



Landscape risk analysis of pesticides applied in rice paddy areas in Europe: a case study for a watershed in Lombardy

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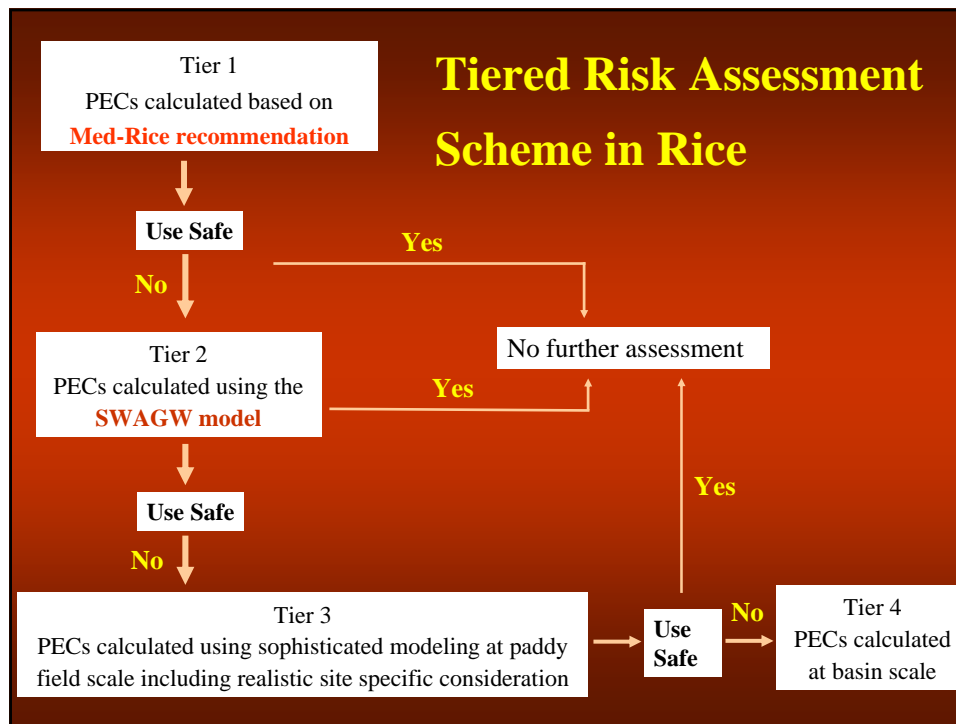


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Risk Assessment in rice in EU

“ Council and Commission recognized that due to particular conditions associated to rice cultivation and the specific criteria and principles referred to in Annex IV were inappropriate”



Mathematical Models for higher tier exposure assessment in rice (Tiers 3 and 4)

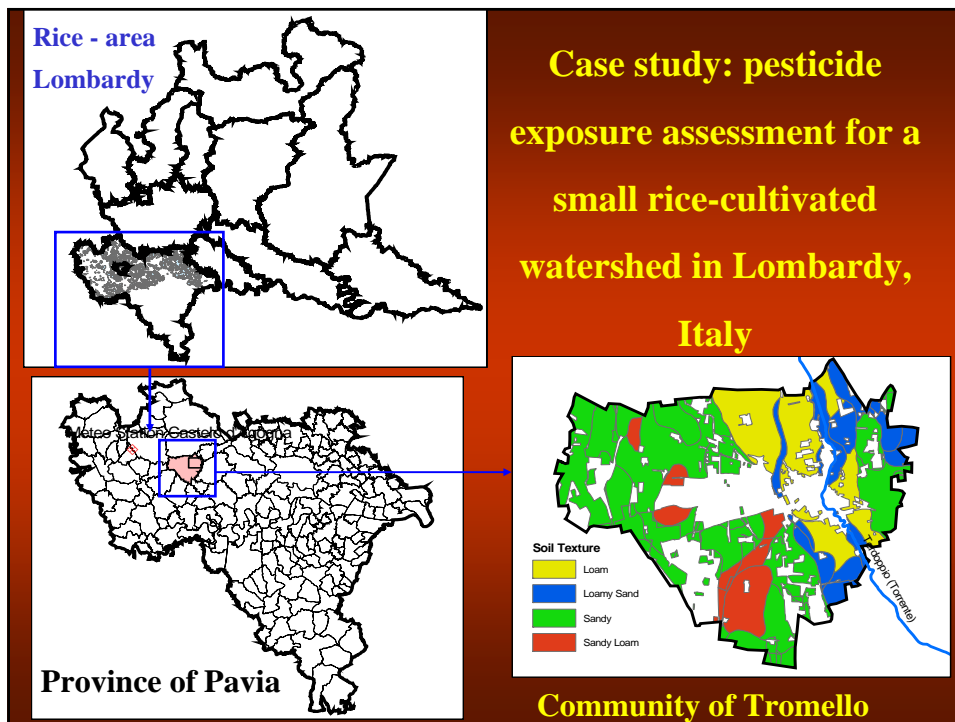
- **RICEWQ 1.6.4v**: PECs in paddy water, paddy sediment and PECs GW when used in an interface with the VADOFT sub-model (Tier 3)
- **RIVWQ 2.02v**: Surface water model used in combination with RICEWQ for receiving water systems (Tier 4)

