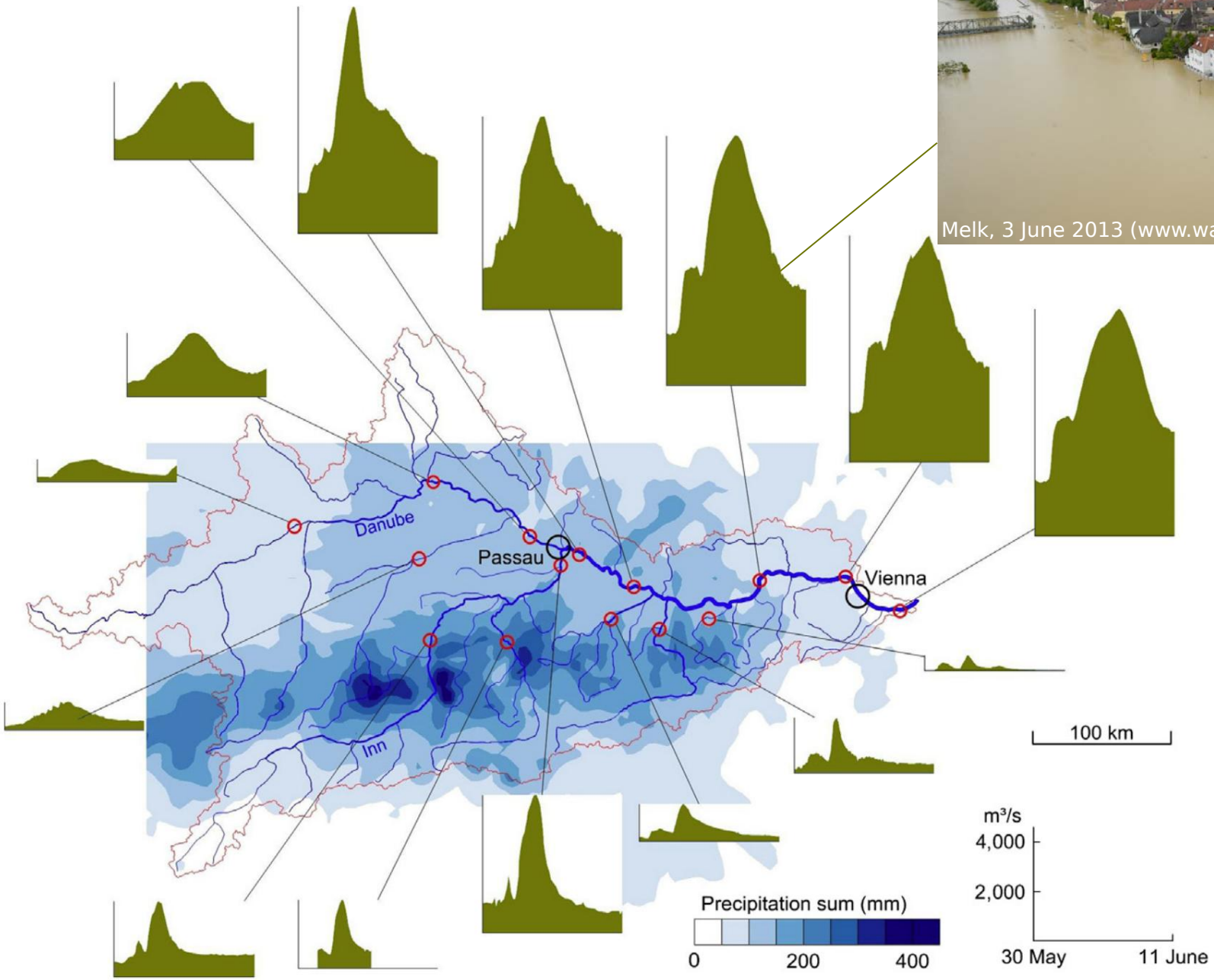
River Flood Hazards across Timescales:
from Flood Events to Long-Term Dynamics

Alberto Viglione, Marlies Barendrecht, Miriam Bertola, David Lun, Günter Blöschl

Melk, 3 June 2013 (www.washingtonpost.com)

June 2013 Danube Flood



from Viglione and Rogger (2015)

event

regional

local

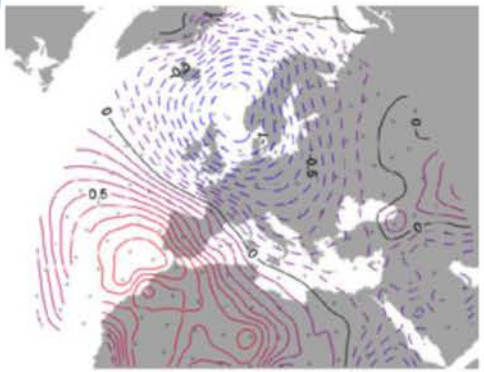
Process control on Flood Events

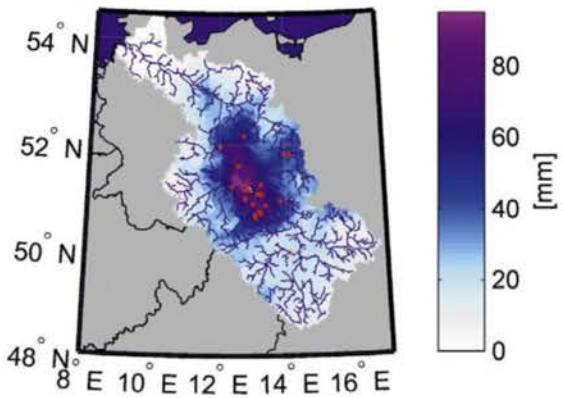
event

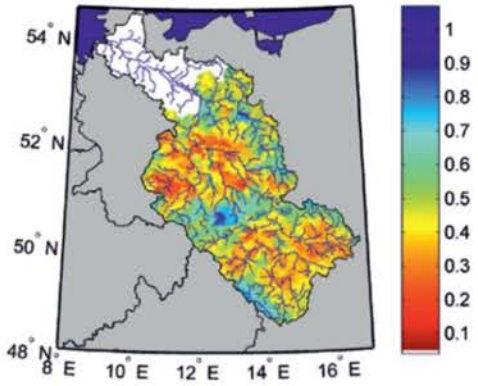
Event classification

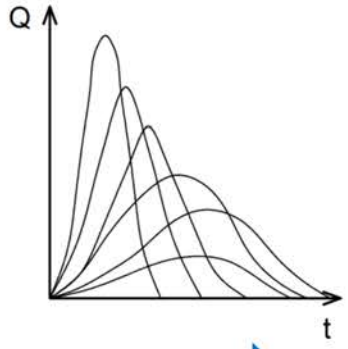
Different perspectives and scales of causative classifications of river flood events

