Site specific pesticide emission patterns

Influence of site specific emissions patterns on pesticide impact potential

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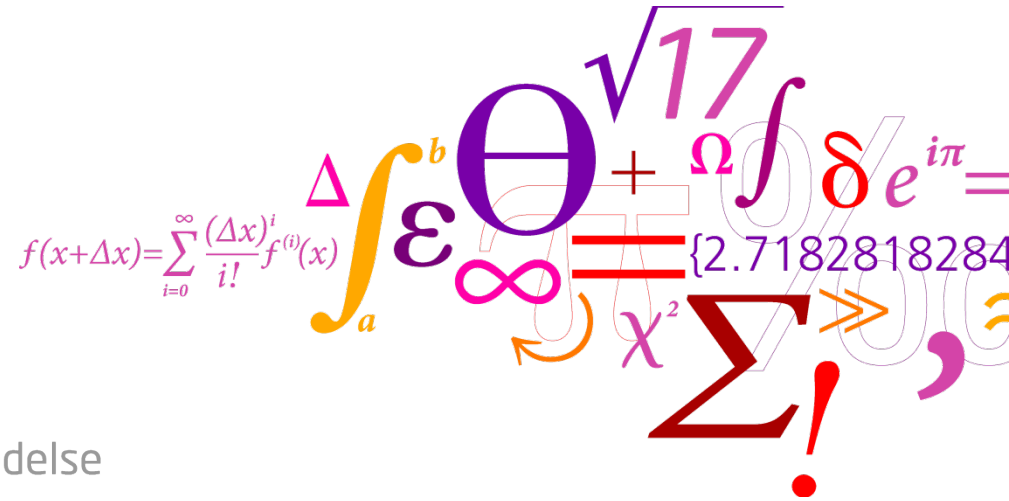

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Agenda

- Aims
- Method
- Results: soil and climate specificity
- Results: impact potential comparison
- Discussion
- Conclusion