Tier 4 - Basin Scale Exposure Assessment

Rice paddies, drainage and irrigation canals **and** related natural surface water bodies like streams and rivers **create a unique ecosystem which should be studied as a whole**



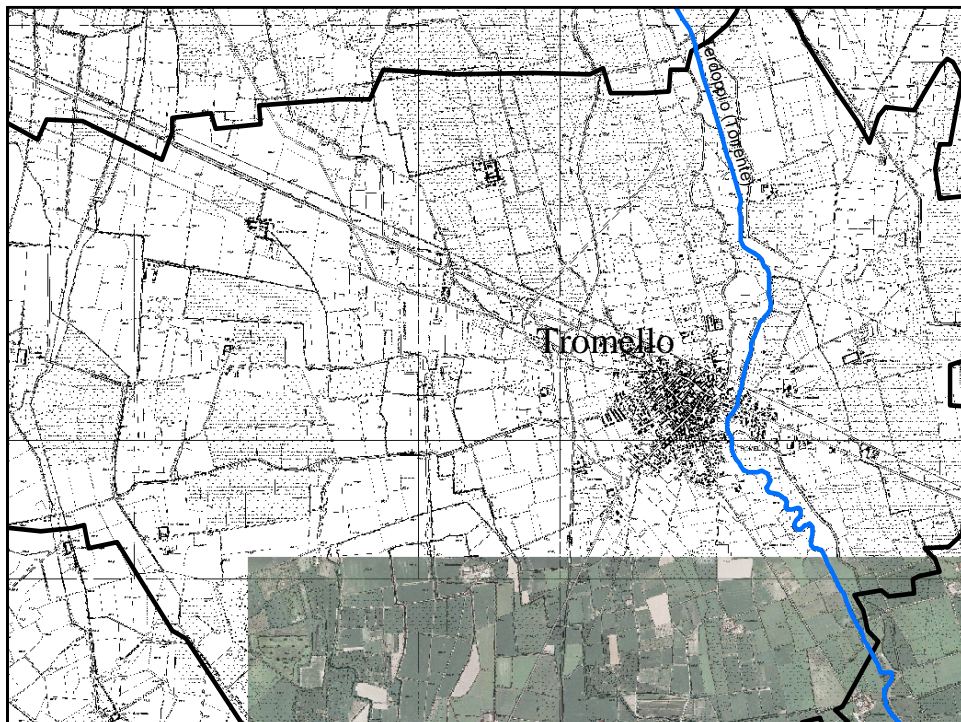
Spatial scaling up is relevant

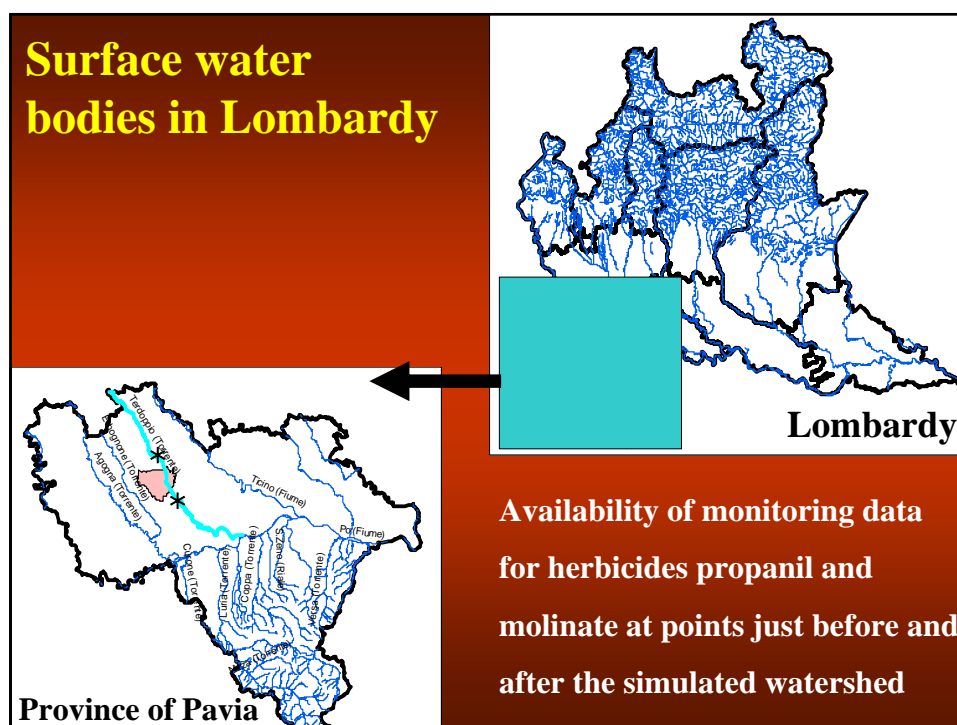
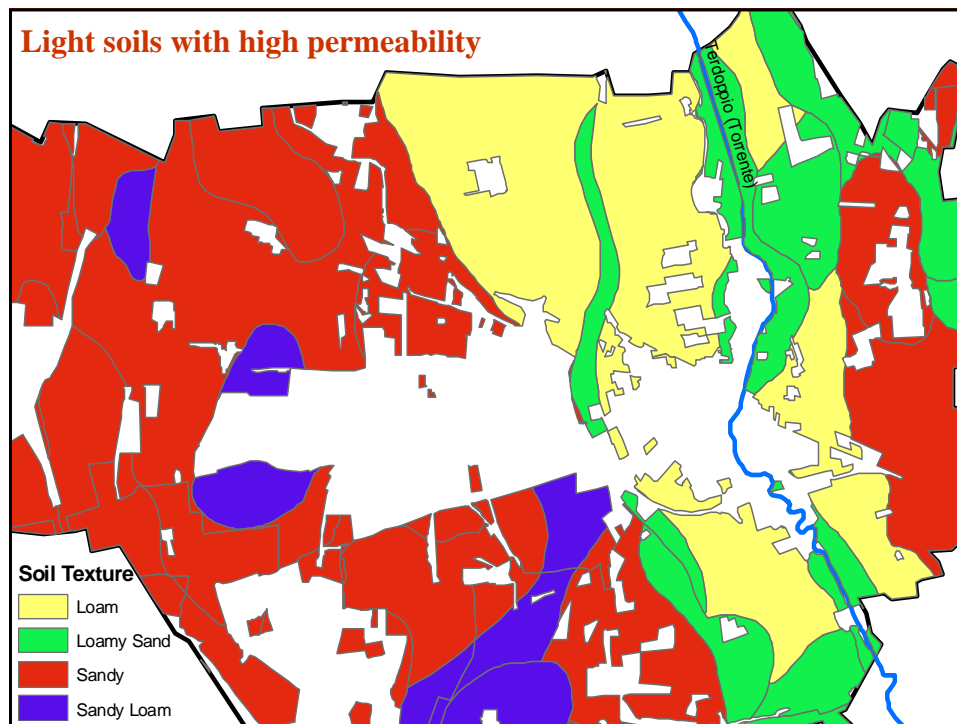


What data were available?

Spatial data for the rice cultivated area of Lombardy
(Lomellina), **Community of Tromello**

- Technical card
- Aerial photographs
- Landuse
- Soil data (soil texture, OM, pH, permeability etc)
- Network of surface water bodies





Aim of the work

- Use of available GIS spatial data in combination with RICEWQ and RIVWQ models to assess the exposure of groundwater and surface water systems (**river Terdoppio**) to pesticides (**propanil and molinate**) used in a rice cultivated watershed in the community of Tromello, Lombardy

Studied Rice Cultivated Watershed

Total Watershed Area: 467 ha (201 paddy fields)

Pesticide Treatment (Scouting and interviews with farmers)

