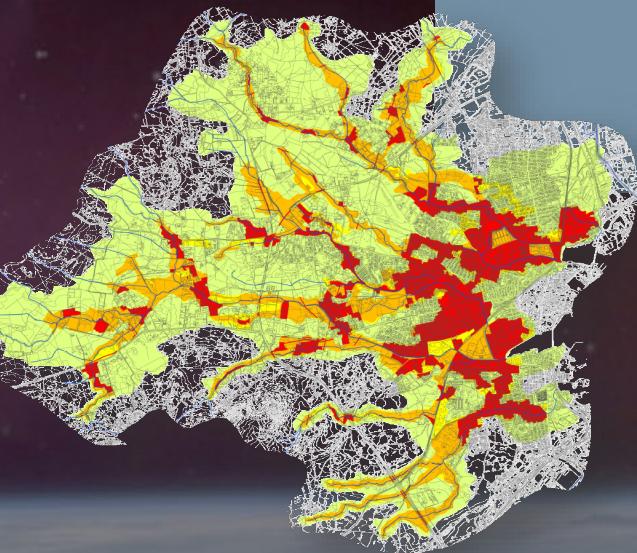




CLIMATE-RELATED RISKS AND EXTREME EVENTS

Milano – 19.11.2020



Marco Mancini*, Giovanni Ravazzani on behalf of (*)

Flood risk mitigation between structural and non-structural works:
the role of flood warning system

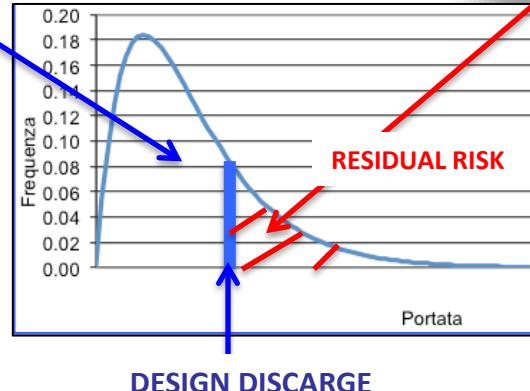
Mitigation actions mixing

IXX, XX Century STRUCTURAL MEASURES

Reducing flood / volume Hazard (H)



EU water directive 2000/60 & Flood directive 2007/60



XXI Century : REAL TIME PROCESS MONITORING AND FORECASTING MANAGEMENT RESIDUAL RISK (NON STRUCTURAL Measure)
...increasing system resilience
(UN, SENDAY 2015 DEFINITIONS)

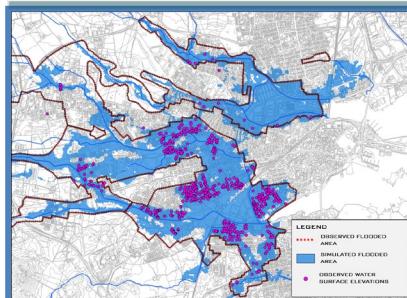


Risk management: a trade off between costs of structural and nonstructural measures and damages reduction

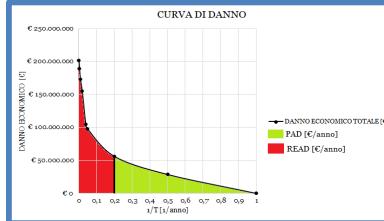
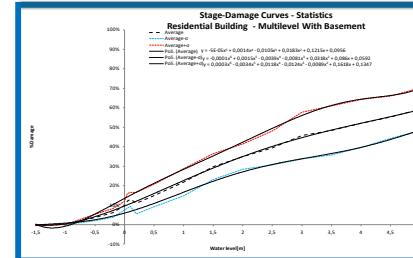
E – Classification of element at risk and assesment of values



