Sorption hardly affects pesticide concentrations leaching to groundwater assuming degradation in liquid phase only

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Problem
Pesticide leaching as calculated with FOCUS leaching models is very sensitive to pesticide sorption properties; therefore the variability of these properties across different soils leads to considerable uncertainty in the predictions.

Conceptual basis leached fraction not affected by sorption processes when degradation is restricted to liquid phase

Hypothesis 1
Leached fraction equation also true assuming Freundlich sorption and a two-site kinetic model

Procedure test 1
• PEARL calculations assuming steady state water flow
• linear sorption isotherm assuming equilibrium
• Freundlich isotherm assuming 50% equilibrium sites and 50% kinetic sites
• $K_{eq} = 1 \text{ L kg}^{-1}$; DT50liquid phase = 20 d

Conclusion 1
Assuming transformation in liquid phase only and steady state water flow, the leached fraction is not affected by sorption parameters irrespective of the sorption model used.

Hypothesis 2
Assuming transformation in liquid phase only, leaching concentrations calculated in FOCUS groundwater scenarios are a strong function of sorption parameters

Procedure test 2
• Calculations with FOCUS_PEARL v2.2.2 and a modified version of PEARL that simulates transformation in the liquid phase only
• Kremsmünster, winter wheat
• FOCUS example compound D, DT50 = 20 d
• DT50liquid phase = 4.53 d

Conclusion 2
The FOCUS leaching concentration is hardly affected by sorption parameters, assuming that transformation is restricted to the liquid phase.

Recommendations
• Perform sorption and degradation studies for pesticide registration with same soils
• Explore usefulness of this approach in pesticide registration procedure