



20
19

AIR European
Seminars

London

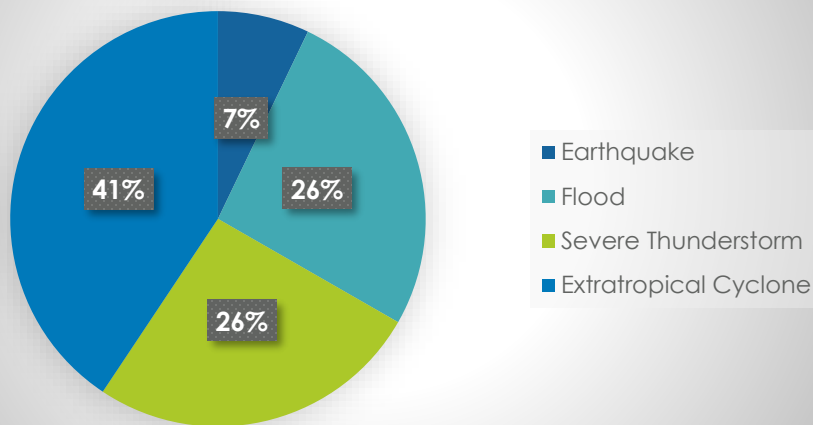
Extratropical Cyclones and Severe Thunderstorms in Europe

Bernhard Reinhardt, PhD

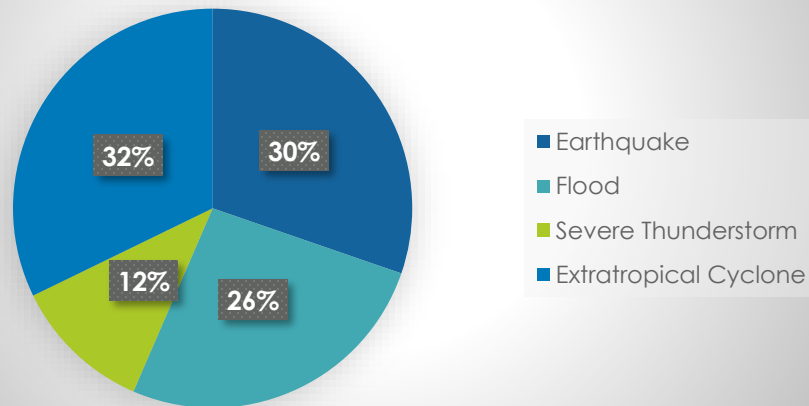
Hazard in Europe: Wind and Hail

Peril Contribution to European Insured Losses

AAL Contribution Europe



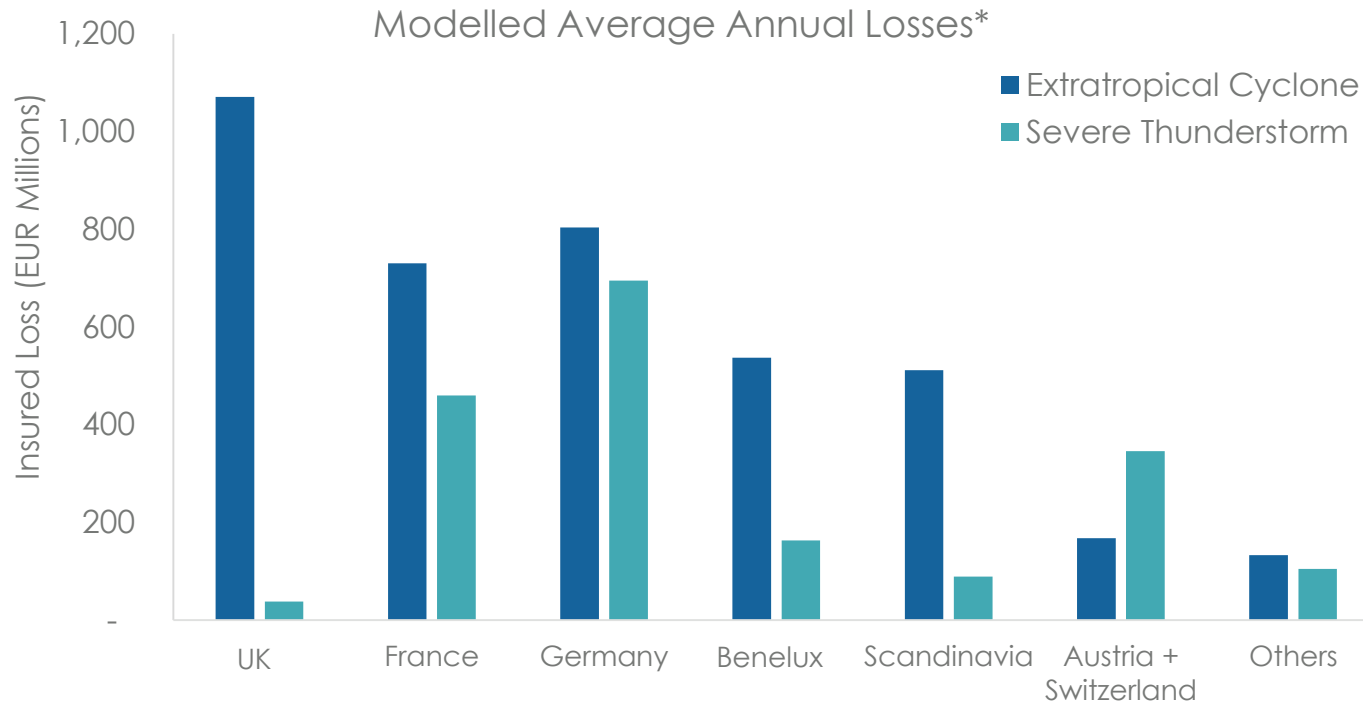
200-Year Occurrence Loss Relativities



ETC, ST, and EQ modelled for the 22 countries within the ETC & ST model domains

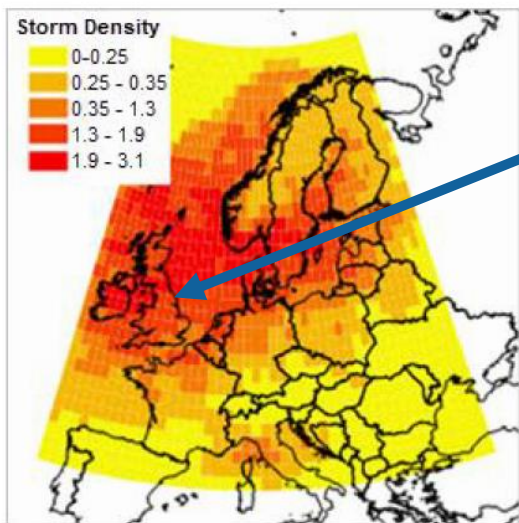
Flood modelled for AT, CH, CZ, DE, PL, and UK

Severe Thunderstorm and ETC Contribute Differently to Overall Wind Losses Depending on Region

