Technical University of Denmark

DTU

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Verification of flood damage modelling using insurance data

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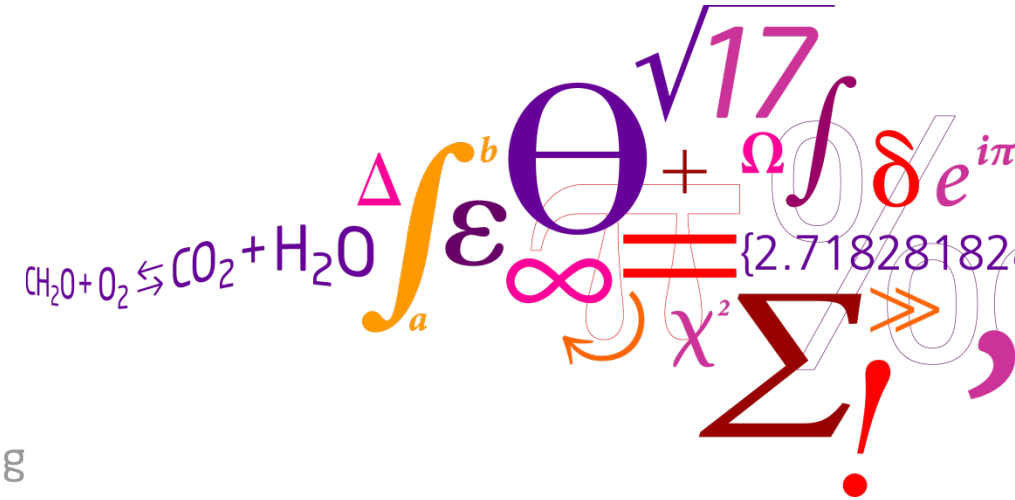