H – Hazard Flood Map and Inundation characteristic in different scenarios

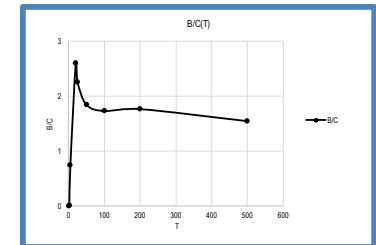


V – Vulnerability assessment, stage damage curve for each type of assets at risk



ED- Total Direct Economic Damage function

B/C - Assessment of optimum design return period comparing the Benefit/Cost



The Olbia case study

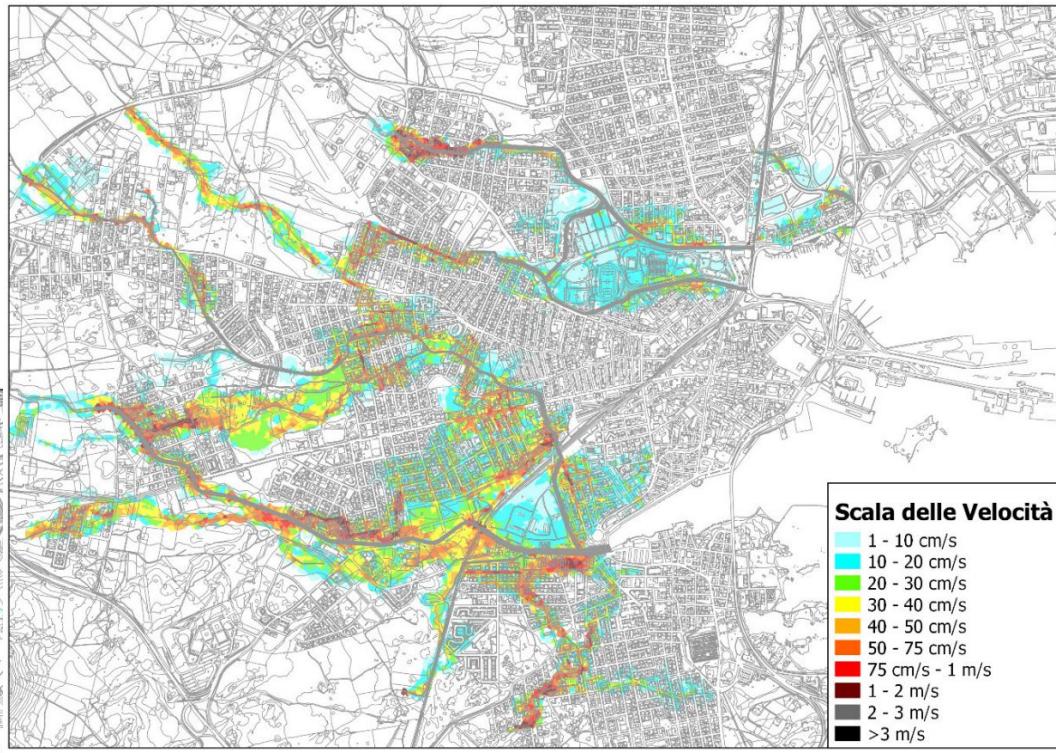
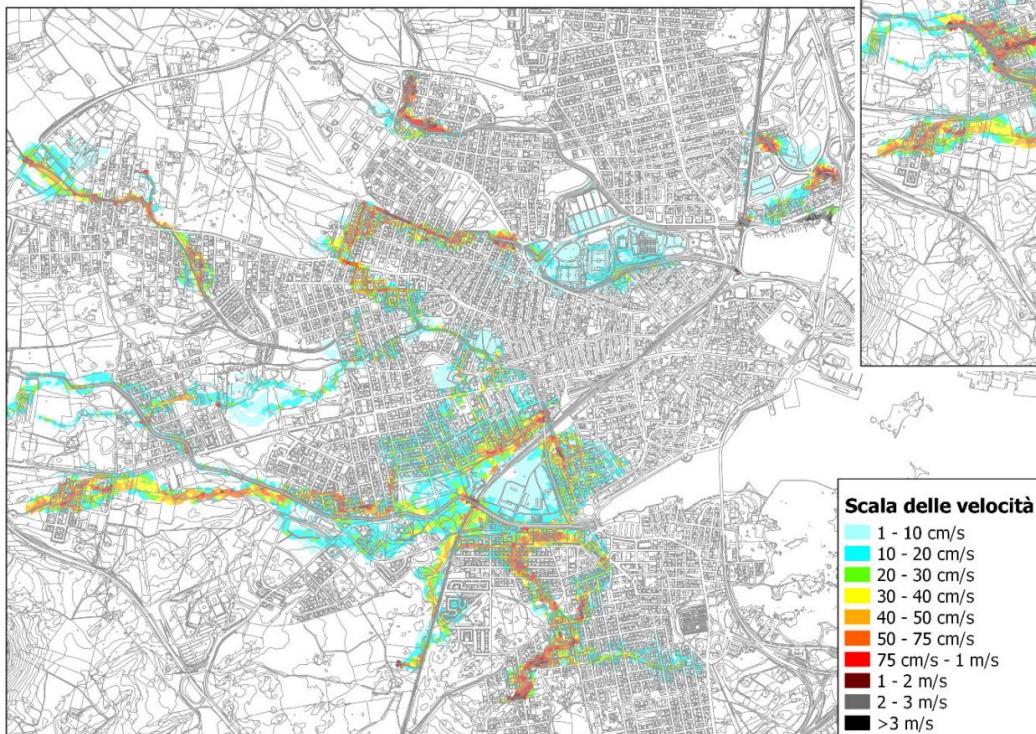
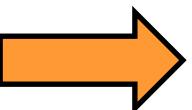