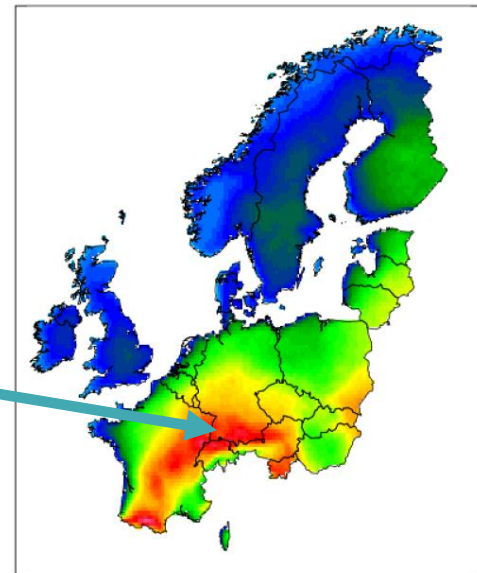
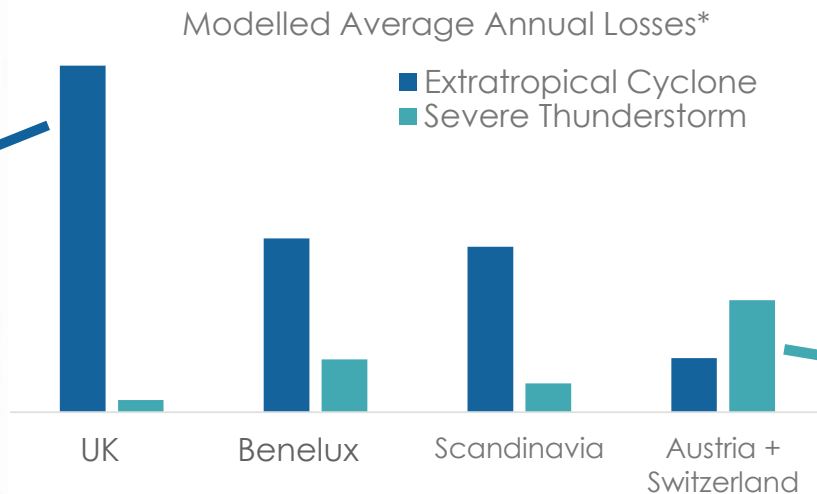


*Excludes auto, forestry, and storm surge losses

Severe Thunderstorm and ETC Contribute Differently to Overall Wind Losses Depending on Region

