



Extreme discharges in the Meuse basin

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Meuse basin

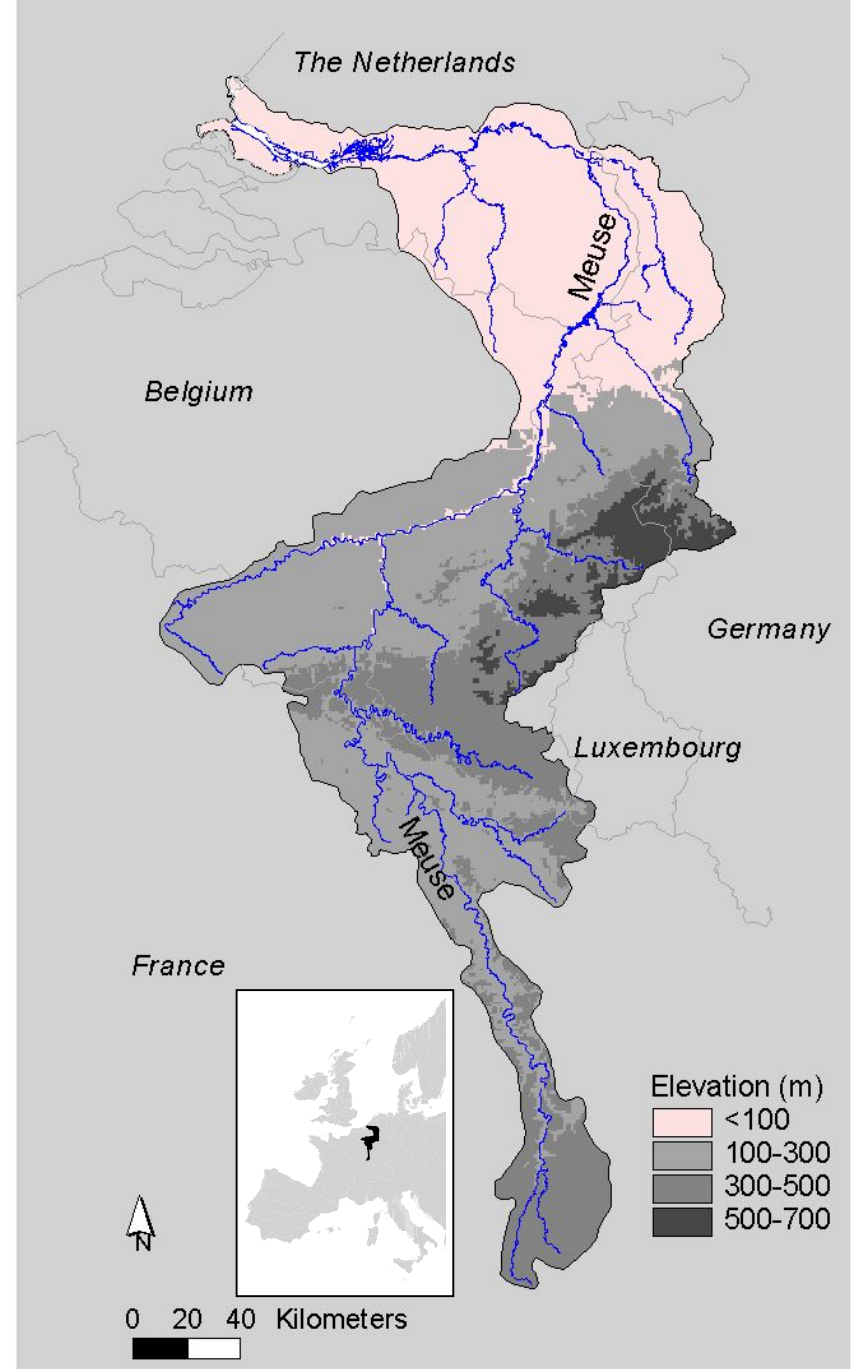
Observations

Scenarios/ Q_{design}

Policy

Characteristics of the Meuse

Length	875	km
Basin size	33,000	km ²
Belgium	40	%
France	30	%
Netherlands	20	%
Germany	10	%
Luxembourg	0	%
Avg precipitation	+/- 900 mm/year	
Avg Q (outlet)	350 m ³ /s	



Meuse basin

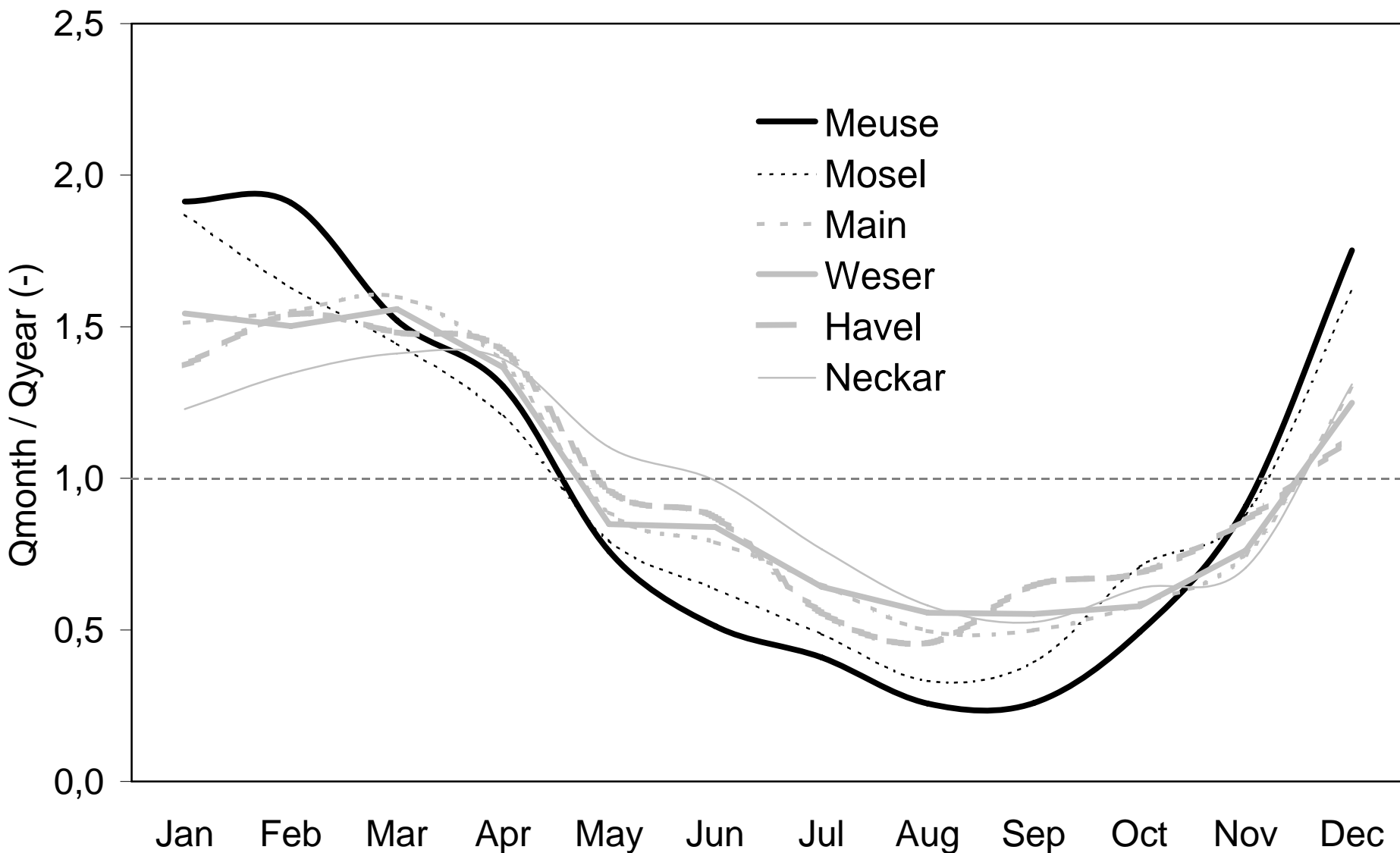
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Discharge regime of the Meuse