Hydroclimatic perspective	Hydrological perspective		Hydrograph perspective
	Hydrometeorology	Catchment state	
sea level pressure	rainfall	soil moisture	streamflow









decreasing spatial scale

continental

regional

local

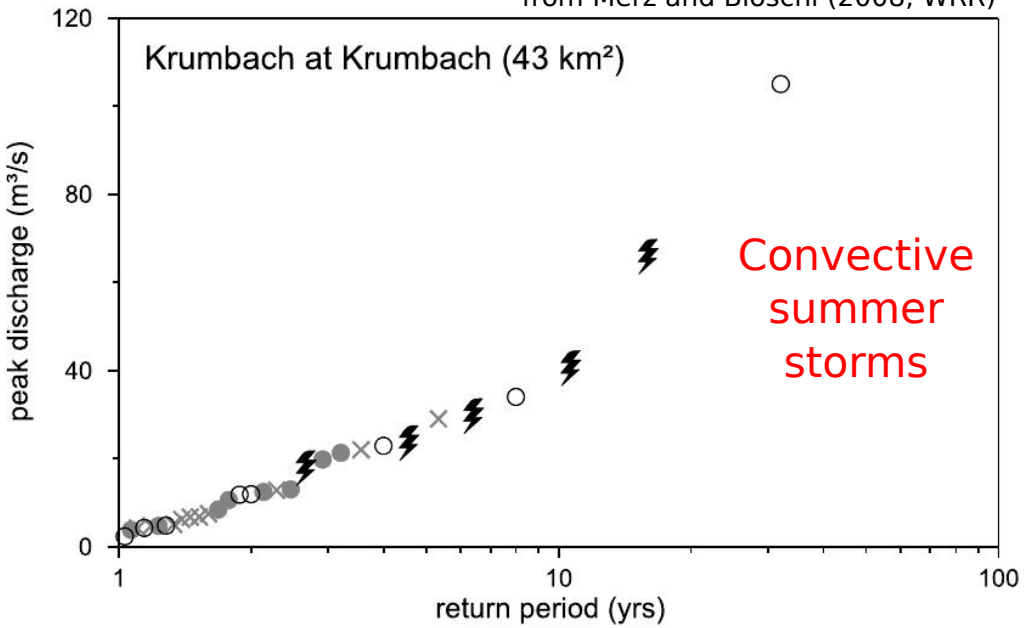
Tarasova et al. (2019, WIREsW)

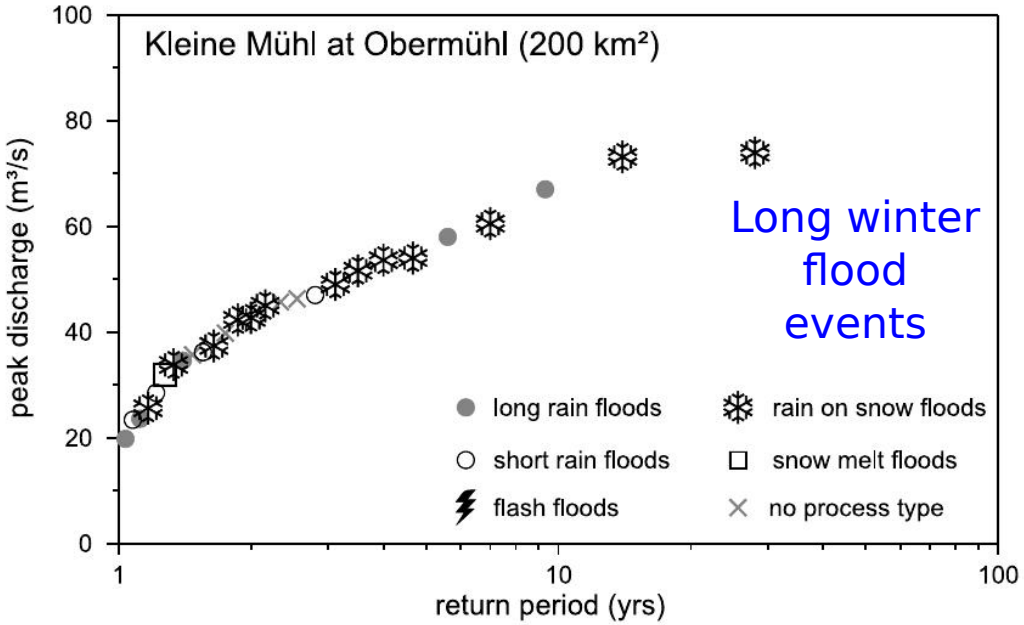
Aim: grouping flood events sharing similar characteristics in distinct classes

Process control on Flood Probabilities

population

from Merz and Blöschl (2008, WRR)