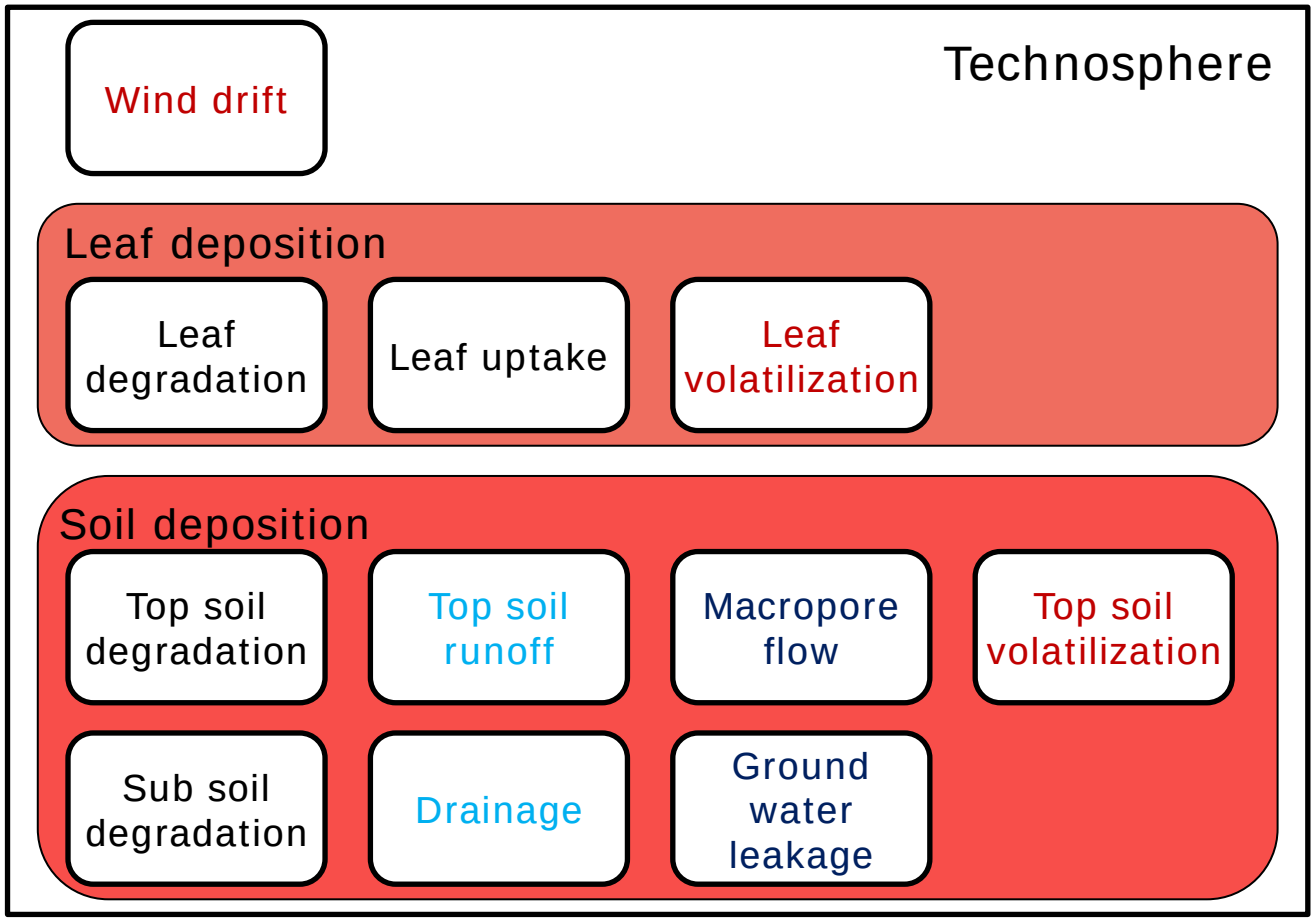
Aims

- Illustrate pesticide emission variability with location
  - Total emissions
  - Distribution
- Show difference in impact potential between current (Ecoinvent) and PestLCI approach

Method (1/4)
Pesticide inventory modeling

- PestLCI is an LCI model to estimate pesticide emissions from a field to 3 compartments:
  - Air
  - Surface water
  - Ground water
- Field: part of technosphere
- PestLCI 2.0: updated and expanded model
  - New version allows for spatial and temporal variation of pesticide emission factors

Method (2/4)
PestLCI 2.0



Emissions to:

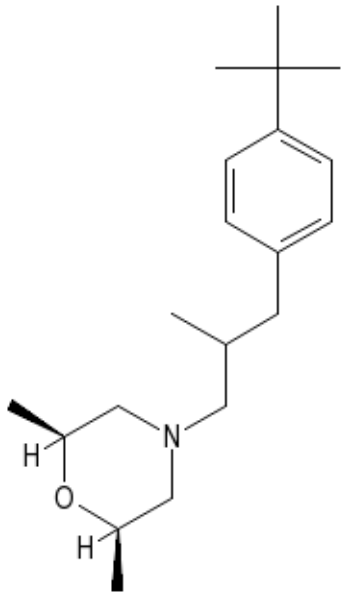
- Air
- Surface water
- Ground water

Method (3/4)
Climate and soil specificity

Scenarios

- pesticide Fenpropimorph, 1 kg ha^{-1}
- crop Maize, stem development
- month May
- climate set DK, SE
- soil S1, S2, S3

