

Boulai Y., Conrad A., Sromova K., Tourret M., Vuilleumard P., Farama E. and Mazerolles V.

ANSES – French Agency for Food, Environmental and Occupational Health and Safety, Regulated Products Assessment Department (DEPR), Ecotoxicology and E-fate risk assessment unit, 14 rue Pierre et Marie Curie, 94701 Maisons-Alfort, France

INTRODUCTION

The EFSA guidance (2017) provides the methodology for calculating the PEC in soil of active substances and transformation products which can be used to conduct a tiered terrestrial risk assessment in the context of the Regulation (EC) No 1107/2009.

The methodology relies on specific scenarios which take into account knowledge on soil, weather and crop. The PEC_{soil} calculations for the active substance and/or its metabolite(s) require only a few input parameters mainly related to (a) the application conditions of PPP (e.g., crop, application rate, crop growth stage, application method) and (b) the properties of the active substance/metabolite(s) (e.g., soil degradation and soil mobility).

This poster provides a feedback on how variations in selected input parameters, linked to application conditions and compound properties, influence Tier 2 PEC_{soil} estimates for annual crops.

METHODS

The analytical PERSAM tool (version 3.09) at Tier 2 was used to estimate the concentrations in total soil in a 5-cm soil depth. Results focused on South regulatory zone.

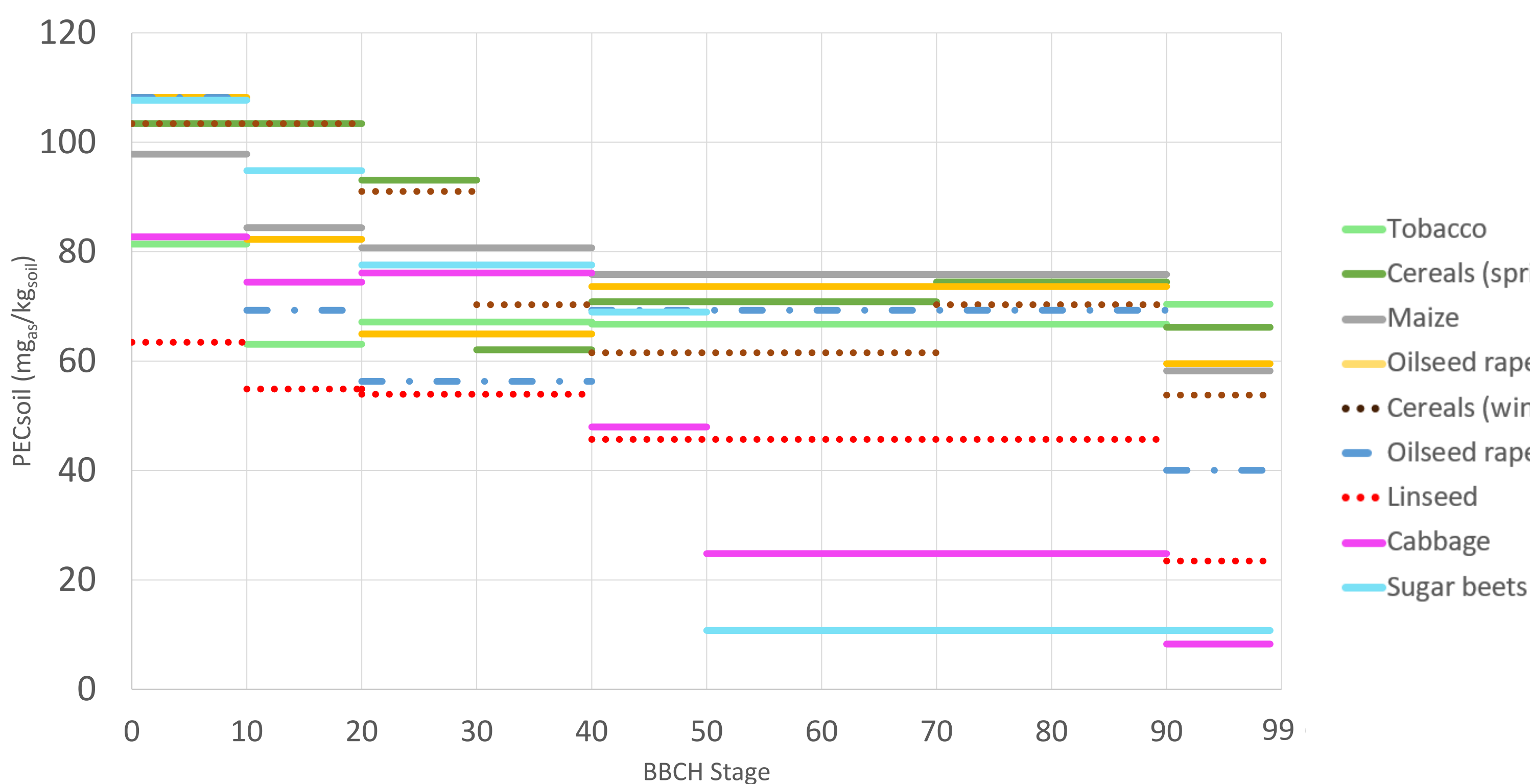
Several sets of PEC_{soil} calculations performed using the following assumptions:

