

Natural disaster monitoring and mapping from global datasets

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Outline

- Assessing trends of flood losses in Europe
- Mapping major flood disasters

Normalising losses from natural disasters in Europe

- Economic losses from floods show a positive upward trend over time
- Trends of losses from natural disasters:
 - societal factors (changes in exposure)
 - climatic factors
- Studies do not tend to take into account socio-economic factors

Normalising losses from natural disasters in Europe

- **Normalisation** explicitly address the influence of socio-economic effects on the time-series of losses
- **Normalisation** attempts to answer the question of what would be the magnitude of economic losses if events from the past were to recur under current societal conditions

Normalisation studies

	World regions				
	Europe	US	Australia	Latin America and the Caribbean	India (Andhra Pradesh)
Hazards					
Flood	0 (6)				
Hurricane		0 (7) 1(10)		0 (7)	
Storm		0 (1)			
Winter storm		0 (1)			
Snowstorm		0 (1)			
Weather-driven			0 (5)		
Tropical cyclone					0 (9)
Tornado		0 (8)			
Windstorm	0 (6)				
Earthquake		0 (11)			

References:

- (1) Changnon et al., 1997, 1998, 2003
- (5) Crompton et al., 2008
- (6) Barredo, 2009
- (7) Pielke Jr. et al., 1998, 2003, 2008
- (8) Brooks et al., 2001
- (9) Raghavan et al., 2003
- (10) Schmidt et al., 2009
- (11) Vranes and Pielke, 2009

0: no upward trend over time
1: positive trend
Reference in brackets

The catalogue of flood disasters 1970-2008

- Sources:
 - Available data from EM-DAT (CRED) and re-insurers
 - Augmented with: historical reports, peer-reviewed articles and other ancillary sources (e.g. newspaper archives, water authorities, etc)
- 31 European countries
- 1970 - 2008

Normalisation method

- We adjusted the data on economic losses over the years according to: inflation, population and real per capita wealth
- Inter-country price differences were adjusted using purchasing power parities (PPP)

$$L_{2008} = L_i \times I_{ij} \times PPP_{ij} \times P_{ij} \times W_{ij}$$

Normalisation example

Storm 87J in France:

1.6 b US\$ (nominal values as of 1987)

Inflation factor 1987-2008:	1.86
Ratio population 1987-2008:	1.12
Ratio real p.c. wealth 1987-2008:	1.38
PPP factor:	0.83

$$\text{Losses}_{2008} = 1.6 \text{ b US\$} * 1.86 * 1.12 * 1.38 * 0.83 =$$

3.8 b int. US\$ as of 2008

How accurate are disaster loss data?

Number of flood disasters

	Entire catalogue	Events > 1b
1970 - 2006	122	27
1970 - 1988	32	12
1989 - 2006	90	15
ratio	2.8	1.3
Losses	100%	82%

Effect of improvements in disaster data collection
or anthropogenic forcings [?]

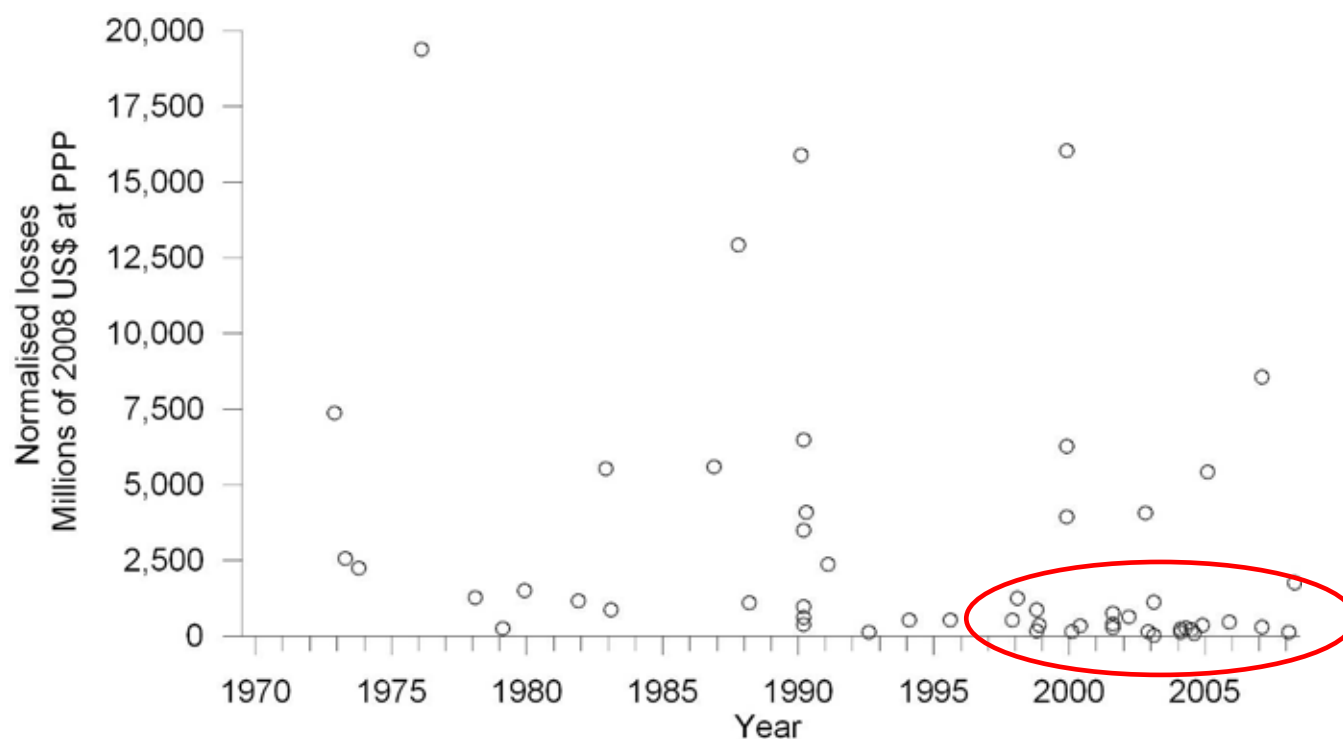
How accurate are disaster loss data?