- Other model parameters unchanged

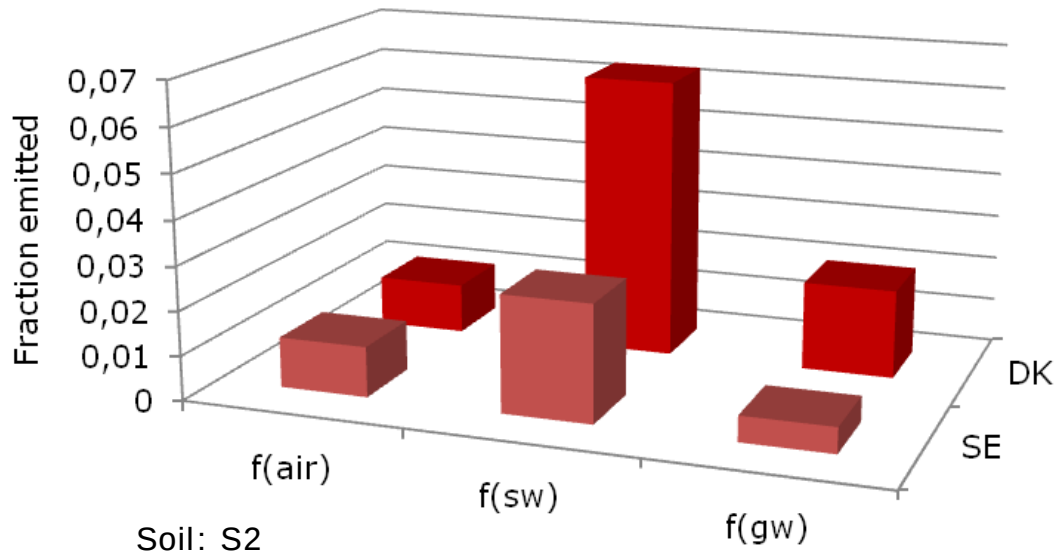


Method (4/4)
Implication on impact potentials

Impact potentials (IP) for freshwater ecotoxicity are compared using 2 approaches

- Current approach: Ecoinvent
  - All applied pesticide emitted to soil
  - IP calculated using USEtox CF for emissions to soil
- PestLCI approach
  - Emissions to air and surface water
  - IP calculated using USEtox CF for emissions to air and surface water