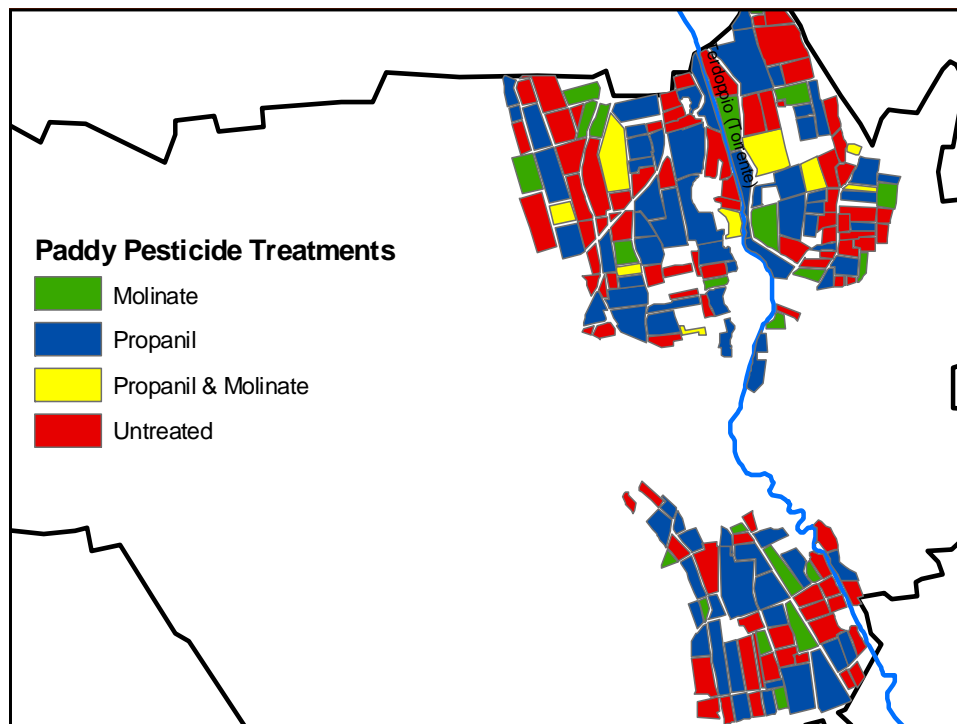
- **Molinate treated area: 73 ha (31 fields)**
- **Propanil treated area: 243.4 ha (85 fields)**
- **Area untreated or treated with other herbicides: 150.6 ha**

Mode of Cultivation (Local experts and interviews)