Ratio between monthly average and annual average discharge for the Meuse compared to some German rivers of comparable size





Southern part

Meuse basin

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Central part

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Northern part

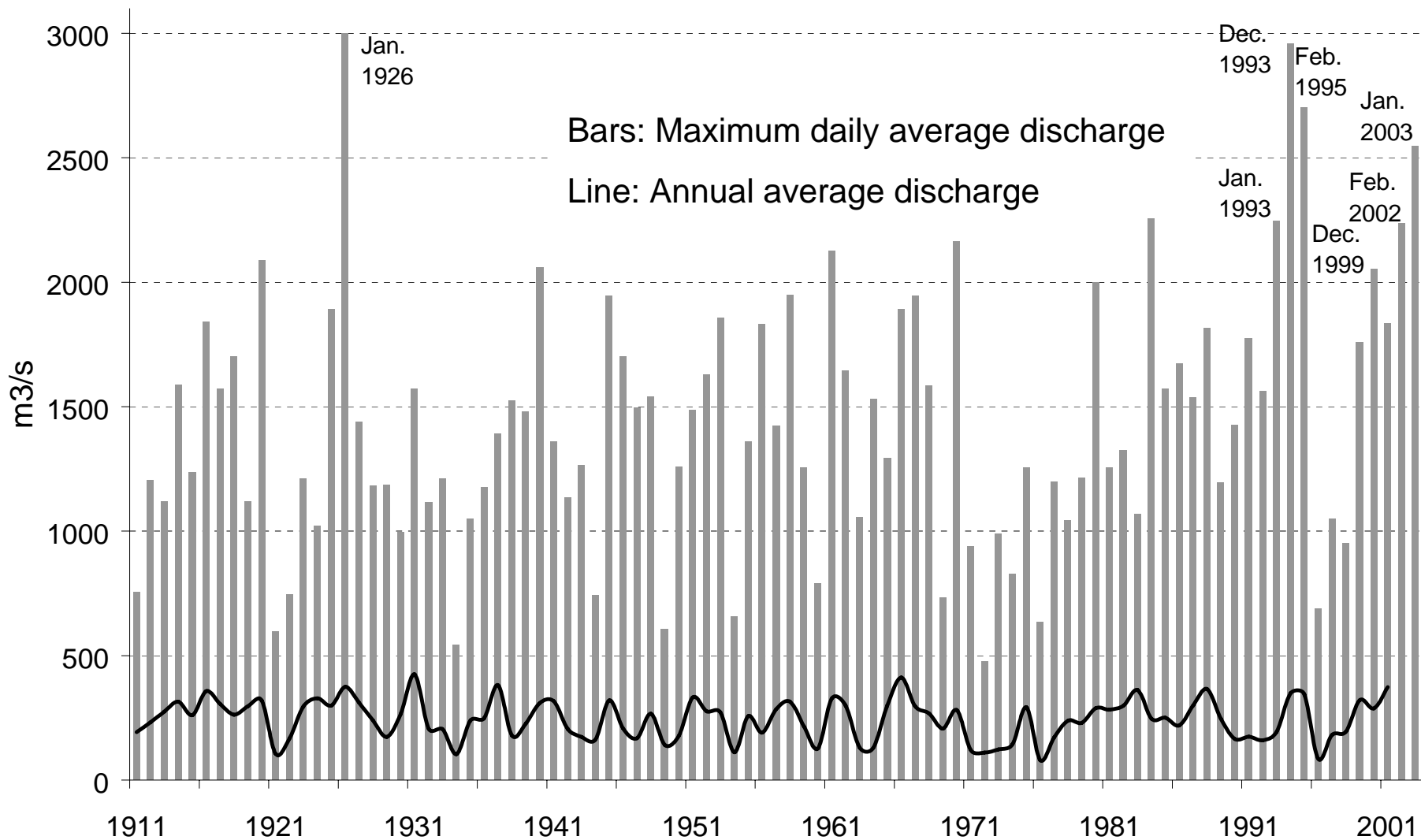
Meuse basin

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Discharge record Meuse-Borgharen