Olbia case study: flood hazard maps

Impact of flood detention basins on 50 years return period flood

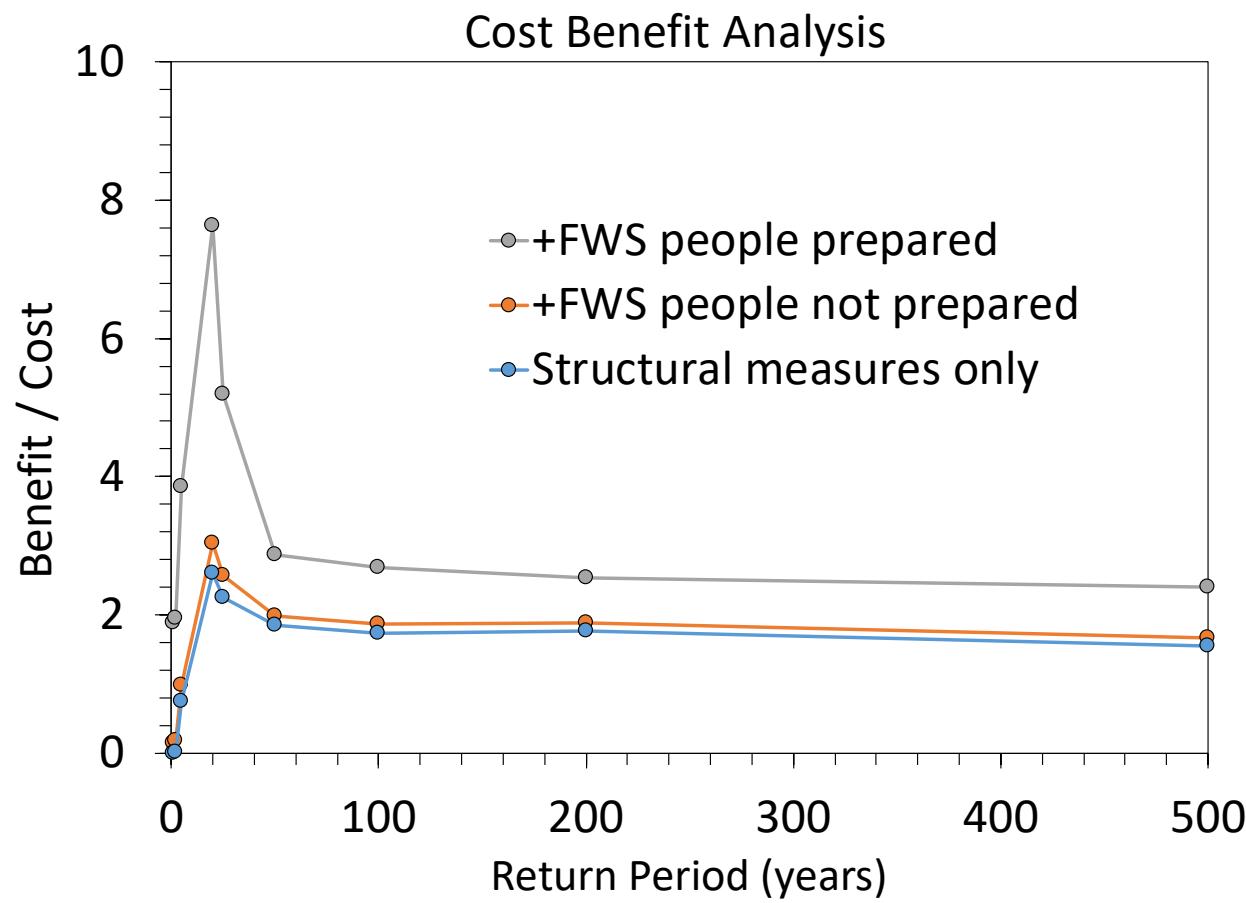
List of priority structural interventions from Water Basin Authority

