Estimation of the damage linked to clusters of storms - Case study over the insurer Generali France

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1 Context

European Windstorms :

- **€221 billion** average annual insured loss in Europe [1]
- Tend to occur in clusters [2]
- Lothar & Martin **€8 billion** in France [3]
- Costliest hazard for Generali France

Clustering impact is likely underestimated [4]

Divergences in storms catalogues and the cost estimate [5]

How can claims be associated to succesive storm events ?

Do usual vulnerability curves capture clustered-event losses accurately?

2 Data

- **Storms** **238** storms

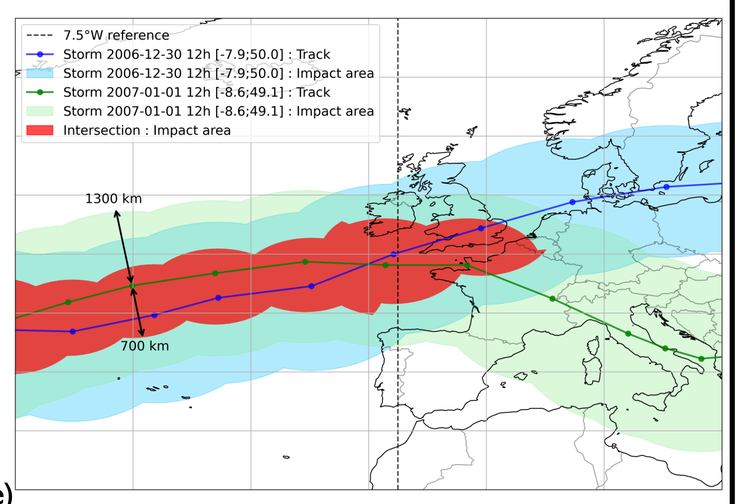
ERA5 data (1998-2024)
TRACK algorithm [6]

- **Clustering** **124** storms **53** clusters

Temporal window (96h)
Non empty intersection of impact surface (700 km) over France

- **Impact** **≈120k** claims

Generali France P&C, Residential (**2.5%** market share)



3 Association Method [7]

Step 1:

Select all the storms such that :

$$d_{storm} - 3\ Days < d_{claim} < d_{storm} + 3\ Days$$

Step 2:

If a claim is associated to more than 1 storm, choose the storm with the maximal windgust at the claim location

Step 3:

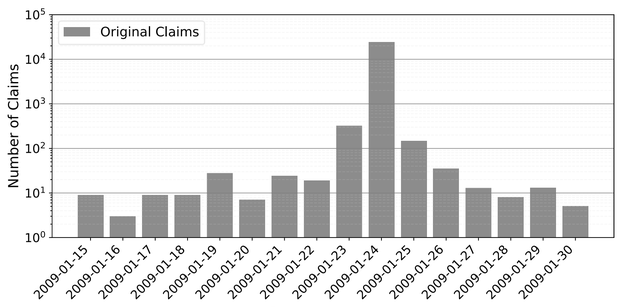
If a storm is associated with less than n_{claims} :
Move its claims to the nearest storm (date)

