Assessment of surface water contamination in a large upland catchment - New mixed approach including modelling and frequency analysis

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1- CONTEXT

The assessment of surface water contamination by a pesticide with strong sorption capacities in a large upland catchment in vineyard area: the Brognoligo catchment (Italy).
The risk assessment of pesticide surface transfer in large area is a major concern at present in EU [1].
Available tools or method:
• Use of in situ monitoring with point samplings but difficult interpretation, expensive.
• Use of global or distributed models coupled or not with GIS and pesticide measurements [2] but need a validation phase and a large data set in time and in space.
Problem: all the pesticide inputs are not often known and rather if the studied scale is large

⇒ Assessment a probability of exposure of the streams

2- AIMS

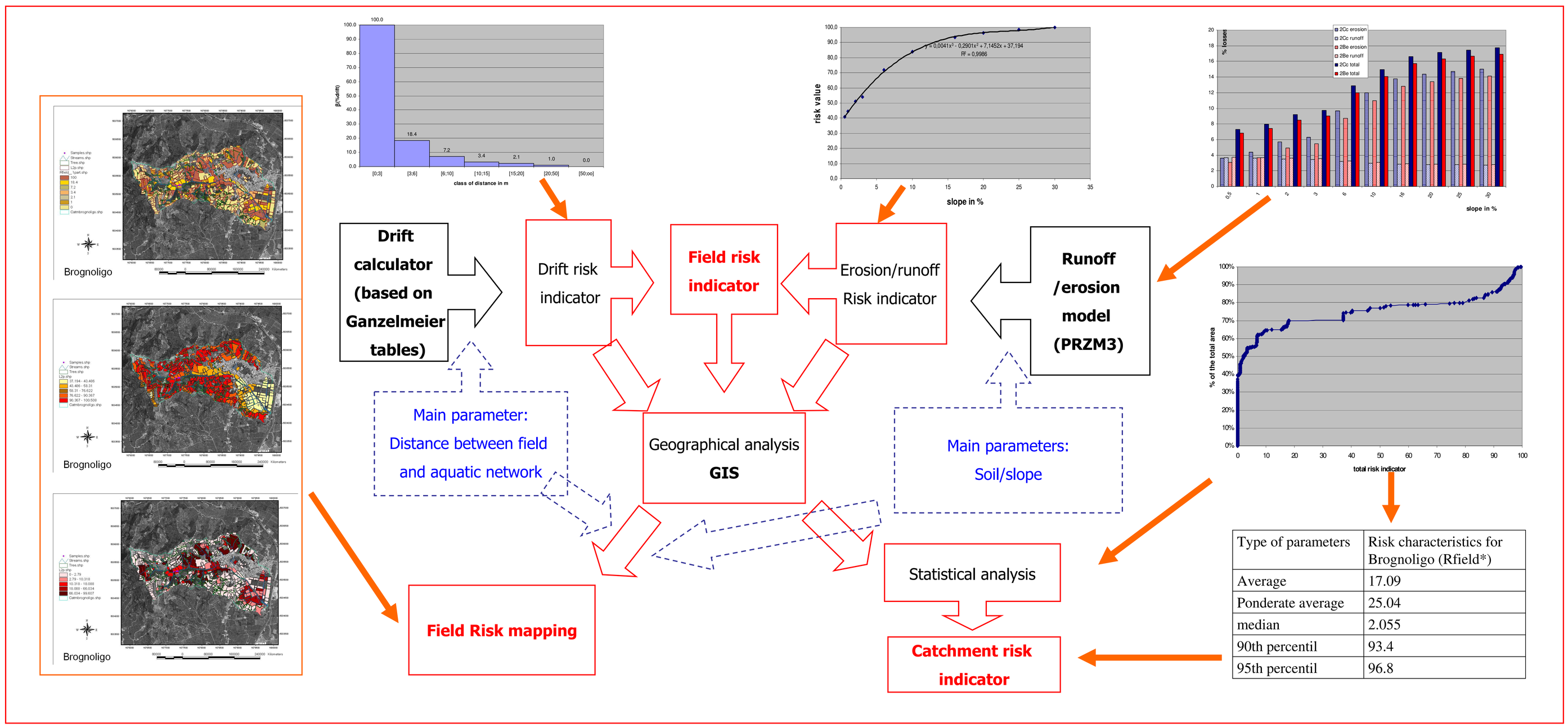
To provide maps of exposure probabilities
To identify the vulnerable areas and water bodies within appropriate sub-catchments
To improve in *situ* monitoring and to find new sampling points of surface waters with a high probability to find pesticide
To help the overall exposure assessment of the sediment and surface water quality and the interpretation of measurements

3- TOOLS AND METHODOLOGY

Development of a new method to assess the probability of exposure to the stream based on modelling, indicator, geographical and statistical analysis

At the field scale, a risk indicator of pesticide transfer is calculated by crossing the possible losses by erosion/runoff and drift. The SWASH drift calculator and the PRZM3 model are used without calibration (with estimated parameters of the fields) to assess the losses at the field scale (in percent of quantity applied), respectively by drift and erosion/runoff according the influent parameters (distance between fields and stream, slopes, type of soil)

For upscaling at the catchment level, different methods used: risk calculation for the fields and frequency analysis for catchment level; frequency analysis of the influent parameters, creation of a virtual catchment with the chosen parameters and risk calculation for this catchment



4-RESULTS

Type of parameters	Risk characteristics for Brognoligo (Rfield*)
Average	17.09
Ponderate average	25.04
median	2.055
90th percentil	93.4
95th percentil	96.8

CONCLUSIONS AND LIMITS

Risk indicator can be a contribution for the risk assessment at large catchment level

However some open questions remain :
Number of parameters to take into account ? (other parameters such as wind speed, wind direction, the influence of buffer zone presence...)
Calculation method ? (simple aggregation, fuzzy logic, other method of calculation of indicator such as statistical analysis of influent parameters and modelling of this "theoretical" field)
Use of modelling (choice of model, parameters, scale...)
Necessity to take account of the hydrology behavior (But in this case need of more precise study)

References

[1] LINDERS J., ADRIAANSE P, ALLEN R., CAPRI E., GOUY V., HOLLIS J., JARVIS N., KLEIN M., LOLOS P., MAIER W.-M., MAUND S., PAIS C., RUSSELL M., SMEETS L., TEIXEIRA J.-L., VIZANTINOPOULOS S., YON D., 2002. FOCUS surface water scenarios in the EU evaluation process under 91/414/EEC. SANCO/4802/2001-rev. 1 (june 2002), 228 p.

[2] CRYER S.A, FOUCH M.A., PEACOCK A.L. and HAVENS P.L., 2001. Characterizing agrochemical patterns and effective BMPs for surface waters using mechanistic modeling and GIS. Environ Model Assess 6: 195-208.