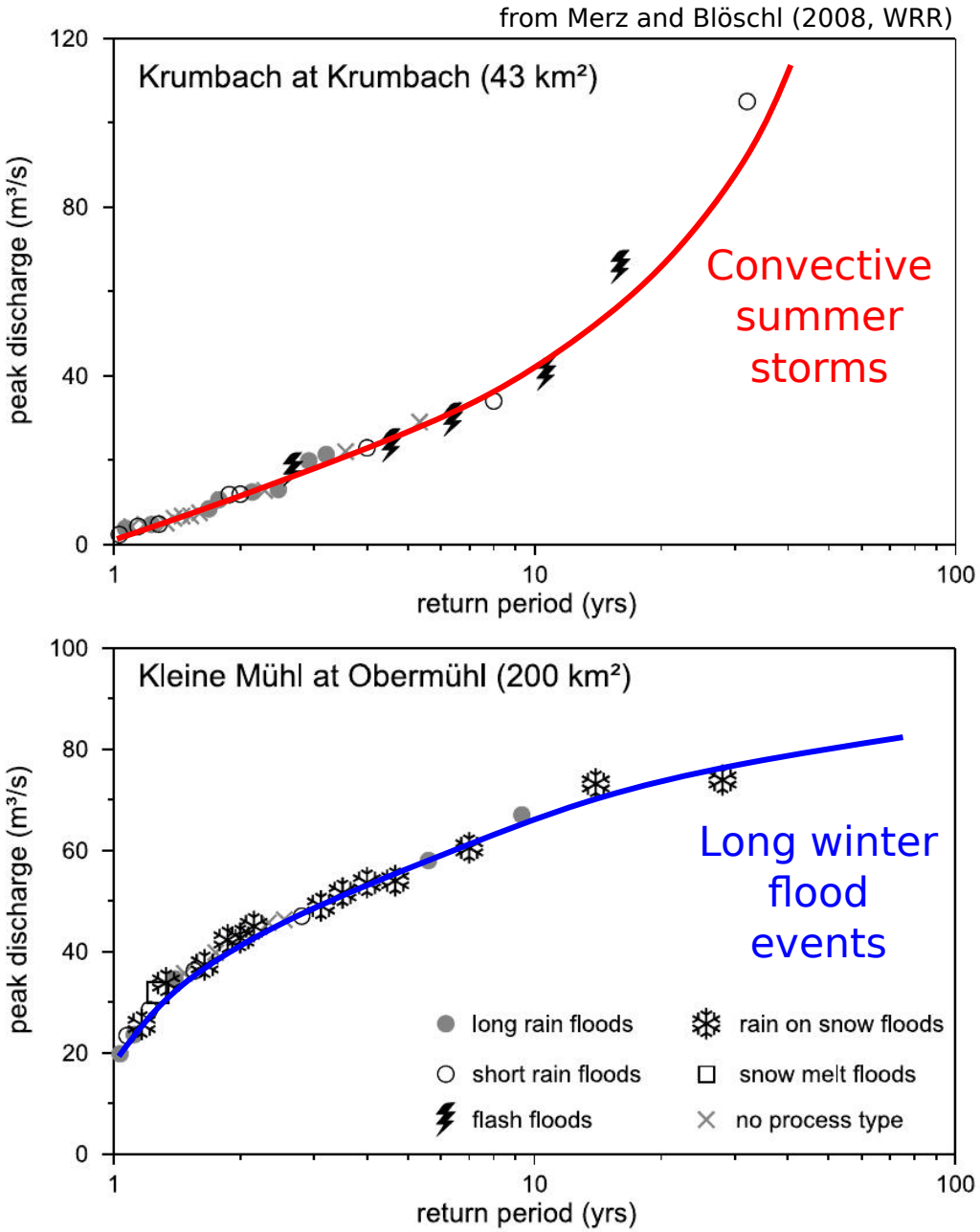
Event classification
allows better estimation of the flood frequency curve through **mixture models** or **derived distribution models**

Event classification
sheds light on the **shape** of flood frequency curves

local

Process control on Flood Probabilities

population



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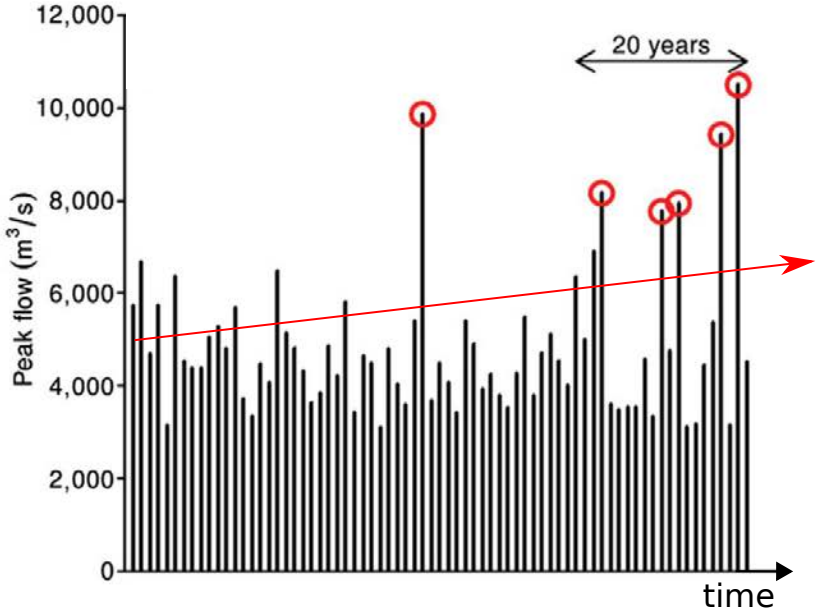
local

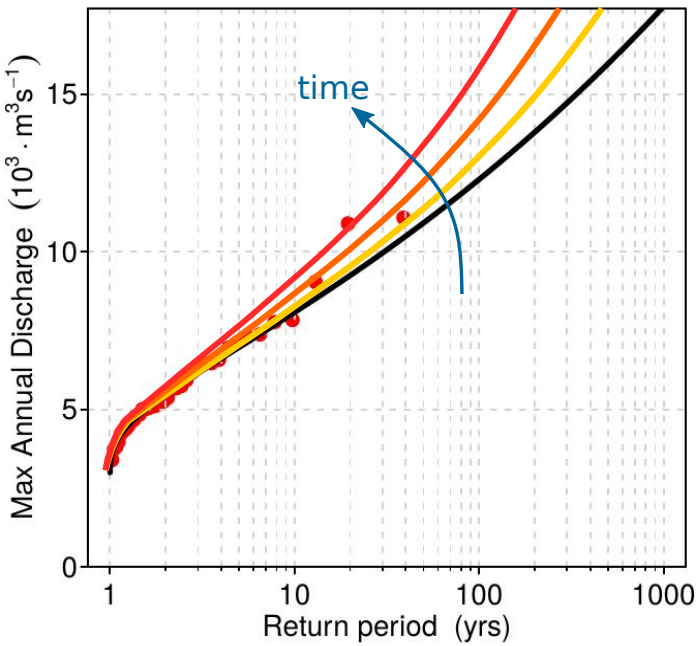
Long-Term Flood Hazard Dynamics



Are there **trends**?

