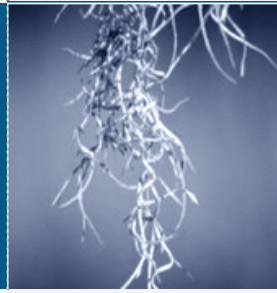
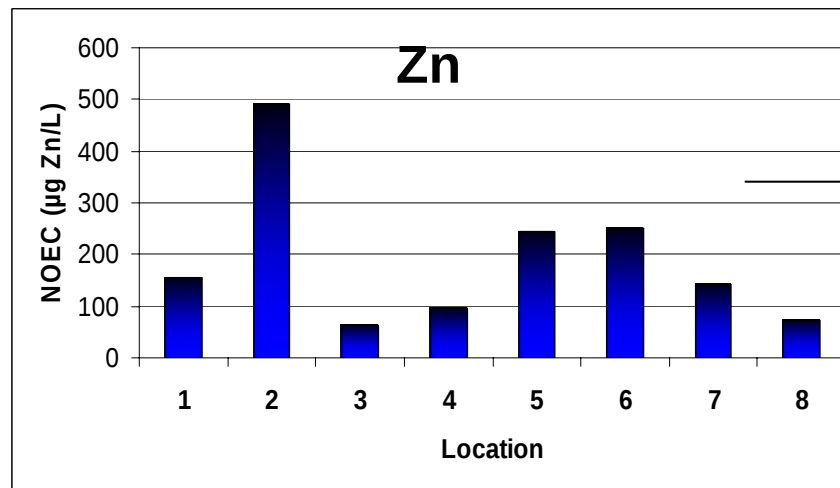
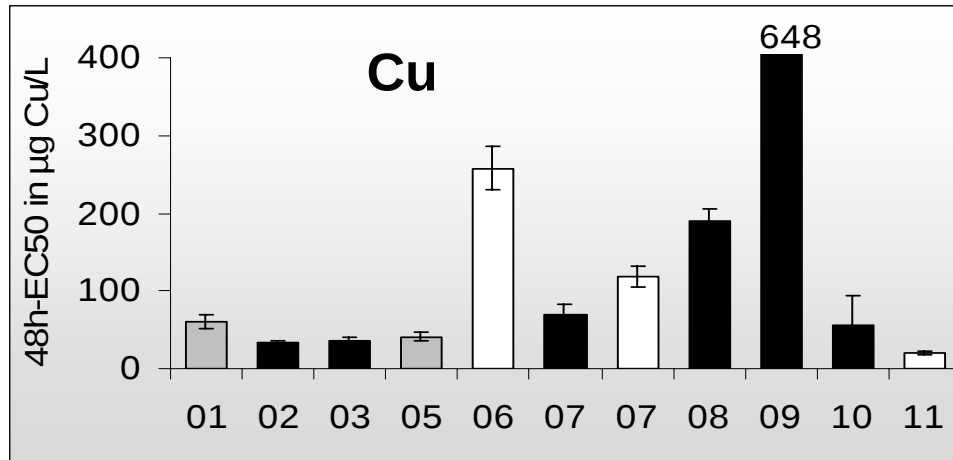
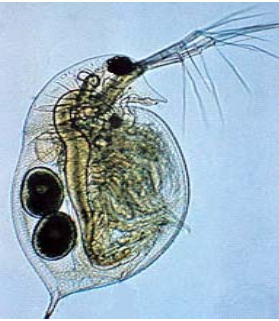