Current situation



Scenario with flood
detention basins

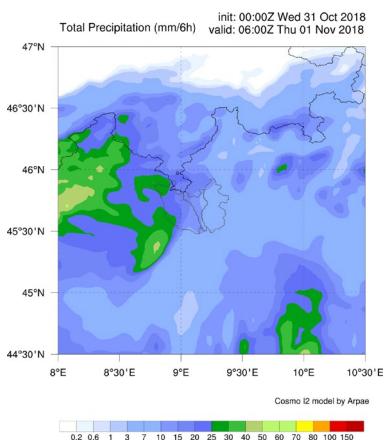
Olbia case study: Cost Benefit Analysis



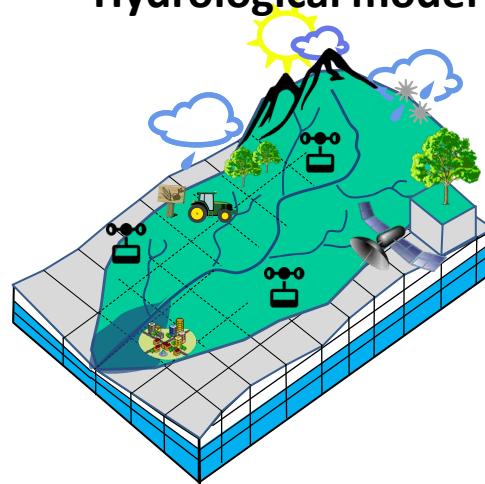
Courtesy of Roberto Dossi master thesis

SOL: Seveso Olona Lambro flood warning system

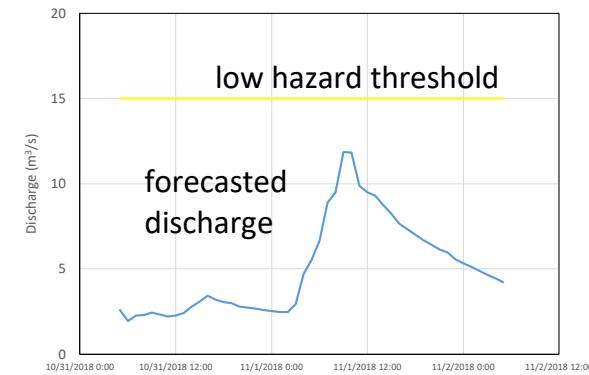
Precipitation forecast