Number of windstorm disasters

	Complete catalogue	Events > 1b
1970 - 2008	54	25
1970 – 1989	13	11
1990 - 2008	41	14
ratio	3.2	1.3
Losses	100%	93%

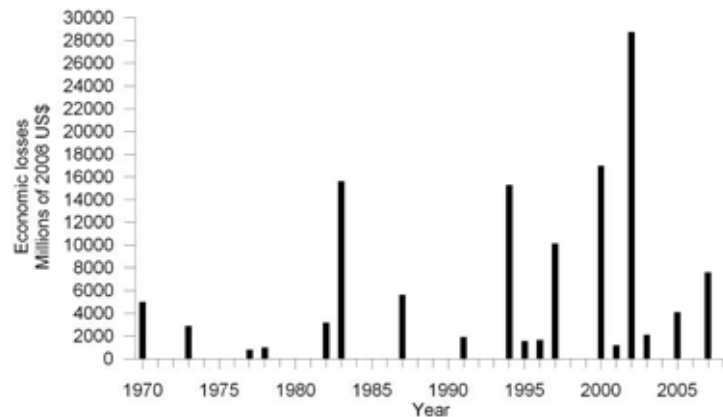
Assessing the catalogue

Time distribution of windstorm disaster losses

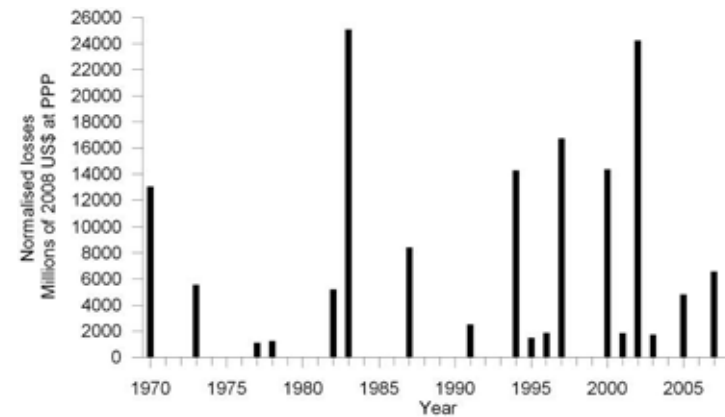


Source: Barredo, J.I., 2009, No upward trend in normalised windstorm losses in Europe: 1970–2008. NHESS submitted.

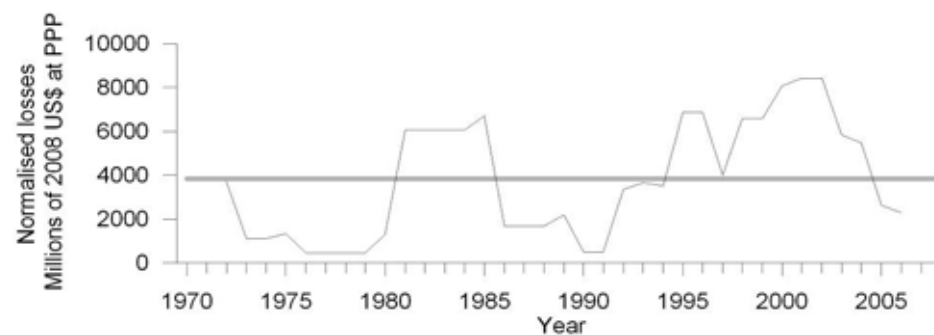
Results: Normalised flood losses



Raw flood losses (inflation-adjusted as of 2008)