Providing high quality services
in the field of risk assessment



Accounting for bioavailability of metals : an overview - water

Rationale for bioavailability incorporation in EU METAL RAs



Site-specific toxicity for

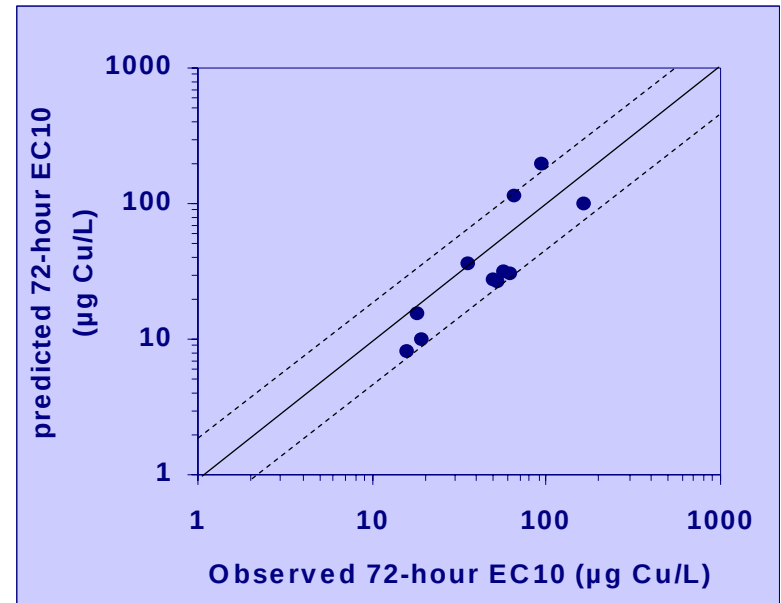
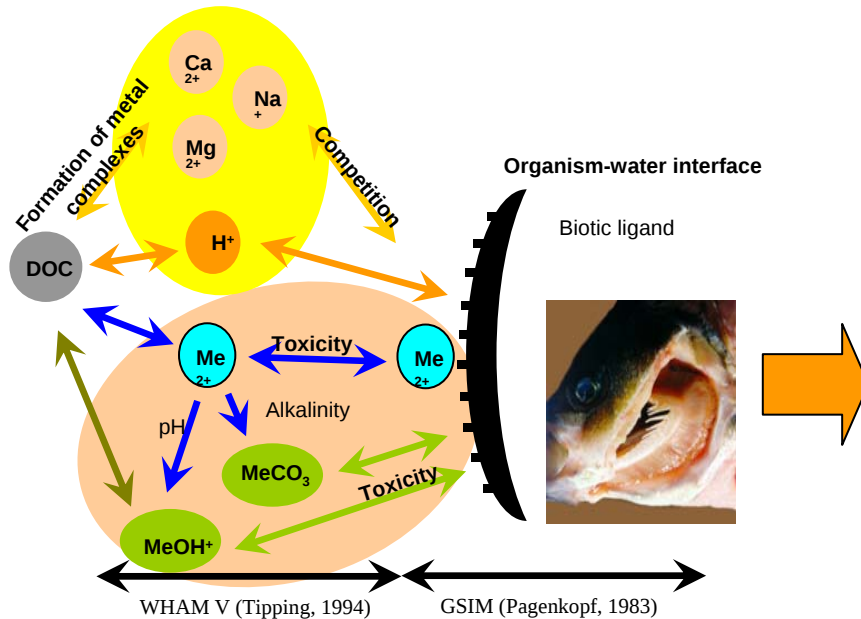
- Cd (hardness)
- Zn (BLM)
- Ni (BLM)

Toxicity of metals ~ water chemistry & biology

Bioavailability models ?

-Freshwater

(c-Biotic Ligand Model)



Available: Cu, Ni, Zn
Under development: Co, Pb, Mo

EQS = f(DOC, pH, Hardness)