- Annual crops and all application periods as defined in the tool for an application on crop canopy at a rate of 1 kg a.s./ha. Two combinations of parameters $\{DT_{50}(\text{days}) ; K_{oc}(\text{mL/g}_{OC})\} \Leftrightarrow$ Low: $\{0.1 ; 1.0\}$ vs High: $\{10,000 ; 100,000\}$ to estimate the range of possible results.
- Annual crops (**Maize** and **Winter cereals**) at BBCH 00-09 for an application on crop canopy at a rate of 1 kg a.s./ha. DT_{50} ranged from 0.1 to 1,000 d and K_{oc} varied from 1 to 100,000 mL/g_{OC} to characterize the sensitivity of the model with respect to these parameters.

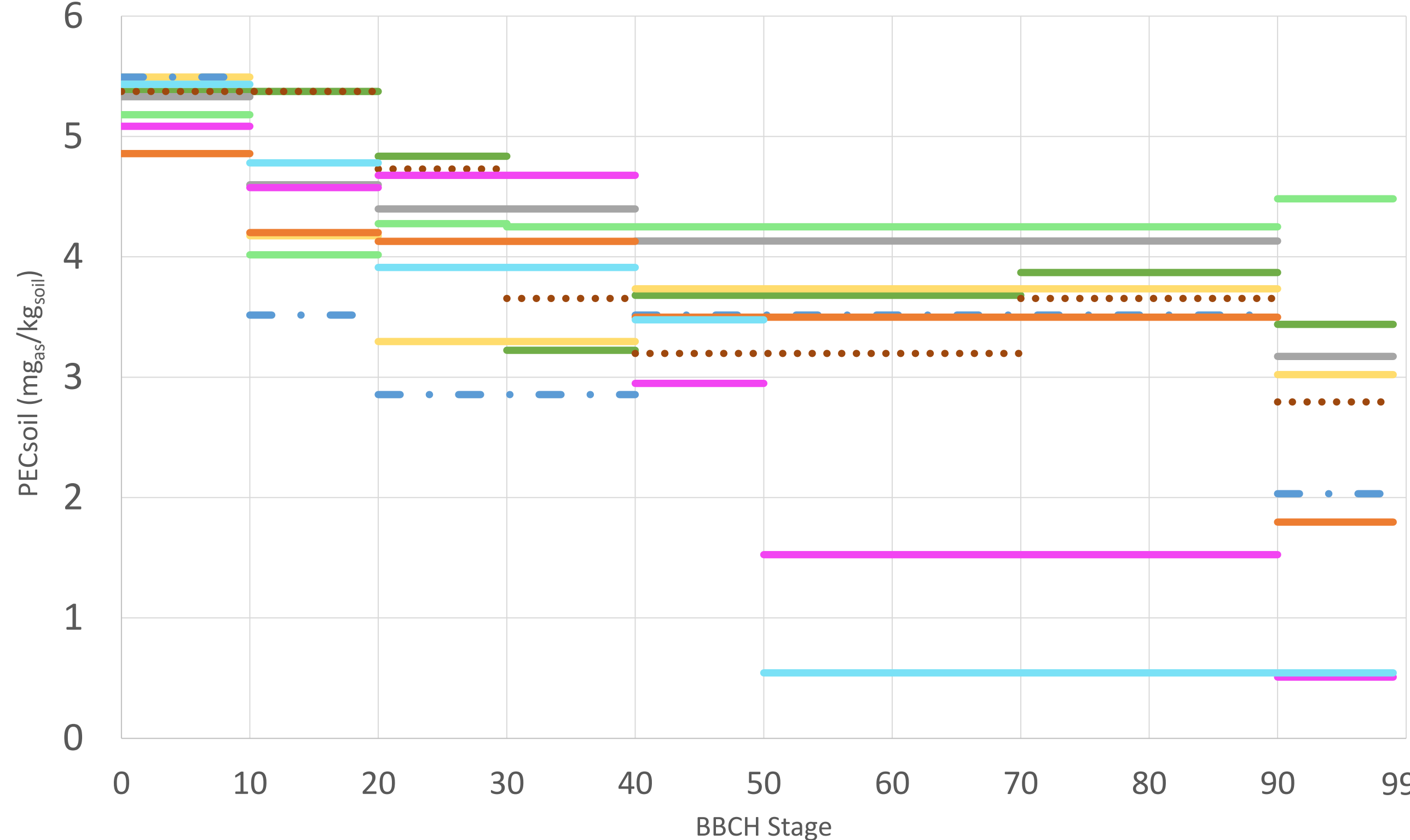
RESULTS

I. PEC_{soil} results related to BBCH stage as defined in PERSAM tool for selected annual crops (application to the crop canopy)

