European scenarios for exposure of soil organisms to pesticides

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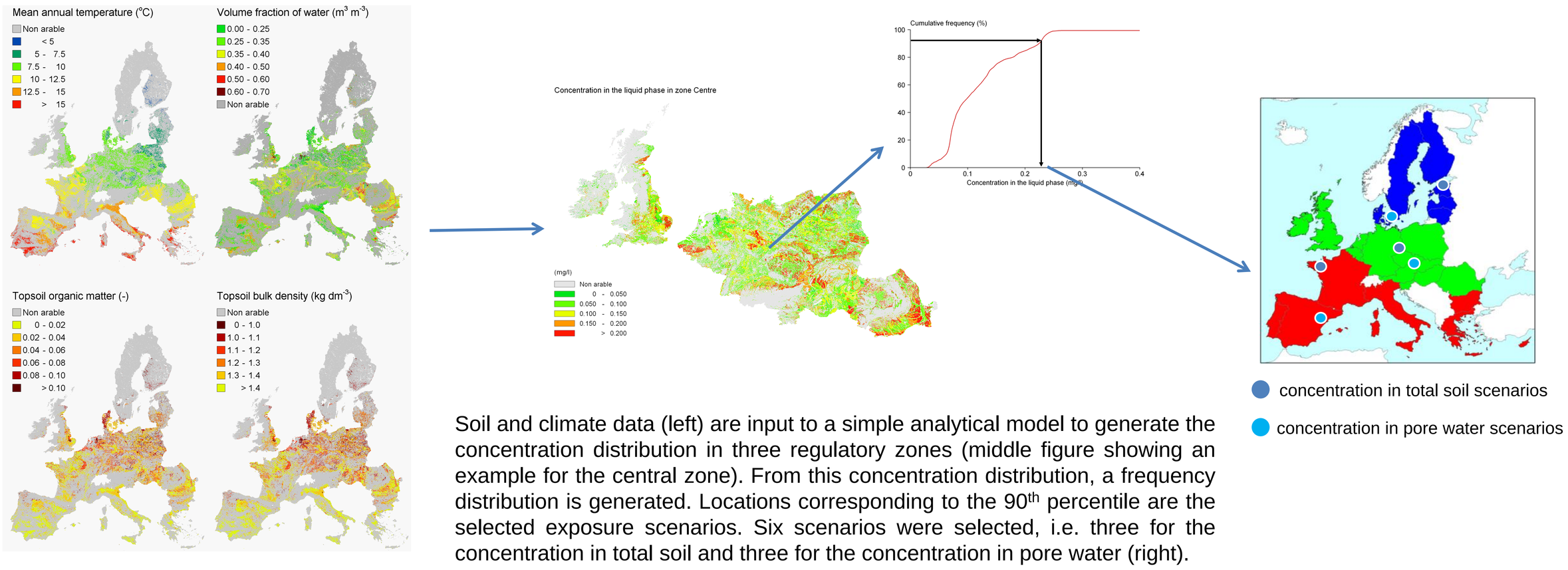
Introduction

European pesticide authorisation procedures require an effect assessment for soil organisms to be carried out. Predicting the environmental concentrations of pesticides by means of exposure models is an essential part of such an effect assessment. The European Food Safety Authority (EFSA) published a guidance document for predicting environmental concentrations of pesticides and their metabolites in soil (EFSA, 2015). Guidance is provided for all types of concentrations that are potentially needed for assessing ecotoxicological effects, i.e. the concentration in total soil (CT) and the concentration in pore water (CL).

Scenario development

The exposure assessment procedure consists of five tiers. Standardised exposure assessment scenarios play an important role in the lower tiers of the assessment (a scenario is a combination of climate, weather and crop data to be used in exposure models). The goal of the exposure assessment is the 90th percentile of the exposure concentration in the area of agricultural use of a pesticide in each of three regulatory European zones (North, Central, South). Separate scenarios were developed for the concentration in total soil (mg/kg) and for the concentration in pore water (mg/L) so that the total number of scenarios developed was six.