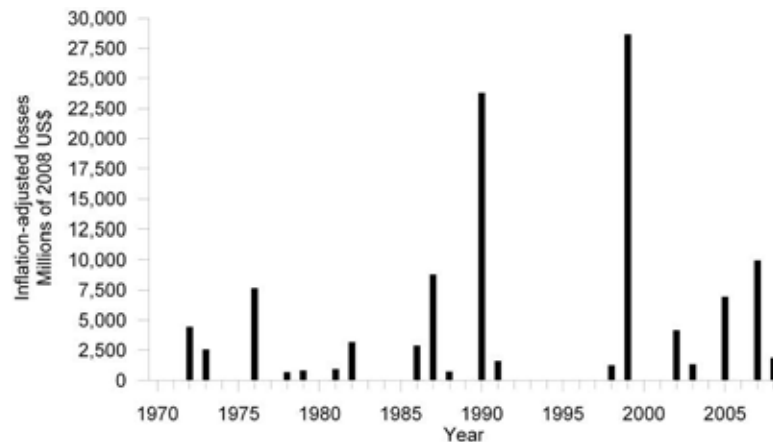


Normalised flood losses (2008 values)

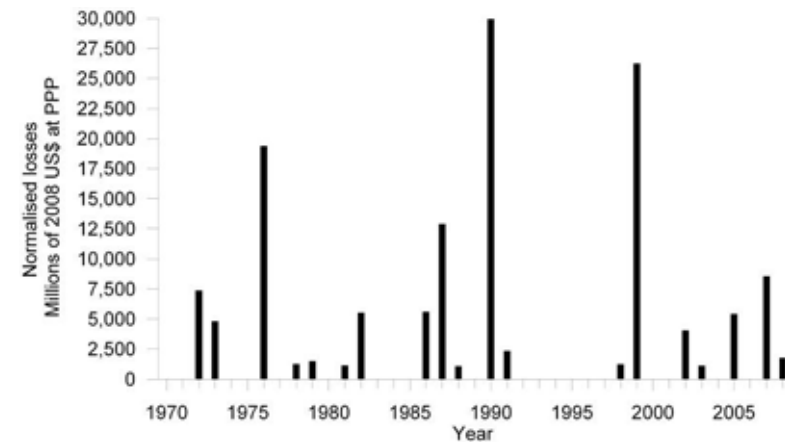


5-year moving average trend (2008 values). The grey horizontal line is the annual average

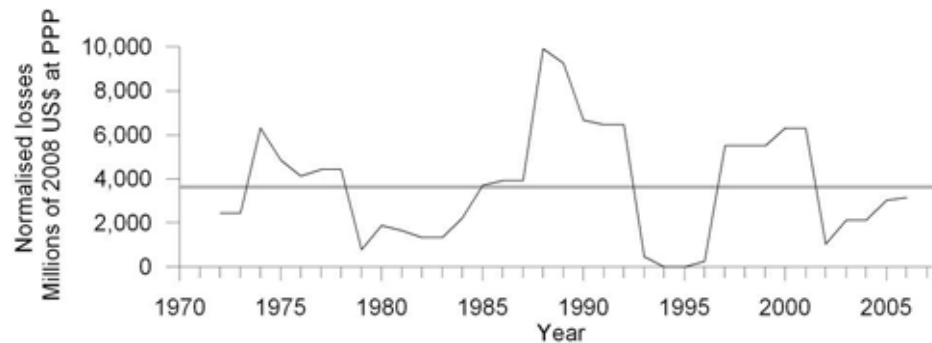
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Raw windstorm losses (inflation-adjusted as of 2008)



Normalised windstorm losses (2008 values)