Source: Rijkswaterstaat

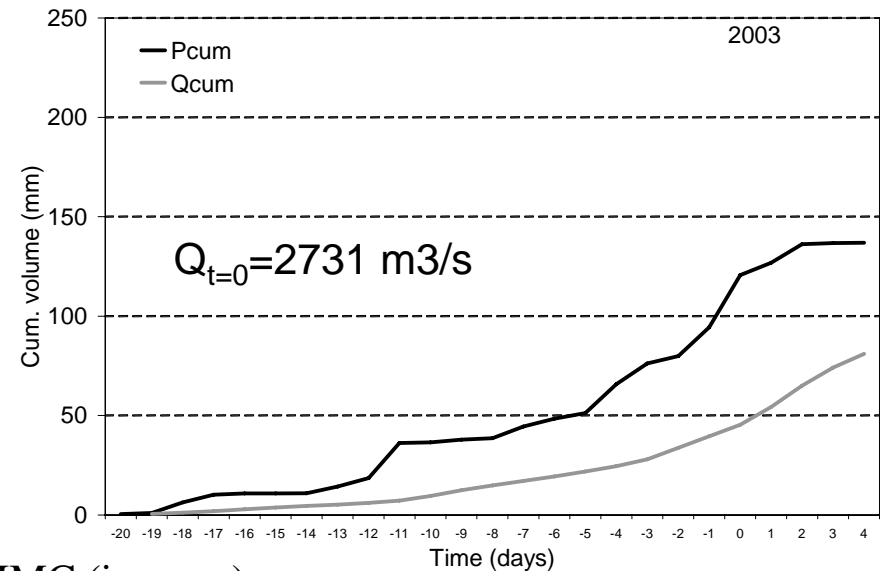
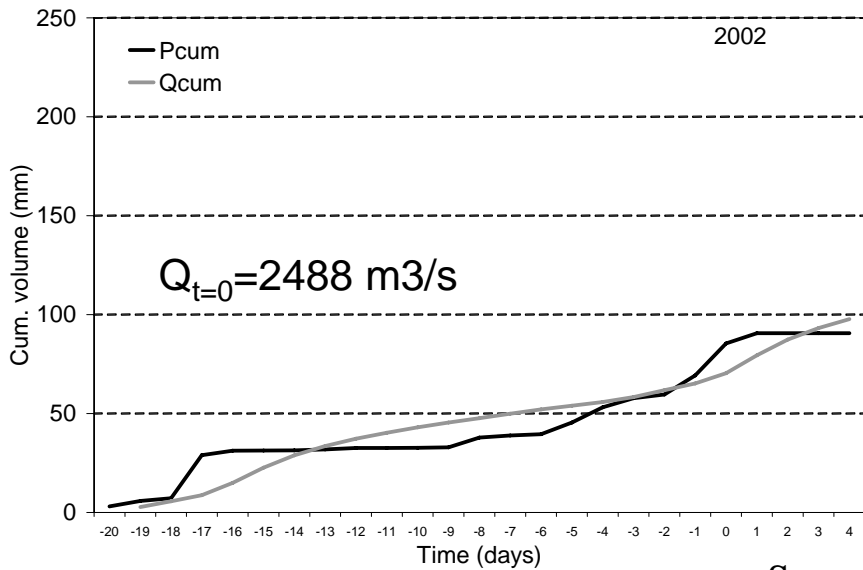
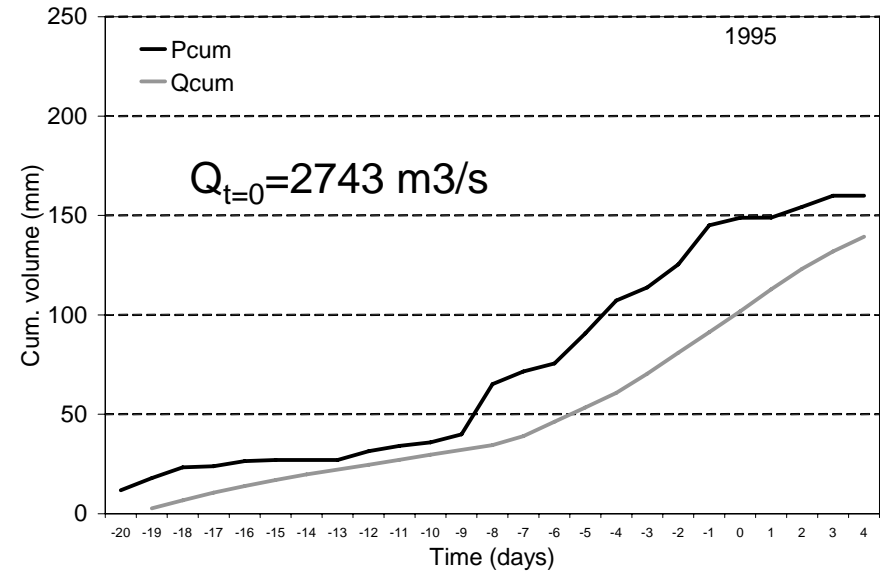
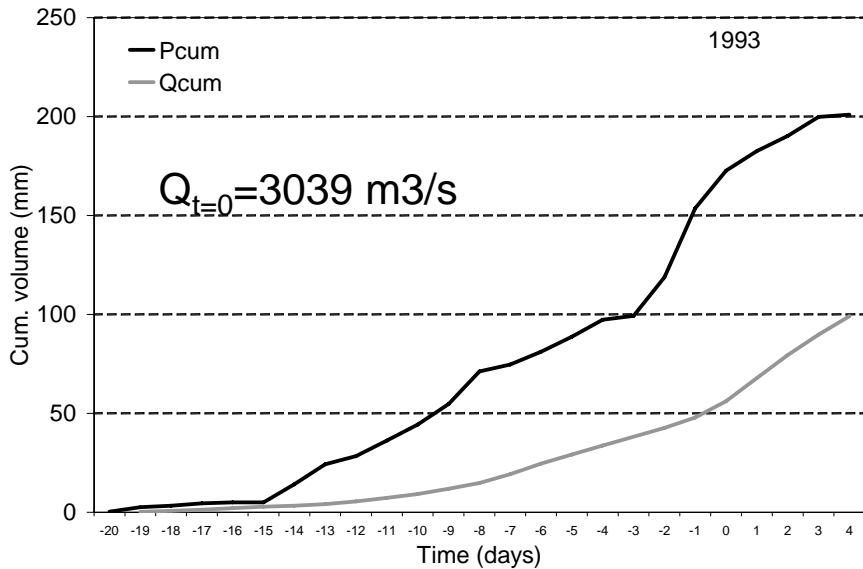
Meuse basin

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Cumulative Q and P for 4 floods (Meuse-Borgharen)



Source: IMC (in prep.)

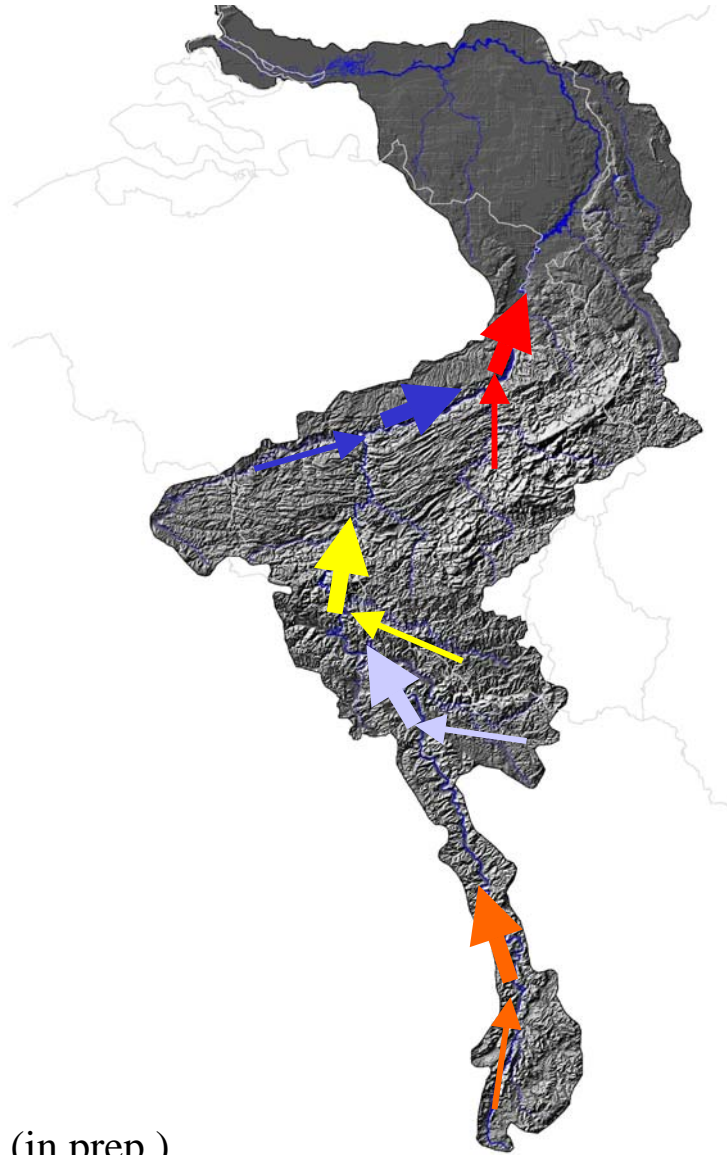
Meuse basin

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Confluence of flood waves



Source: IMC (in prep.)

