CRUE FLOODING ERA-NET

*Integrate, Consolidate and Disseminate*
***European Flood Risk Management Research***

**ERA-NET CRUE Funding Initiative**

# Effectiveness and Efficiency of Early Warning Systems for Flash Floods

EWASE Early Warning Systems Efficiency


K. Schröter, TU-Darmstadt (IHWB)
M. Ostrowski, D. Sempere, C. Velasco, GRAHI-UPC, Barcelona
H.P. Nachtnebel, B. Kahl, BOKU Wien (IWHW)
M. Beyene, M. Gocht, ProAqua, Aachen

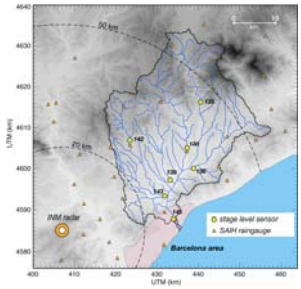

## Objectives

- Relating the concept of risk analysis to the evaluation of Early Warning Systems (EWS)
- Comparing forecast reliability and economic benefit
- Analysing uncertain factors of the warning production chain and risk analysis

## Study basins

- Besòs catchment, near Barcelona (Spain)

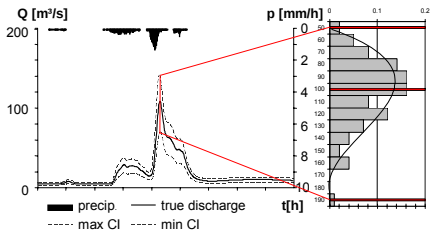
Elevation: 0 – 1350 m
Mediterranean climate
$A_{E0}$: 1024 km²
hP: 660 mm/a
MQ: 5 m³/s
HHQ: 2500 m³/s

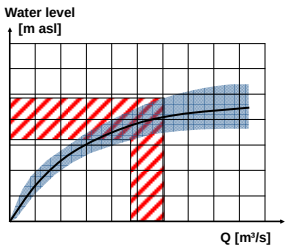


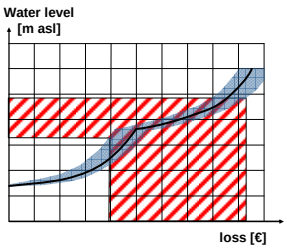

- Traisen catchment, north east Austria

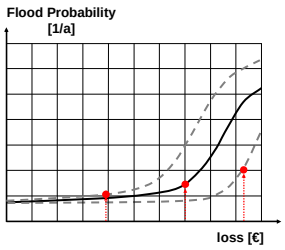
Elevation: 200 – 1800 m
Alpine/Pannonian climate
$A_{E0}$: 920 km²
hP: 700 – 1500 mm/a
MQ: 13.5 m³/s
$HQ_{100}$: 725 m³/s

## Uncertainty Analysis



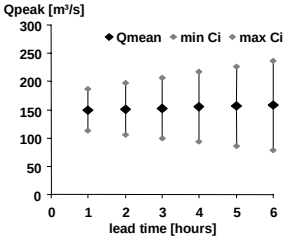




Model forecast uncertainty — Inundation forecast uncertainty — Uncertainty of risk — Uncertainty of loss

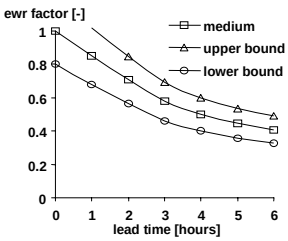
## Forecast reliability

- Input (forecast) uncertainty
- Model uncertainty
- Malfunction of measurement devices




## Economic Evaluation

- Damage factors for water levels
- Loss adjustment
- Annual expectation of loss



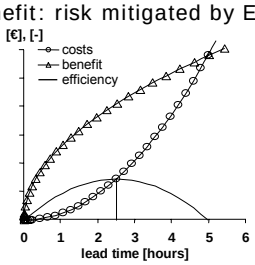

## EWS Assessment

Benefit Cost Analysis (comparison of):

- Costs: EWS construction, operation, maintenance

and

- Benefit: risk mitigated by EWS





**Co-ordinator:** Dr Sebastian Catovsky (Defra)
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**EWASE contact:** ewase@gmx.net
**website:** www.ewase.net