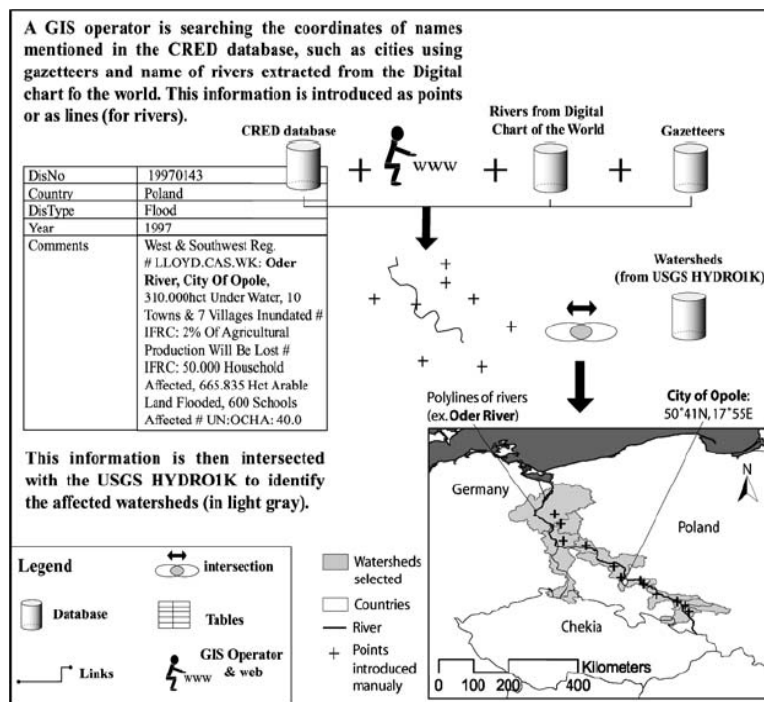


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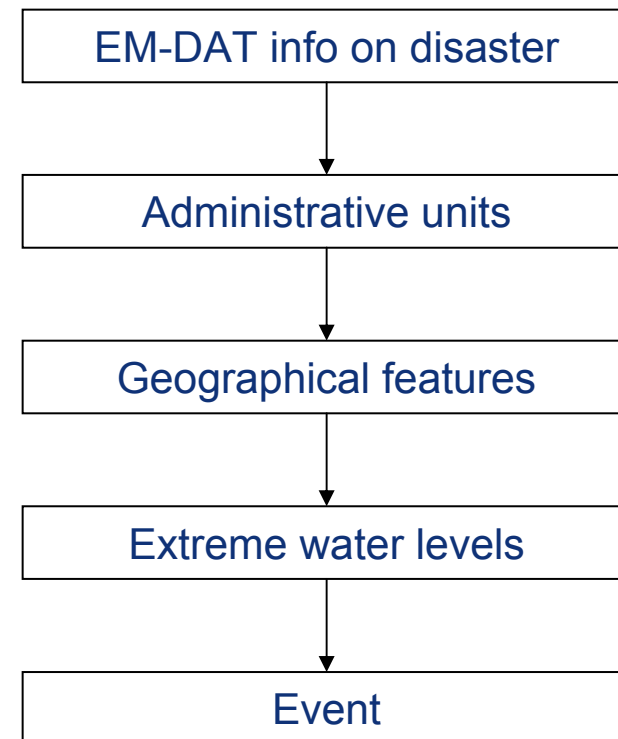
Methods for mapping major natural disasters

- EM-DAT
- Ancillary geographical data
- Watersheds (USGS HYDRO1K)

- EM-DAT
- Ancillary geographical data (GISCO)
- Potential flood hazard map (extreme water levels)



Peduzzi et al. (2005) Mapping disastrous natural hazards using global datasets. *Natural Hazards*, 35: 265–289.



Barredo, J.I. (2007) Major flood disasters in Europe 1950–2005. *Natural Hazards*, 42: 125–148.

Methods for mapping major flood disasters

- EM-DAT
- Ancillary geographical data (GISCO)
- Potential flood hazard map (extreme water levels)

EM-DAT raw data

Start: 12/2/2003

End: 12/3/2003

Country/Location: **France: Herault, Gard, Bouches-du-Rhone, Vaucluse (South and East); Rhone river**

Type: **Flood**

Sub Type: **Flash flood**

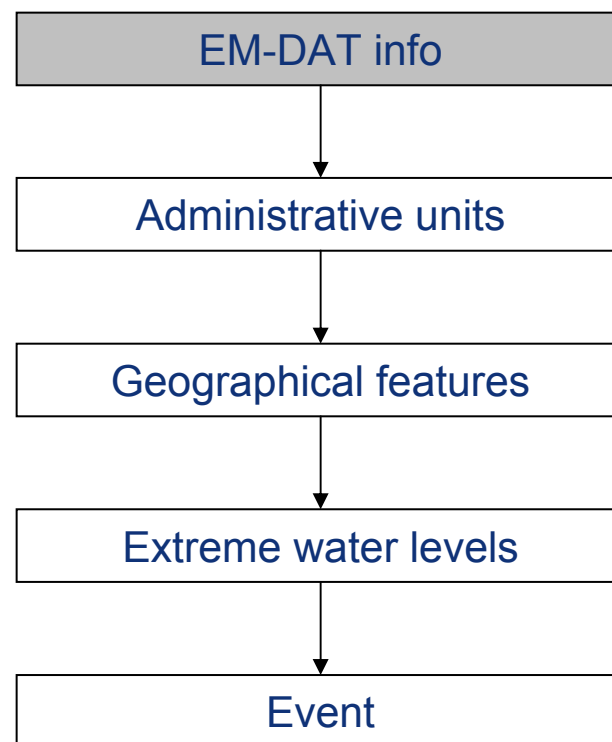
Name:

Killed: **9**

Tot. Affected: **27,000**

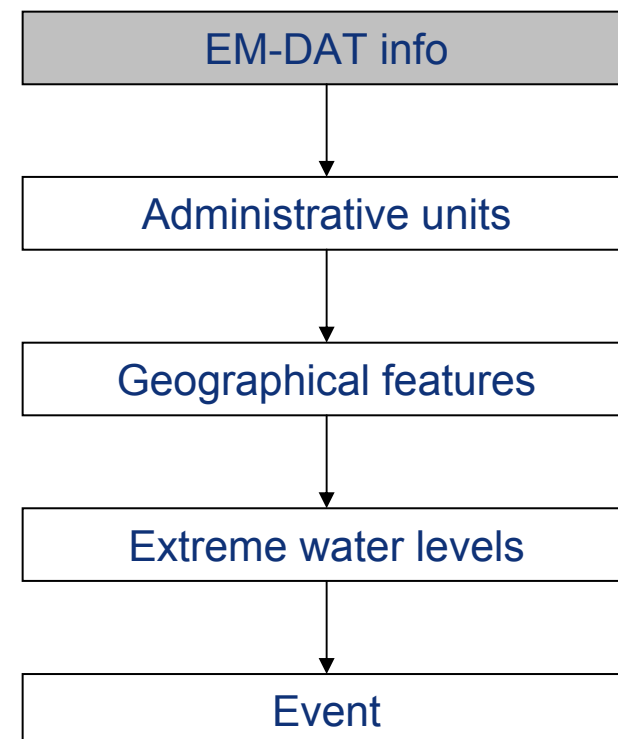
Est. Damage (US\$ Million): **1,500**

DisNo: **2003-0586**



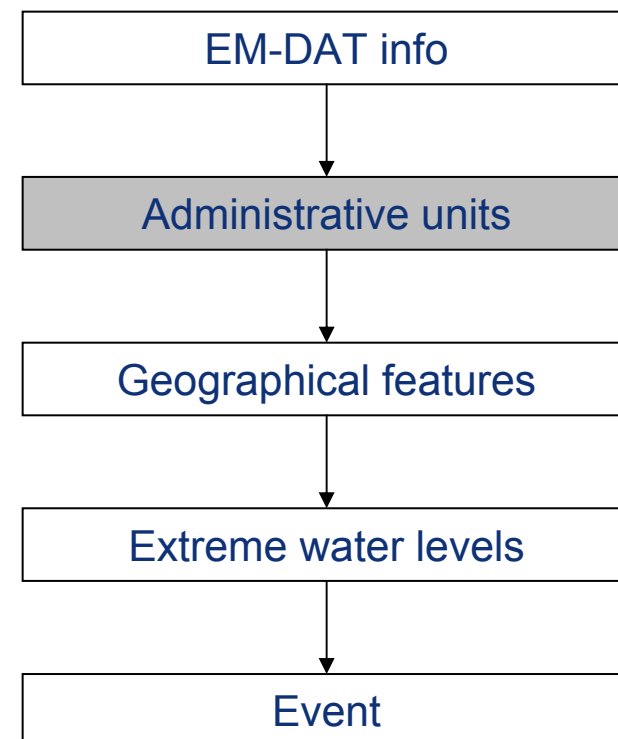