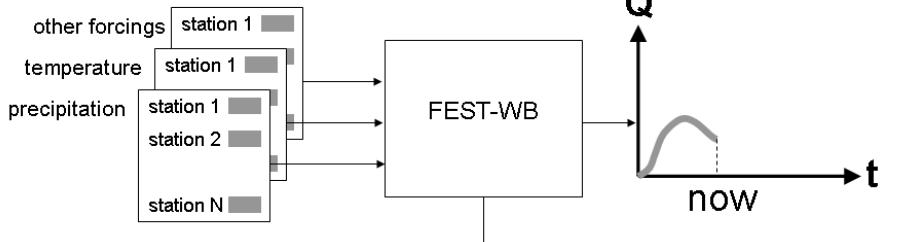
Hydrological model



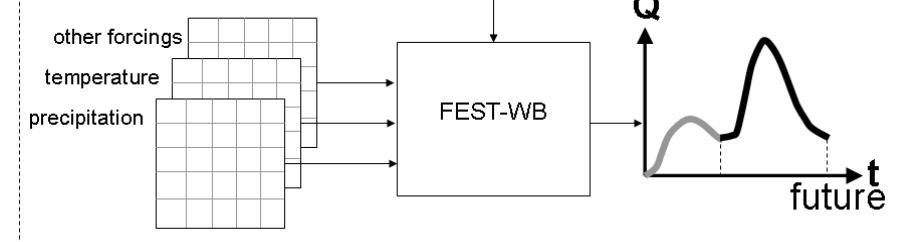
Flood forecast



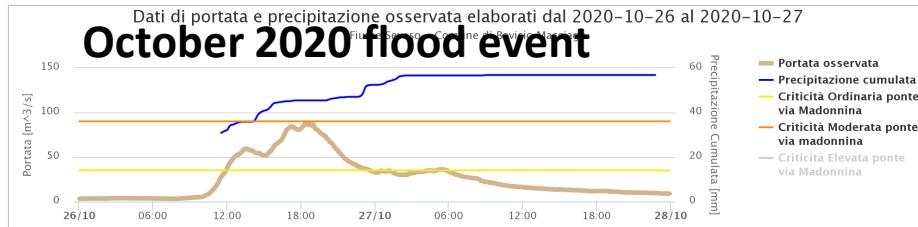
INITIALIZATION RUN



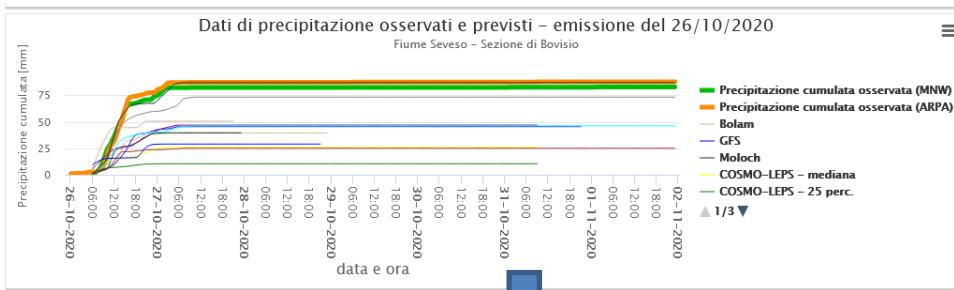
FORECASTING RUN



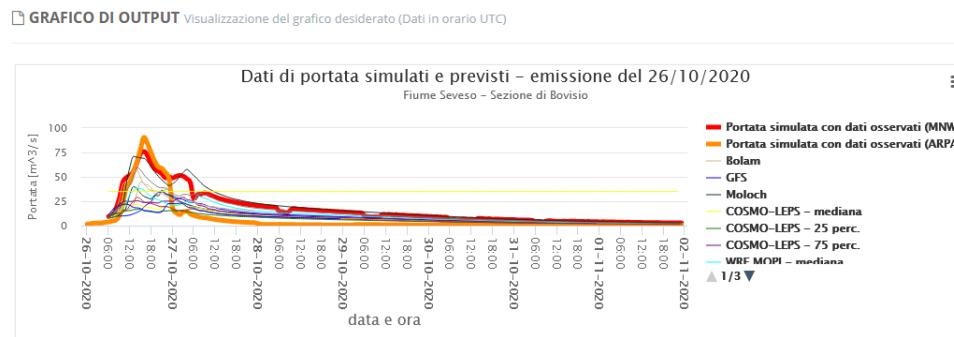
SOL multi model approach



Multi-model precipitation forecast