A statistical approach was adopted to find scenarios that are consistent with this exposure goal (EFSA PPR Panel, 2012; Tiktak et al., 2013). Scenario development began with the simulation of the concentration distribution in the entire area of use by means of a simple analytical model. In subsequent steps, procedures were applied to account for parameter uncertainty and scenario uncertainty (i.e. the likelihood that a scenario that is derived for one pesticide is not conservative enough for another pesticide). In the final step, the scenarios were defined by their average temperature, soil organic-matter content and their soil textural class.



Soil and climate data (left) are input to a simple analytical model to generate the concentration distribution in three regulatory zones (middle figure showing an example for the central zone). From this concentration distribution, a frequency distribution is generated. Locations corresponding to the 90th percentile are the selected exposure scenarios. Six scenarios were selected, i.e. three for the concentration in total soil and three for the concentration in pore water (right).

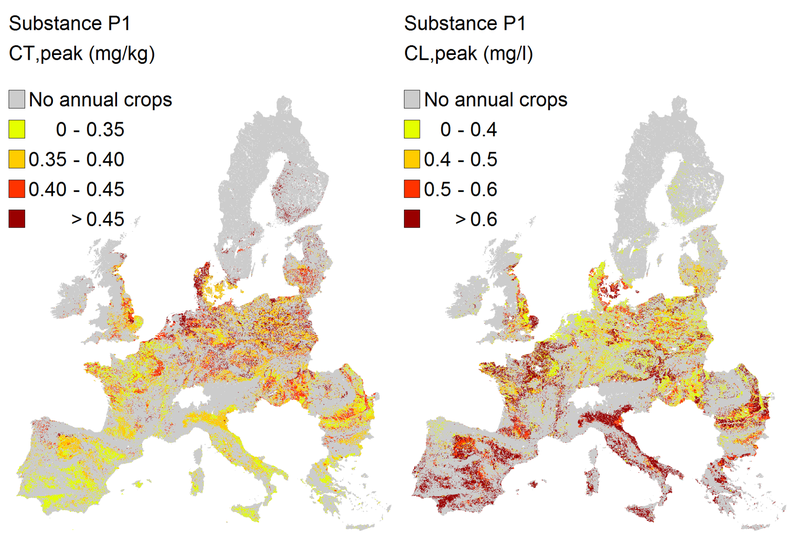
Results and conclusions

Organic matter of the selected scenarios decreased in the order North-Central-South (tables below). Because organic matter has a different effect on the concentration in total soil than it has on the concentration in the liquid phase, the concentration of pesticides in total soil decreased in the order North-Central-South whereas the concentration in the liquid phase decreased in the opposite order.

	T (°C)	OM (%)	CT (mg/kg)
North	5	12	1.0
Centre	8	9	0.8
South	11	5	0.6

	T (°C)	OM (%)	CL (mg/L)
North	8	2.2	0.23
Centre	9	1.6	0.26
South	13	0.9	0.32

Right: The concentration in total soil (CT) decreases from North to South, the concentration in pore water (CL) increases from North to South.



References and acknowledgments

EFSA, 2015. EFSA Guidance Document for predicting environmental concentrations of active substances of plant protection products and transformation products of these active substances in soil. EFSA Journal 2015;13(4):4093, 102 pp. doi:10.2903/j.efsa.2015.4093

EFSA PPR Panel, 2012. Scientific Opinion on the science behind the guidance for scenario selection and scenario parameterisation for predicting environmental concentrations of plant protection products in soil. EFSA Journal 2012;10(2):2562, 76 pp. doi:10.2903/j.efsa.2012.2562

Tiktak A, Boesten JJTI, Egsmose M, Gardi C, Klein M, Vanderborght J, 2013. European scenarios for exposure of soil organisms to pesticides. Journal of Environmental Science and Health, Part B (48):1-14.

This work was performed by the EFSA working group on PECs in soil.

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European Food Safety Authority