- **Traditional: 326.9 ha**
- **Dry – seeded: 140.1 ha**

Mode of Irrigation – Drainage

- **Continuous Flow-through system**



Surface water systems simulated

20 Drainage Canals



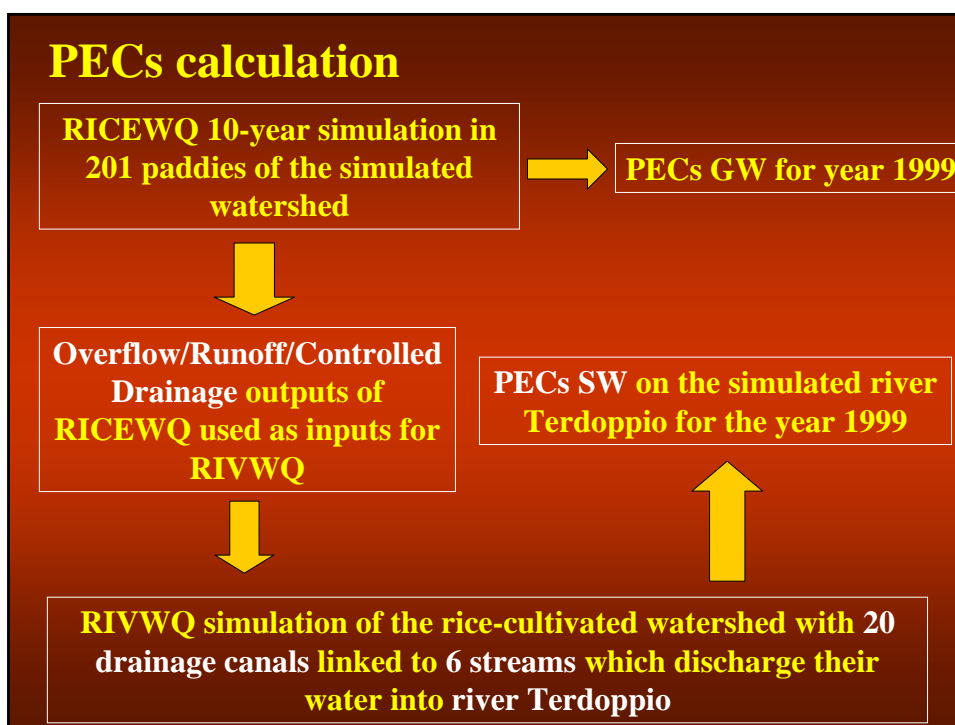
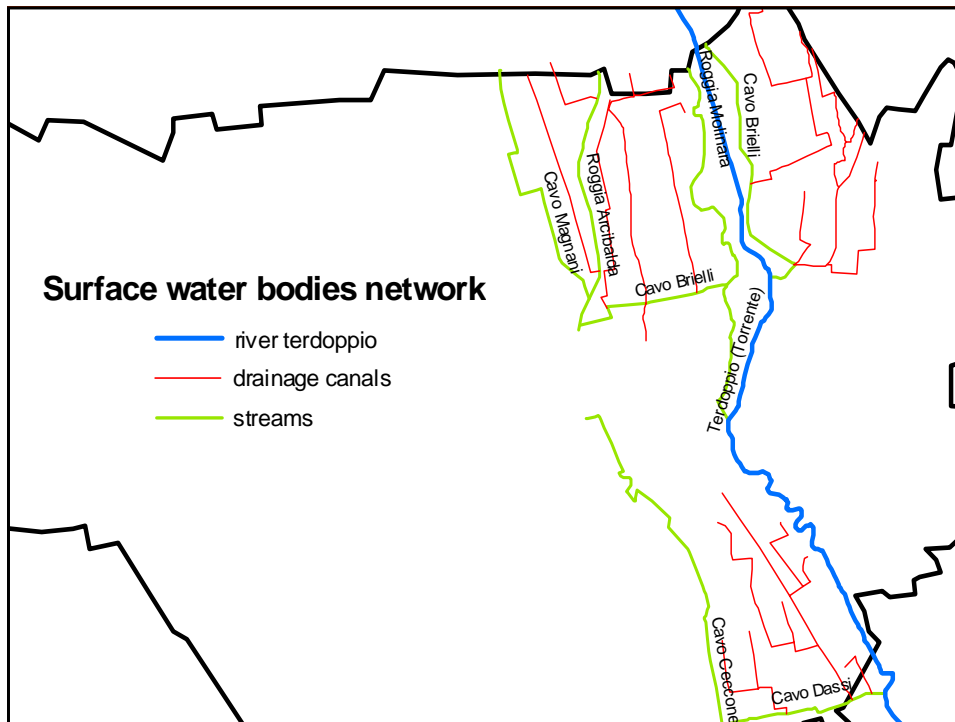
River Terdoppio



6 Streams

C. Brielli, R. Molinara, R. Arcibalda, C. Magnani, C. Ceccone, C. Dassi





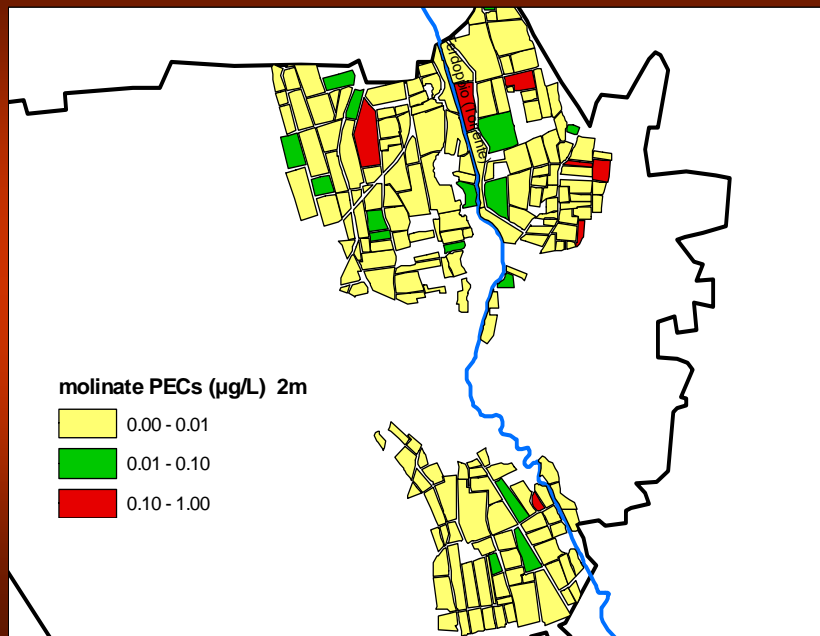
RICEWQ parameterization

- **Irrigation/drainage and crop practices:** Local experts
- **Pesticide Treatment:** Scouting and interviews with farmers
- **Mode of Application:** Local experts
 - No drift for **molinate** (**granular application**)
 - Drift losses 2.77% of the application rate for **propanil**
- **Frequency of application:** 1 per year for molinate (4.5 kg/ha)
2 per year for propanil (4 kg/ha)
- **Pesticide Properties (K_{deg} , K_d , S_w):** Appropriate literature studies
- **Soil – Hydrology (percolation rate, soil texture):** Spatial GIS data