Danube at Vienna (100.000 km^2)

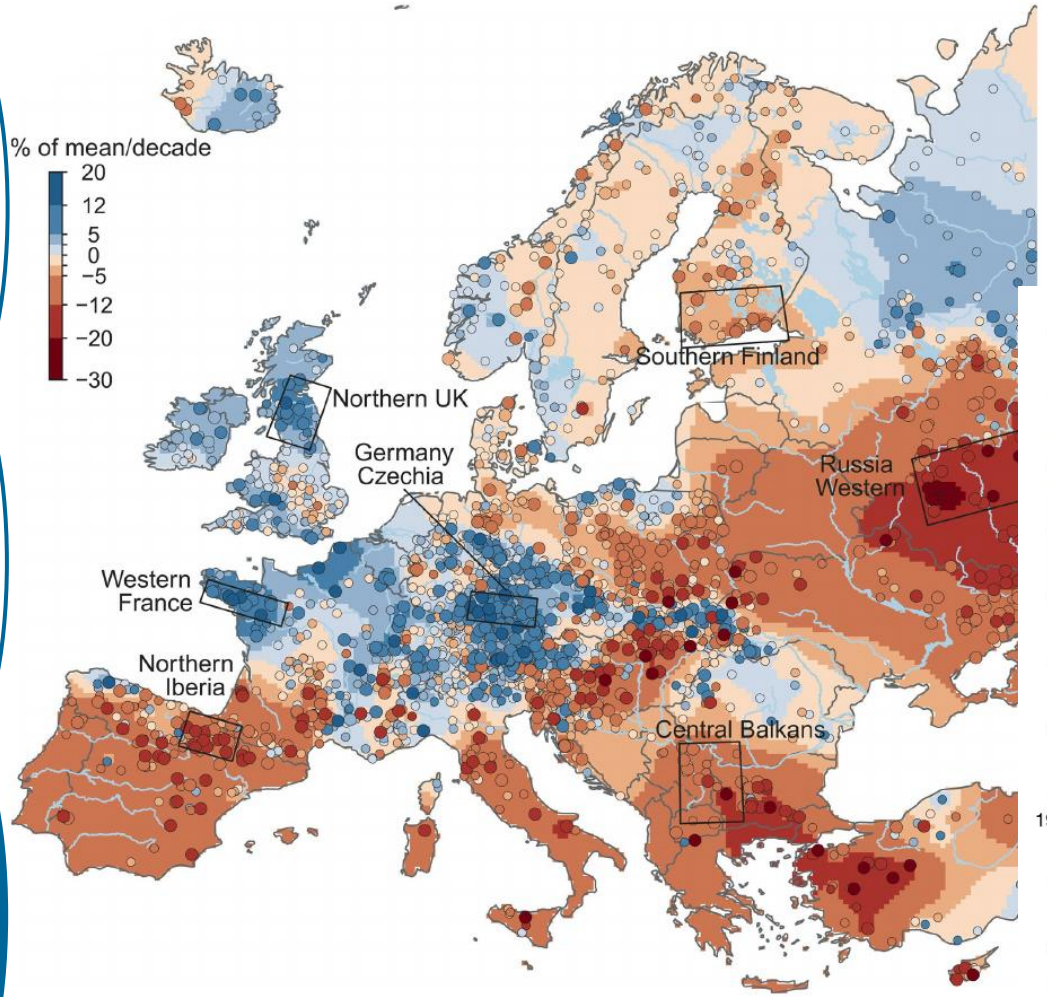
Is the **river flood hazard increasing** in time?



