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GREEN WORLD RESEARCH

Numerical accuracy of PEARL calculations for leaching from lysimeters

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Introduction

Procedure

Results

Conclusions

Introduction

Earlier workshops: high accuracy needed to solve inverse modelling problems

Normal procedure in past:
compartment thicknesses of 5 cm
(maximum number of layers usually less than 100)

PEARL:
-500 compartments
-controls timestep so user only responsible for compartment thickness

Aim: evaluate effect of compartment thickness on accuracy for leaching concentrations around 0.1 ug/L

Procedure

scenario considered:
- Hamburg soil
- Hamburg weather (FOCUS database)
- lysimeter of 1.2 m deep
- winter wheat

example pesticide:
- K_{om} = 35 L/kg
- half-life variable 15-20 days
- long-term sorption kinetics:
  $K_{om,ne} = 0.5\ K_{om,eq}$
  desorption rate coeff. of 0.01 d^{-1}
- default parameters from FOCUS

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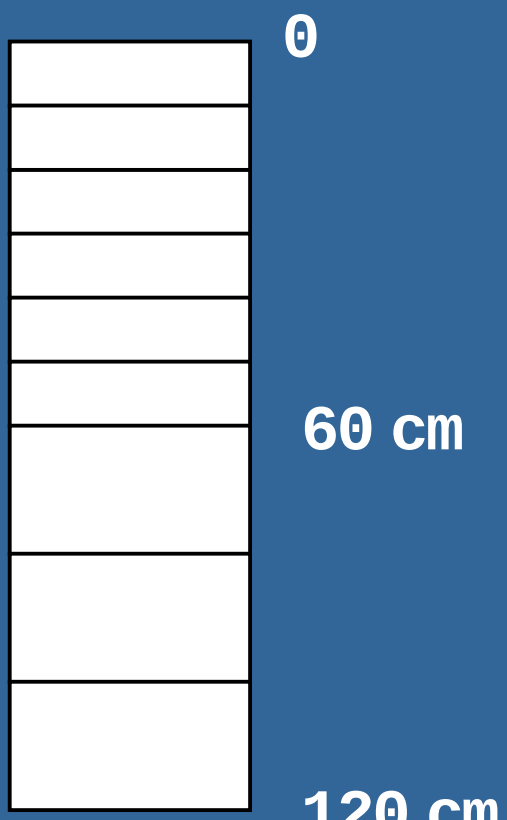
Procedure

case:
- 1 kg/ha applied at 5 June 1905
- total amount leached 1905-1910

compartment thickness:
- uniform in 0-60 cm and 60-120 cm
- two times thicker in 60-120 cm



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Results

- percentage leached presented as function of compartment thickness in 0-60 cm layer