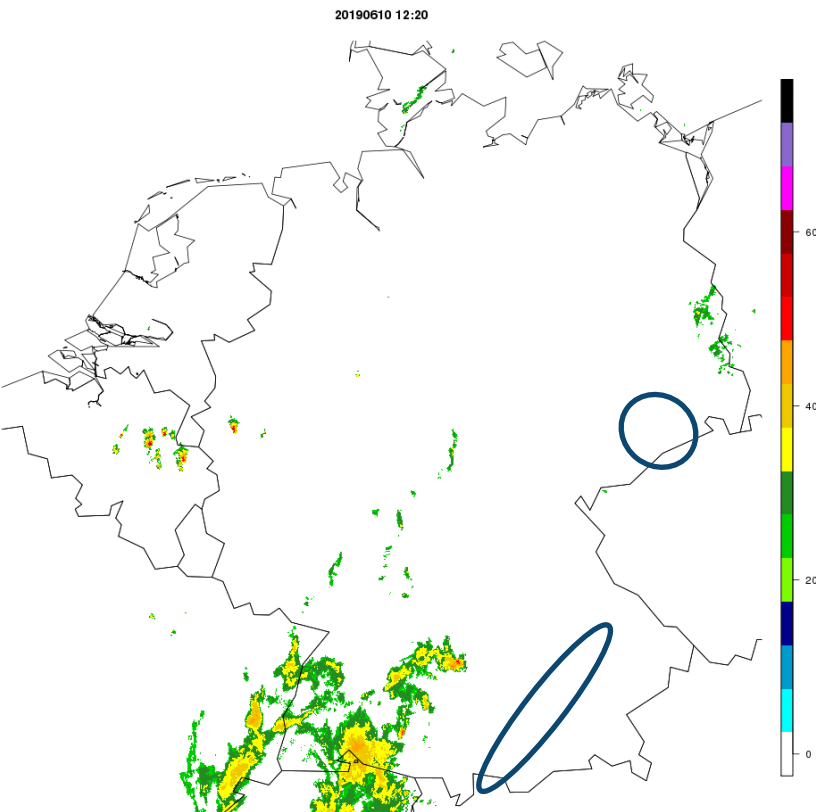


Historical ETC Storm Track Density



Number of Simulated Hail Days

Case Study: Hail Event on 19 June 2019

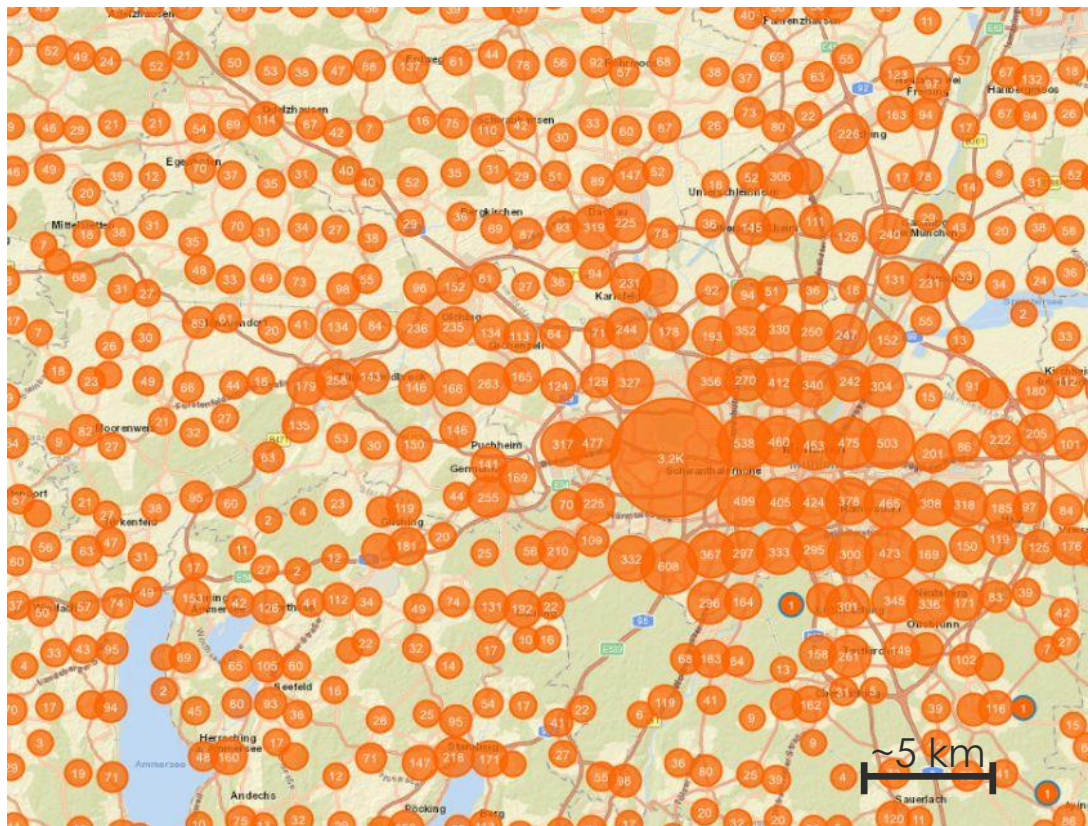


Data Source: German Weather Service (DWD)
Visualisation: AIR



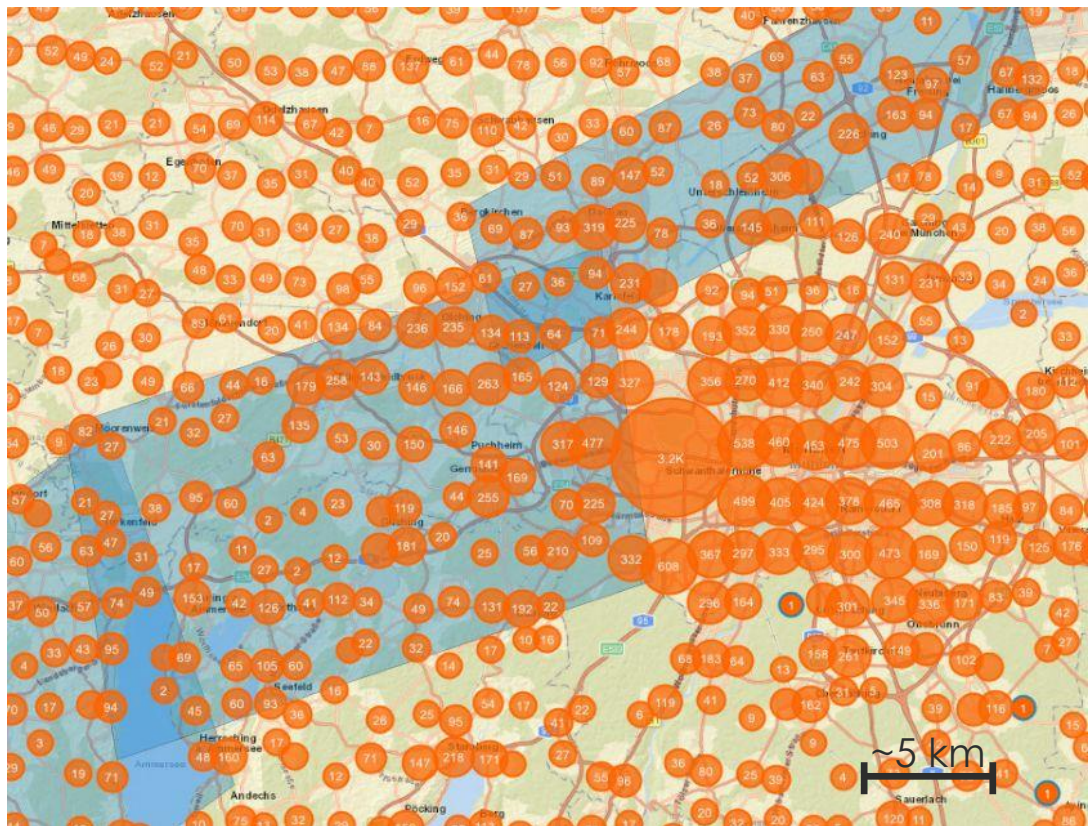
Source: AIR Damage Survey

Location, Location, Location!



Orange Cluster Points:
Exposure concentration in
AIR's industry exposure
database

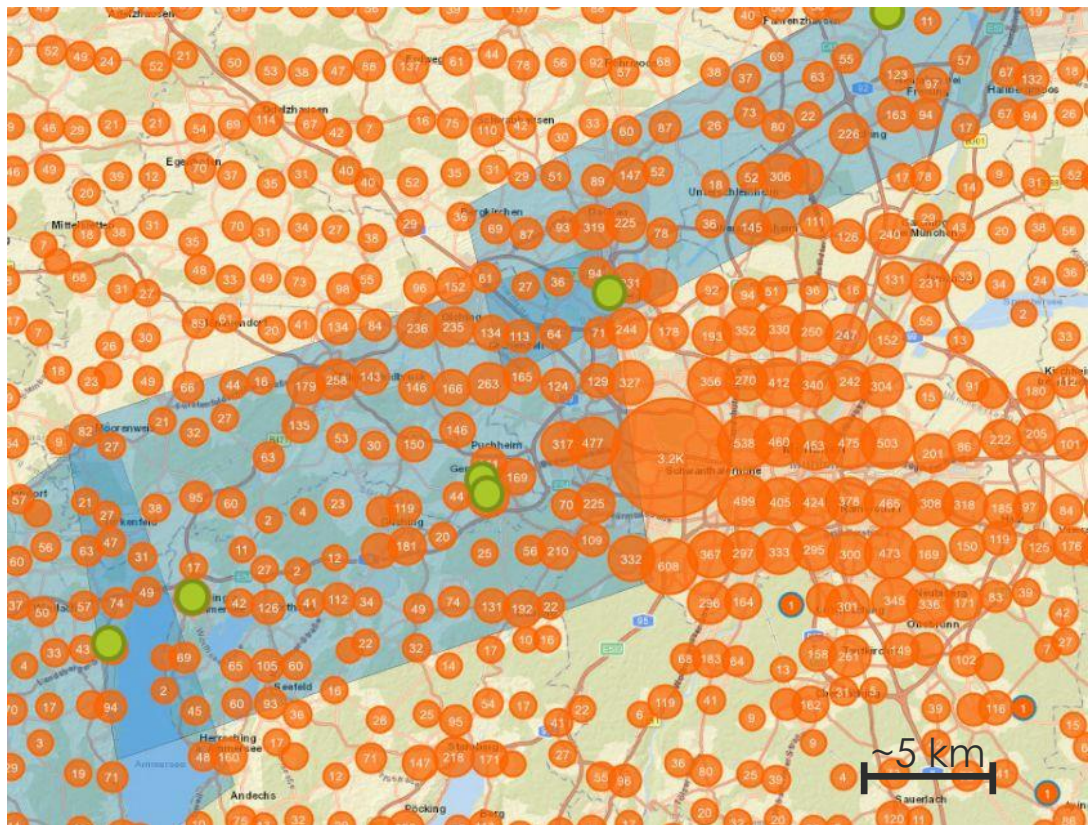
Location, Location, Location!



Orange Cluster Points:
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Polygons: Areas with high
probability of hail, derived
from weather radar data

Location, Location, Location!