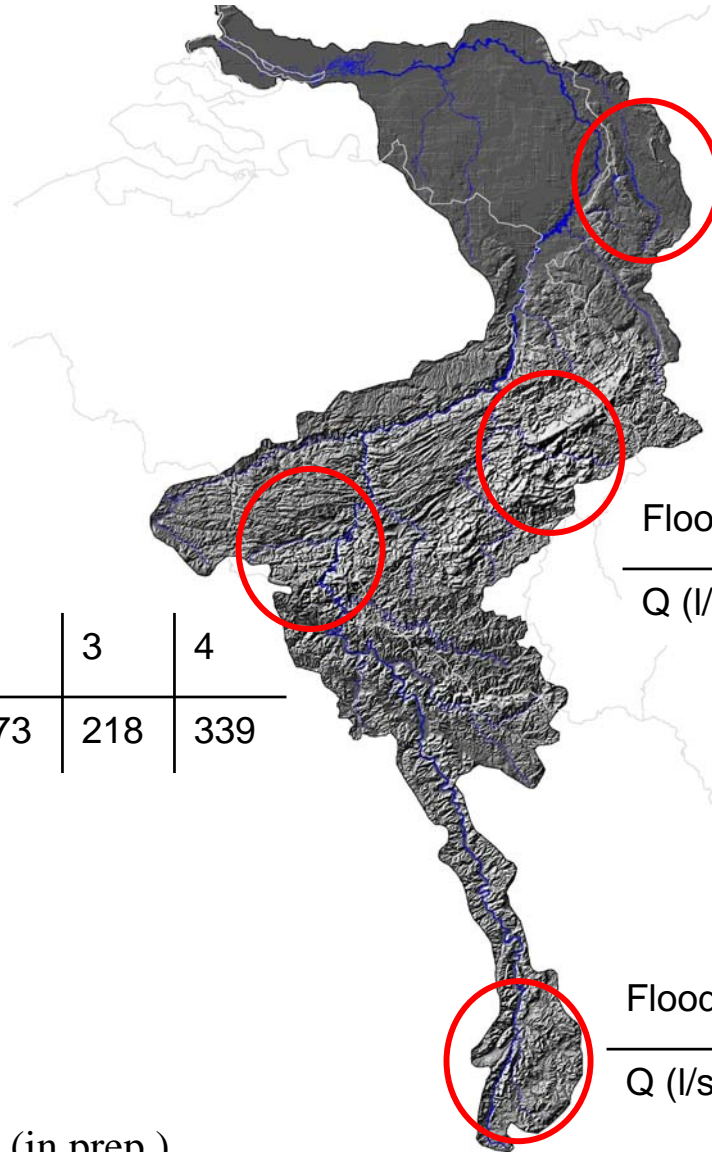
Meuse basin

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Area specific runoff for 4 floods



Flood event	1	2	3	4
Q (l/s*km ²)	19	32	25	28

Flood event	1	2	3	4
Q (l/s*km ²)	207	213	251	165

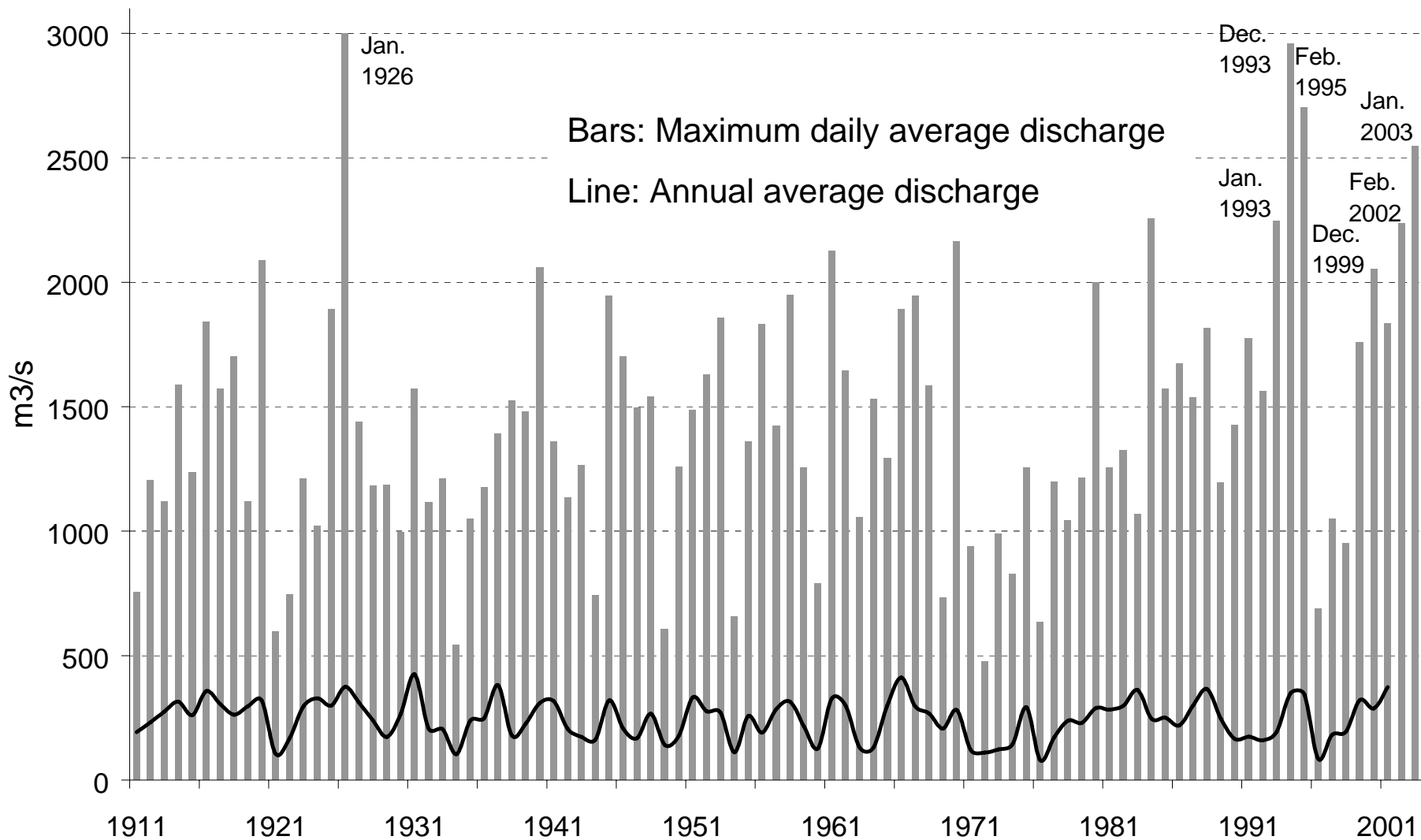
Flood event	1	2	3	4
Q (l/s*km ²)	493	273	218	339

Flood event	1	2	3	4
Q (l/s*km ²)	166	181	569	159

Source: IMC (in prep.)