half-life (d)	15	20
% leached	0.01	0.1
C_{MAX} (ug/L) in percolate	0.02	0.3

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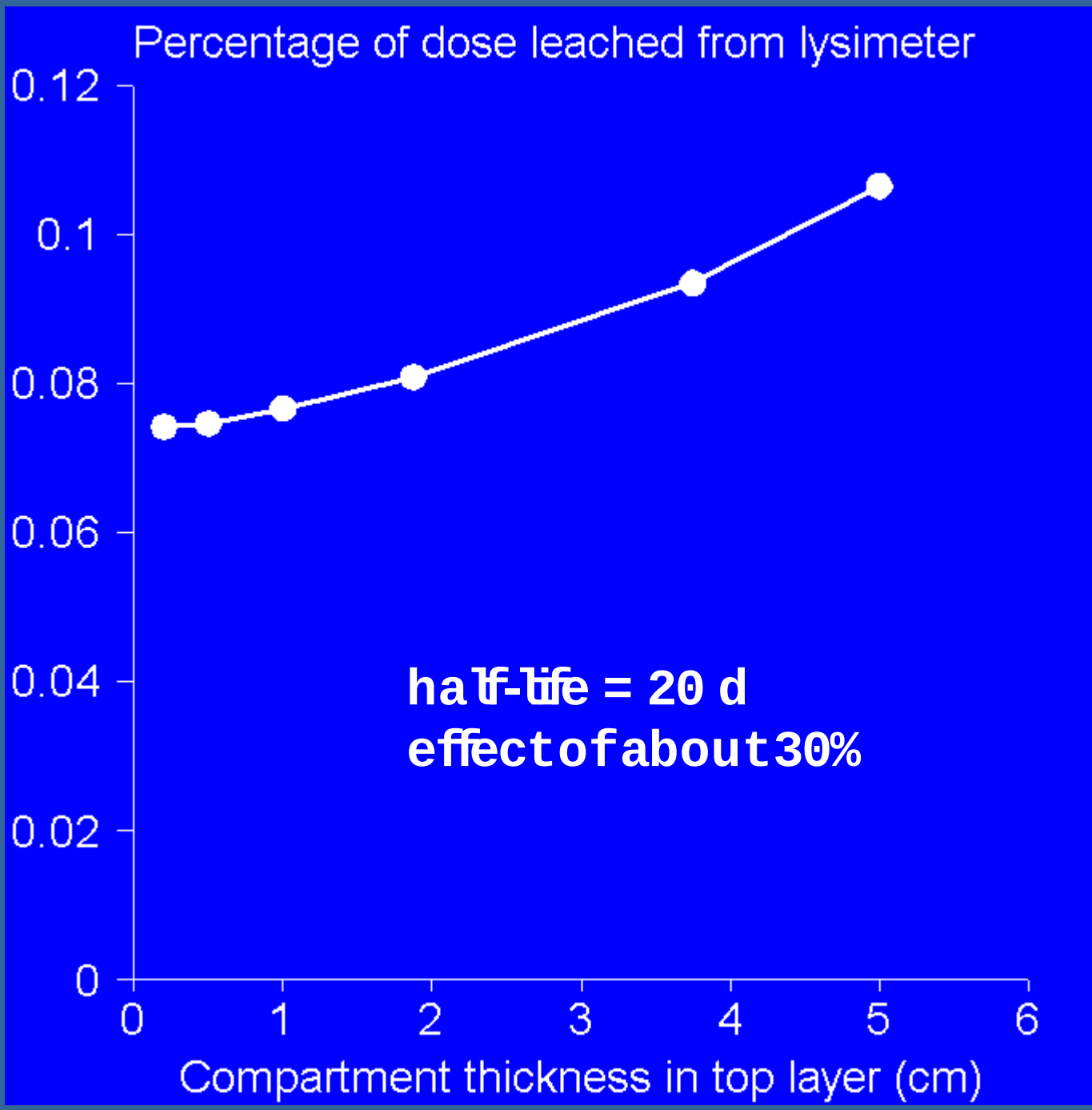

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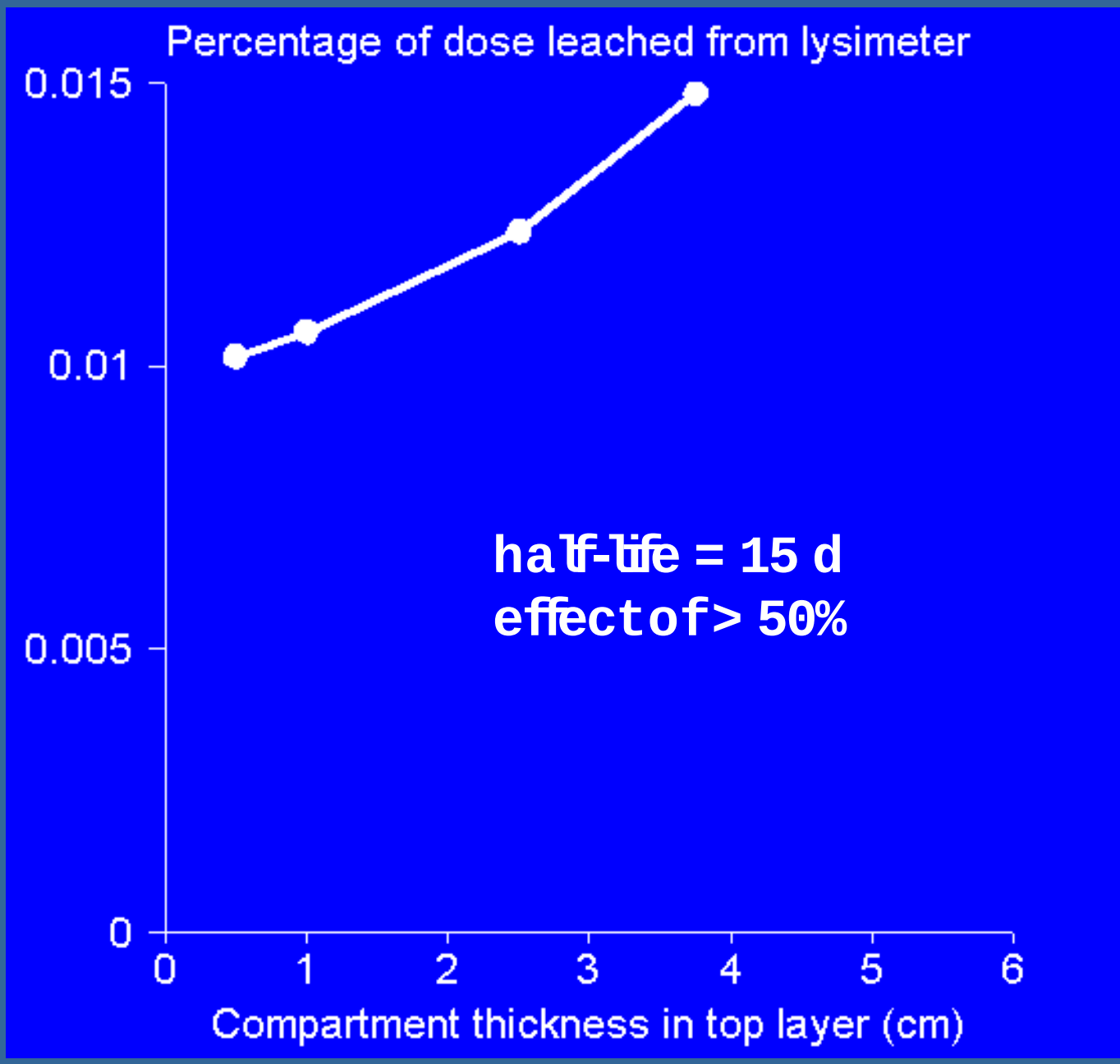

