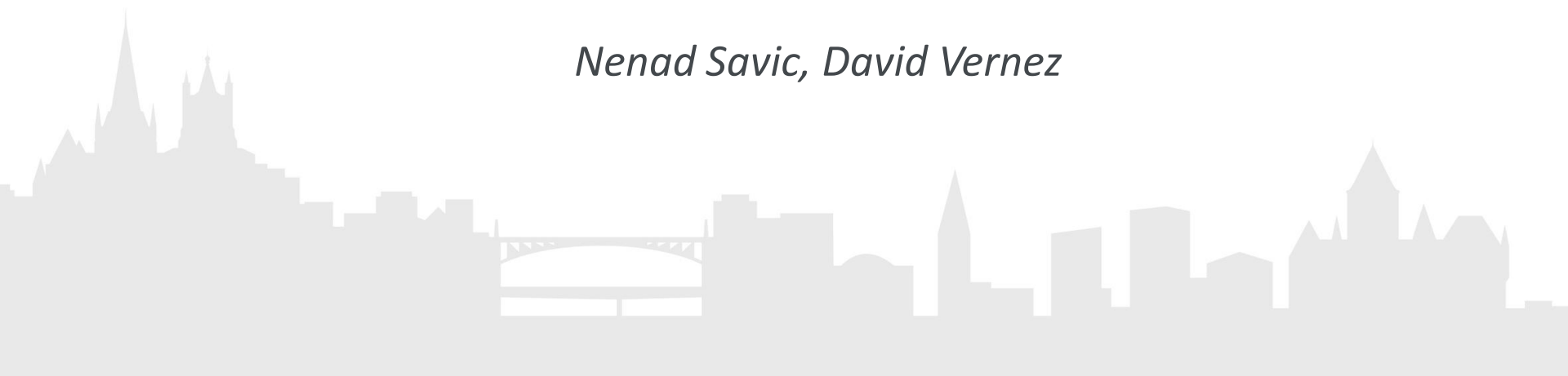


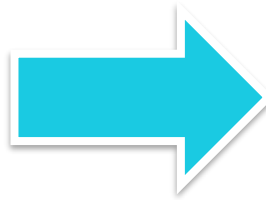
*TREXMO plus: an advanced self-learning model for
occupational exposure assessment*

Nenad Savic, David Vernez



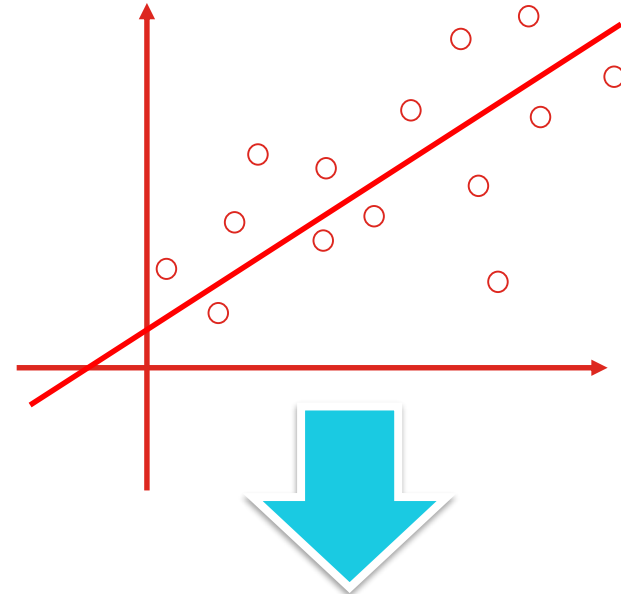
Context – Models development

- How to predict exposure to chemicals without specific data ?
- Statistical models