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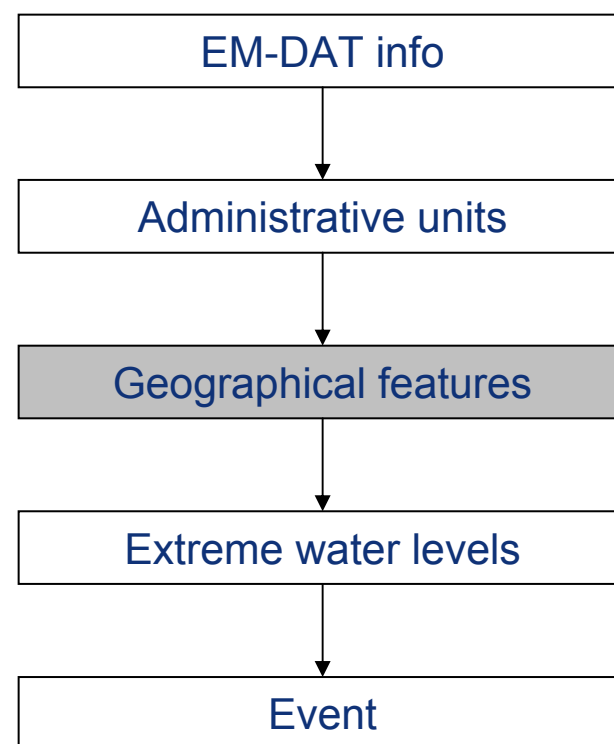
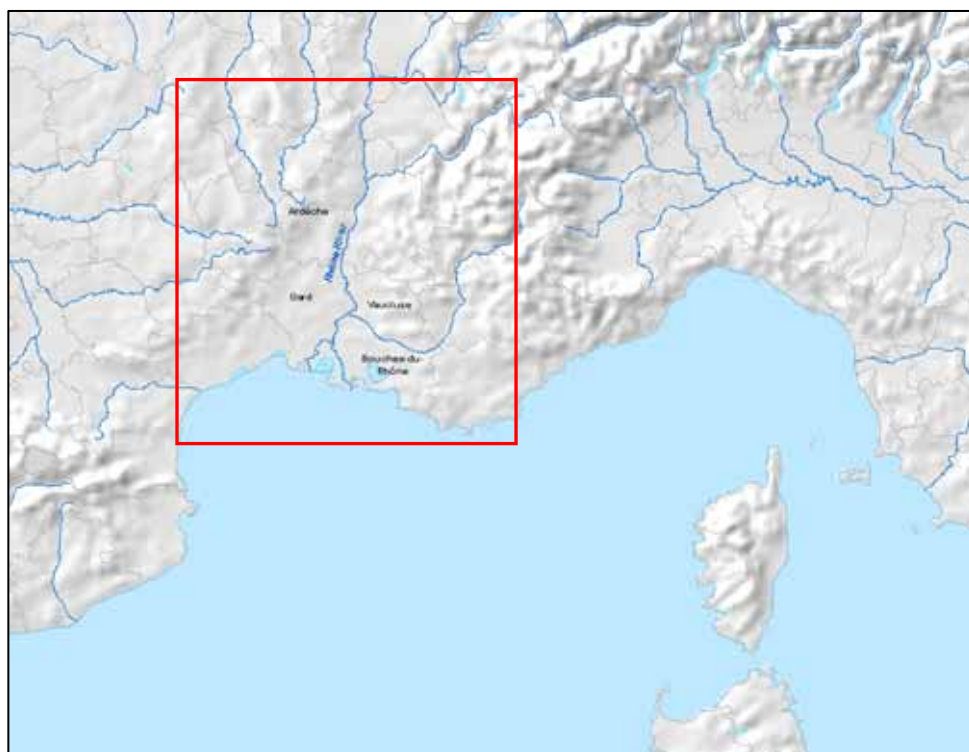
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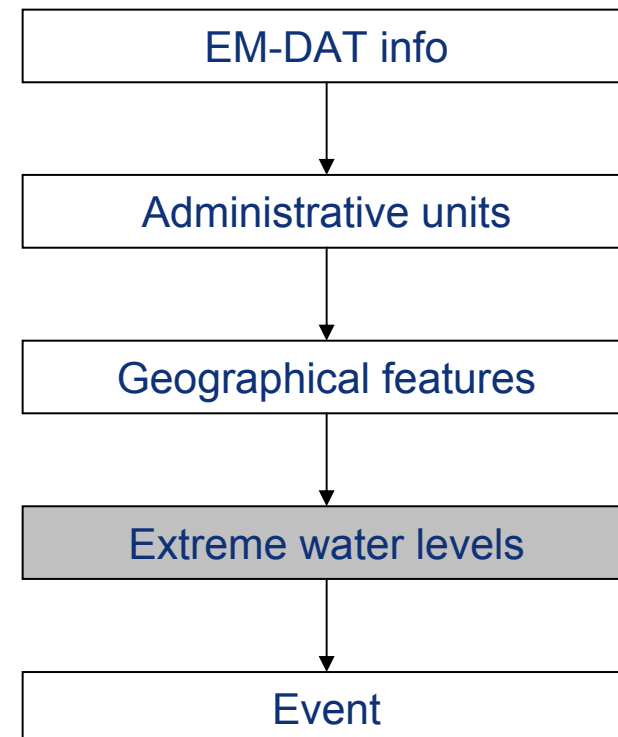