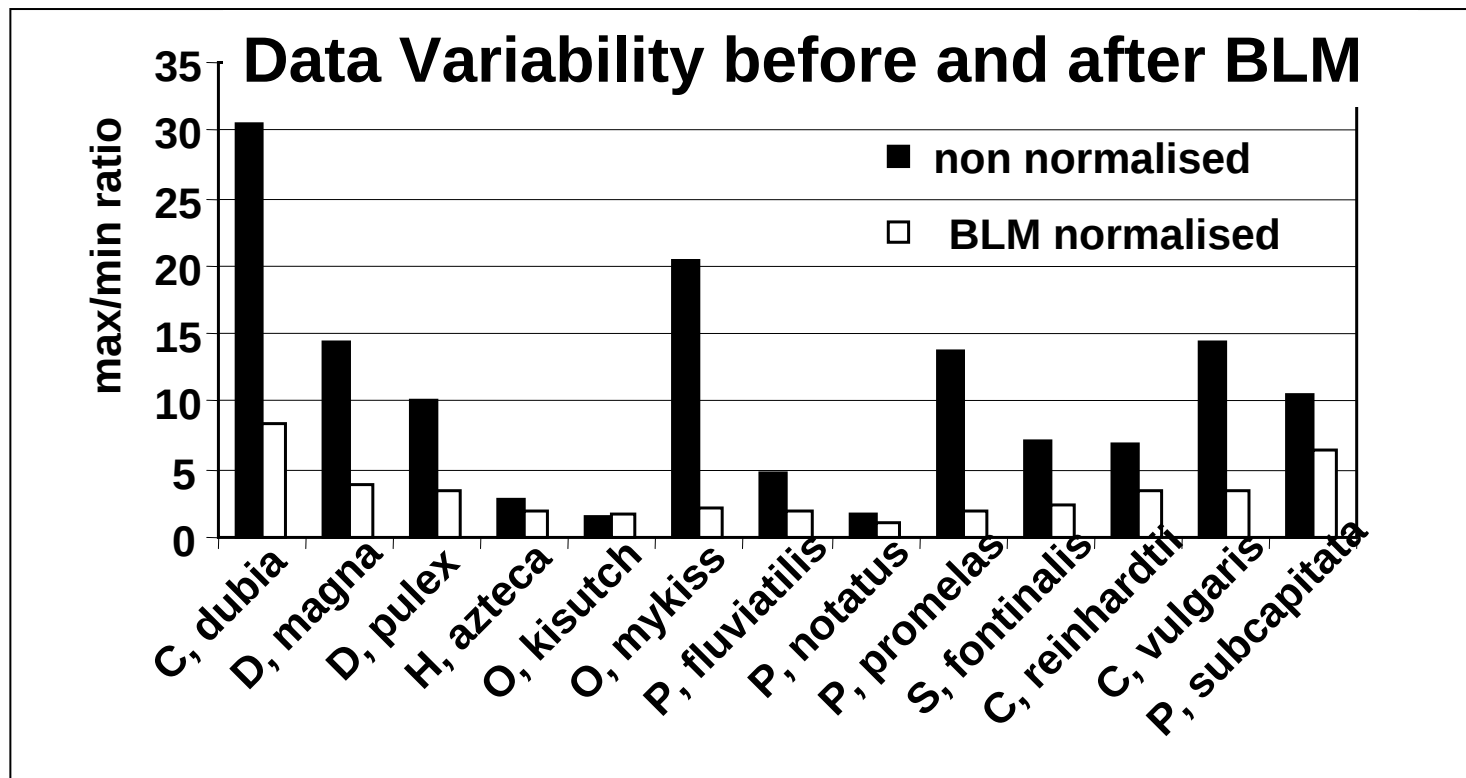
Model validation: within factor of 2

Chronic BLMs available for algae, invertebrates and fish

Bioavailability assessment reduces uncertainty



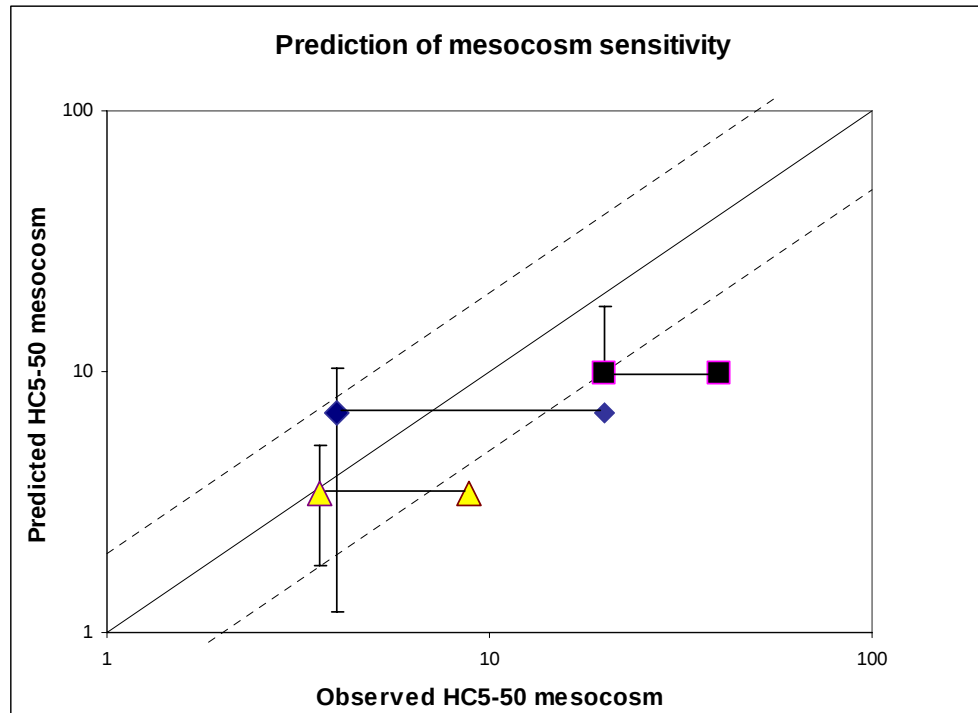
Normalisation = reduction of the variability



Requirement for BLM applications accross species defined and agreed at TCNES

Bioavailability models ?