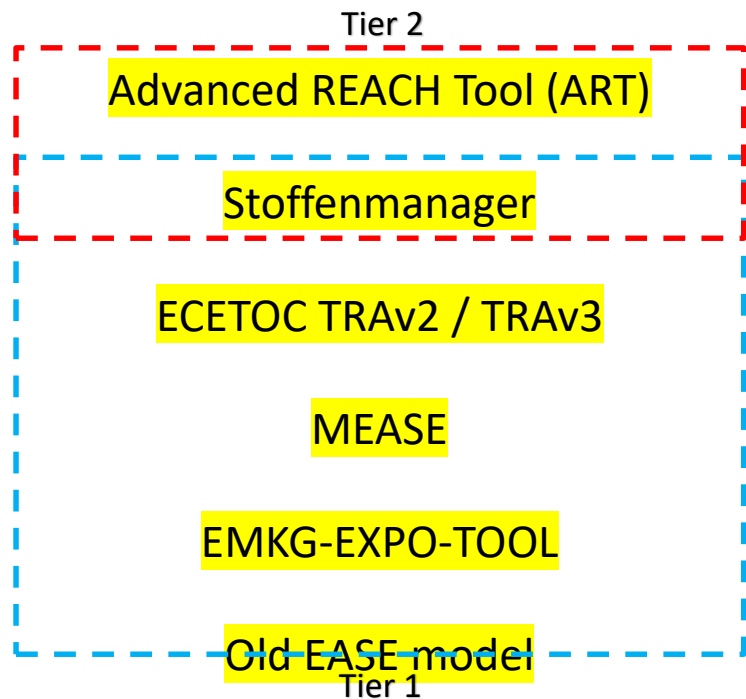
Measurements collected over years

- VP / dustiness level
- Concentration
- Ventilation system (e.g. local exhaust ventilation)
- Room volume ...



$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 \dots + \beta_n X_n$$

Context - REACH Models



Tier 1

- Several models developed
- Simple conservative tools
- Screening tools

Tier 2

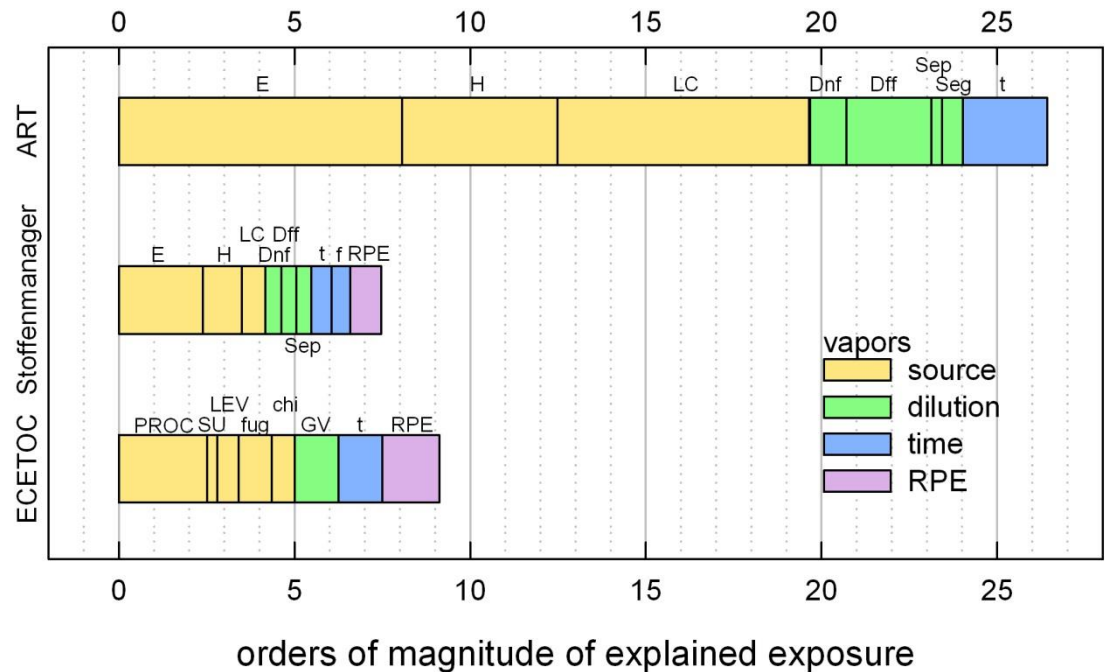
- ART / Stoffenmanager (Tier 1.5)
- Require more exposure information
- More precise predictions
- Exposure distribution

Context – Current issues

- Different models based on different data
- Models use different exposure parameters
- Overall performance is poor, conservatism dubious

