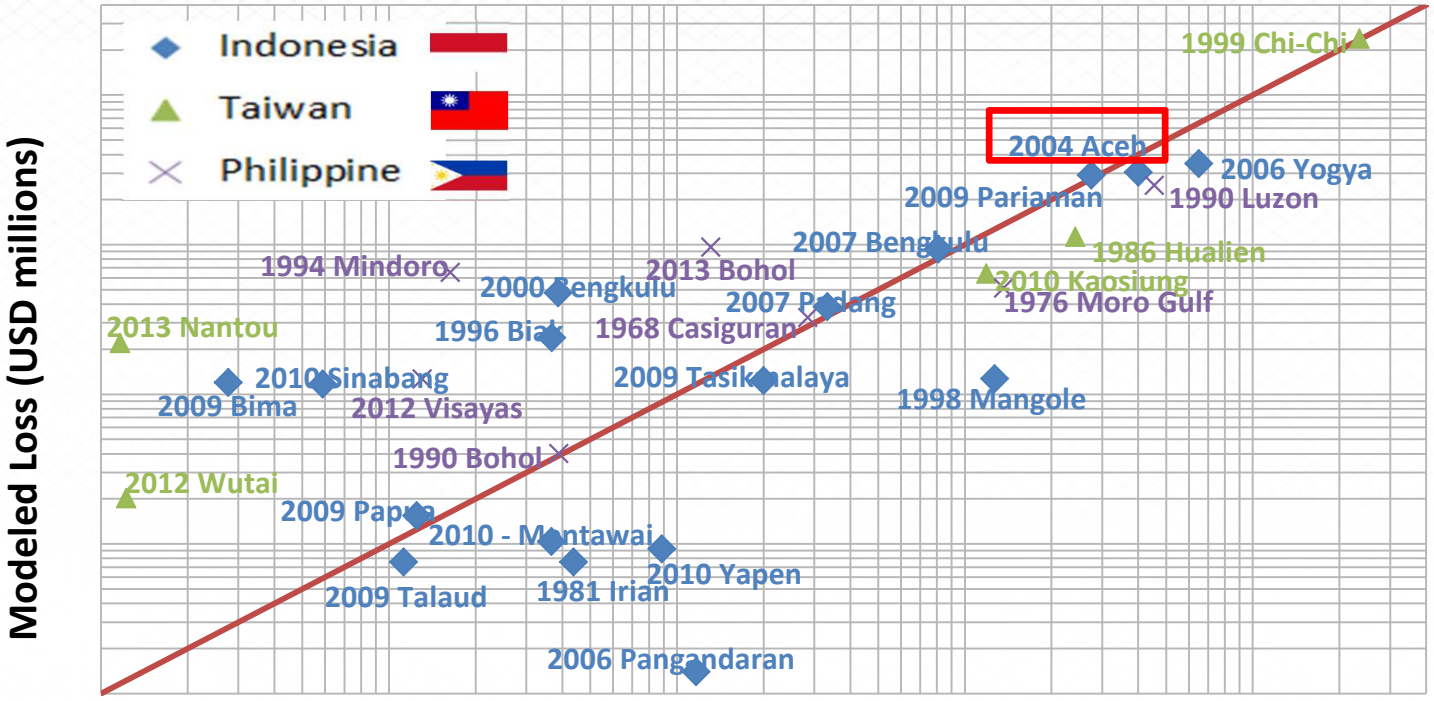
Validation

Data Used for Model Validation: Considerations & Limitations



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Data Used for Model Validation: Considerations & Limitations

