LE RISQUE EST AUSSI UNE OPPORTUNITÉ
IMPACT DES NOUVELLES TECHNOLOGIES SUR LA MODÉLISATION DES COÛTS DES CATASTROPHES

Dr. Laurent Marescot
Sr. Director, Model Product Management
Risk Management Solutions
ARE WE SAFE IN THIS BUILDING TODAY?

Géopolis building, UNIL
Coord: 46.526756, 6.578886
Occupancy: Municipal
Construction: Concrete (reinforced)
4 stories, with basement
2012
Total Insured Value: CHF 14M

@ 200 year
Wind Loss Cost: 0.06%
Loss: 0.06% * 14M = 8,500 CHF

Example for illustration only
RMS AT A GLANCE

Founded: 1988
Industry: Insurance ++
Total Employees: 1,000+
Including 250+ experts engaged in science and technology of superior risk management
Headquarters: Silicon Valley
Global Offices: Silicon Valley, NY, Bermuda, London, Zurich, Noida (India), Singapore, Tokyo, Beijing

What is a catastrophe model vendor?
Professional, independent company focusing on building scientific-based models and modelling software without bearing or trading any insurance risk
INDEPENDENT VIEW OF RISK
Value to critical business functions for insurance industry
CATASTROPHE SCIENCE - RMS PRIMARY PERIL MODELS COVERAGE

- Earthquake
- Tropical Cyclone
- Windstorm
- Severe Convective Storm
- Winter Storm
- Flood
- Terrorism
- LifeRisk
- Agriculture
BUT THERE IS AN ISSUE...

2015 Windstorm Niklas
Mainly DE
USD 1.4bn economic
USD 1bn insured losses
~72%

2002 CEE Flood
Mainly DE and CZ
USD 13.8bn economic
USD 3bn insured losses
~22%

2013 CEE Flood
Mainly DE, AT and CZ
USD 16.8bn economic
USD 4.2bn insured losses
~25%

Flood is essentially a large non-modelled tier one risk

Data: Swiss Re Sigma
MODELLING FLOOD RISK AT CONTINENTAL SCALE: SOLVING THE NEXT CHALLENGES IN CAT MODELLING

Concerns around current solutions

No cross-border information / spatial correlation

~20%: 200-year loss increase for CZ / DE portfolio due to correlation
Concerns around current solutions

- No cross-border information / spatial correlation
- ~20%: 200-year loss increase for CZ / DE portfolio due to correlation
- Limited off-flood plain risk
- 30-50% of loss is off-flood plain
MODELLING FLOOD RISK AT CONTINENTAL SCALE: SOLVING THE NEXT CHALLENGES IN CAT MODELLING

Concerns around current solutions

- No cross-border information / spatial correlation
- Approximately 20%: 200-year loss increase for CZ / DE portfolio due to correlation
- Limited off-flood plain risk
- 30-50% of loss is off-flood plain
- Mainly undefended views
- More than 25% of new submissions unnecessarily declined
NEED FOR MORE ACCURATE MODELS

New Flood Model

Complete and Consistent

1 Pan-EU single event set
~ 850'000 stochastic events
50’000 years simulation

High Resolution

National views
Spatial hazard resolution down to 5 m
Exposure disaggregation
NEED FOR MORE ACCURATE MODELS

Pan-European Flood Model
- Complete and Consistent
- 1 Pan-EU single event set
- ~850,000 stochastic events
- 50,000 years simulation
- High Resolution
  - National views
  - Spatial hazard resolution down to 5 m
  - Exposure disaggregation

Windstorm Model
- Aggregated hazard
- 1 – 10 km
- < 50,000 events
NEW TECHNOLOGY

Computing Power

Remote Sensing

Modelling Science

Social Networks

Data Collection & Processing
DELIVER BETTER SCIENCE
BETTER MODELLING OF FLOOD RISK PROCESSES

Precipitation simulation  Hydrological modelling  Flood modelling

Precipitation  Rainfall Runoff Model  Routing  Defense model  Inundation
## A SCALABLE APPROACH: MODELLING U.S. INLAND FLOOD

<table>
<thead>
<tr>
<th>Area</th>
<th>River Network</th>
<th># Grid Cells</th>
</tr>
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<tbody>
<tr>
<td>Europe</td>
<td></td>
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<tr>
<td>U.S.</td>
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<td></td>
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<tr>
<td>Mississippi</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Legend**

- Straight stream order
- 1
- 2
- 3
- 4
- 5
- River basins

*Image of a map of the United States with various river basins marked.*
DELIVER BETTER SCIENCE
MORE COMPREHENSIVE VIEW OF RISK

All Types of Inland Flooding:
Better risk estimate

Major floodplains

Minor floodplains, pluvial flood phenomena

Continental-scale event set
Start with precipitation

New view on cross-country correlation:
Opportunities for risk diversification
DELIVER BETTER SCIENCE
FILL IN THE DATA VOID

NEW PROBABILISTIC DEFENSE MODEL

Modeling the missing 70% permanent / temporary defenses

The undefended view over-estimates risk and could show profitable regions as ‘high hazard’
DEVELOP INNOVATIVE FUNCTIONALITIES
NEW WAYS TO ADJUST MODELS

RMS Europe Flood Model
Bespoke Flood Defenses

CREATE OWN VIEWS OF RISK
INNOVATE NEW TYPES OF COVERAGES

EXACT DEFINITION AND REPRESENTATION OF EVENTS

PRECIPITATION MODELLED AT DAILY BASIS
Enable adjustment of hours clauses in the model

Impact of Changing Hours Clauses on Exceedance Probability Curve

Return Period (year)

Loss €

- no hours clause
- 504 hours clause
- 168 hours clause

504 hours
168 hours

504 hours
168 hours
'Dry’ antecedent conditions
Extreme precipitation

Very ‘wet’ antecedent conditions
Severe precipitation
2013 wetness

Dark blue: maximum soil moisture of period 1962-2012 was exceeded
Blue: second highest max exceeded
Aquamarine: third highest max exceeded

Stein and Malitzn (2013)

2002 Precipitation

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DELIVER ADDITIONAL VIEWS
CLIMATE UNCERTAINTY AND REALISTIC STRESS-TESTS

Flow ▲~40%
Flood extent ▲~250%
Overall loss ▲~400%

Based on RMS Europe Flood model
DELIVER SOLUTIONS ON SHORTER TIMELINES
FLOOD EVENT RESPONSE

Hydrological Model

1 2 3 4 5 6
Flood height
River height

Eva (from 26 Dec)

RMS Field Reconnaissance
IN SUMMARY...

RMS® RiskLink 15
600,000+ diskettes

IRAS v1.0
17 diskettes

1989 2015
NEW TECHNOLOGY
Helps delivering...

NEW OPPORTUNITIES

► New ways to understand the risk
► New tools to innovate new forms of coverages

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GROW THE INDUSTRY
MAINTAIN INSURANCE INDUSTRY’S RELEVANCE FOR SOCIETY
ABOUT RMS

RMS is the world’s leading provider of products, services, and expertise for the quantification and management of catastrophe risk. More than 400 leading insurers, reinsurers, trading companies, and other financial institutions rely on RMS models to quantify, manage, and transfer risk. As an established provider of risk modeling to companies across all market segments, RMS provides solutions that can be trusted as reliable benchmarks for strategic pricing, risk management, and risk transfer decisions.

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