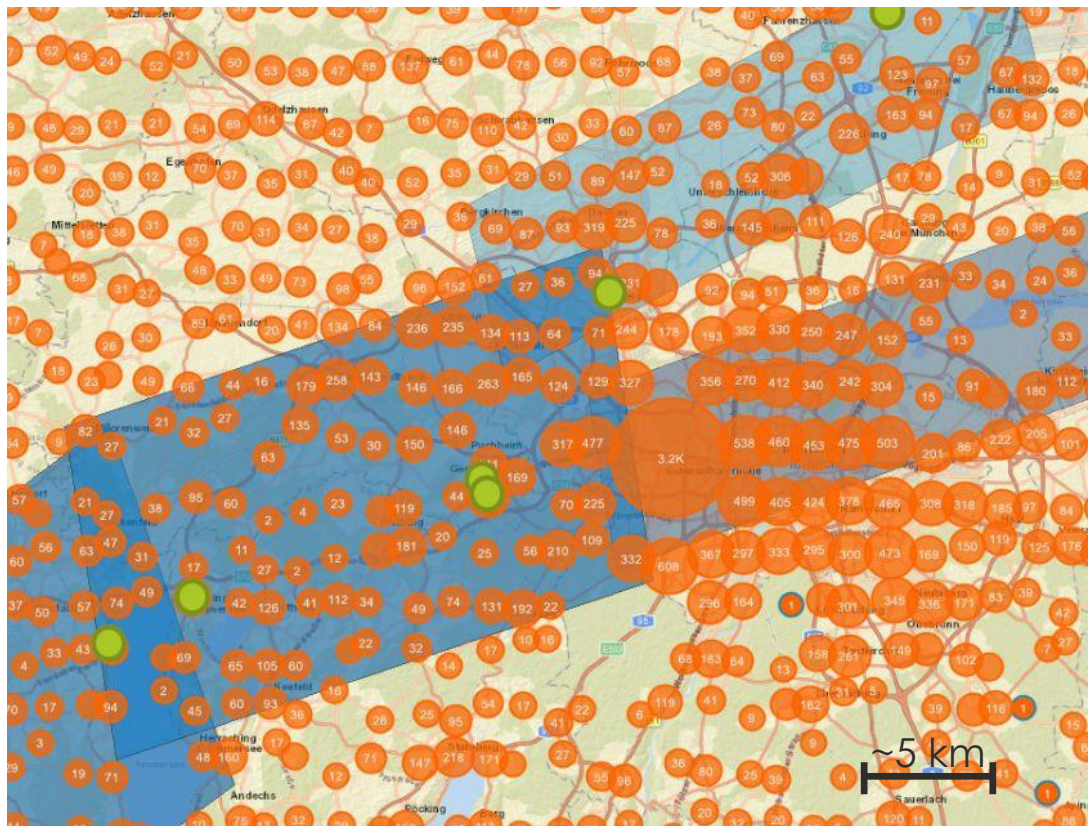
Orange Cluster Points:

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Polygons: Areas with high probability of hail, derived from weather radar data

Green Circles: Hail damage confirmed by AIR damage survey

Location, Location, Location!

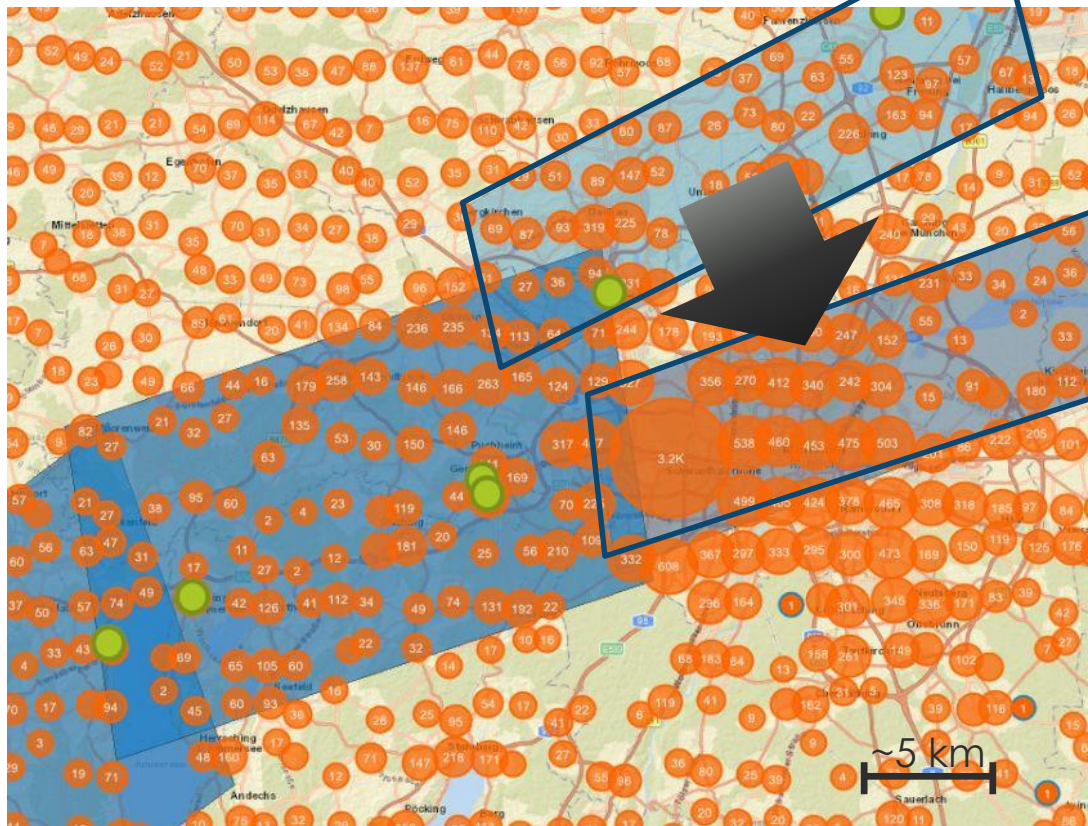


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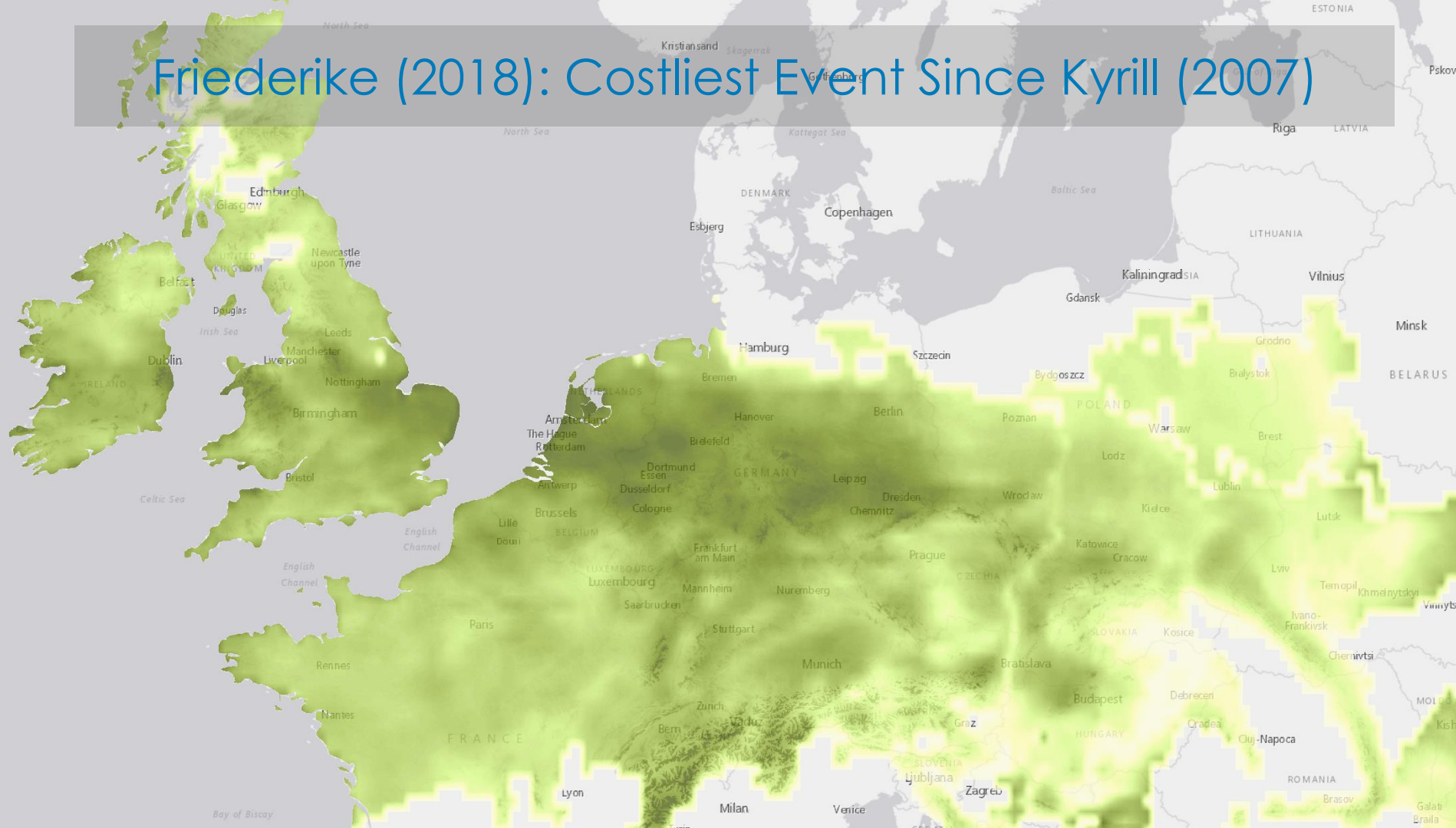
Green Circles: Hail damage
confirmed by AIR damage
survey