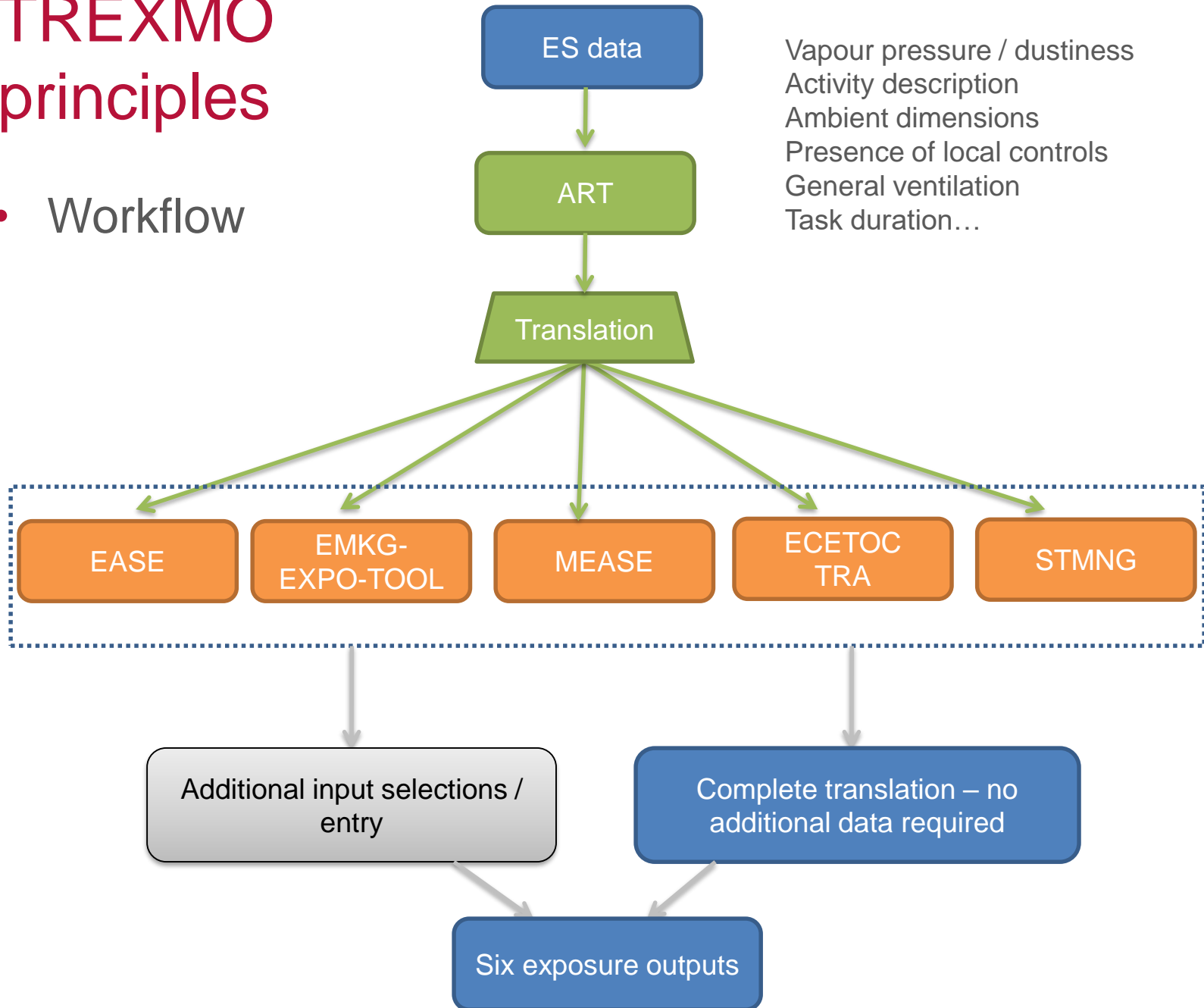
Different weighting of exposure determinants

Tier 2 models are not refined version of Tier 1 models !