By U.S. Navy photo by Photographer's Mate 2nd Class Philip A. McDaniel

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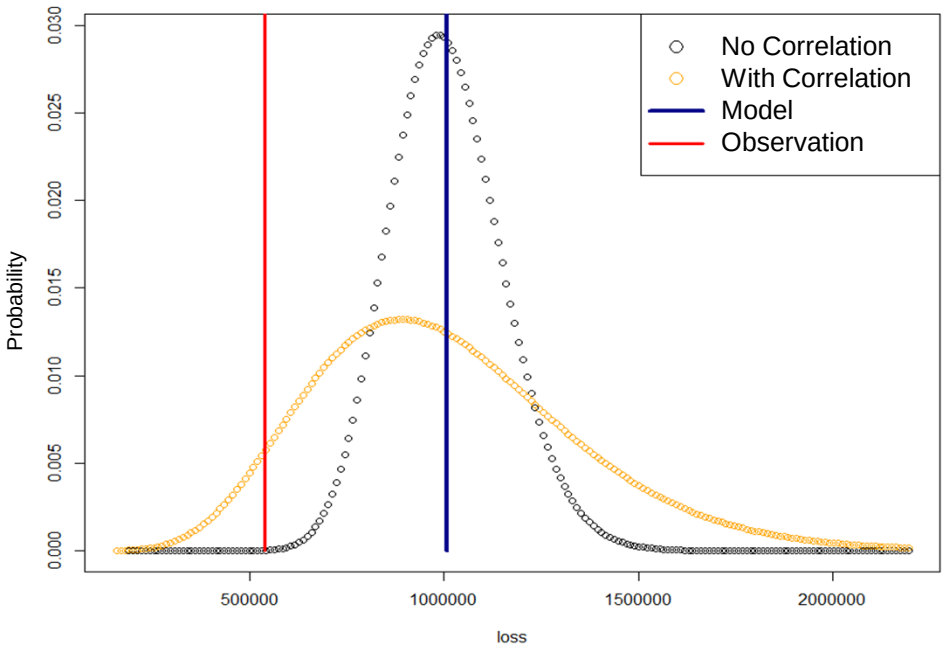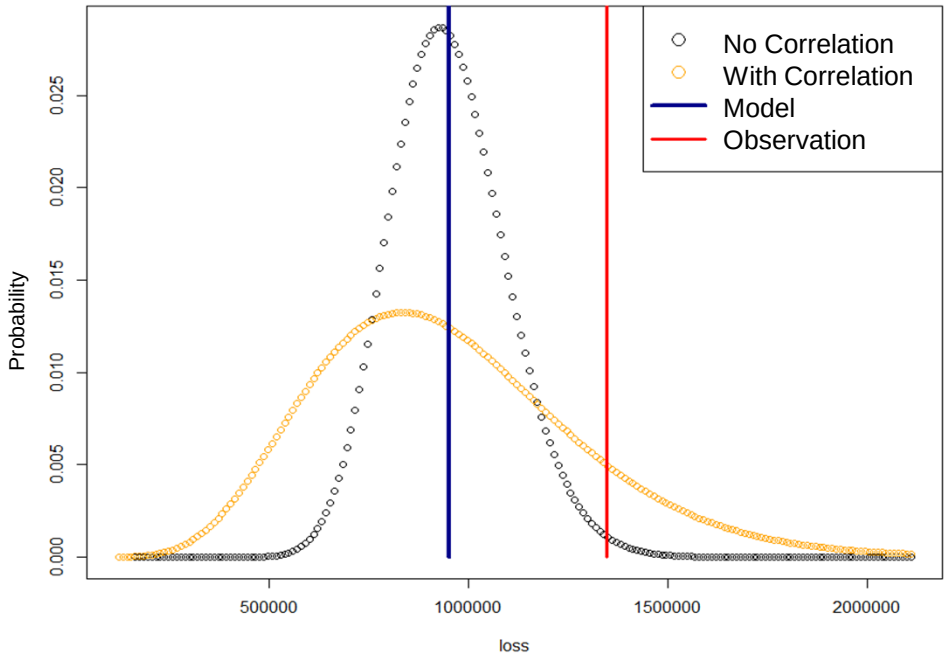
On the Horizon: Improvements to Financial Model Informed by Data and Analysis