Location, Location, Location!



**About 3x more exposure
affected just 10 km south of
actual hail swath track**

Friederike (2018): Costliest Event Since Kyrill (2007)



Modelling Wind and Hail

Comprehensive Model Coverage



22 Countries

Newly added:

Slovakia

Slovenia

Hungary

Liechtenstein



New Risk Types

Industrial Facilities

Marine Risks

Wind Turbines

Forestry



Comprehensive Event Sets

Year-round catalogues

More historical events

Extreme Disaster
Scenarios

Extratropical Cyclone and Severe Thunderstorm Models Share Features and Components

ETC

Numerical Weather
Prediction based
stochastic model

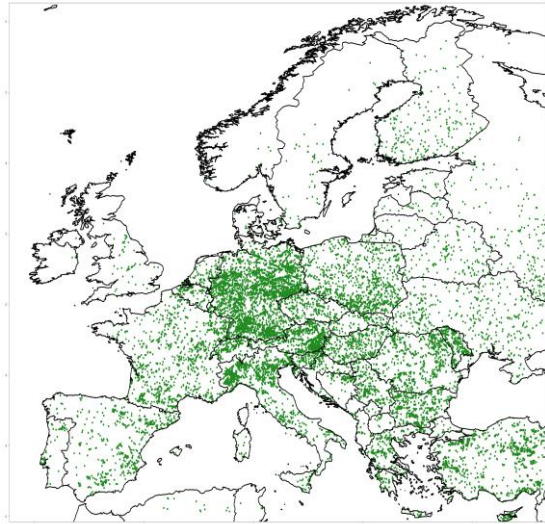
ST

Stochastic hail and wind
swaths driven by
meteorological
environment

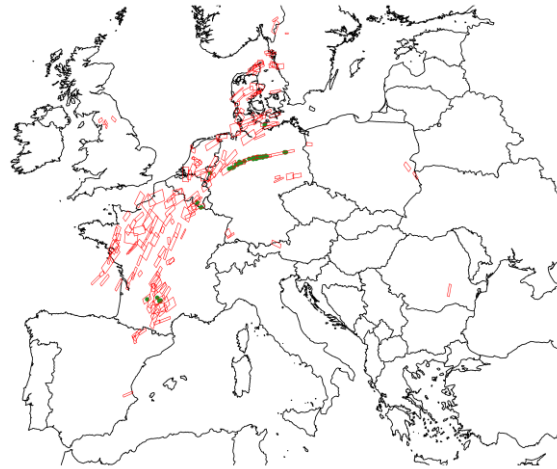
Common Vulnerability Framework

Scale of Severe Thunderstorms Requires a Multi-Faceted Hazard Modelling Approach

Storm Reports (ESWD)



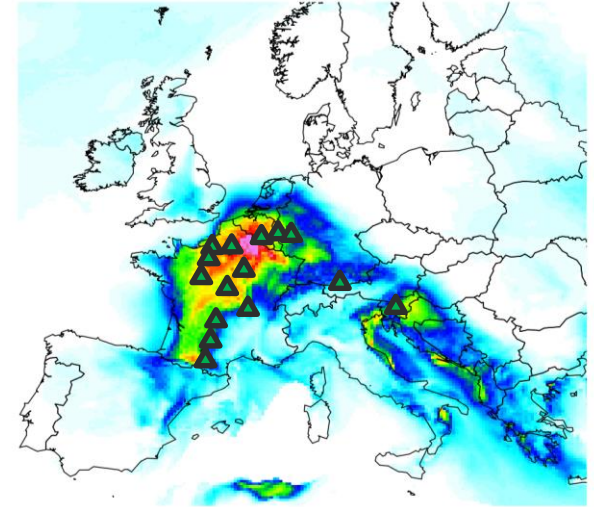
Radar Identified Hail Swaths



 Swath

 ESWD Hail Report

Atmospheric Conditions (ERA-Interim Re-Analysis)



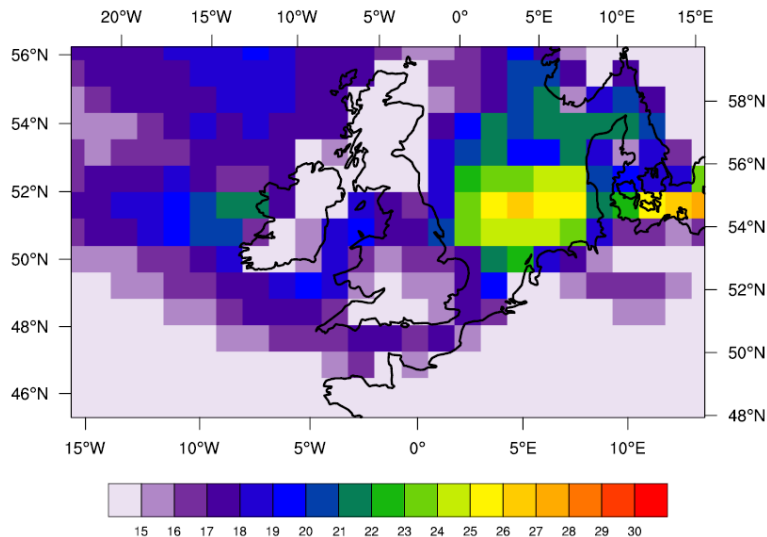
 ESWD Hail Report

ESWD: European Severe Weather Database

ETC: High-Resolution Physical Simulation Captures Details in Wind Field

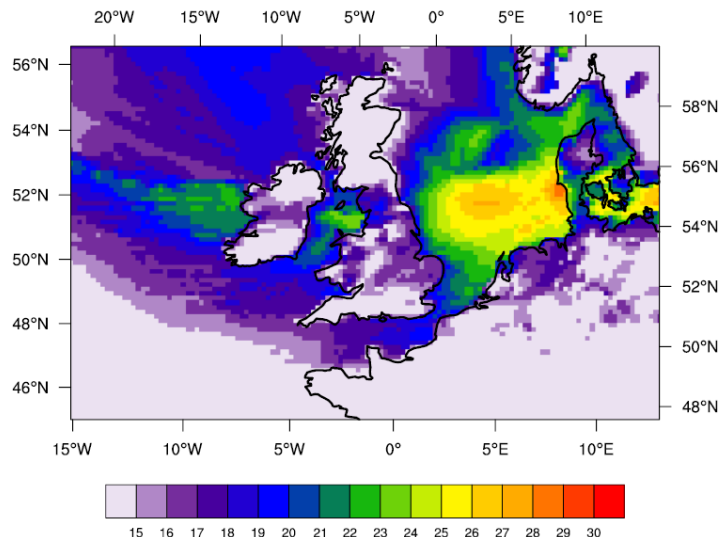
2011 Model Version

Anatol 90 km



2018 Model Version

Anatol 16 km



Wind Speed (m/s)