TREXMO principles

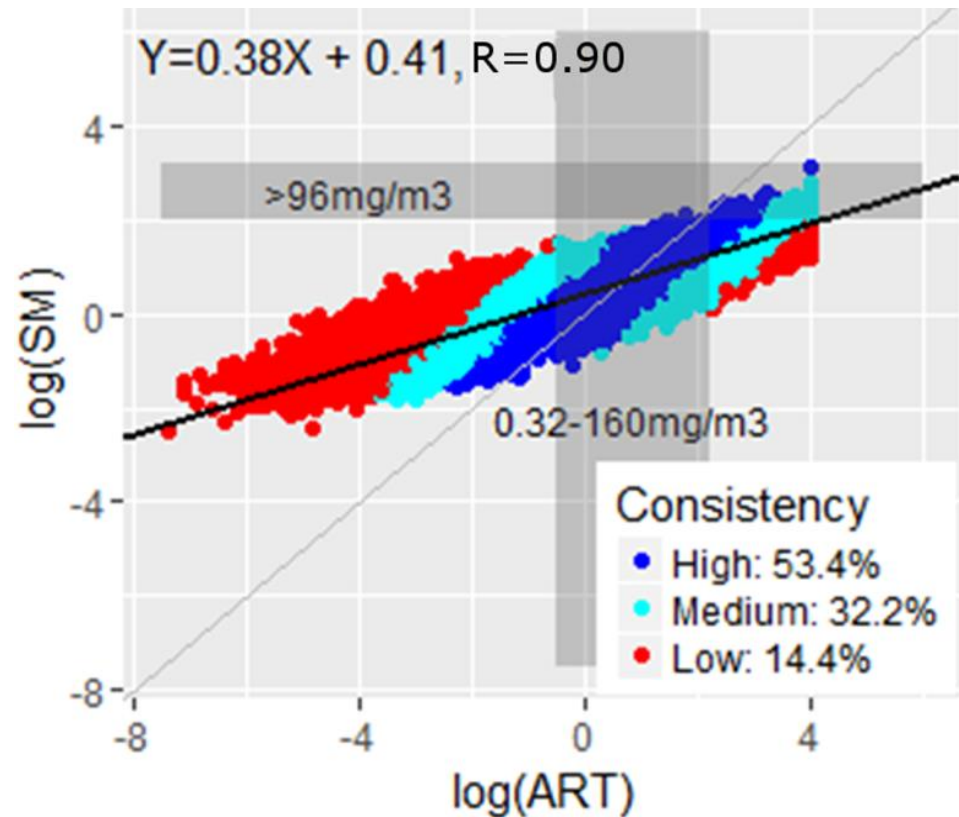
- Workflow



Inter-model comparison

- In Silico, 300'000 parameter combinations set in ART
- Translated into Stoffenmanager and TRAv3

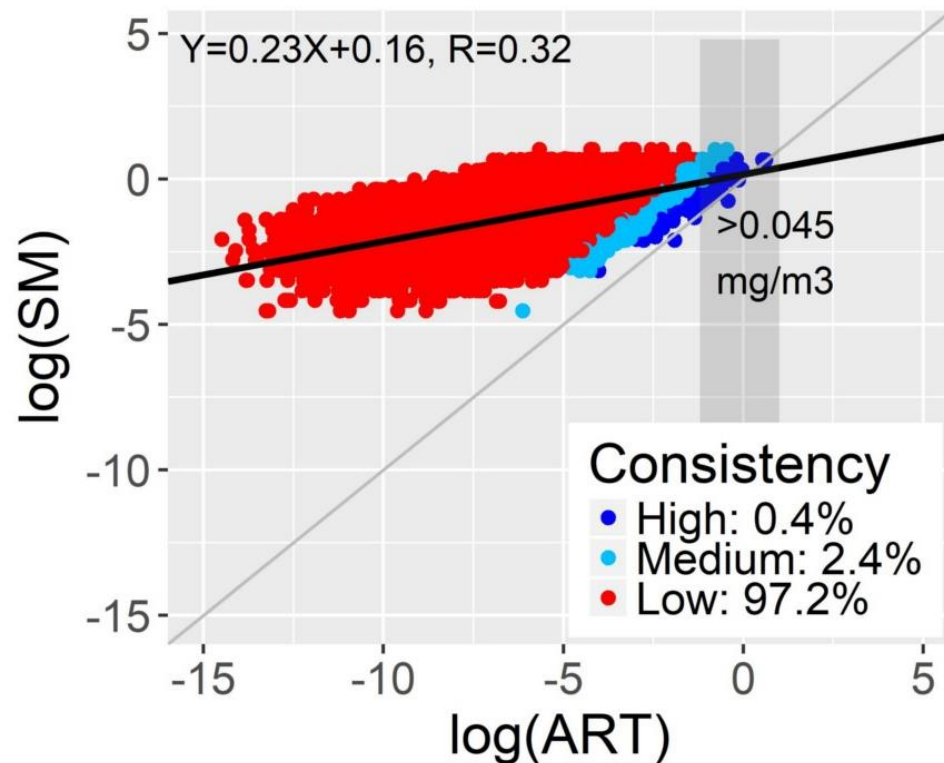
- Red > 2 OM
- Light blue 1-2OM
- Dark blue <1 OM