- Biotic Ligand Model validation

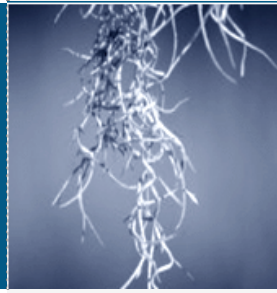


Predicted BLM normalised HC5-50 values (mean + standard deviation) versus observed mesocosms No Observed Ecological Adverse Effects (NOEAEC) and Lowest Observed Ecological Adverse Effects (LOEAEC), connected by a line.

Rhomb:Roussel, 2006; Squares:Schaefers, 2001; Trangles:Hedtke, 1984

EQS corrected for bioavailability is protective for mesocosms, including dietborne exposure

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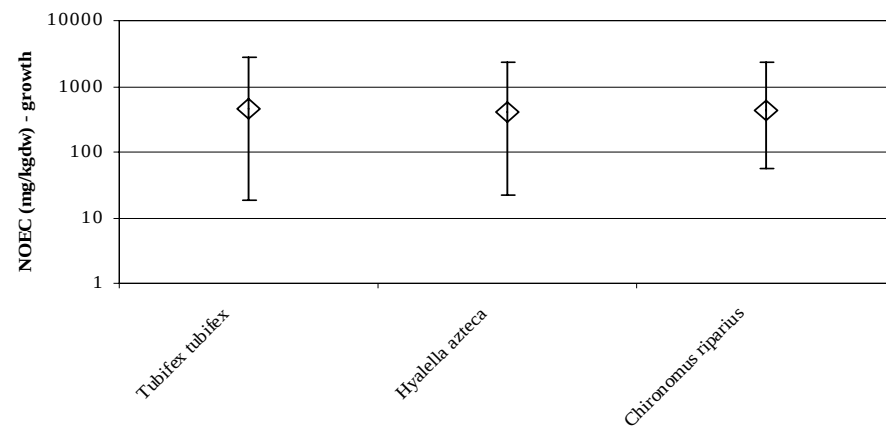


Accounting for bioavailability of metals : an overview - sediment

Bioavailability sediments?