Discharge record Meuse-Borgharen



Source: Rijkswaterstaat

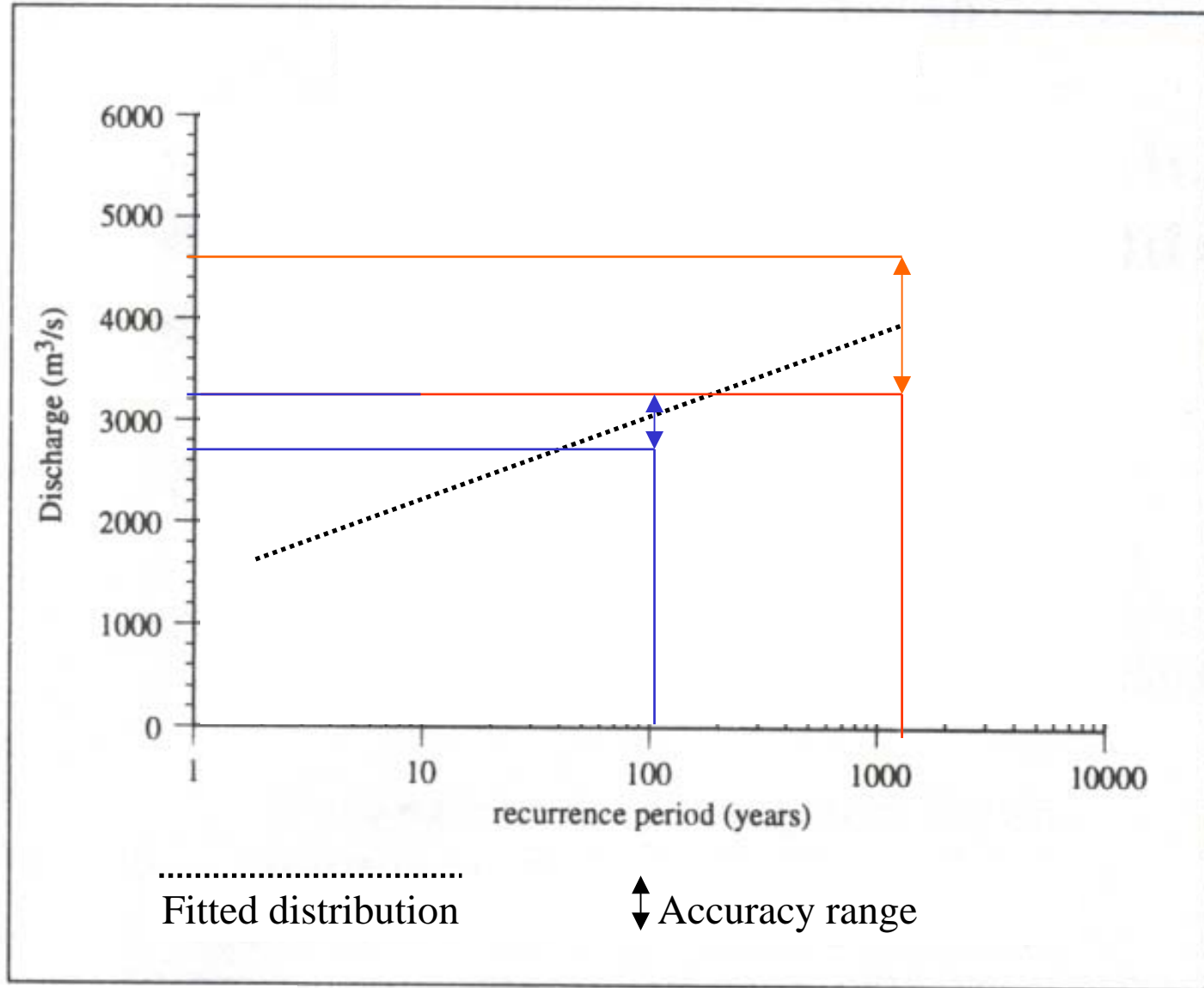
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Traditional way of determining design discharges