**Output of the Numerical Weather Prediction Model; final hazard resolution
after downscaling is 1 km**

ETC: Further Areas of Hazard Sophistication

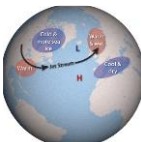
Areas of Enhancement



Storm Surge Sub-Peril



New Historical Events



North Atlantic Oscillation (NAO) Signal



Enhanced Wind Speed Calibration

Drivers of Vulnerability Updates

Expansion of
Supported
Lines of
Business

Vulnerability in
the Absence of
Detailed
Exposure Data

New and
Detailed
Claims and
Loss Data

Support for Non-Traditional Lines of Business



Industrial Facilities



Marine



Wind Turbines

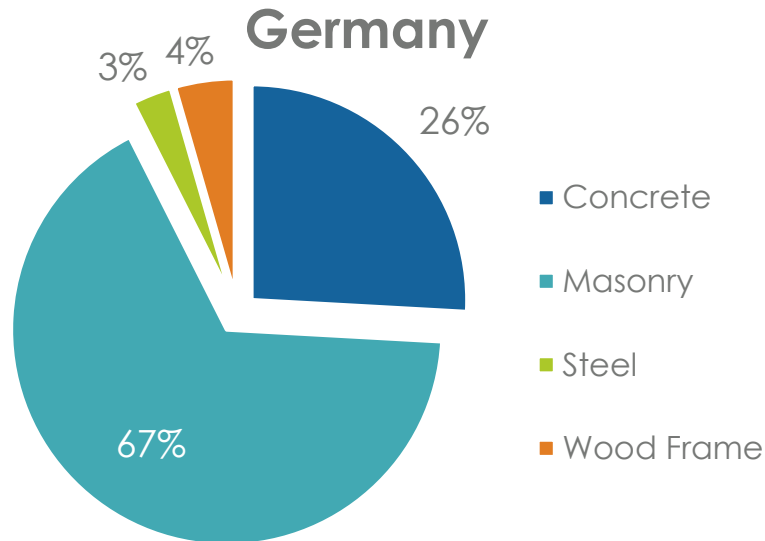


Forestry*

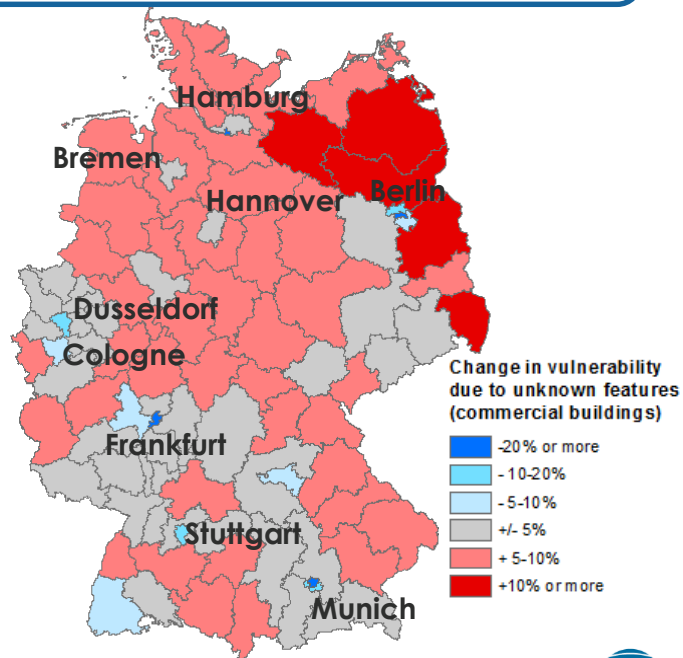
* Forestry is now supported for all countries in the model domain

Enhancements to the “Unknown” Damage Functions: Germany and Commercial Buildings

**Vulnerability Is Now Differentiated
Based upon Regional Building Stock**

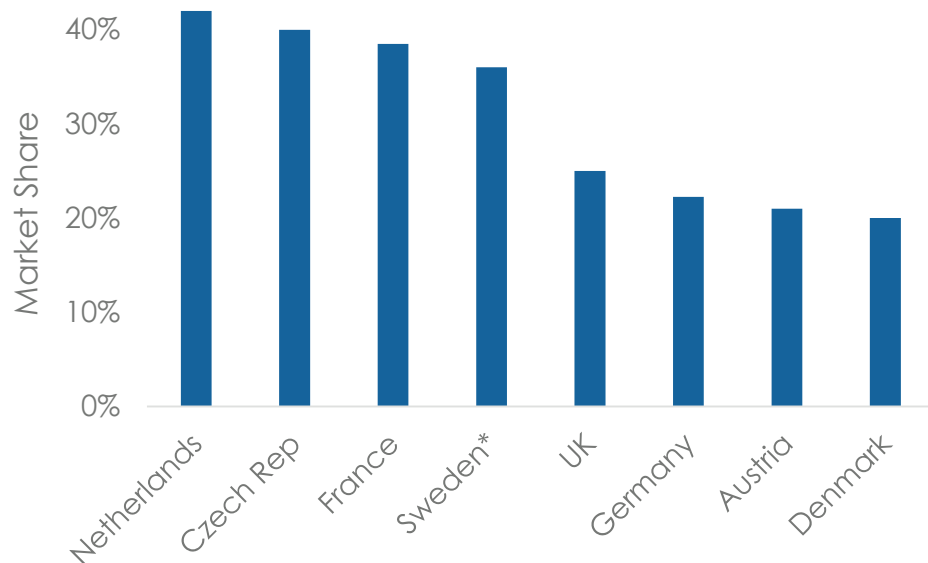


**Improved Risk Differentiation
Based upon Location**



More than EUR 7 Billion in ETC Claims and EUR 20 Trillion in Exposures

Combined Market Share of Companies Providing Claims Data



* Excluding forestry data; for forestry we have claims from about 50-60% of the market

Summary of Claims Data

- Residential/non-residential breakdown: ~ 55%/45%
- Number of companies: 15
- Number of countries: 14
- Number of events: 14, dating back to Daria (1990)
- Some data sets with the full claims history for the past three decades