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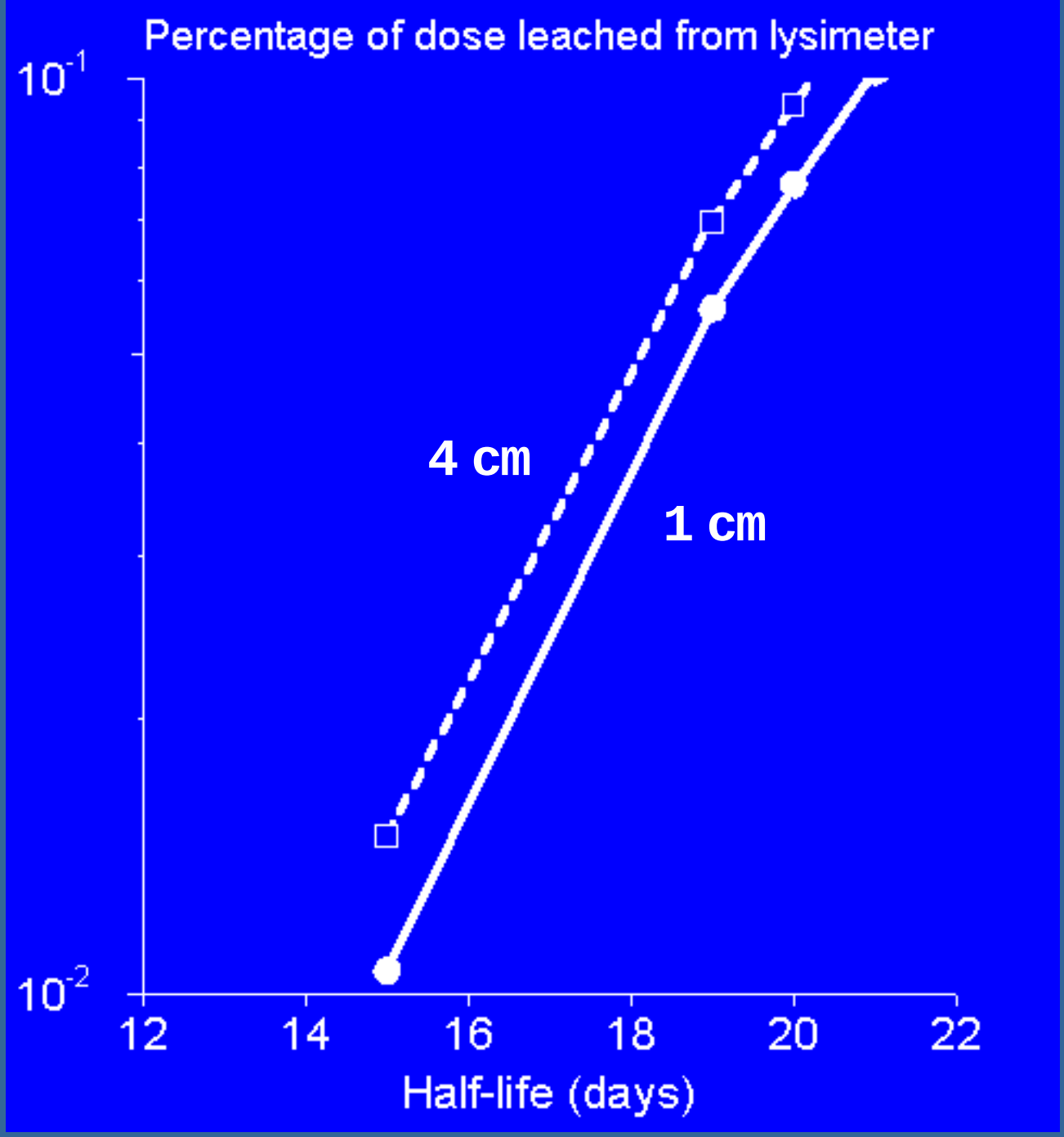