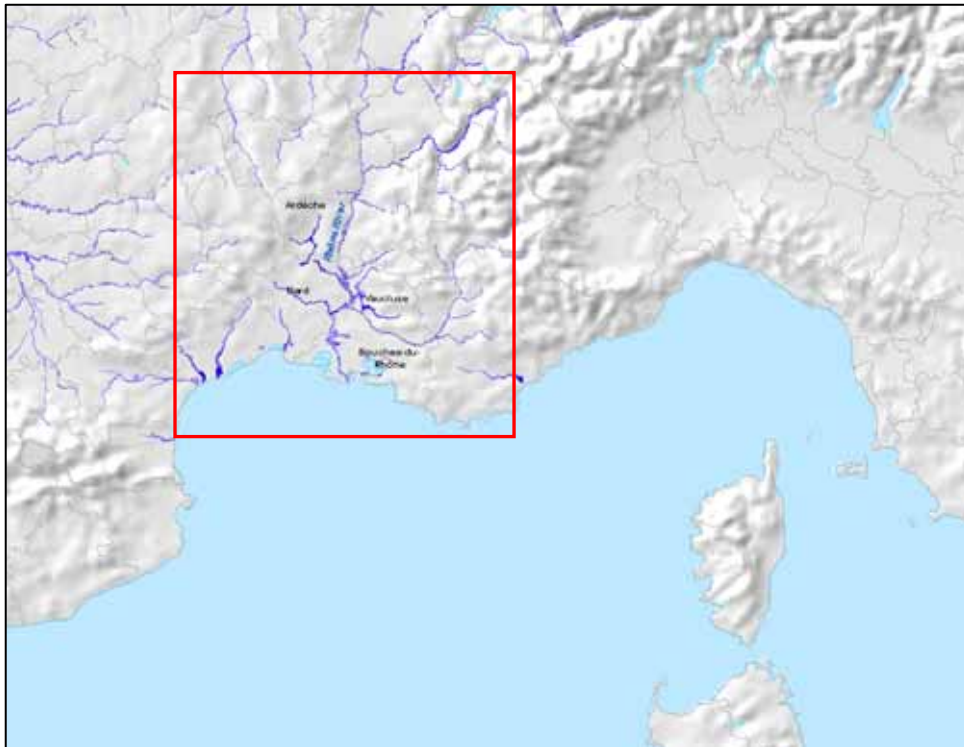
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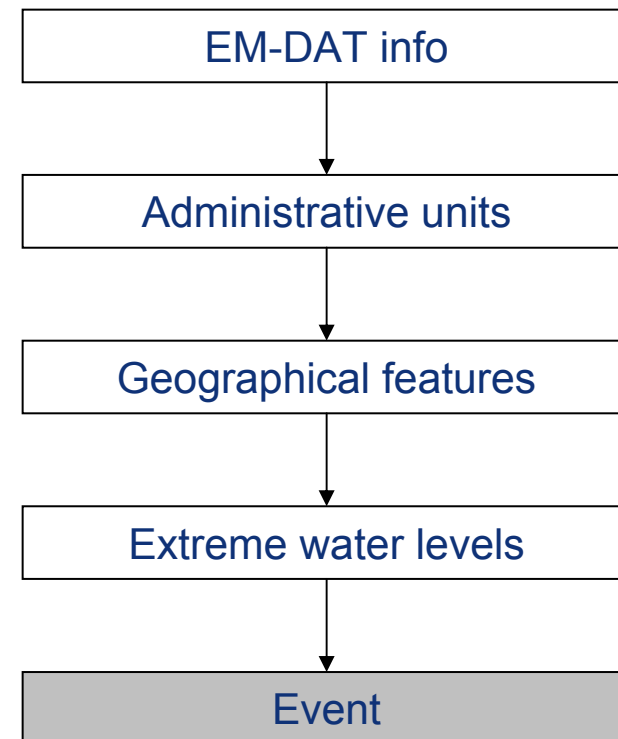
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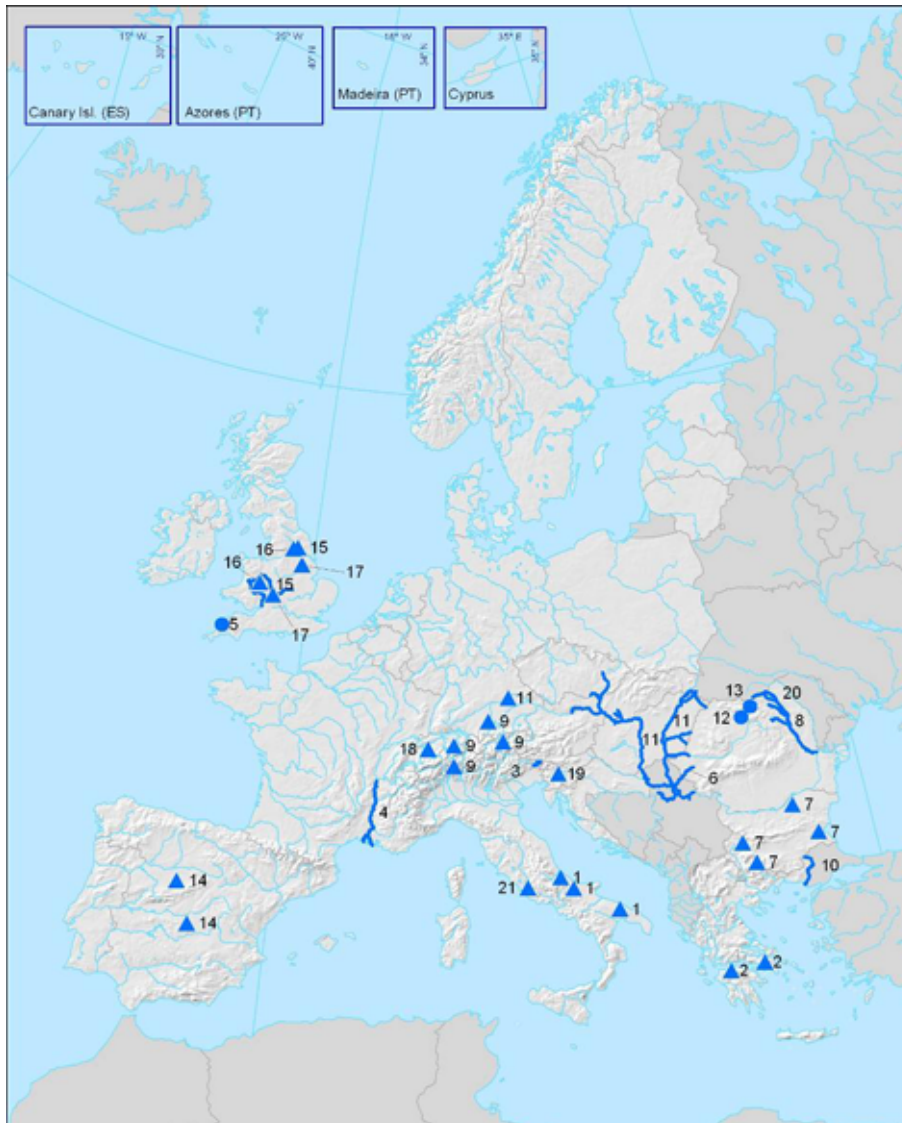