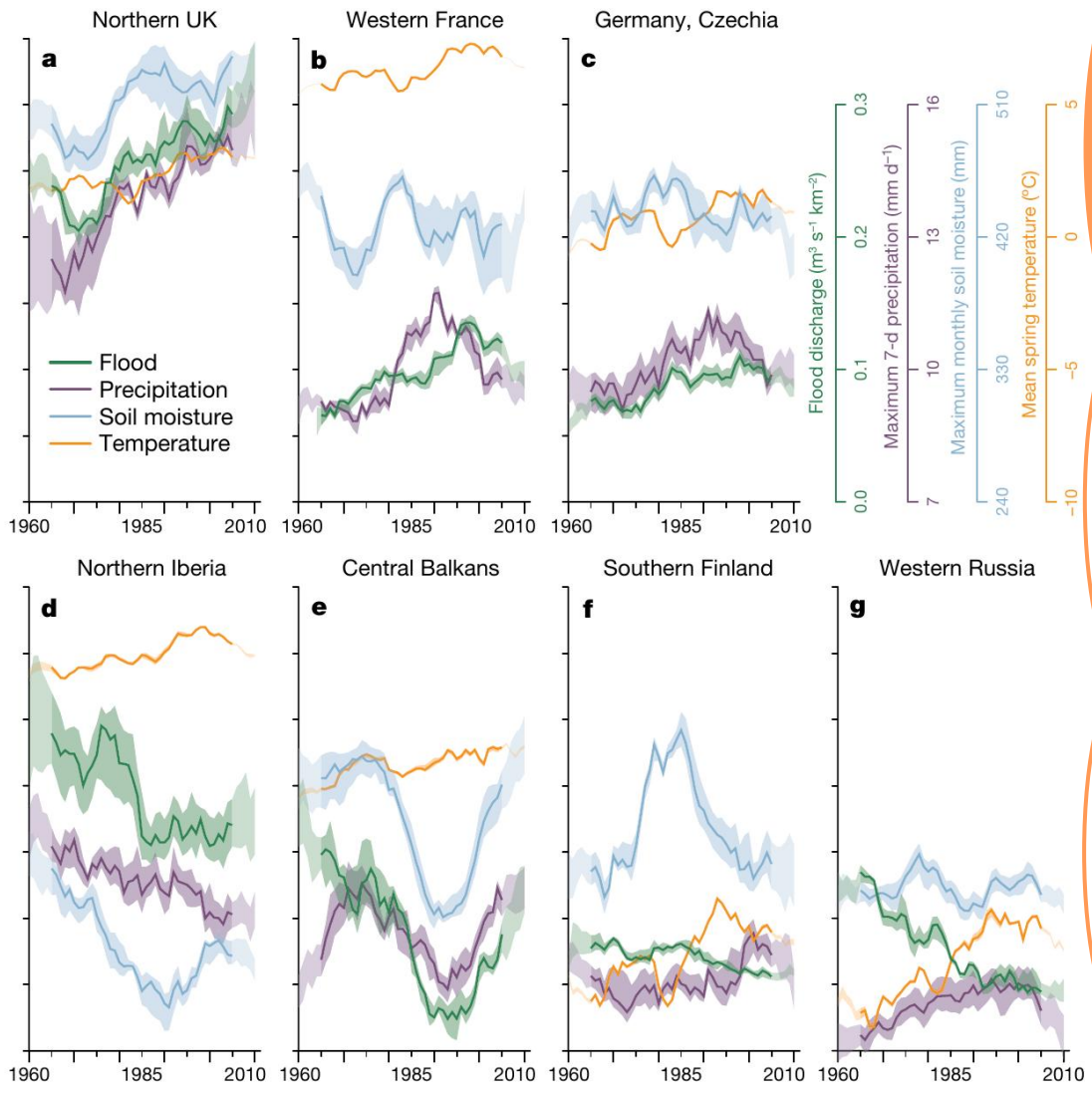
long-term

local

Long-Term Flood Hazard Dynamics



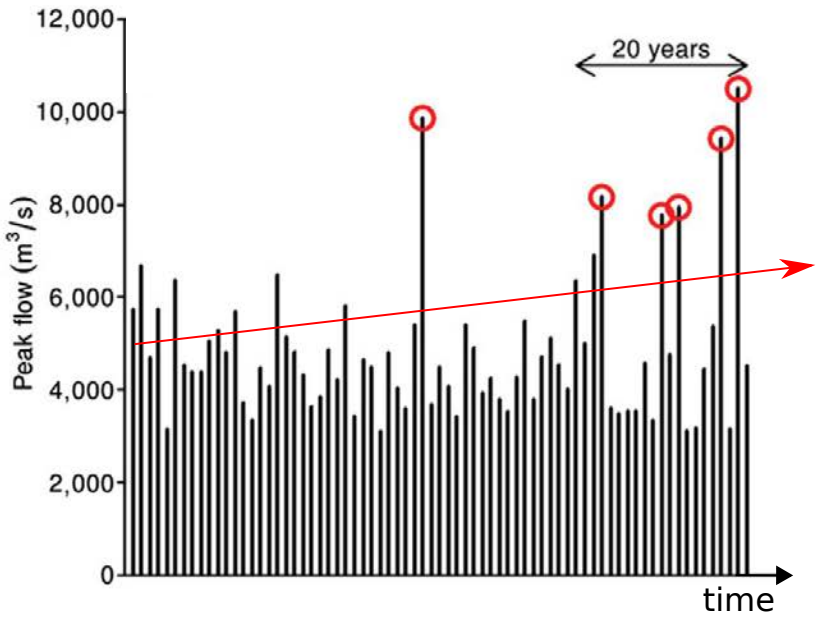
Blöschl et al. (2019, N)



long-term

continental

Long-Term Flood Hazard Dynamics



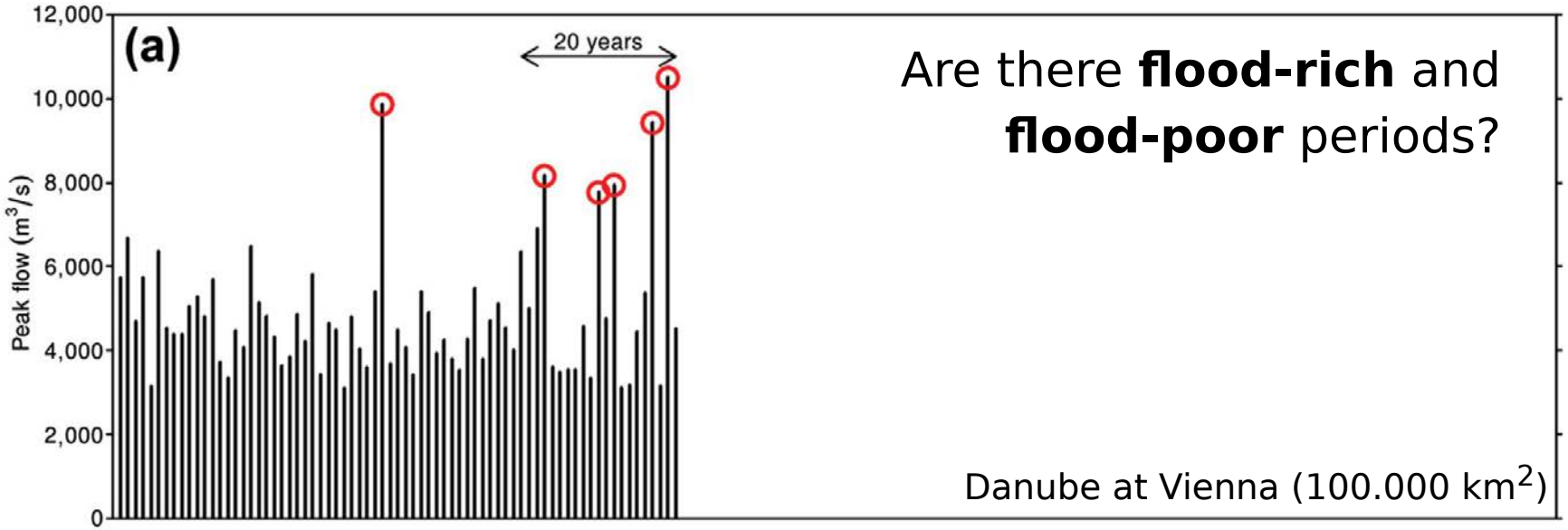
Are there **trends**?

Danube at Vienna (100.000 km^2)