DTU Environment

Department of Environmental Engineering

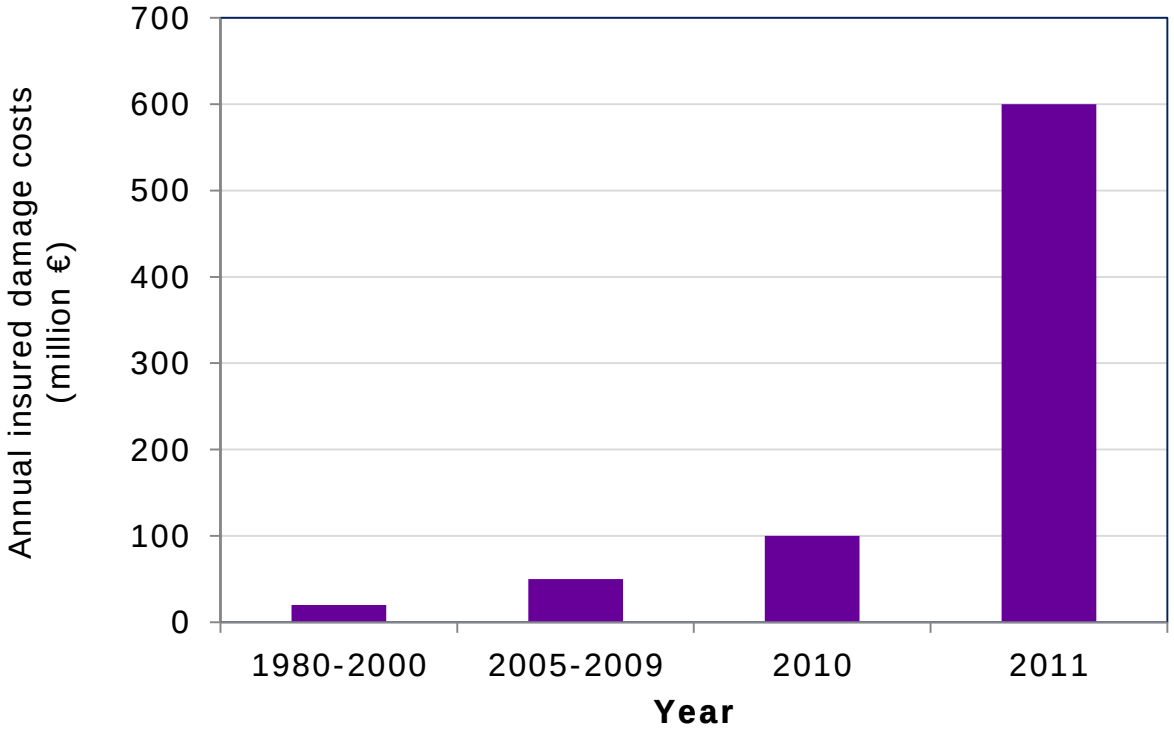
Climate change and Insured costs

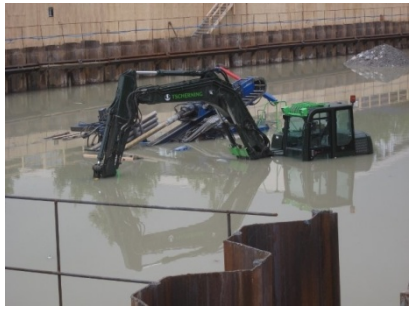
Copenhagen Floods:

August 2010

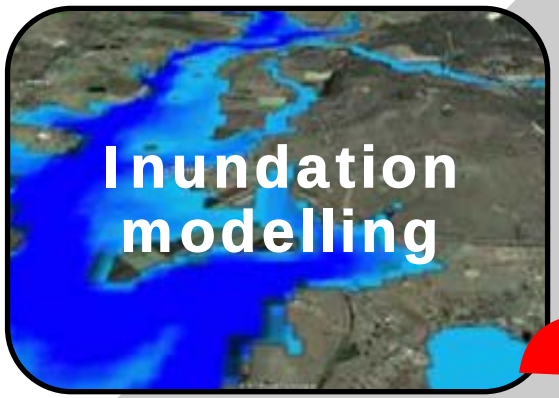
July 2011

August 2011





State-of-the-art modelling approach



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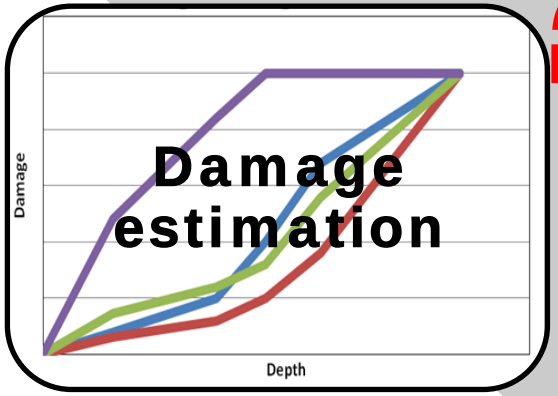
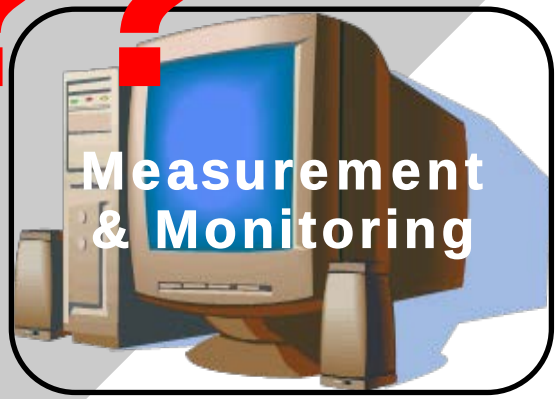