Numerical error corresponds with difference in half-life of order of 1 day

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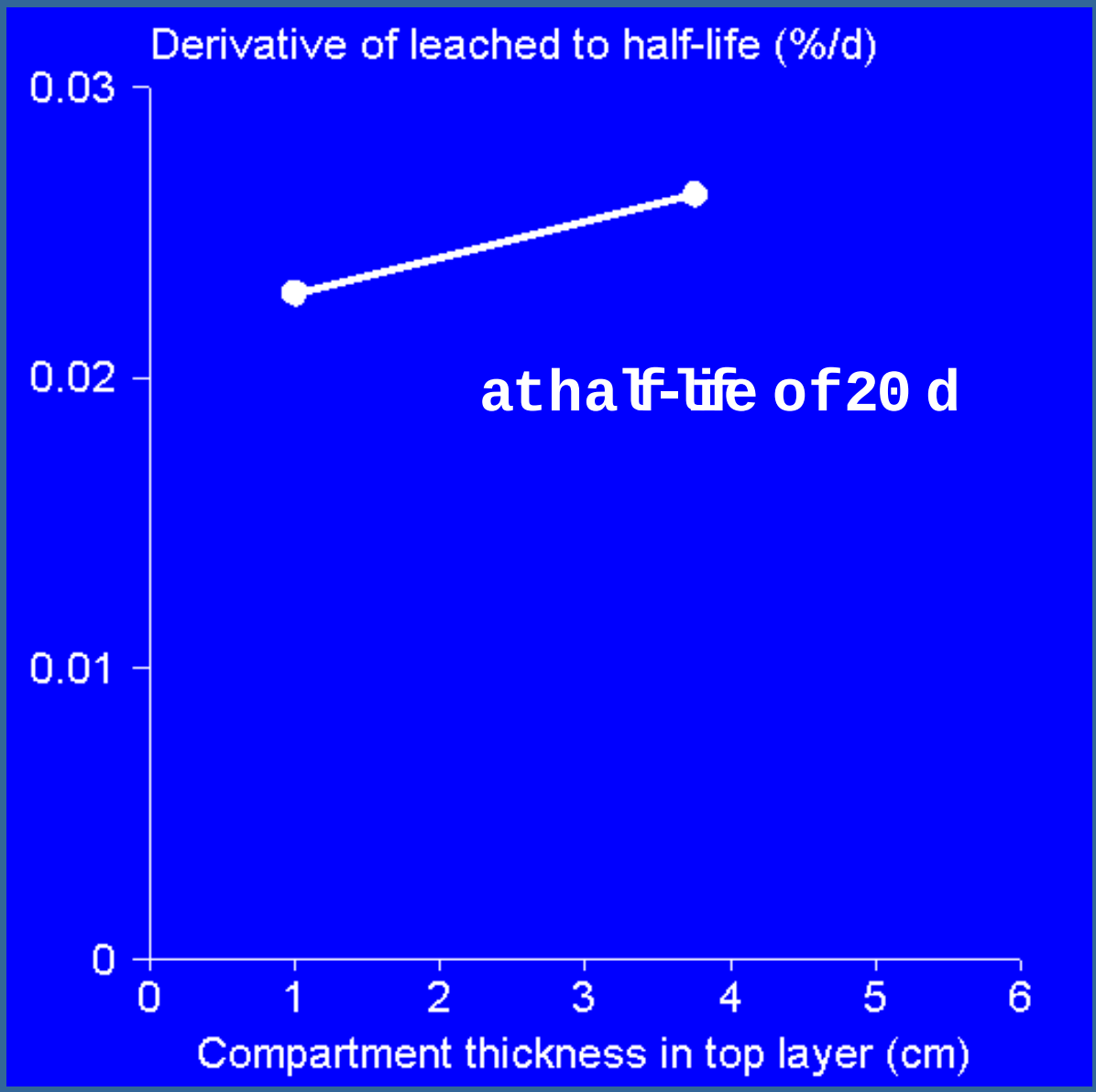