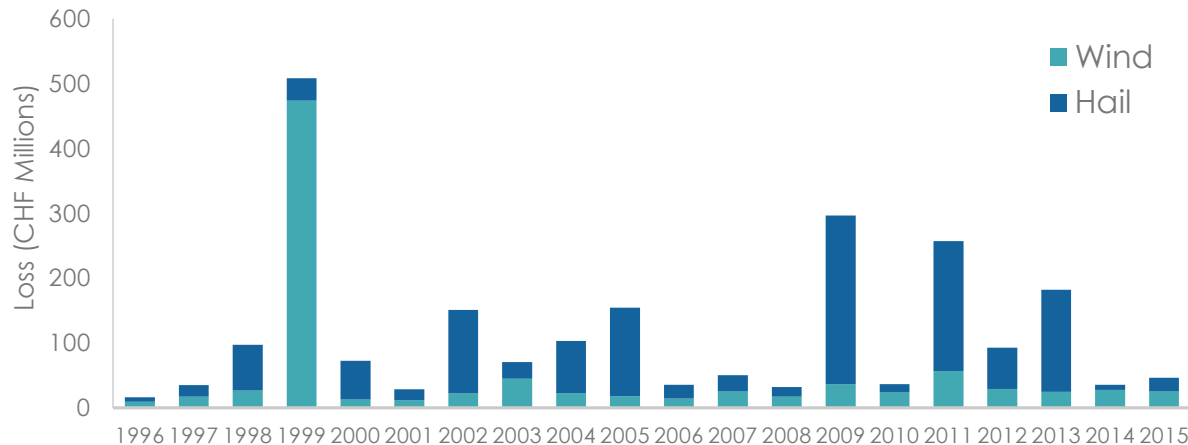
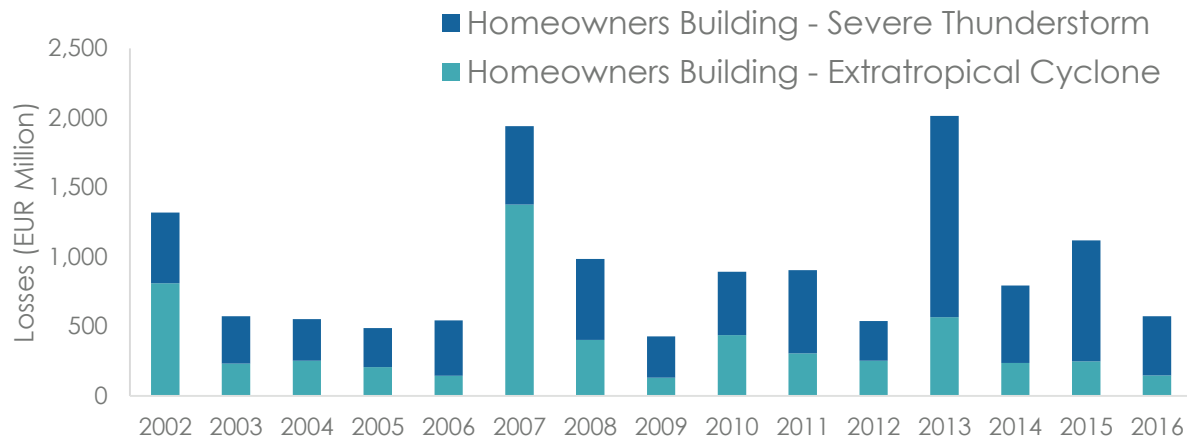
Data from Insurance Associations Is Leveraged in Model Validation