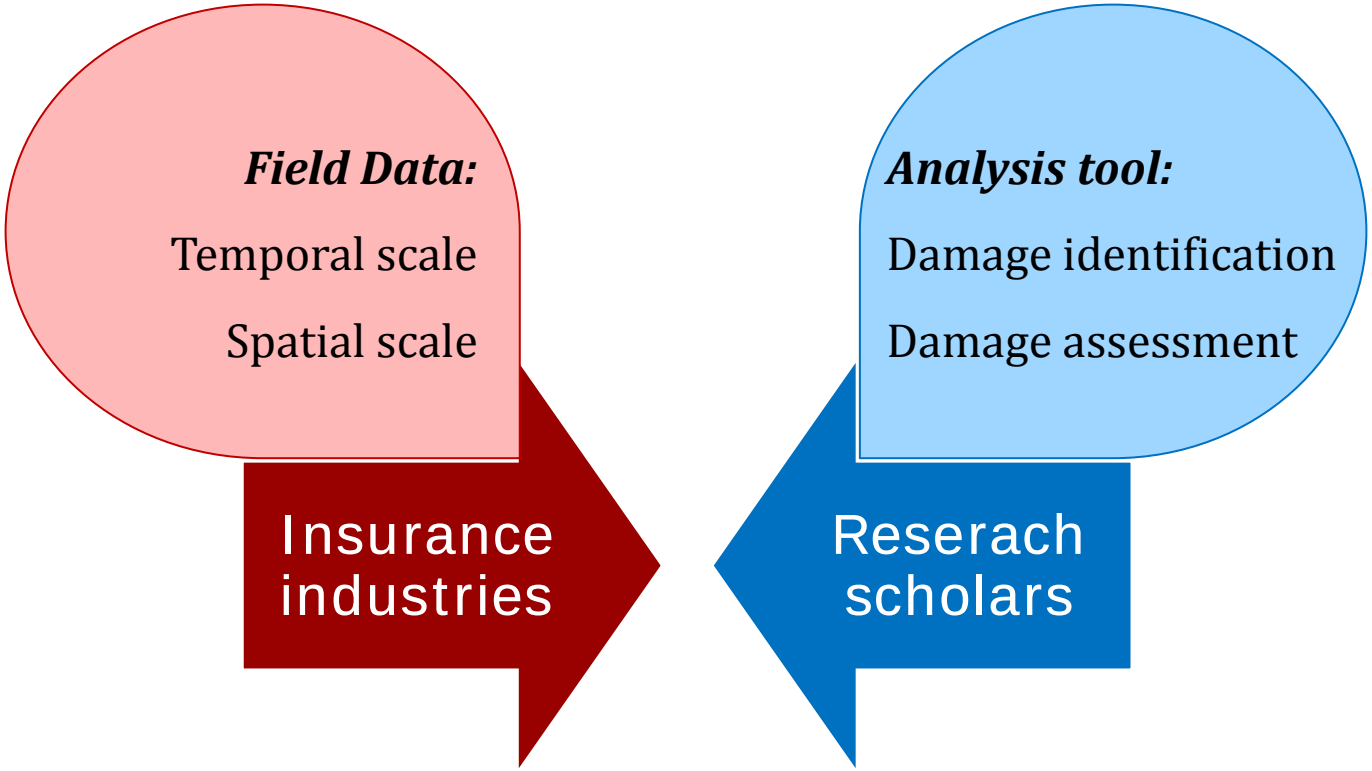
Calibration

Measurement

Data

Verification

Insurance data as a means



Objectives & Main questions

To what extent:

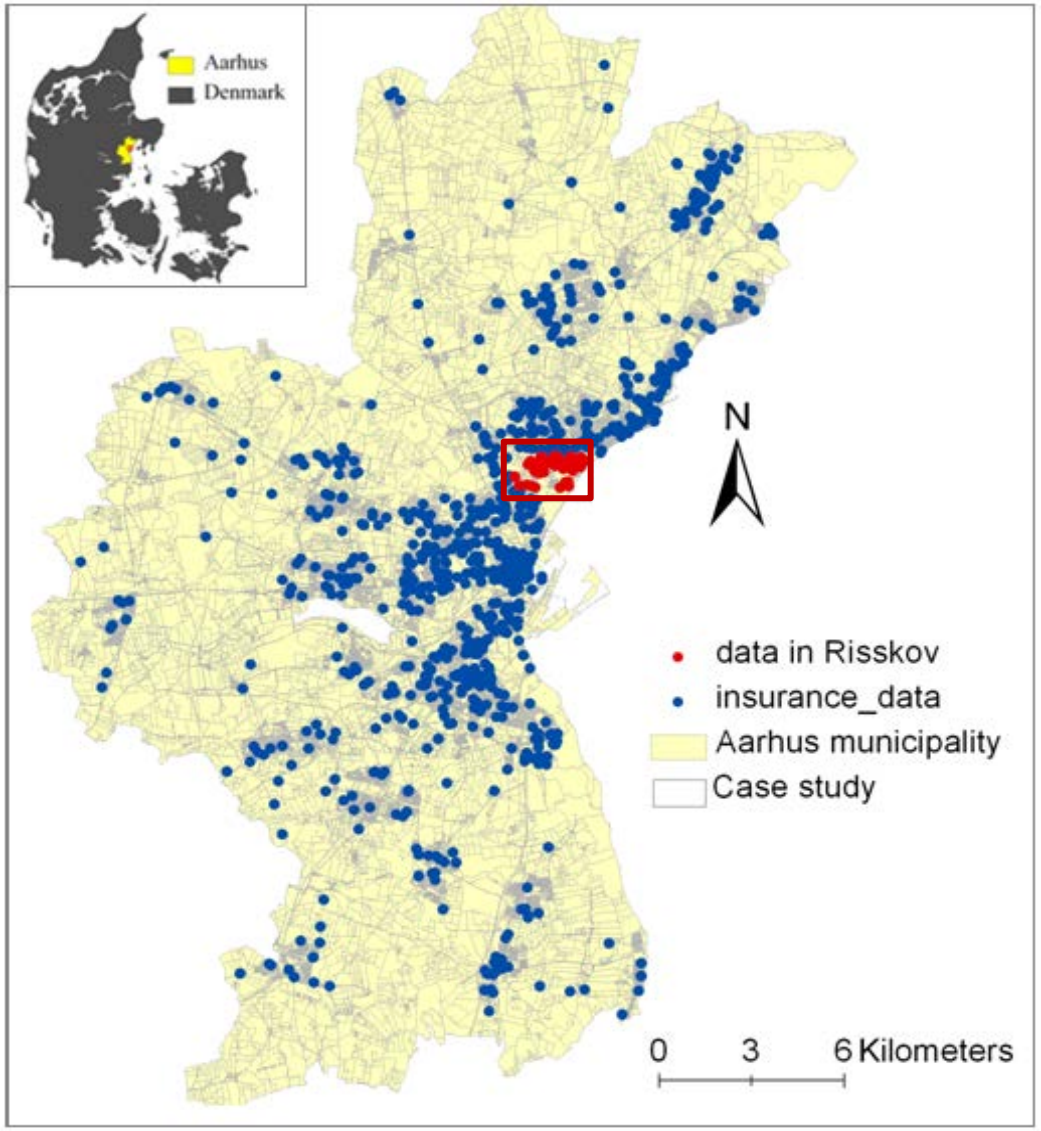
- is it possible to model the *damage per claim* given information about the *rainfall*?
- is it possible to model the *cost per day* given information about the *rainfall*?
- can simple *indicators* of flood risk give reliable information about the *flood risk*?
- can the insurance data be used to *verify* the hazard and flood risk maps in terms of *frequency and severity* of damages?

Case study

Area:
Aarhus: rainfall & damage
Risskov: hazard & Vulnerability modelling

Insurance data:
>1000 insurance claims
Geocoded
Year 2005-2011

Rainfall data:
Maximum hour intensity
Daily rainfall depth
Annual variation_month
Year 2005-2011