Inverse modelling based on derivatives of model output to parameter values

inaccuracy in derivative limited to 20%

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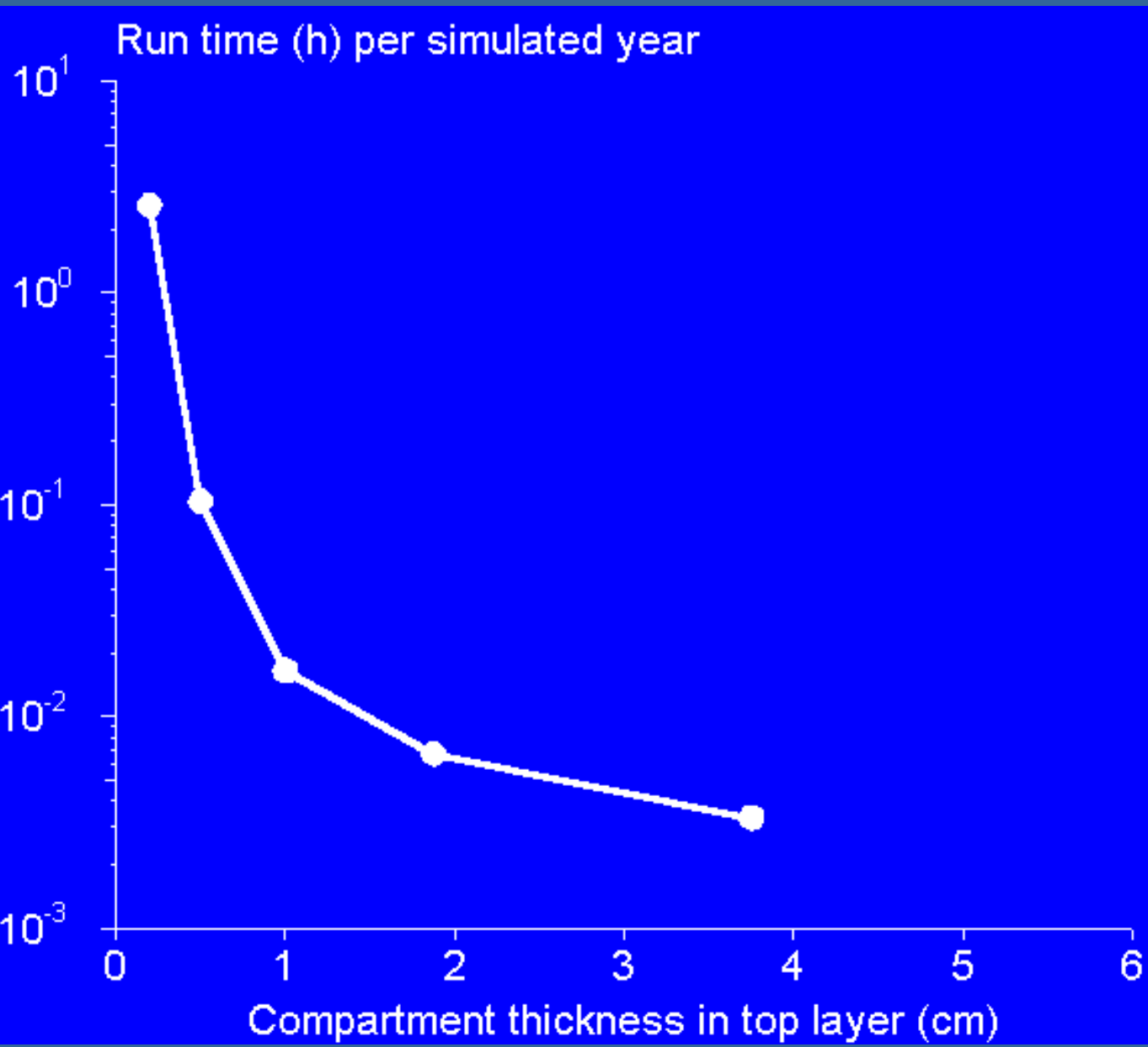

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Conclusions

- higher accuracy leads to less leaching

- in critical range compartments of 5 cm overestimate leaching by 30-50%

- errors in derivatives in order of 20%

- too thick compartments, then inverse modelling gives too short half-life (and too large K_{OM})

- sensitivity to half-life overrules inaccuracy
(if correct optimum
is found, error in half-life is small)