Meuse basin

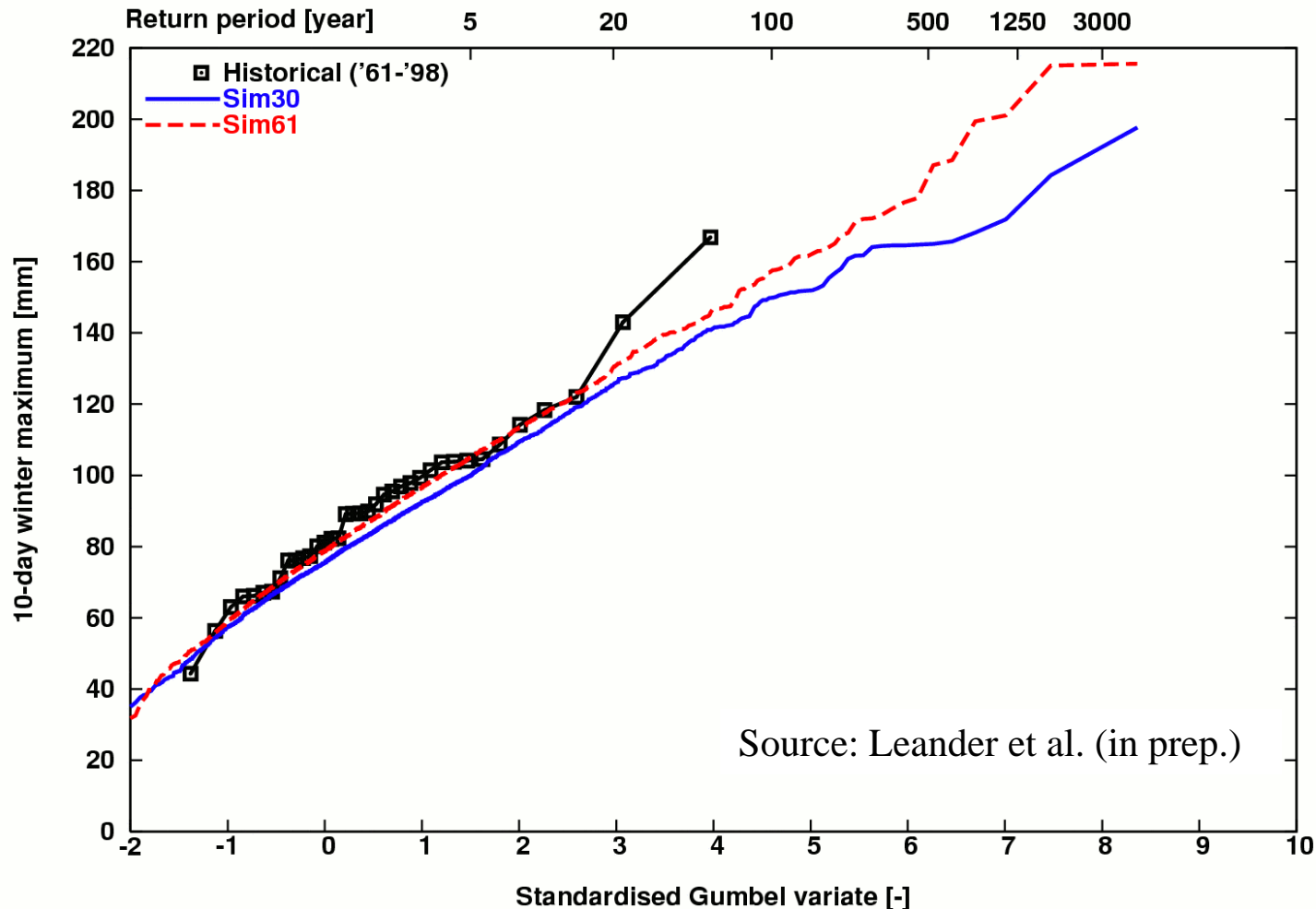
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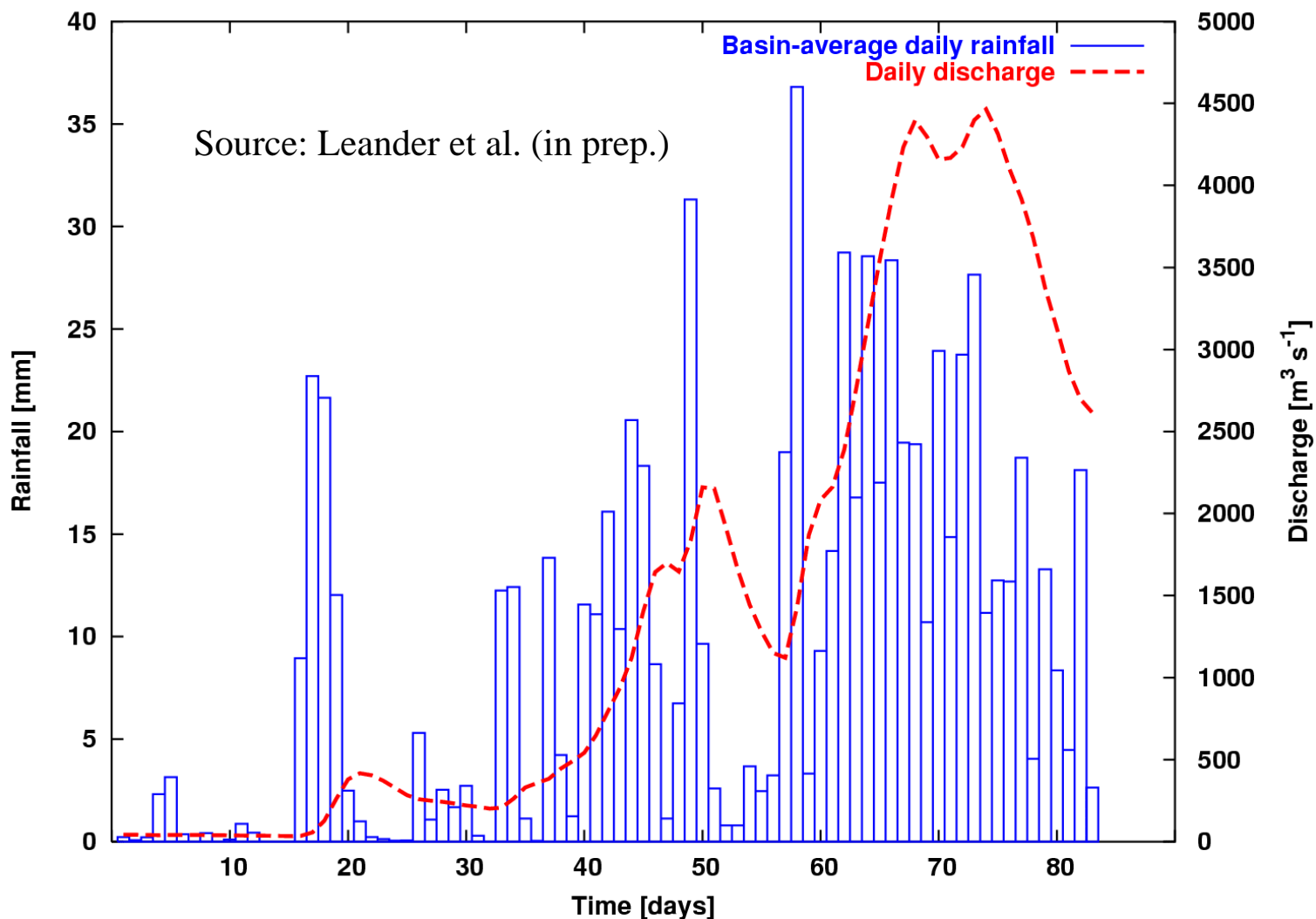
Rainfall generator for the Meuse basin

Winter maxima of 10-day basin average rainfall from the historical records for the period 1961-1998 (dots) and from two different simulations (blue and red lines)