Correlation between claimed damage & rainfall characteristics

$$sqrt(D) = \mu + a * d + b * x + c\ Month + \varepsilon$$

X: hour precipitation intensity

d: rainfall depth per day

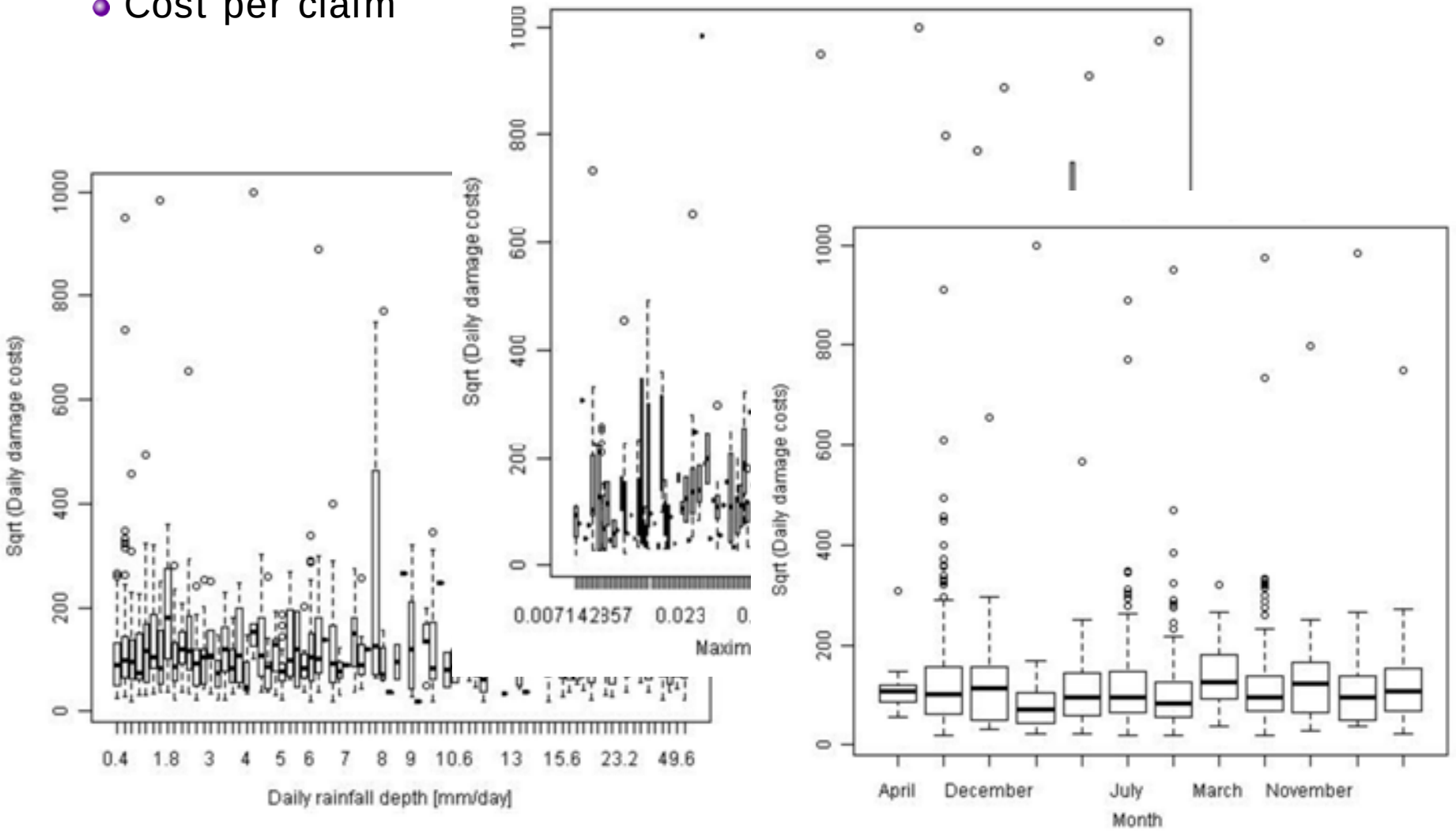
Month: annual variations described by a factor variable for each month

	Daily depth, *d*	Max hour intensity, *x*	Annual variation, *Month*
Cost per claim			
Cost per day	***	**	***

† significant at 10%, * significant at 5 %, ** significant at 1%, *** significant at 0.1%