Hydrograph forecasts & discharge thresholds



GFS

50 km, Δt 3h, +144h

Bolam

11 km, Δt 1h, +72h



Moloch

1.5 km, Δt 1h, +45h

Cosmo-i2

2 km, Δt 3h, +48h



Cosmo-i7

7 km, Δt 3h, +72h

Ensemble models

COSMO-
LEPS

7 km, Δt 3h, +132h
16 ensemble

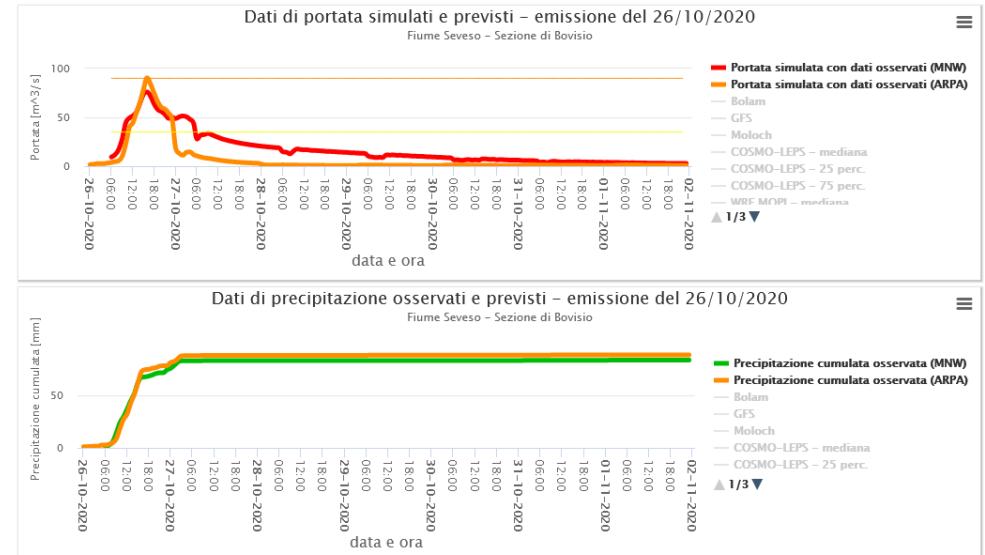
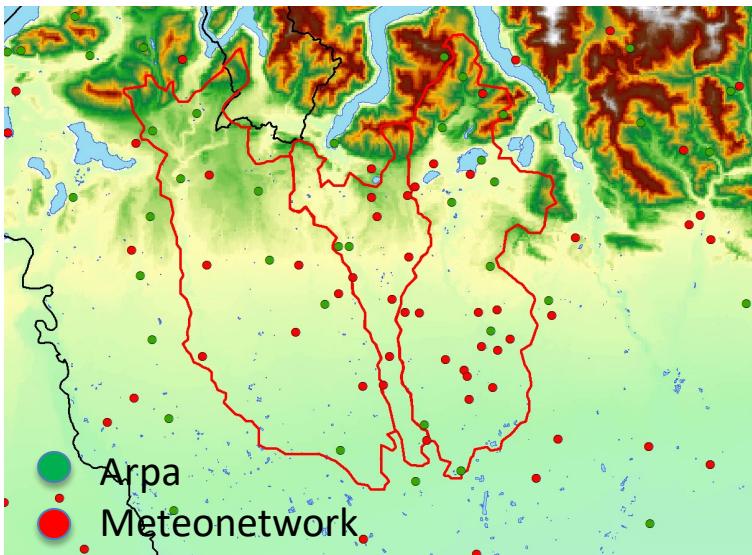