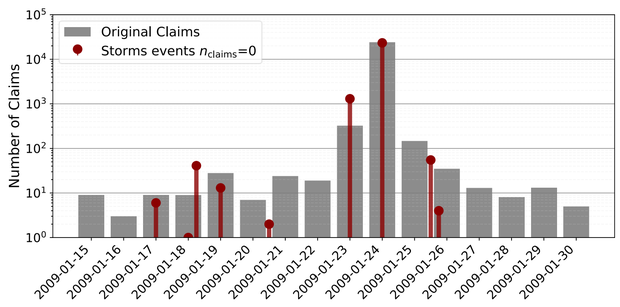
1 Claim
0 Storm

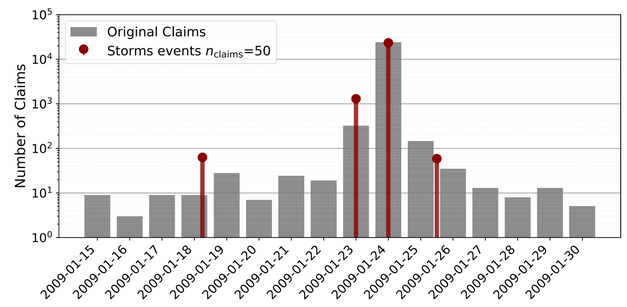
1 Claim
Several Storms

1 Claim
1 Storm

1 Claim
1 Storm

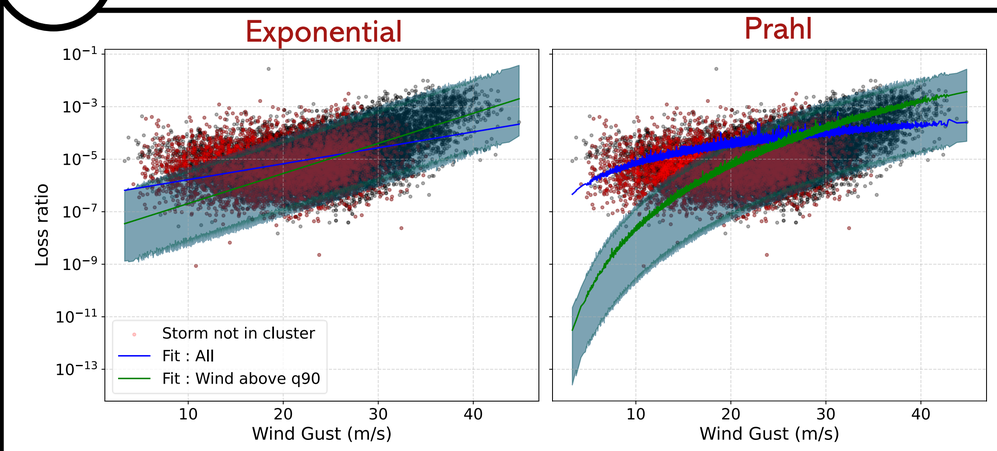






- **Successive storms can be identified**
- **Good alignment between the peak of claims and the storm events**

4 Vulnerability curves



Highest wgust and loss ratio found for storms in clusters
Difference of behaviour when using wgust above q90