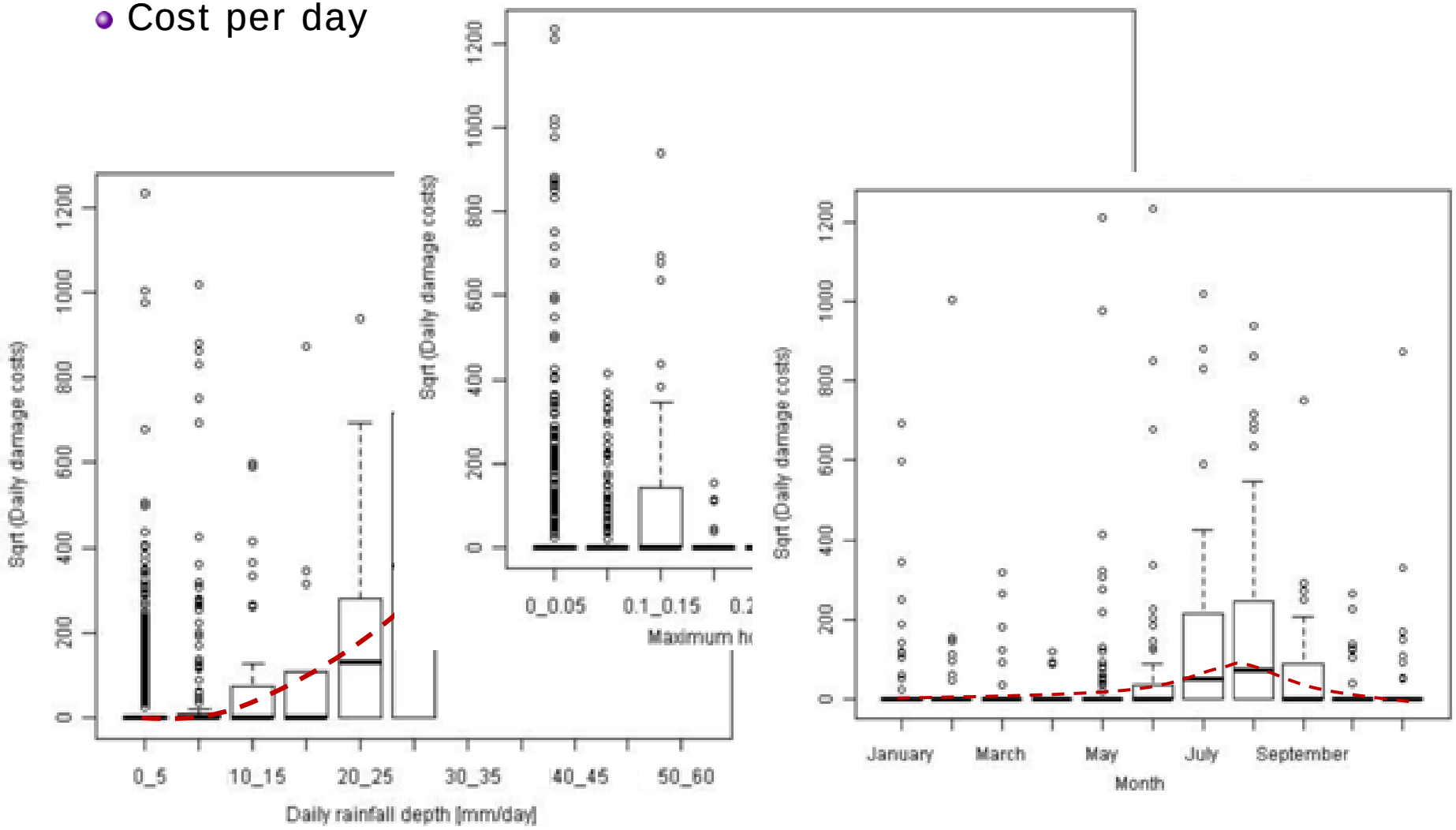
Correlation between claimed damage & rainfall characteristics