High $\{DT_{50} ; K_{oc}\}$ promoting accumulation in soil layer

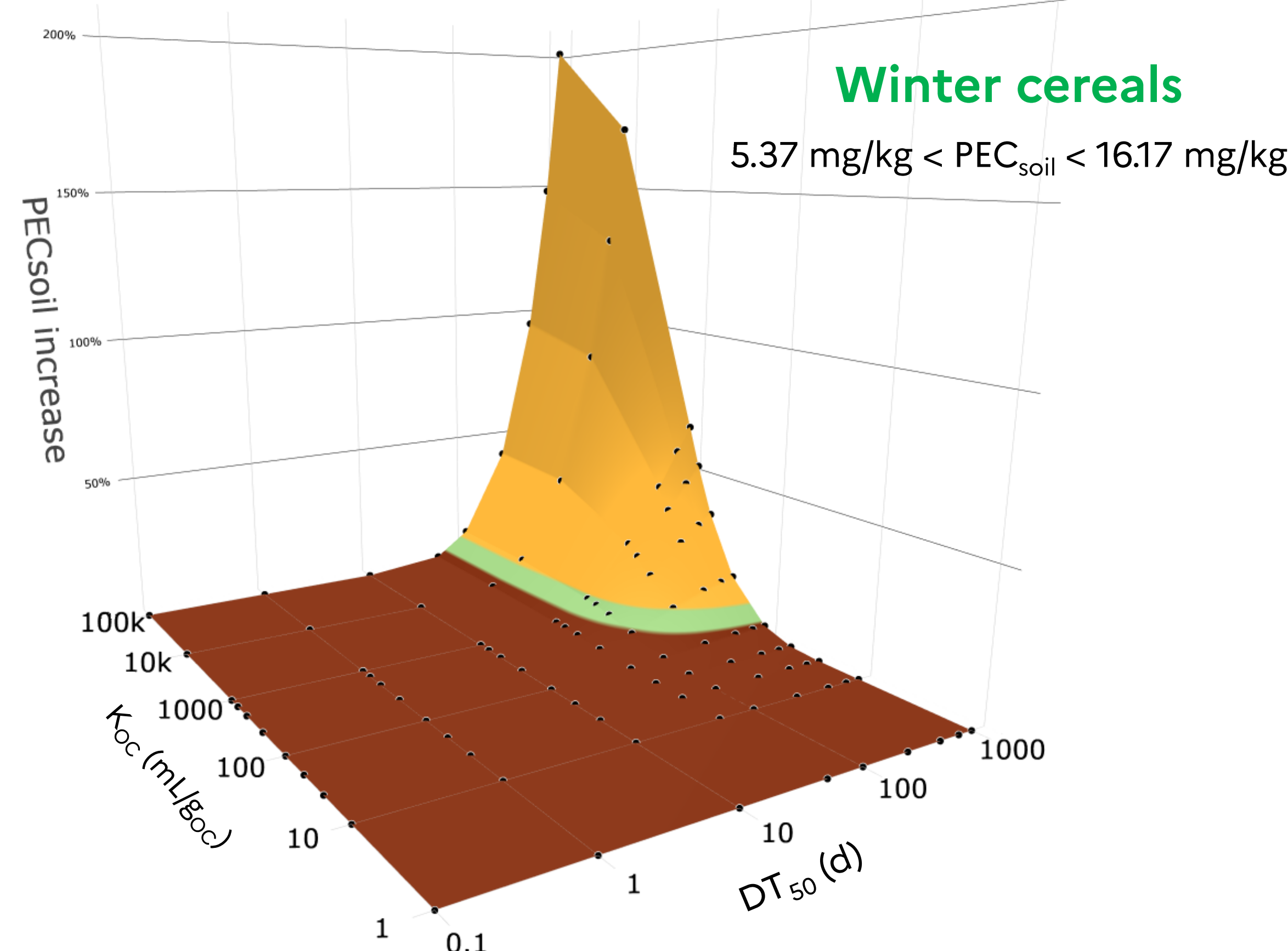