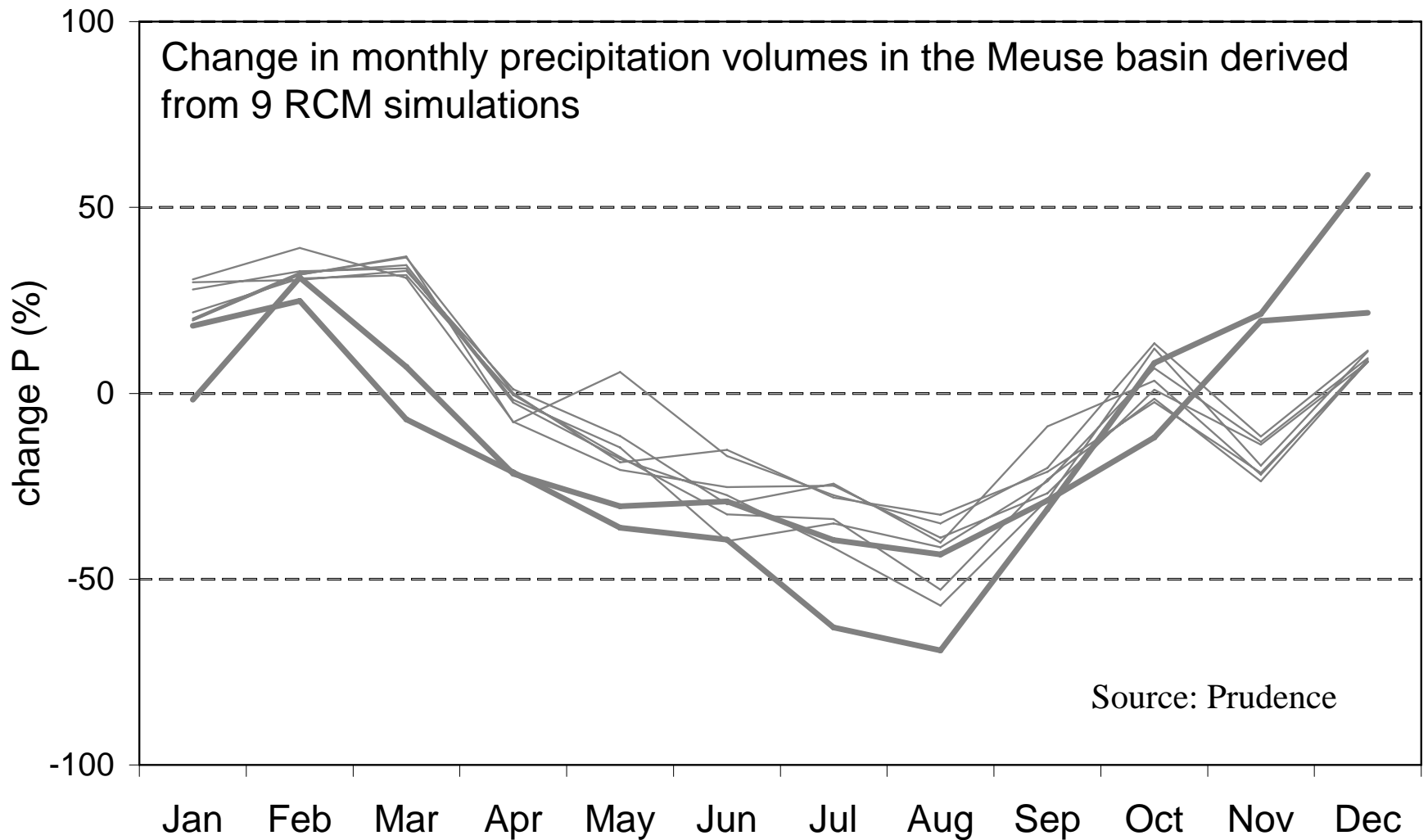


Rainfall generator for the Meuse basin

The largest generated flood event driven by a generated rainfall record



Climate change



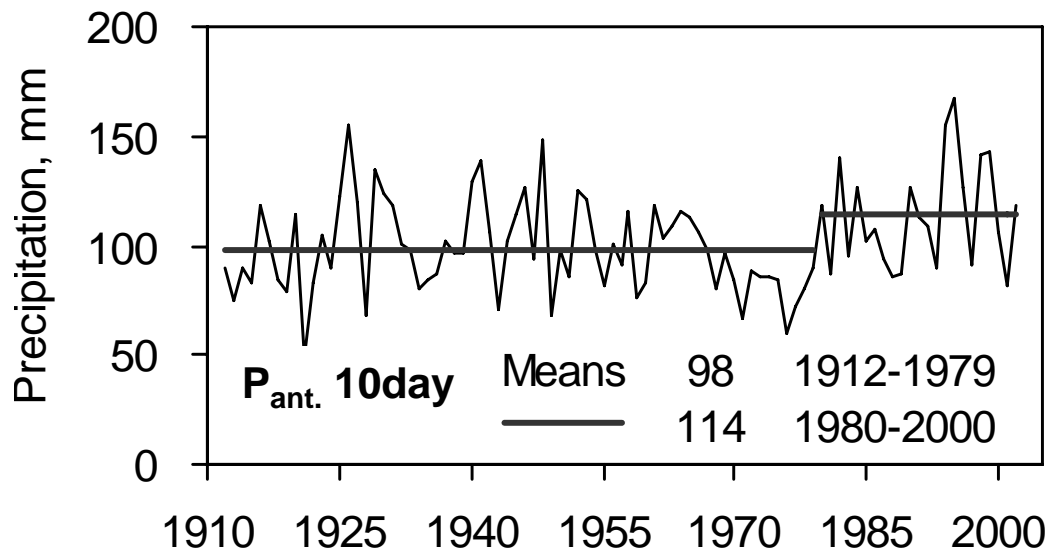
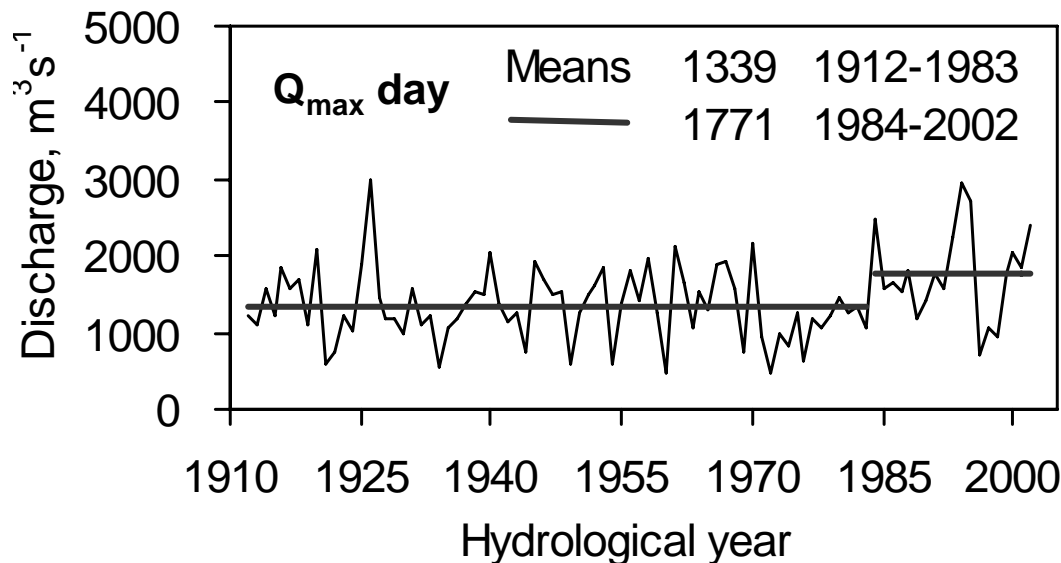
Meuse basin

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Observed 'changes' in extreme Q and P (Meuse-Borgharen)



Source: Tu et al. (2004)

La France

La Région wallonne de Belgique

La Région flamande de Belgique

Les Pays-Bas

Plan d'Action Inondations Meuse

Namur, 6 Mai 2002 • Namur, le 6 Mai 2002

Werkgroep
Hoogwater
Maas
(WHM)