- Cost per claim



Correlation between claimed damage & rainfall characteristics

- Cost per day

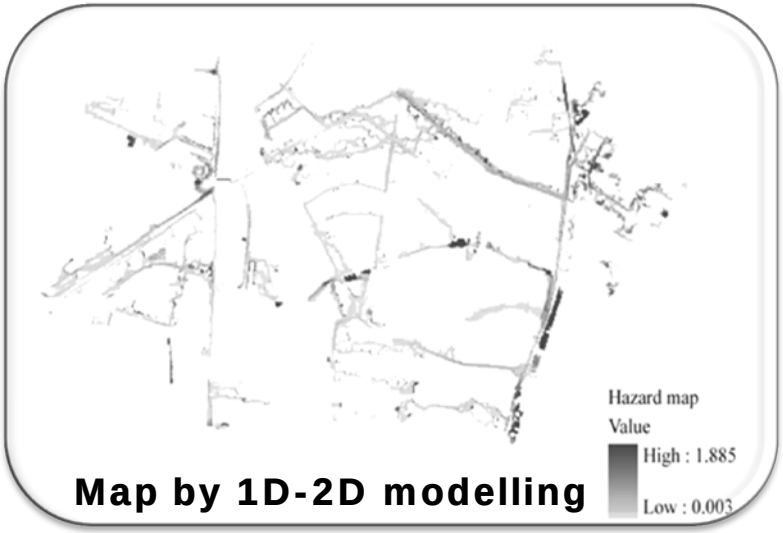


Flood hazard modelling

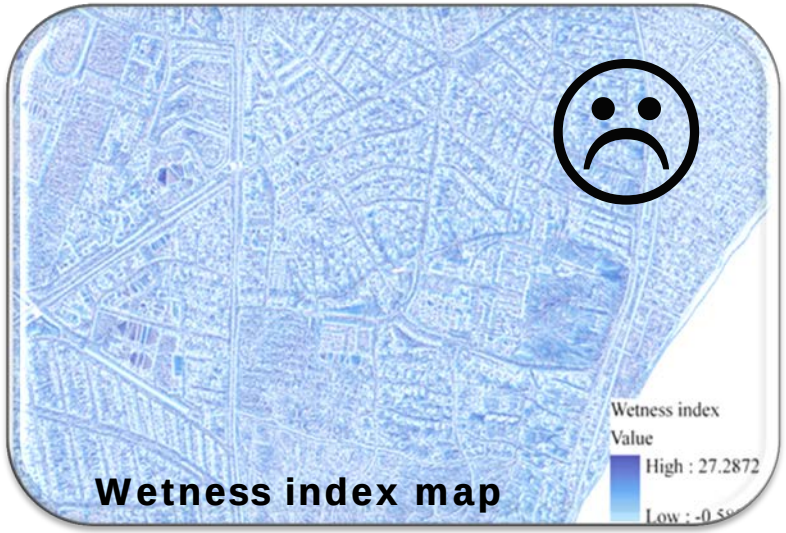
- Simple GIS toolboxes used in the insurance industry
  - To identify flood zones or assess risk of flood
  - Based on simple risk indicators, e.g. topography and slope
  - Digital Elevation Models as inputs
  - Wetness index calculations and local depression identifications

- 1D-2D coupled inundation models
  - Input rainfall
  - Topographical characteristics
  - Drainage systems