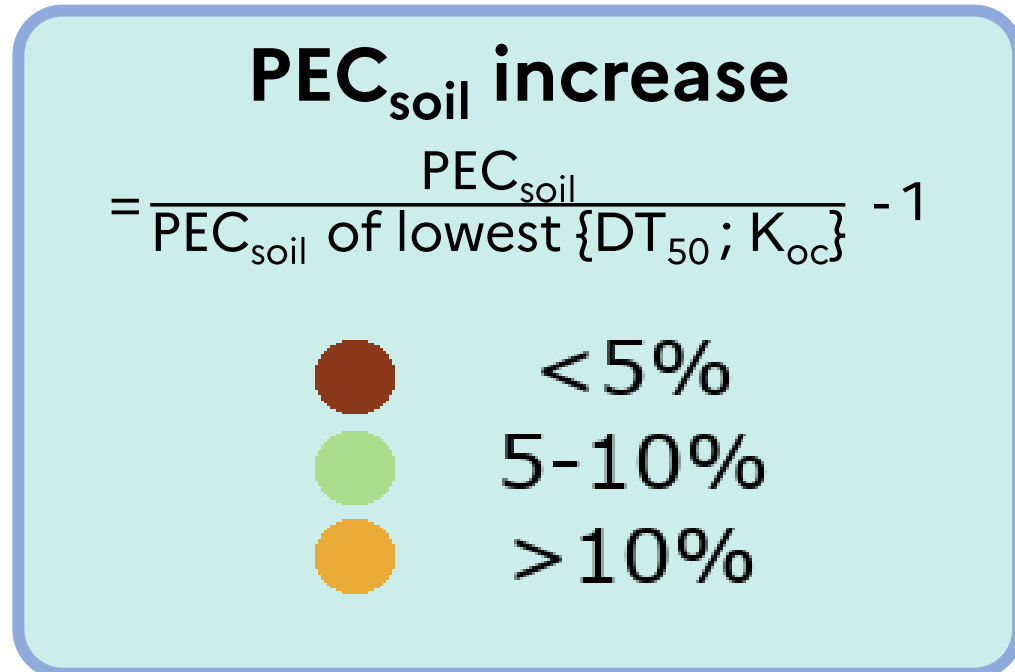
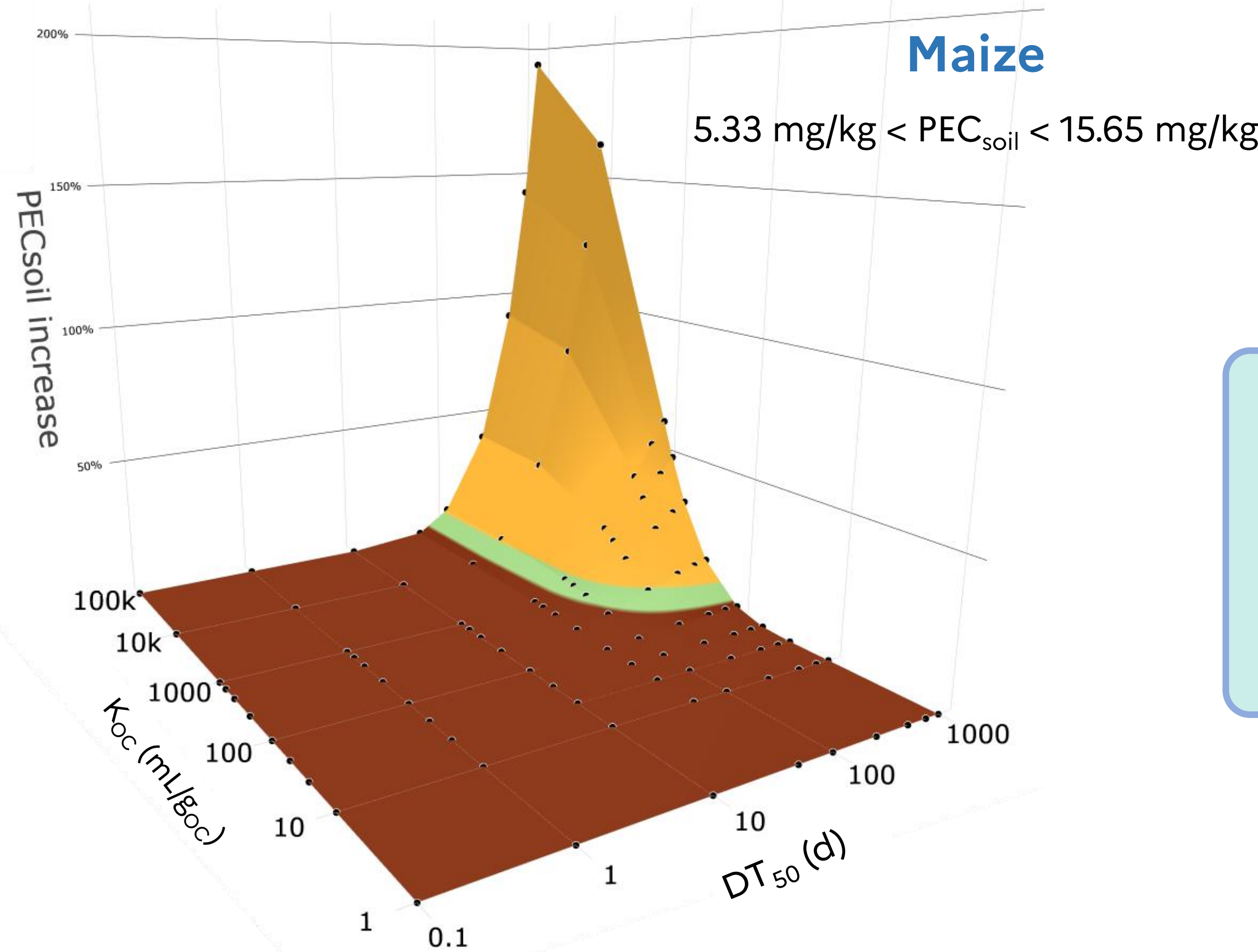