long-term

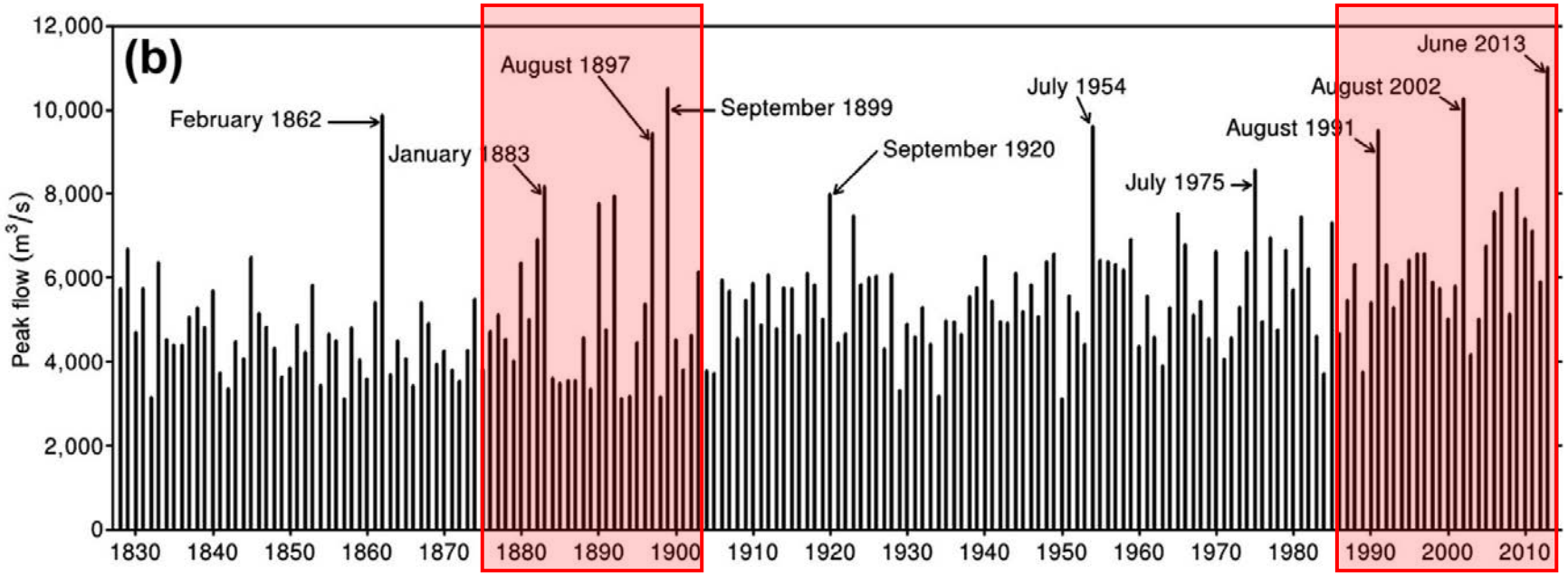
local

Long-Term Flood Hazard Dynamics



Are there **flood-rich** and **flood-poor** periods?

Danube at Vienna (100.000 km^2)



from Viglione and Rogger (2015)

long-term

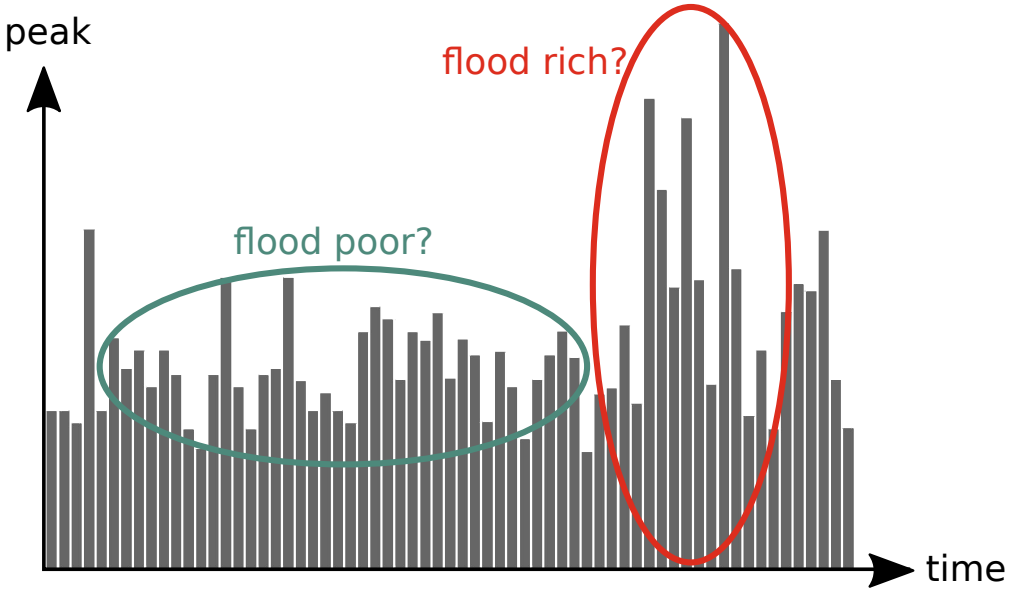
local

Lun et al. (in prep.)

Detection of Flood-rich and -poor Periods

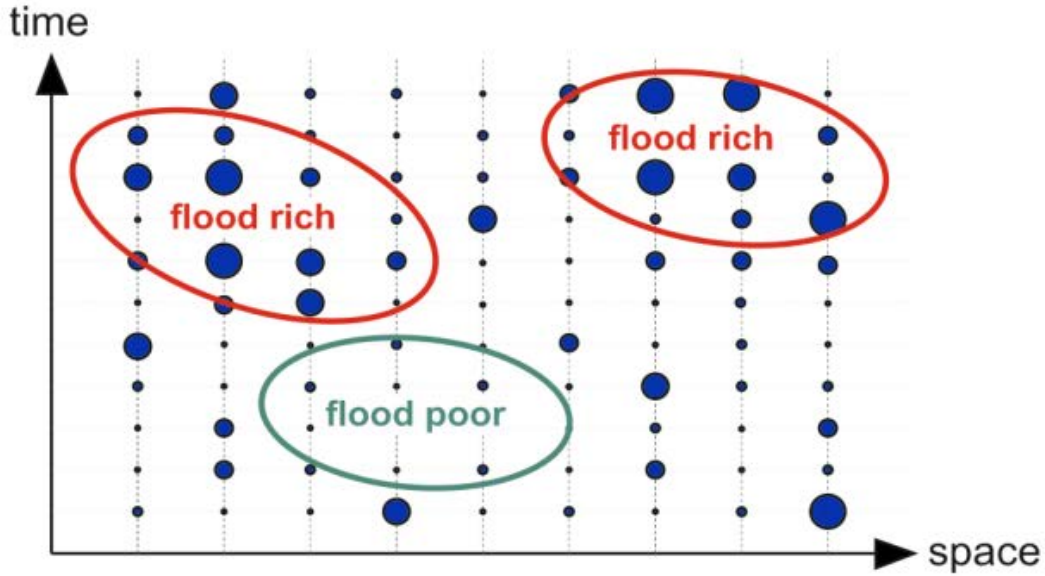
long-term

continental



Need for developing **formal tests** for detecting the **existence** and **location** of flood-rich and flood-poor period