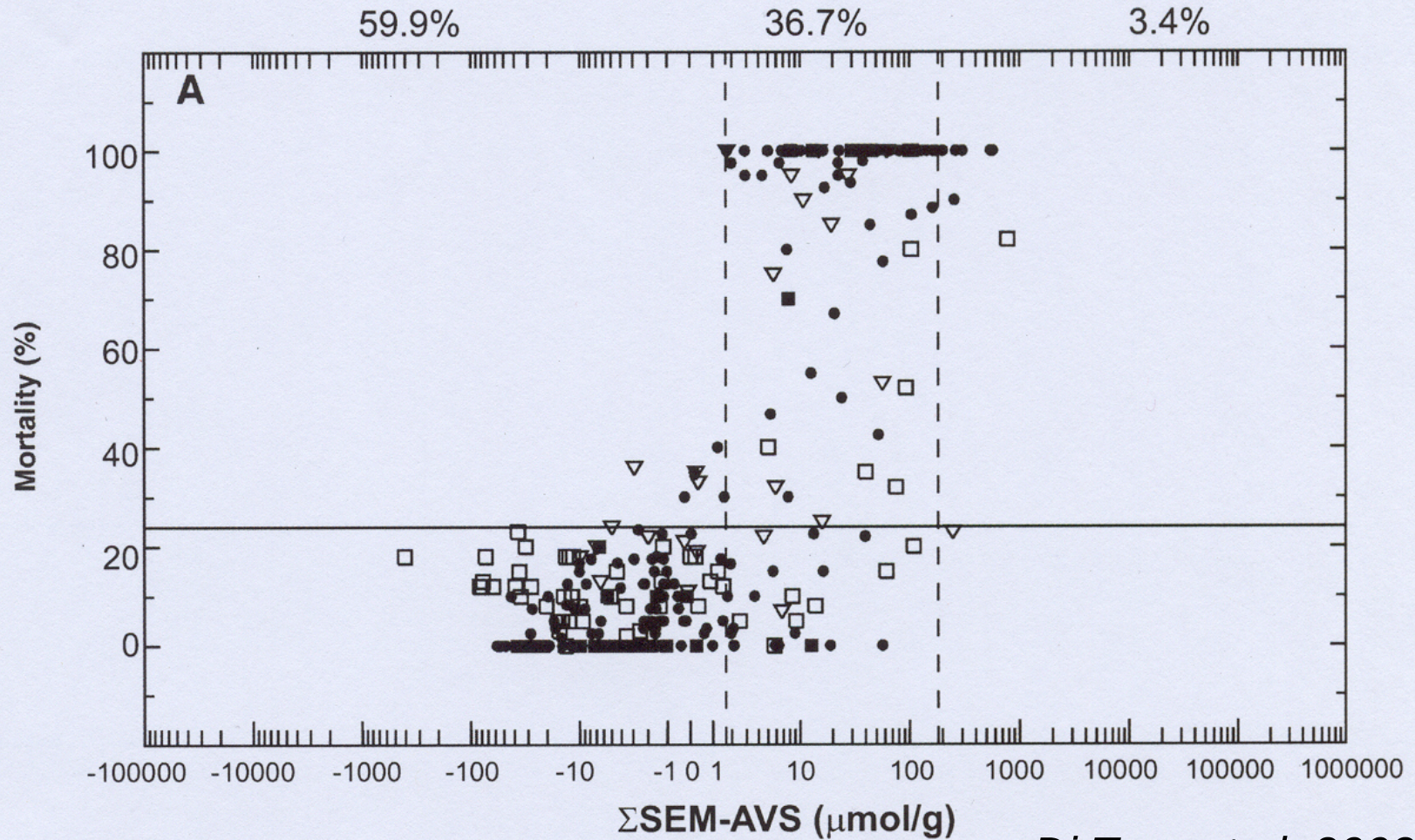
Intraspecies variability (total Cu)

Species	Max/Min ratio growth
<i>T. tubifex</i>	101
<i>H. azteca</i>	70
<i>C. riparius</i>	26



EQS corrected for bioavailability is needed

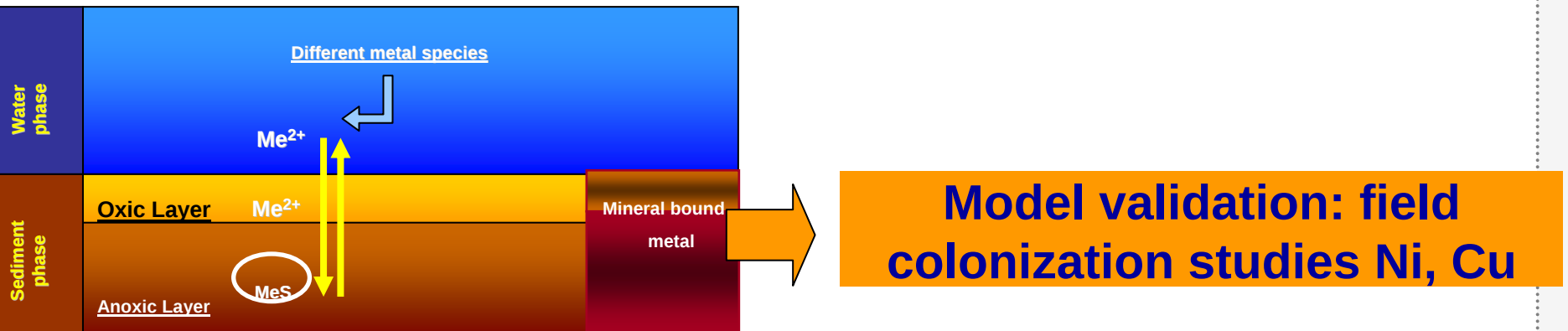
SEM-AVS concept



Di Toro et al, 2002

Bioavailability models ?

- Sediment (SEM/AVS; OC model)



Available: Cu, Ni, Zn, Pb, Cd

$$EQS = f(AVS, OC)$$

Bioavailability models ?

➤ Bioavailability models for metals

= conservative approach

✓ do not account for other binding sites such as FeO, MnO, ...