WRF

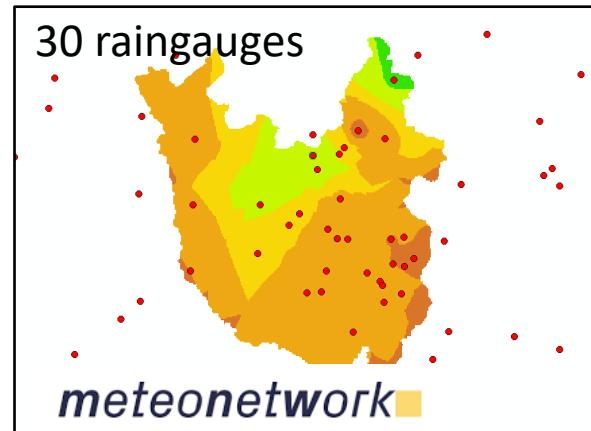
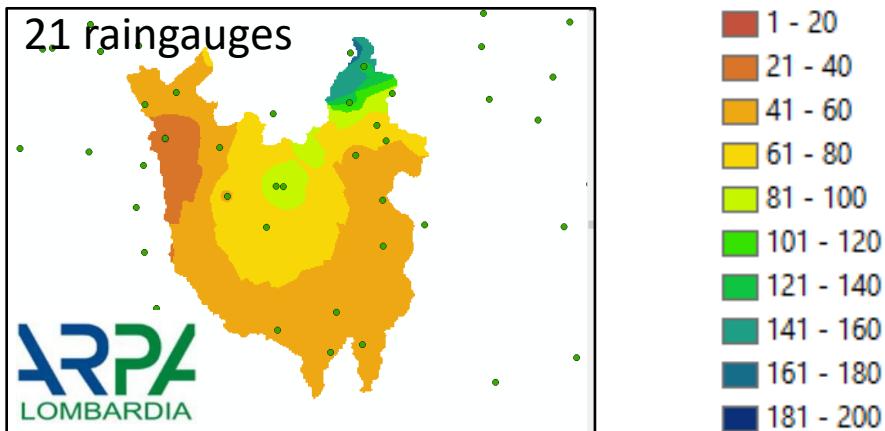
5.5 km, Δt 1h, +72h
8 ensemble



Citizen science and official information integration



24 hours of cumulated rainfall [mm] over the SOL basins



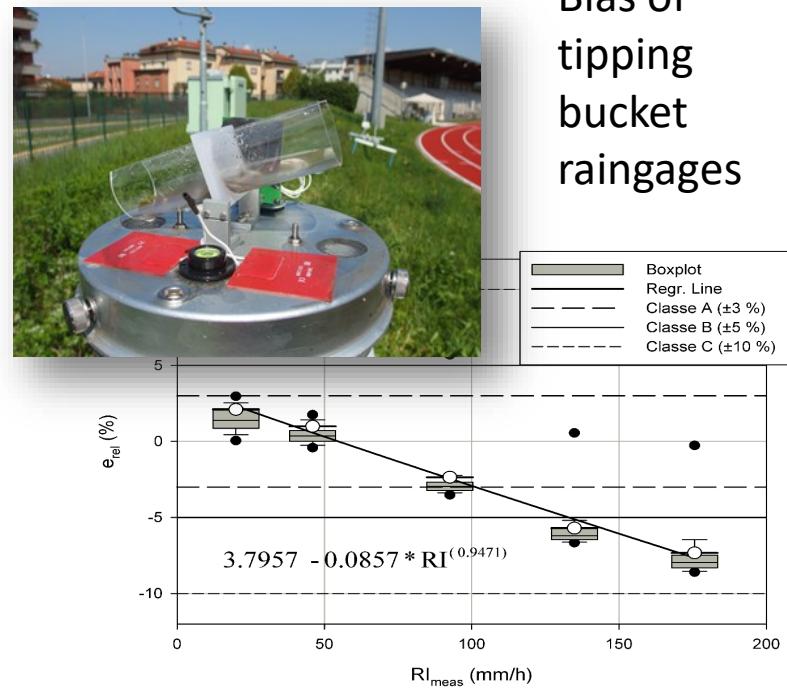
Test of mechanical and wind induced bias on rain measurement