~EUR 9 Billion

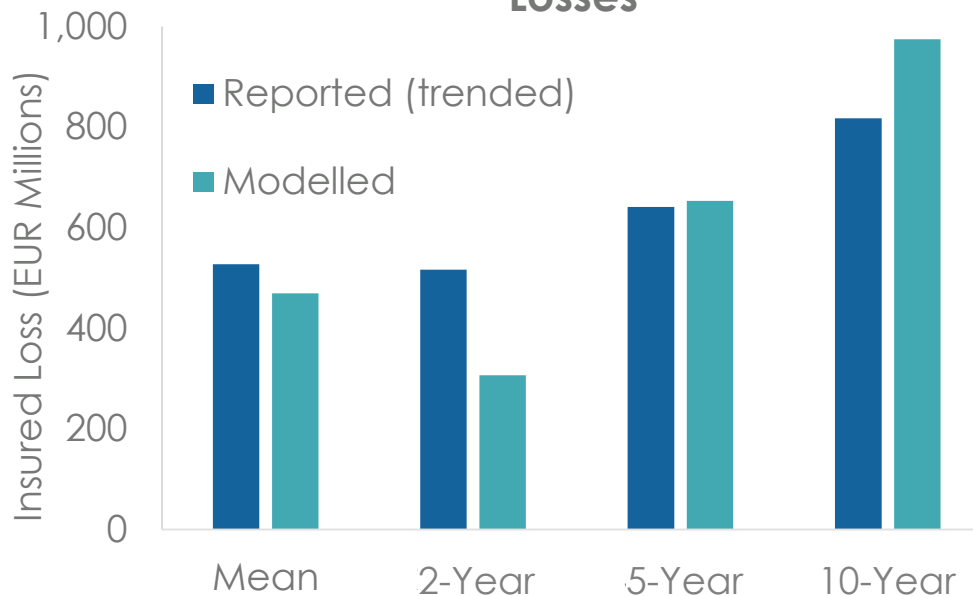


~EUR 2 Billion

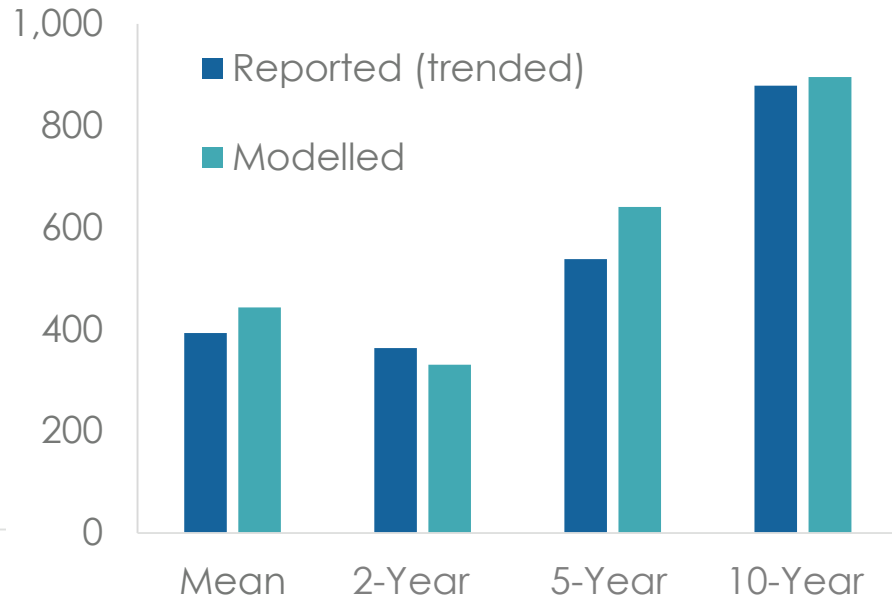


Severe Thunderstorm Stochastic Events Loss Evaluation: Germany

Residential Buildings: Aggregate Losses



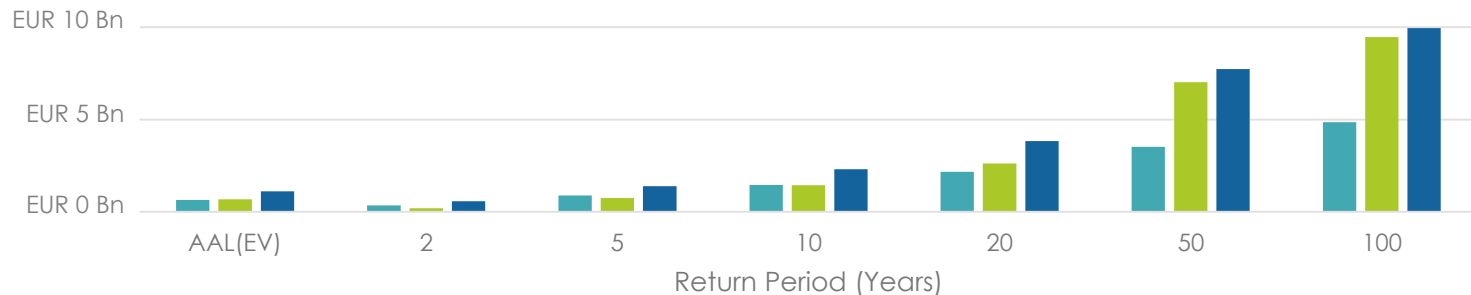
Automobiles: Aggregate Losses



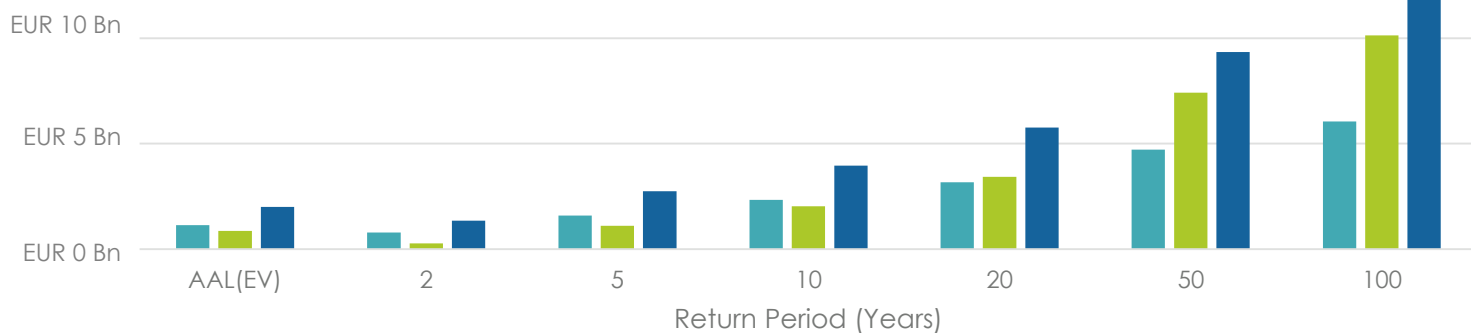
Source for Reported Losses: GDV

Combining ETC and ST Losses

Germany Occurrence Losses



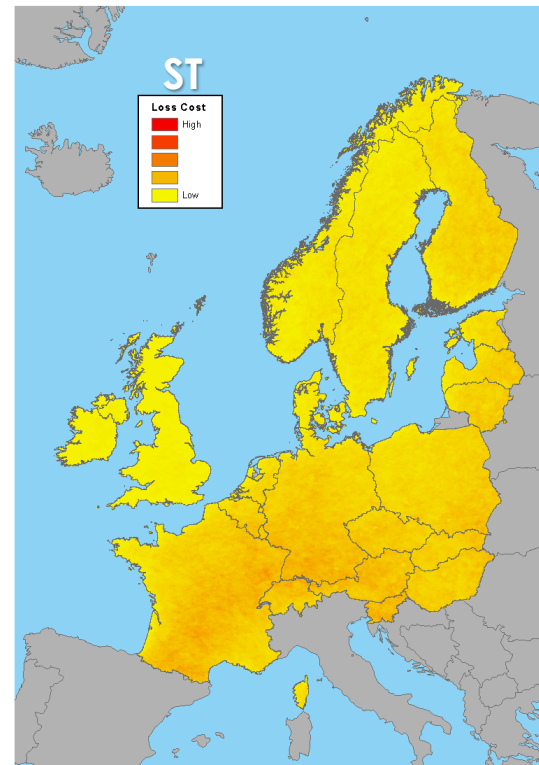
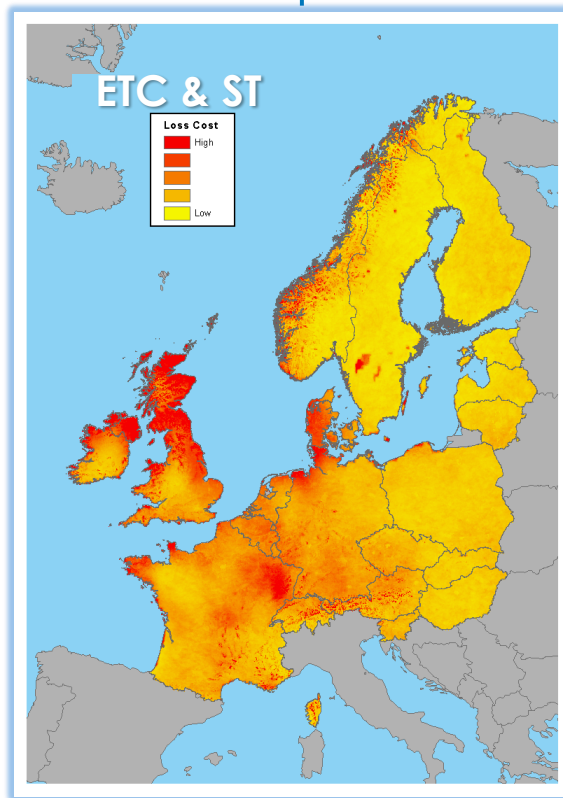
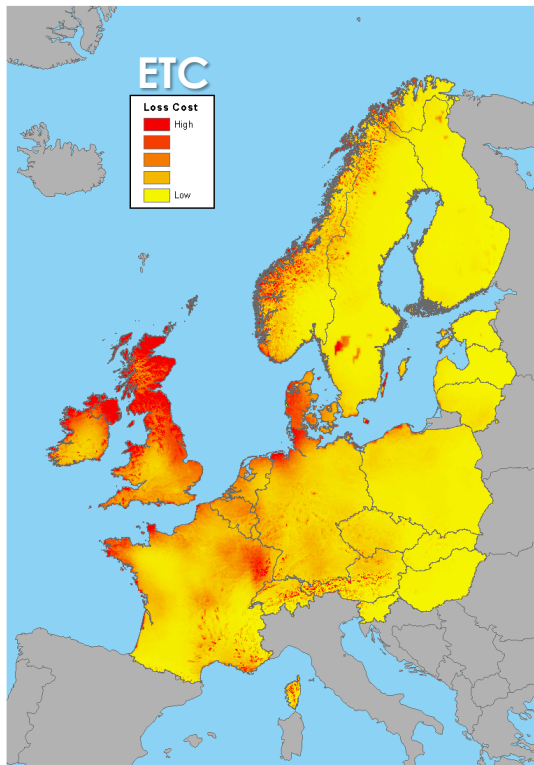
Germany Aggregate Losses



■ Severe Thunderstorm ■ Extratropical Cyclone ■ All Wind

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Using Both Models Provides a Comprehensive View of Risk to Wind Policies in Europe



Toward a Comprehensive View of Natural Perils Risk for Europe



**Extratropical Cyclone
(Including Storm Surge)**



**Severe
Thunderstorm**



Flood



Earthquake

Questions?



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