Low $\{DT_{50} ; K_{oc}\}$ limiting accumulation in soil layer



- Crop type and/or application period results in different PEC_{soil} .**
- As expected, 'Low' $\{DT_{50} ; K_{oc}\}$ values lead to lower PEC_{soil} compared to the 'high' $\{DT_{50} ; K_{oc}\}$ values.
- Results at **BBCH 00-09** (all amount reaching the soil) **cover all later BBCH stages** for each crop, but results for a given crop do not necessarily cover all other crops (due to differences in the pedoclimatic scenario selection).
- Across the BBCH 00-99 range, with only a few exceptions, the same trend is observed for all crops: PEC_{soil} for a same crop decrease non-linearly with increasing BBCH stage, due to processes accounted for in the model (e.g., wash-off factor, crop interception).

II. Analysis of effect of simultaneous variation of the pair of parameters $\{DT_{50} ; K_{oc}\}$ on PEC_{soil} results for **Maize** and **Winter cereals**



- For **Maize** and **Winter cereals**: same trend observed - DT_{50} and K_{oc} values impact differently PEC_{soil} results. **Non-linear relationship** is observed between $\{DT_{50} ; K_{oc}\}$ parameters and the PEC_{soil} results.
- PEC_{soil} increase up to ca. 200 % between the 'high' pairs $\{DT_{50} ; K_{oc}\}$ related to the PEC_{soil} obtained with the 'Low' pairs $\{DT_{50} ; K_{oc}\}$.
- When $DT_{50} < 50$ d for all K_{oc} or $K_{oc} < 100$ mL/goc for all DT_{50} , less than 5% of variation on PEC_{soil} is observed for both targeted crops.
- For risk assessment purpose, a deviation on the input parameters will result in more uncertainties on the PEC_{soil} estimated for high DT_{50} and K_{oc} values regarding the tested assumptions.

CONCLUSIONS

This sensitivity analysis of annual crop-related parameters and compound properties improves understanding of Tier 2 model behaviour and helps anticipate its use in risk assessment:

- All tested parameters (Crop, application period, DT_{50} , K_{oc}) affect the Tier 2- PEC_{soil} results for annual crops,
- PEC_{soil} results for BBCH 00-09 cover all later BBCH stages for a given annual crop, but not between crops. 'Risk envelope' approach should be performed with caution
- For the worst-case growth stages BBCH 00-09, in case of $DT_{50} < 50$ d or $K_{oc} < 100$ mL/goc, PEC_{soil} results are in the same order with less than 5 % of variation. For higher DT_{50} or K_{oc} values, the impact on the outcome of the exposure assessment can be high.

Acronyms: a.s.: active substance; EFSA: European Food Safety Authority; PEC: Predicted Environmental Concentration ; PPP: Plant Protection Product

References EFSA (European Food Safety Authority), 2017. 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 2017;15(10):4982, 115 pp.