RIVWQ parameterization

Characteristics	Drainage Canals	Streams	River Terdoppio
Shape	Rectangular	Rectangular	Rectangular
Length (km)	Variable	Variable	7
Top Width (m)	1.5	6	15
Depth (m)	1.5	2	4
Flow velocity (m/s)	0.01	0.07	0.2

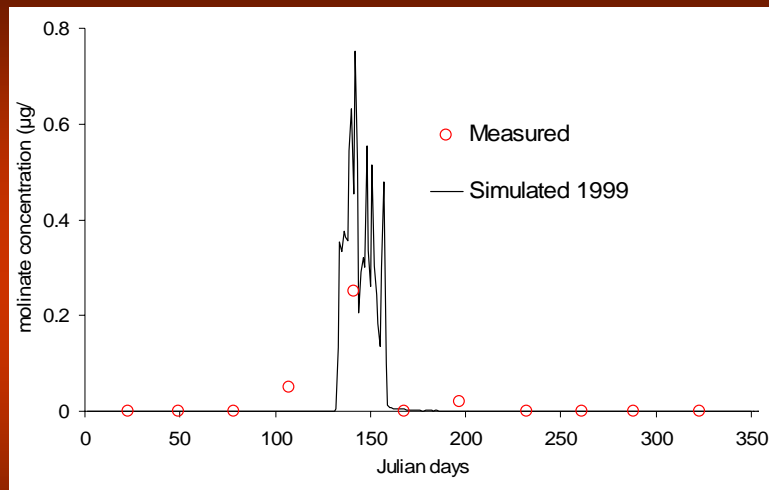
GW Risk Assessment - Molinate



Validation – Surface water predictions

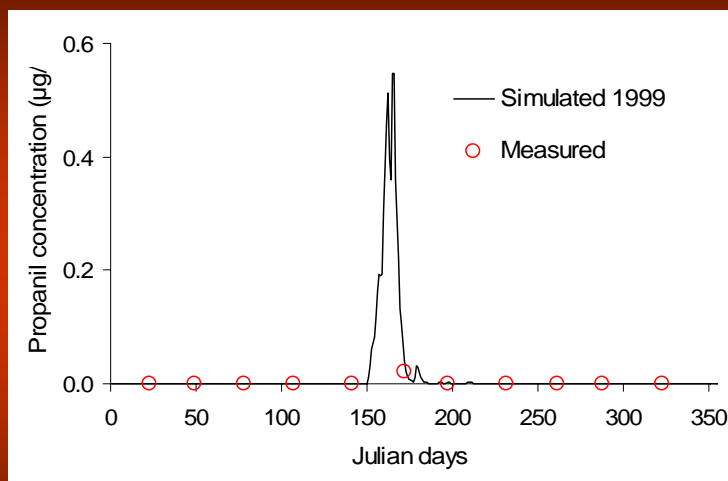
- Comparison of **PECs for propanil and molinate** at the point 6.5 km along the length of the simulated part of the river Terdoppio for the year 1999 with **measured values** at approximately the same point of the river
- Measured data were kindly provided by the Analytical Laboratory of the Province of Pavia

Validation - molinate



Generally good agreement between simulated and measured concentrations of molinate also at temporal level

Validation - propanil



Generally good agreement between simulated and measured concentrations of propanil

Closing remarks

- Propanil entails low risk for GW contamination unlike molinate whose PECs exceeded 0.1 µg/L in certain fields
- Relatively good agreement between measured and simulated values of molinate and propanil in the river Terdoppio
- Landscape risk assessment using GIS as pre- or post-processing tool in combination with RICEWQ, RIVWQ models could be used in higher tier exposure analysis in rice cultivated basins

More information in our website

www.ricewq.org



Special thanks to Marco Pastori, ERSAF for providing assistance and GIS data and to Ms Broglia, Province of Pavia for providing the monitoring data