Actieplan
Hoogwater
Maas

Voortgangsrapportage
1995-2001

Groupe de Travail
pour la prévention
des Inondations dans
le bassin de la Meuse
(GTIM)

Plan
d'Action
Inondations
Meuse

Rapport d'avancement
1995-2001



Meuse basin

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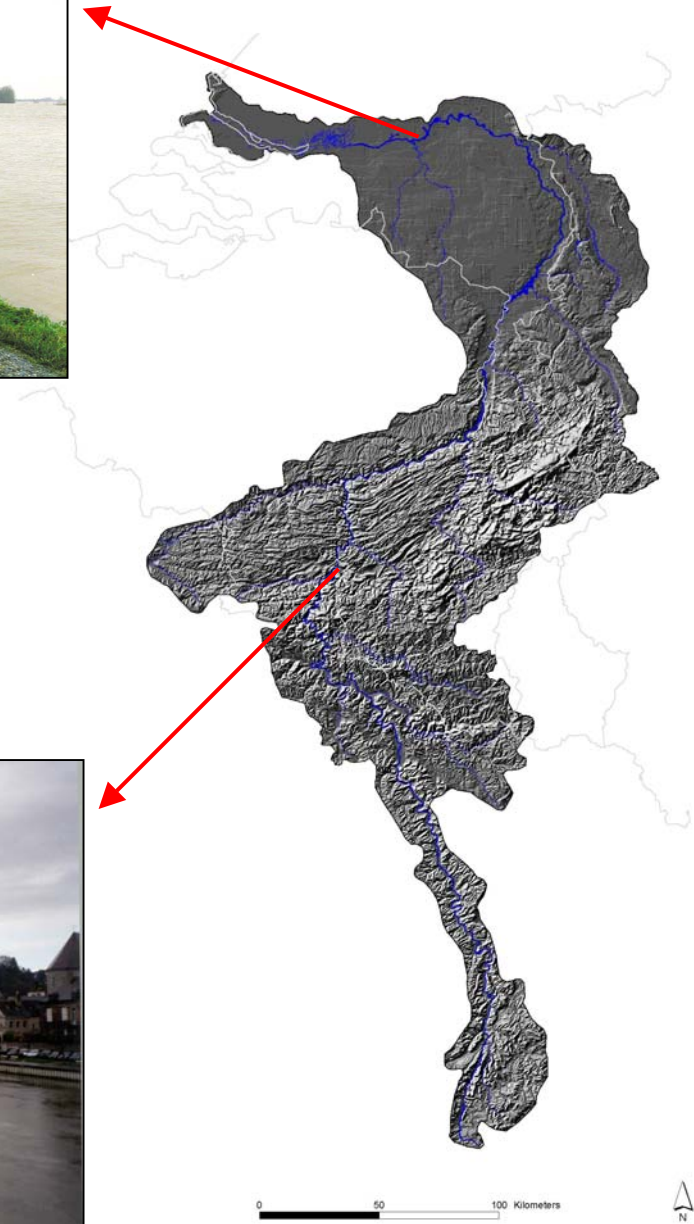
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Differences in damage risk

Differences in Q design

Differences in measures



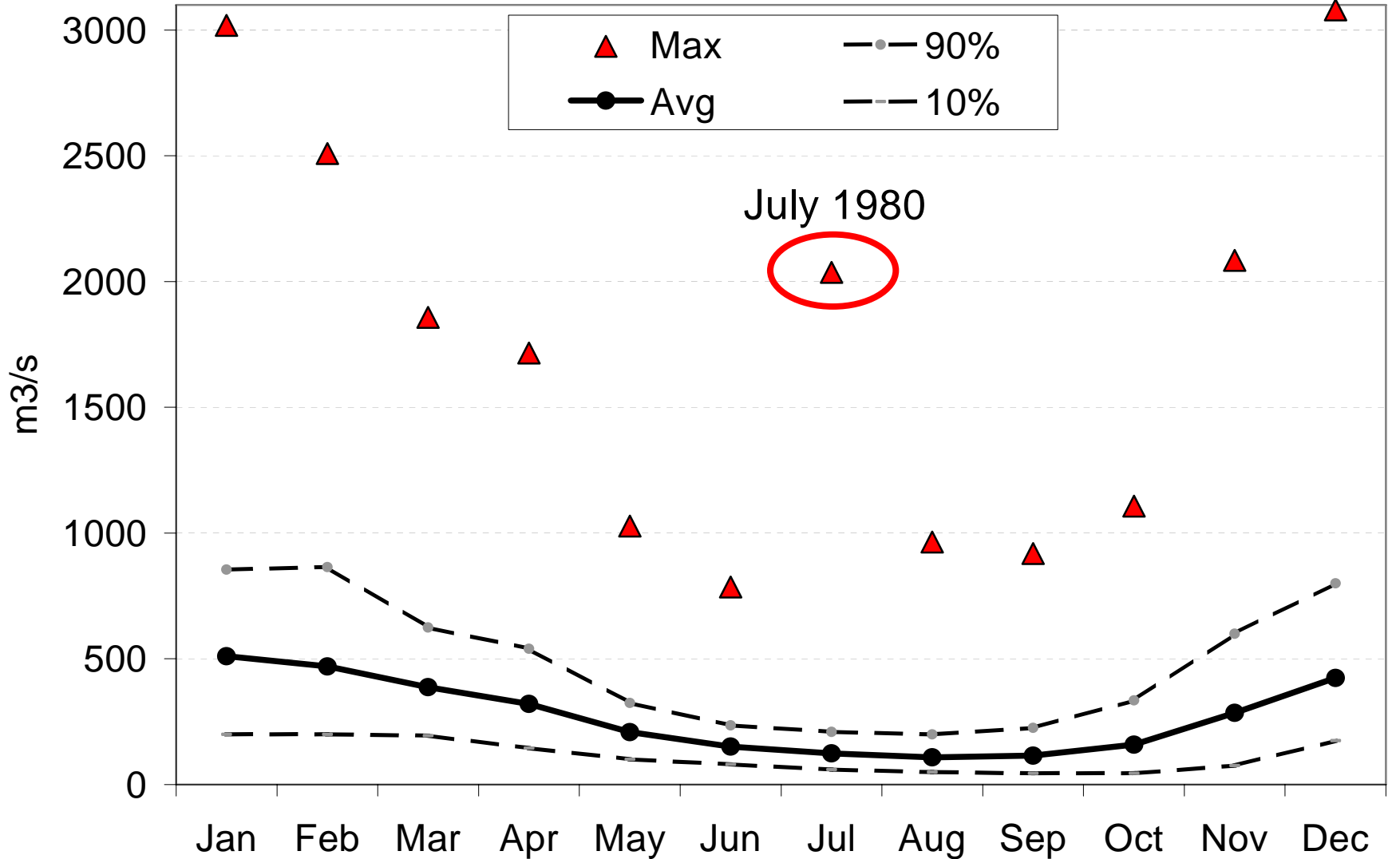
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Extreme summer flood of July 1980



Meuse basin

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