RECONCILING PRECIPITATION WITH RUNOFF

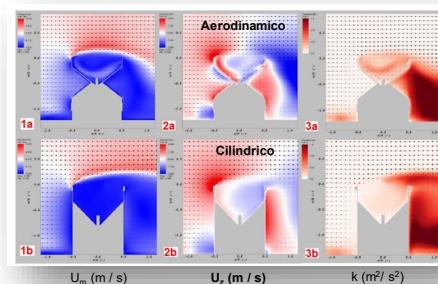
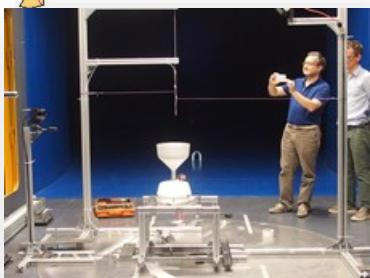
PRIN-15

20154WX5NA

<http://www.precipitation-biases.it/>



Wind induced bias: test in POLIMI wind tunnel



Courtesy of Arianna Cauteruccio PhD thesis

Real time dashboard available online

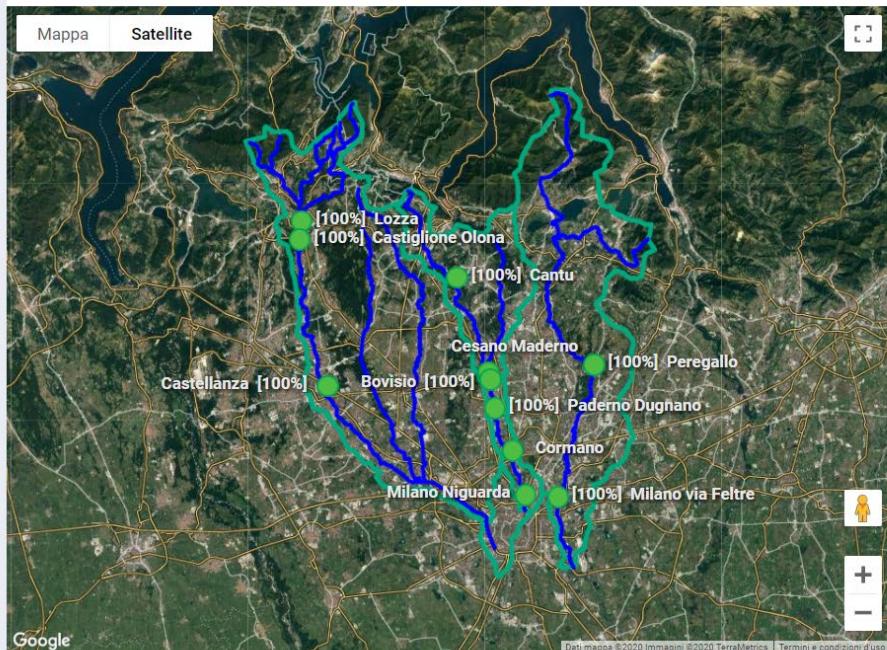
<http://padus.dica.polimi.it/Bacini>



QUANDO ARRIVERÀ LA PROSSIMA PIENA?

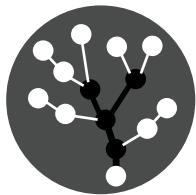
SOL ti fornisce in tempo reale una previsione sulla possibile futura esondazione con un anticipo di **24-36 ore**.

Clicca sui pallini nella mappa per maggiori dettagli - Vuoi approfondire? [CLICCA QUI](#)



Stazione	18/11/2020	19/11/2020	Shift 19/11/2020	20/11/2020
	(100 %)	(100 %)	(100 %)	(100 %)
Lozza				
Castellanza				
Cantu				
Paderno Dugnano				
Peregallo				
Milano via Feltre				
Bovisio				
Castiglione Olona				
Modelli disponibili:	33	33	--	33

THAN YOU FOR YOUR ATTENTION



The Real Time Hydrology
Group

www.fest.polimi.it

Marco Mancini, Giovanni Ravazzani, Chiara Corbari, Alessandro Ceppi, Gabriele Lombardi, Mouna Feki, Veronica Herrera Gomez, Nicola Paciolla, Imen Ben Charfi,