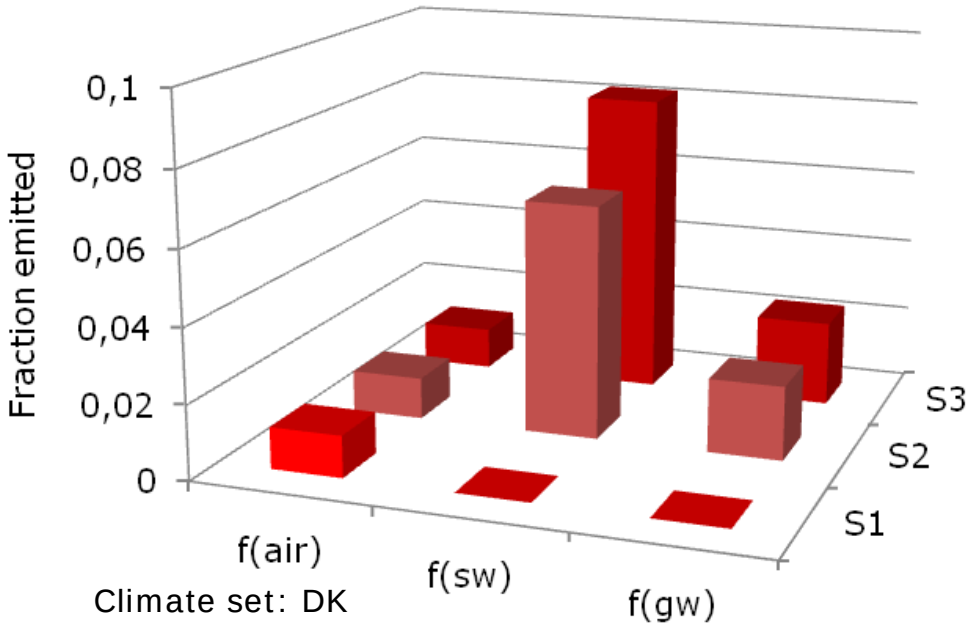
Results (1/3)
Climate specificity

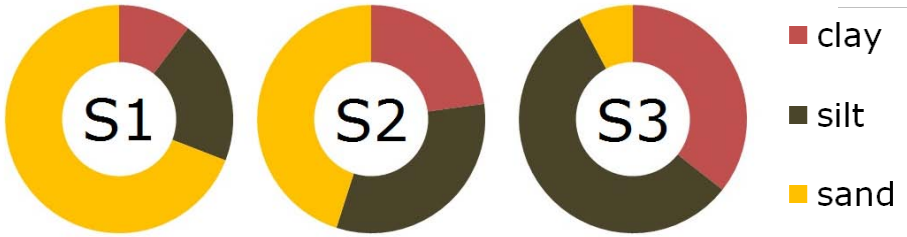


Soil: S2

- Total emissions (fraction):
  - 0.094 (DK)
  - 0.043 (SE)
- Site variability
  - f_{air} 1.0
  - f_{sw} 2.4
  - f_{gw} 3.5

Results (2/3)
Soil Specificity





- Total emissions (fraction):

  0.011 (S1)

  0.094 (S2)

  0.116 (S3)

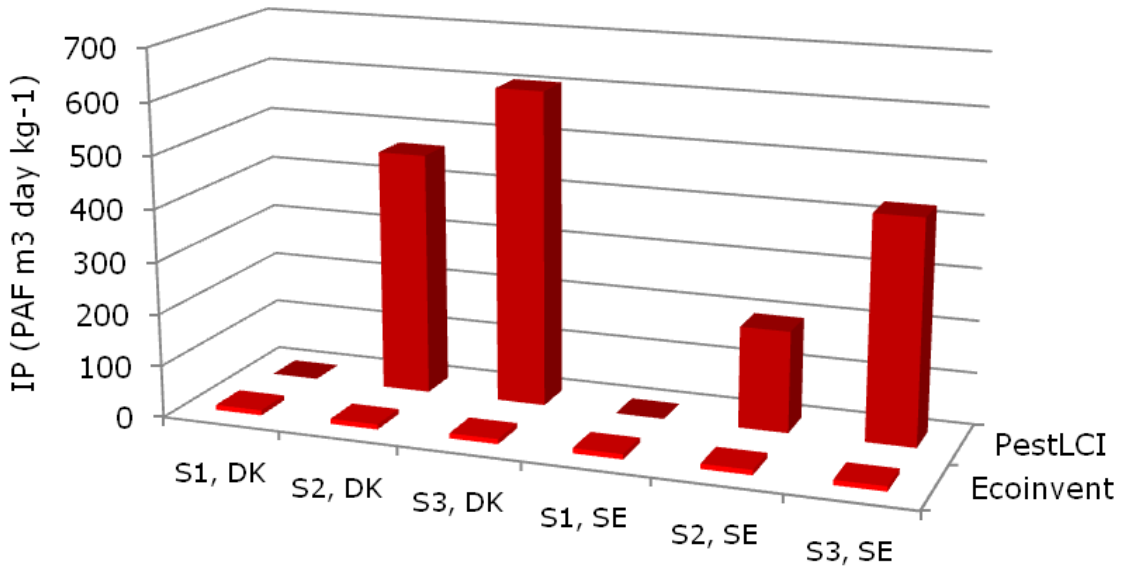
- Site variability

  f_{air} 1.0

  f_{sw} $1.7 \cdot 10^{4}$

  f_{gw} $3.2 \cdot 10^{3}$

Results (3/3)
Impact potential comparison



USEtox characterization factors:

Air, countryside	7.2
Surface water, countryside	$7.4 \cdot 10^3$
Agricultural soil	9.8

- Emissions: PestLCI < Ecoinvent factor ~10-100
- Impact potentials: Ecoinvent < PestLCI up to factor ~60

Discussion

Pesticide emissions

- Climate specificity relatively low
- Potential overestimation soil specificity
- Total emissions 1.1-11.6%; average 7.0%

Impact potentials

- PestLCI approach: low emissions, high IP
- PestLCI approach: no emissions to soil
- Ground water CFs are not included in USEtox

Conclusion

- Pesticide emissions are site-specific
  - soil and climatic circumstances
  - to compartments and summed

- Current LCI approach underestimates impact potential of pesticide emissions

Thank you for your attention!

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