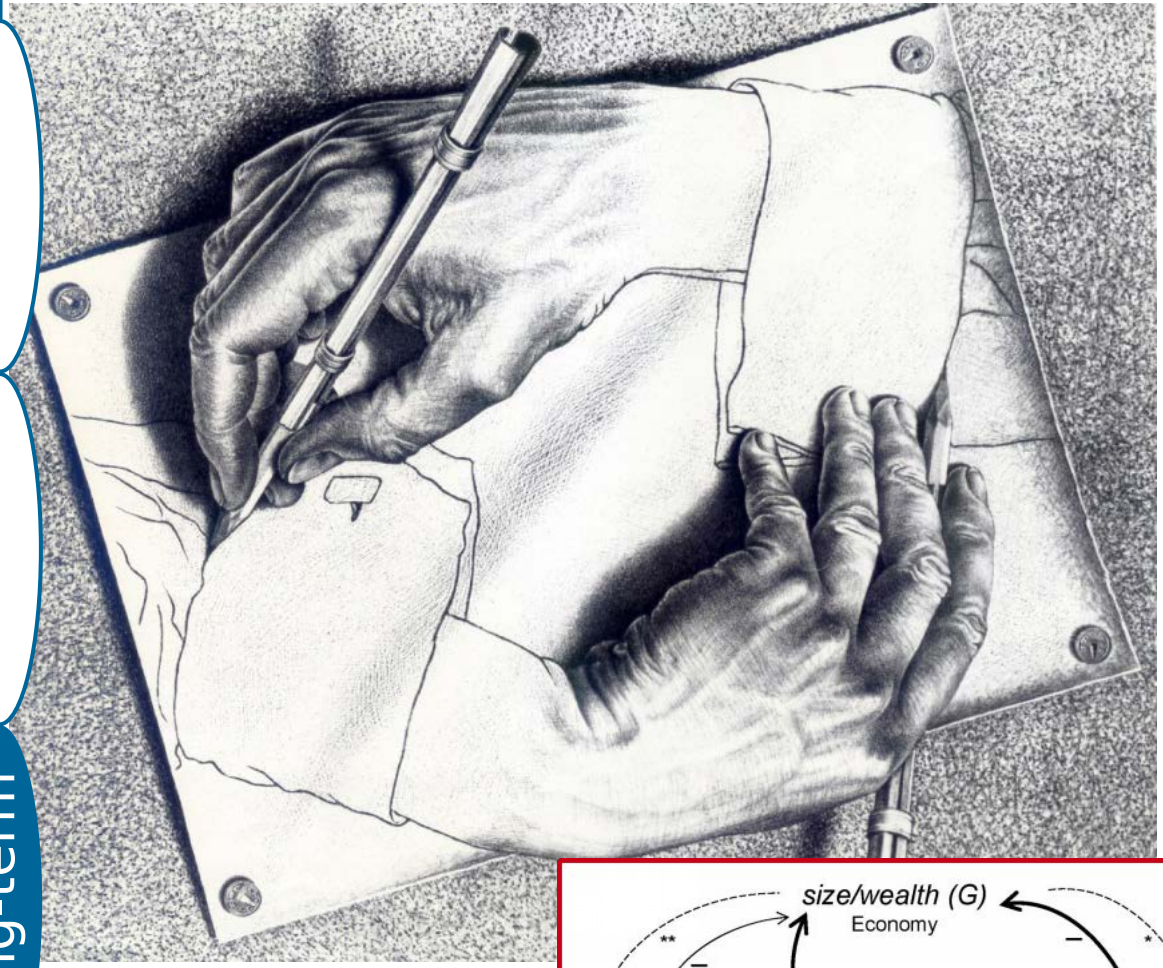
Are there **flood-rich** and **flood-poor** periods?

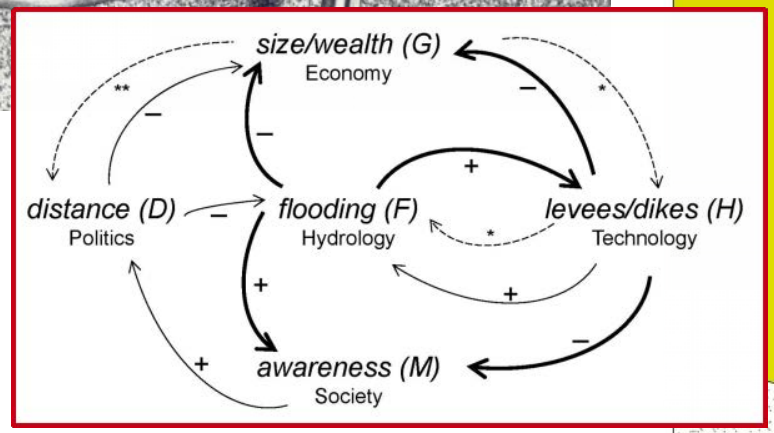


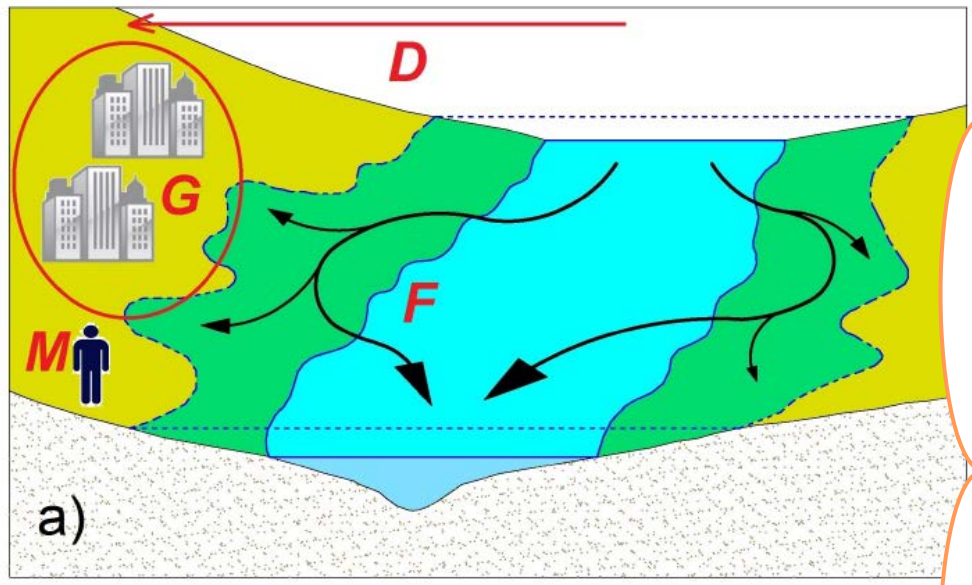
Are flood rich periods become **longer**, **larger**, **more frequent**?