Inter-model comparison

- >97% ART and SM differ by at least 2 orders of magnitude

FF-outdoors = 21,000 ESs



TREXMO V2

Existing models
independent predictors of
exposure

learns about weaknesses
and strengths



TREXMO V.2

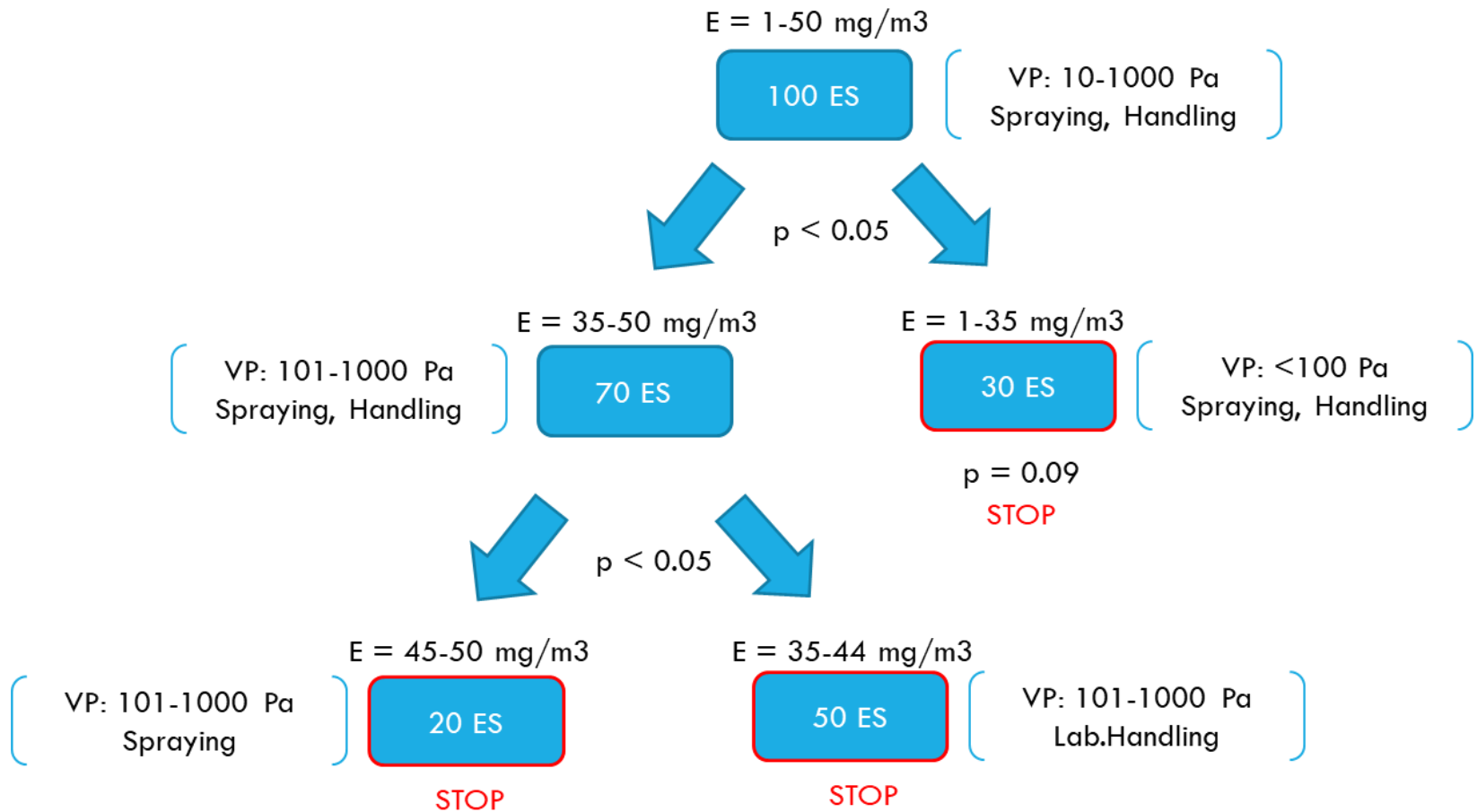
- Uses conditional regression trees to classify exposure situations into smaller subsets.
- Computes regression coefficients for three different models (ART, SM and TRAv3), using an independent dataset.