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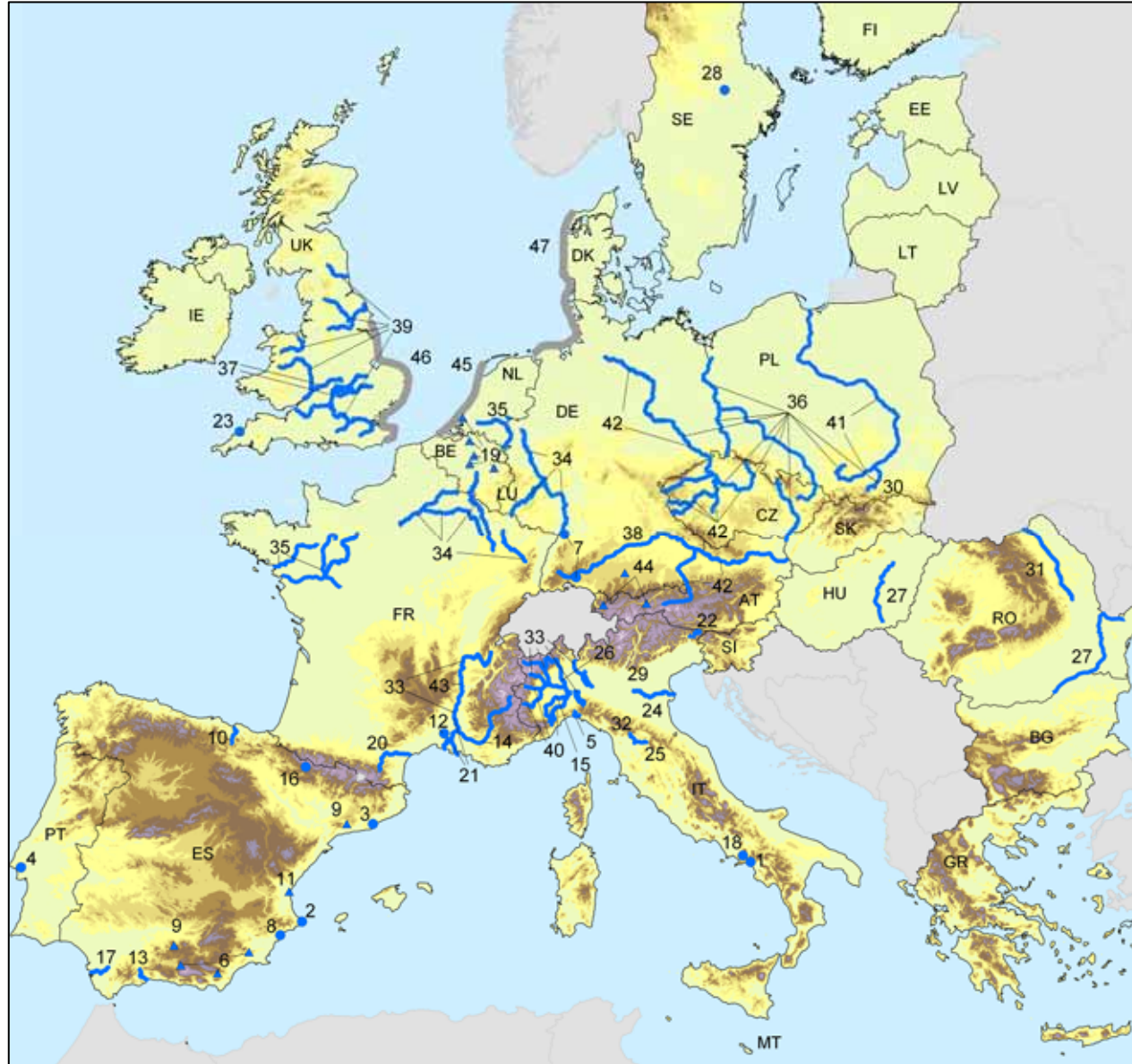


Major flood disasters in Europe: 2003-2008



- Local events (e.g. urban floods)
- ▲ Large regional events
- River segments

Major flood disasters in Europe: 1950-2005



1 to 23: flash floods, 24 to 44: river floods, 45 to 47 storm surge floods.
Triangles represent large regional events

Outlook

- Setting-up of disaster-prone macro-regions (hot-spots)
- Monitoring of major disasters
- Coarse resolution / accuracy issues (continental scale)
- Results could be evaluated at province/county [NUTS-3] level: casualties, losses

Further cooperation with CRED (EM-DAT) and applicability issues

- Monitoring and mapping of natural (flood) disasters
 - Reporting: European Environment Agency (EEA)
 - EU's Directive of flood risks
- Trends of natural disasters: improvements on the reporting of major disasters e.g. > 1b US\$ (retrospective 1970s)
- Geo-referencing: Information on location: administrative units, geographical features → rivers, cities, regions, counties, etc
- Link with other providers → e.g. Reliefweb, Dartmouth Flood Observatory (DFO), others

Further cooperation with CRED (EM-DAT) and applicability issues

- Easy access to EM-DAT database: web-site, agreement
- Crosschecking with disaster data from Reinsurance firms

Thank you

<http://floods.jrc.ec.europa.eu>