Flood hazard modelling

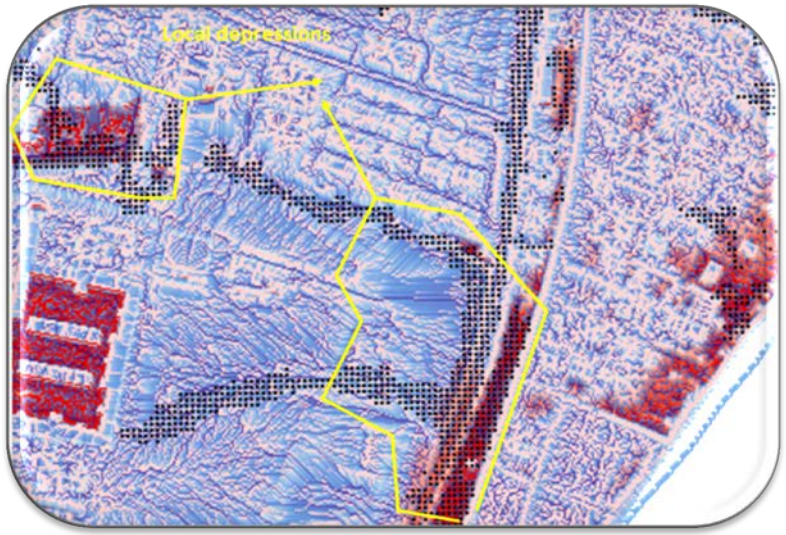


Map by 1D-2D modelling



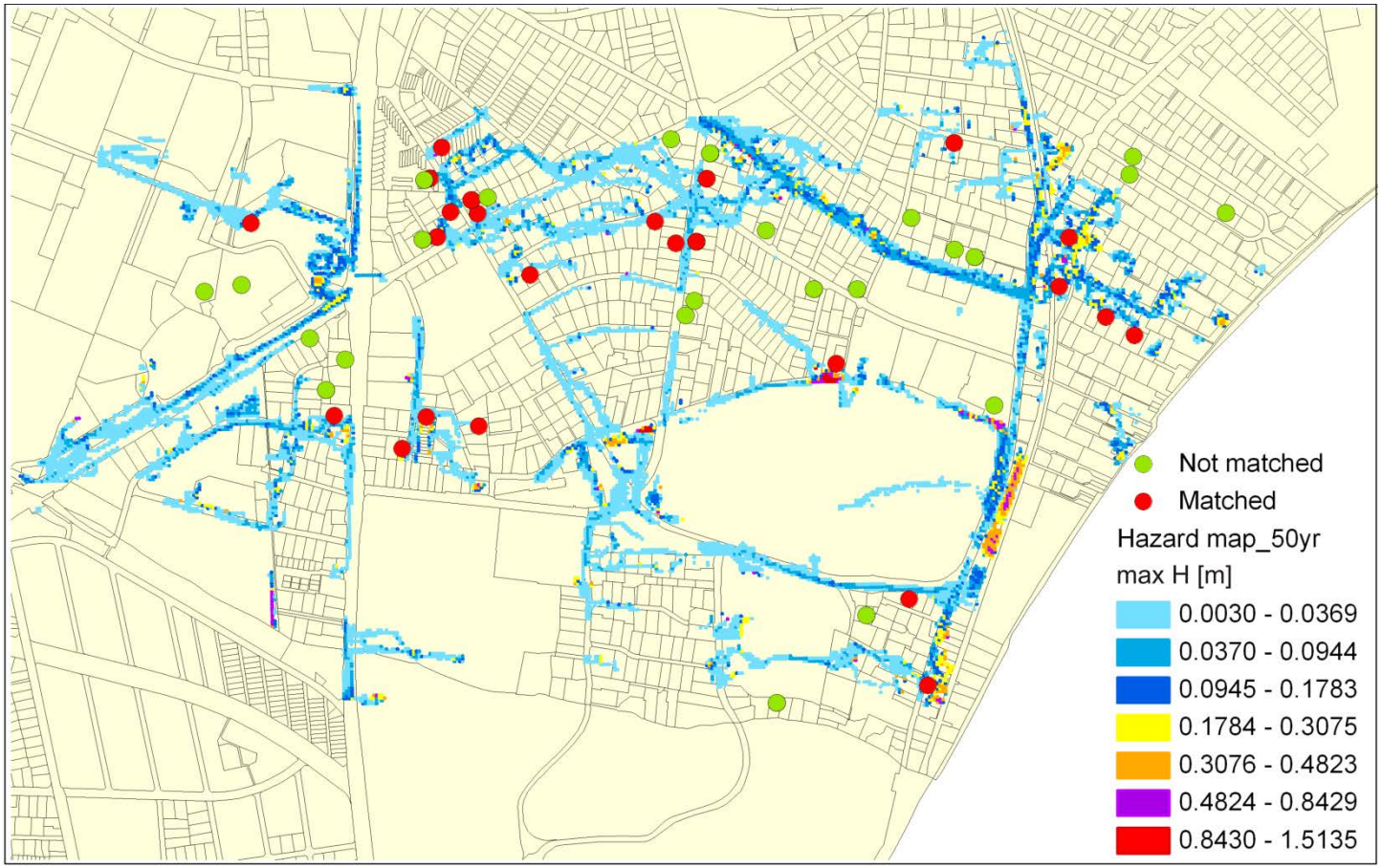
Wetness index map

Local depression map



Combined overview

Verification of damage assessment



Verification of damage a ent

Claimed costs are assigned

No costs are assigned

Probability		Consequence			Flooded percent.
Frequency	#/year	Expensive >25,000 DKK	Cheap 0-25,000 DKK	No cost 0 DKK	
Often	≥ 0.1	3	11	11	56%
Sometimes	0.1-0.01	12	7	46	29%
Very unlikely	<0.01	8	8	1468	1%

Location of damage:

good statistical agreement for the high hazard events

Costing of damage:

results were less clear and damage costs are lower than expected. Possible reasons, e.g. individual protection measures

Conclusions

- Simple rainfall statistics are not able to describe the variation in cost per claim; however, prove feasible for the overall daily claimed costs
- Simple GIS-operations are not helpful in giving reliable information on flood hazards.
- Insurance data are valuable for calibrating inundation modelling, although it's difficult to accurately identify the flood location for the low hazard category.
- Take into account socioeconomic variables for better explanation of costing of damage per claim
- Improvements on data collection and analysis are required.

Thanks for your attention!