$$Loss\_ratio = \frac{losses}{exposure}$$

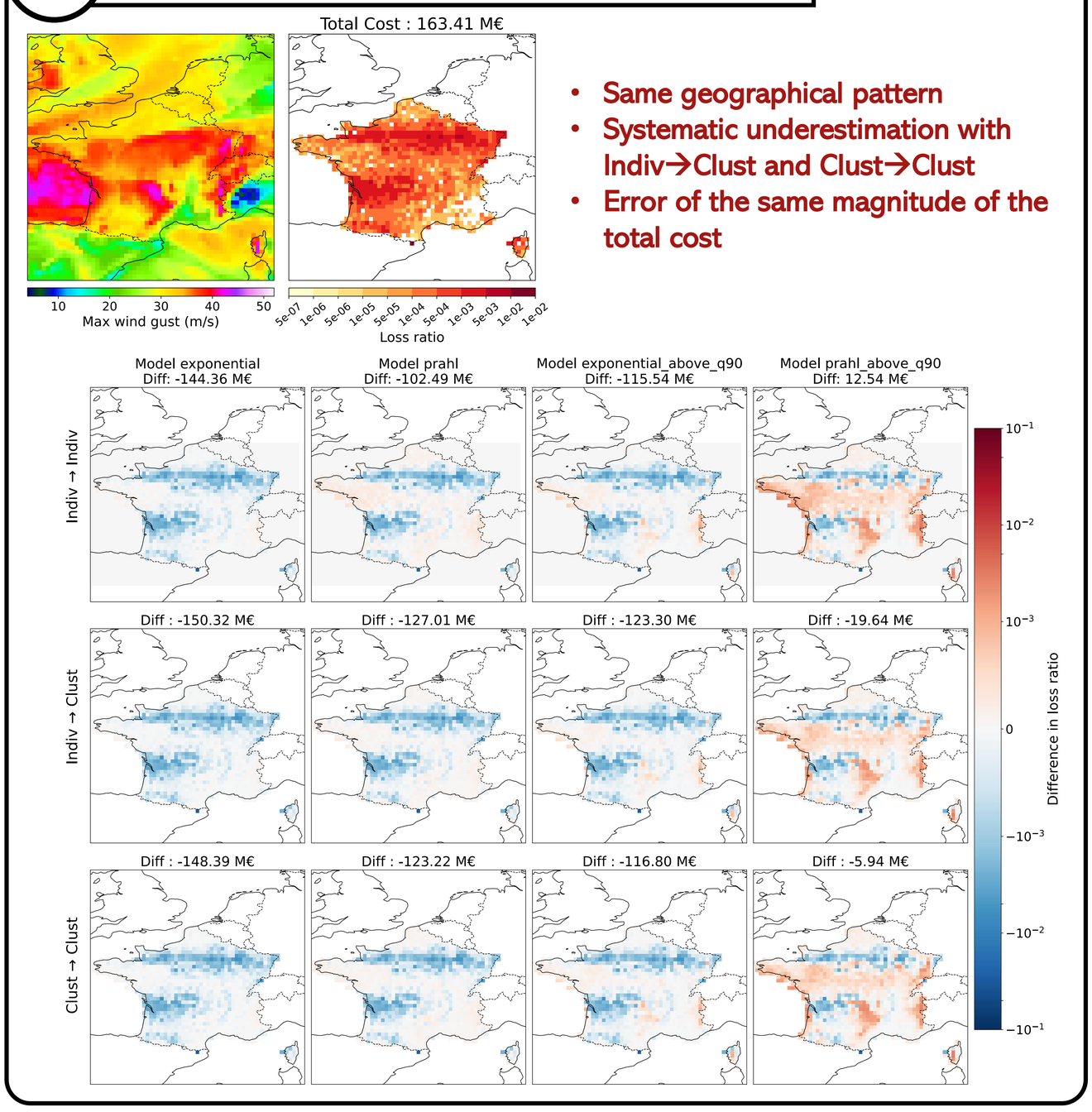
Losses : Grouped at ERA5 resolution
Exposure : Averaged and weighted from 2018-2024 exposure. Constant with time

Exponential : $L_{exp}(v) = e^{A_1(v-A_2)}$

Prahl [8] : $L_{prahl}(v) = \left(\frac{v}{A_2}\right)^{A_1} + A_3$

	Indiv → Indiv	Indiv → Clust	Clust → Clust
Training	Storm as membre	Storm as membre	Clust as membre (Max wind, Sum cost)
Prediction	Storm as membre	Clust as membre (Max wind)	Clust as membre (Max wind)
	Clust (Sum cost)		

5 Case study Anatol/Lothar/Martin



- **Same geographical pattern**
- **Systematic underestimation with Indiv→Clust and Clust→Clust**
- **Error of the same magnitude of the total cost**

6 Conclusions & Perspectives

The association method separate claims within successive storms events

85% of losses are linked to clustered storms

Usual vulnerability curves :

- Underestimate total losses of clustered events
- Underestimate loss ratios for the strongest wind gusts
- Overestimate loss ratios in clusters for moderate wind gusts (<q90)

Points for discussion

- Input dataset limitations : Possible underestimation of peak wind gusts
- Tail behaviour : Better capture extreme wind gusts
- Model structure :
  - Separation into **occurence** and **severity** modules
  - Different vulnerability functions
- Spatial aggregation : Smoothing of local vulnerabilities
- Exposure assumptions

Next Steps

- Quantify added costs linked to clustering
- Extend to other compound hazards (wind/rain)

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