$$TrPlus = w_{ART}E_{ART} \times w_{SM}E_{SM} \times w_{TRA}E_{TRA}$$

w – “weights” – regression coefficients

E – Exposure predictions (mg/m³)

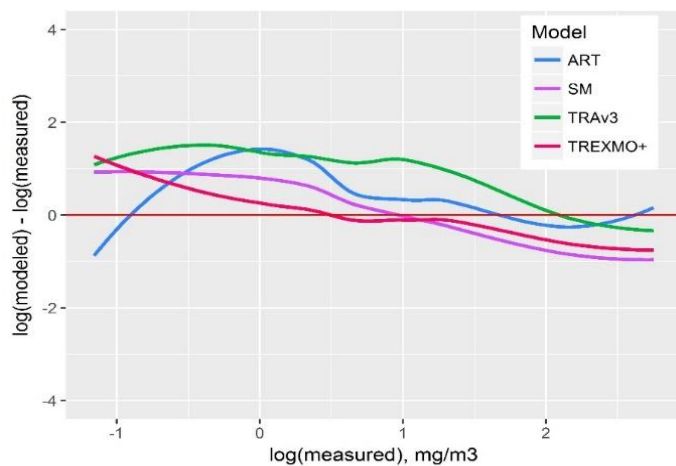
TREXMO V.2



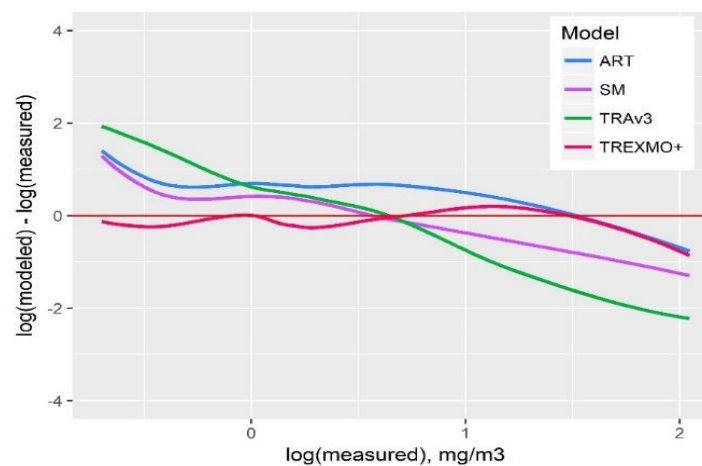
Results

- Predicted vs measured exposures
- SUVA dataset (n=700)
- Locally-weighted smoothed residuals

$$r_i = \log \hat{y}_i - \log y_i$$



Liquid products



Solid products

Conclusions, perspectives

- The way forward: using meta-models to combine the strength of different approaches
- Allows to combine different sources of information (incl. measurements and physical models)
- Ongoing collaborations with NIOSH and INRS

... any other ?

Thank you for your attention

Any question ?

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Schweizerische Eidgenossenschaft
Confédération suisse
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Secrétariat d'Etat à l'économie SECO