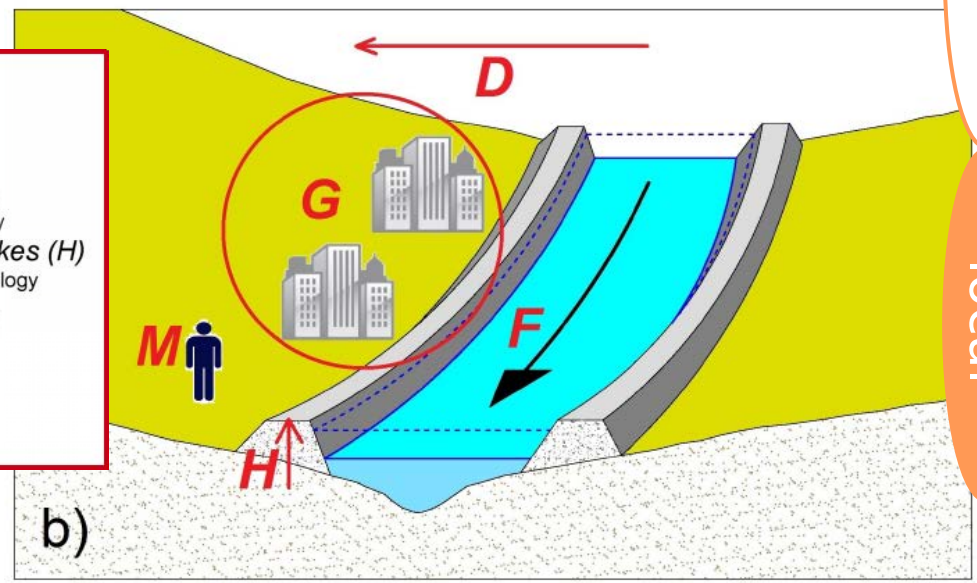
Lun et al. (in prep.)

Long-Term Feedbacks: Human-Floods







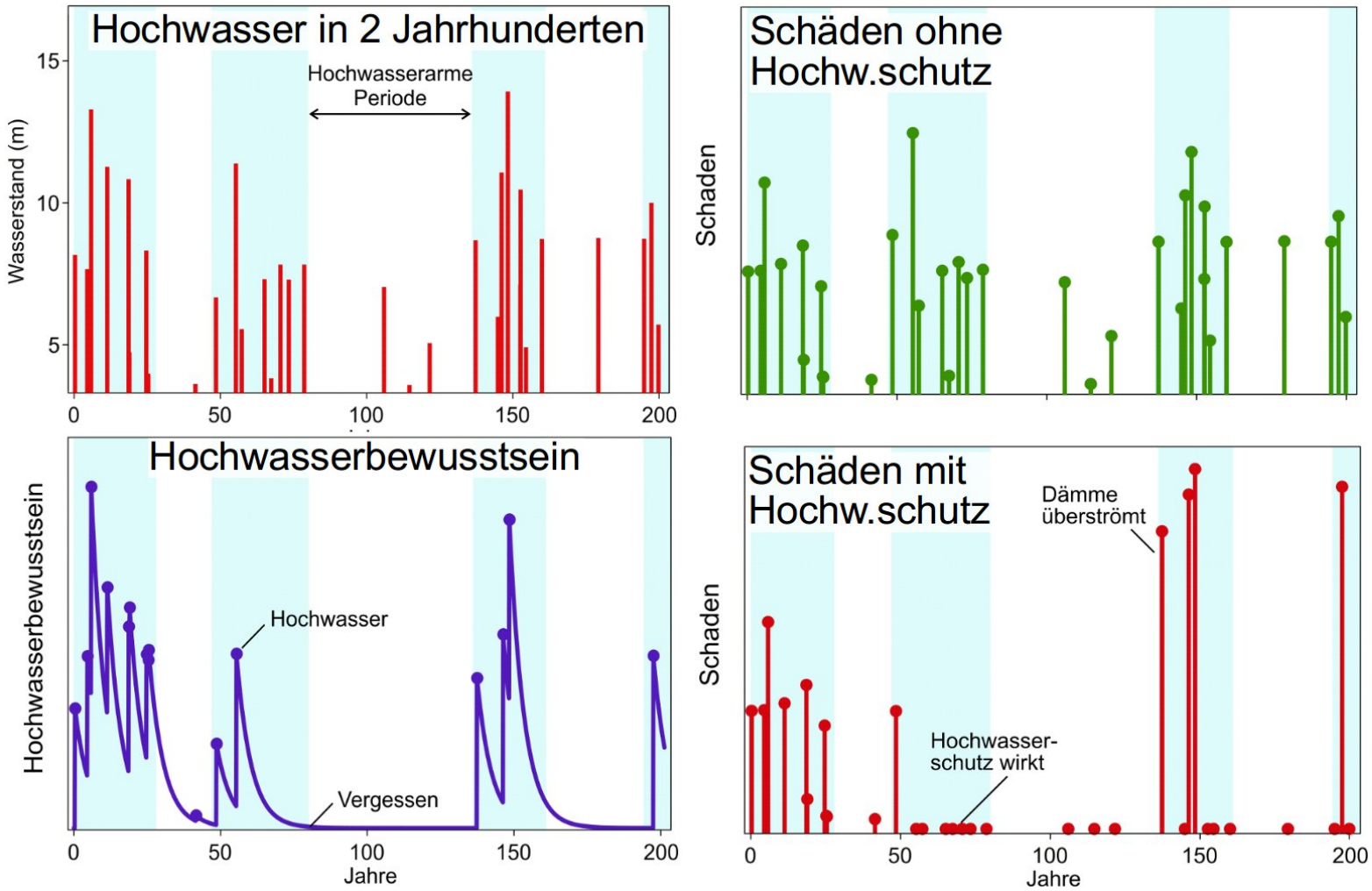


long-term

local

Di Baldassarre et al. (2013, HESS)

Long-Term Feedbacks: Human-Floods



Viglione et al. (2014, JoH)

long-term

local

Long-Term Feedbacks: Human-Floods

City of **Vienna and Danube** from Kahlenberg:

1830: Braided river that did not allow development of the low areas

1930: Cut through channel, with some development in the north of the city (left and centre of photo)

2015: Relief channel when the north of the city had been further developed including a business district

from Barendrecht et al. (2017, WS)

long-term

local

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