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# Quantification of sources to support air quality plans: Comparison of PSAT & scenario analysis

P. Thunis

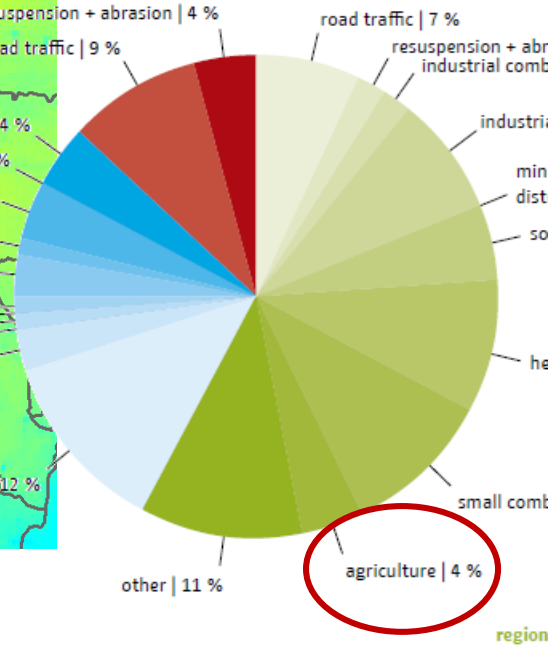
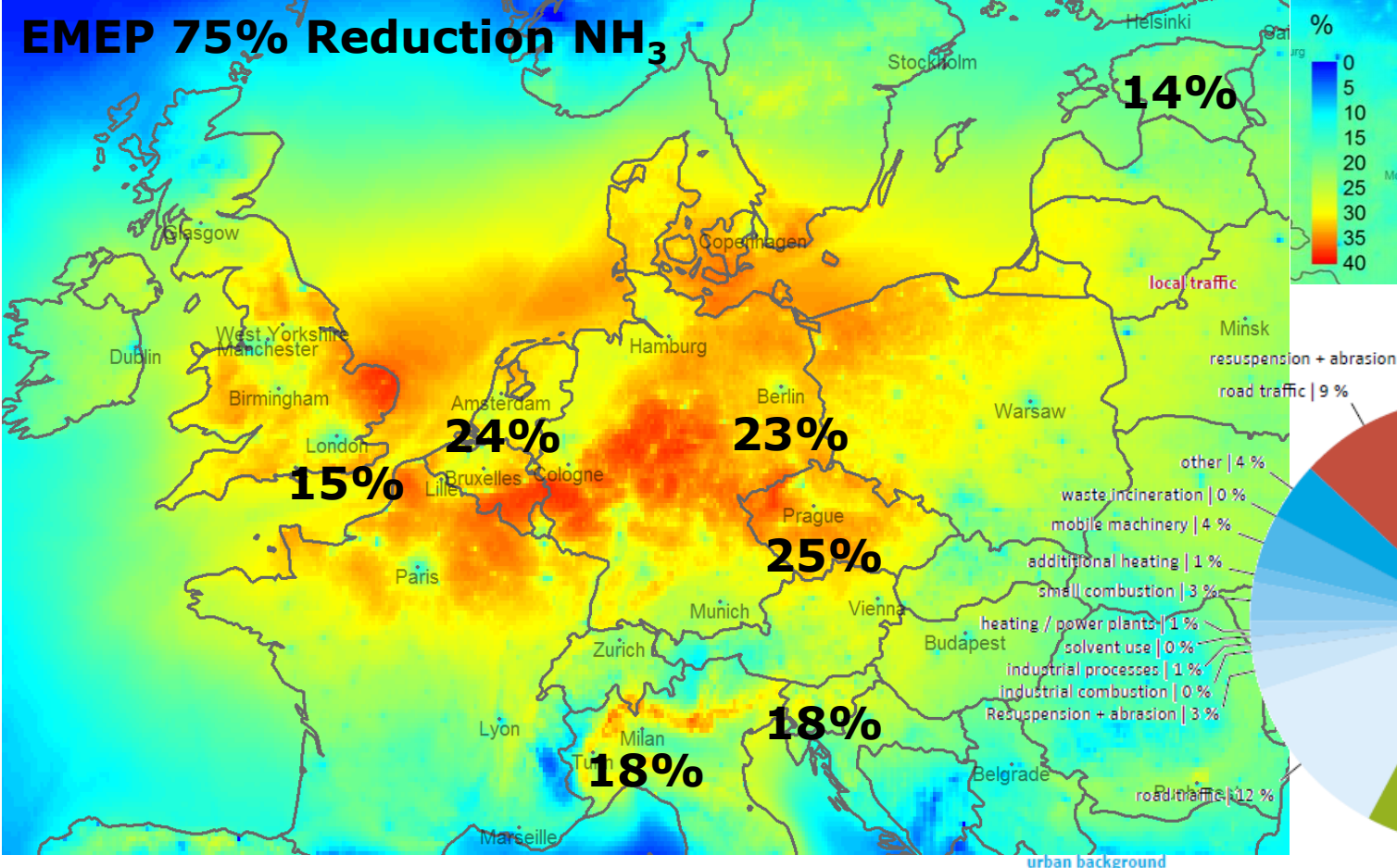
Tallinn

**26 June 2018**

# Motivations

- ❑ Outcome of the WG3 inter-comparison exercise
- ❑ Differences between CTM/SHERPA and source apportionment studies (e.g. agriculture contribution in Berlin)

# EMEP 75% Reduction NH<sub>3</sub>

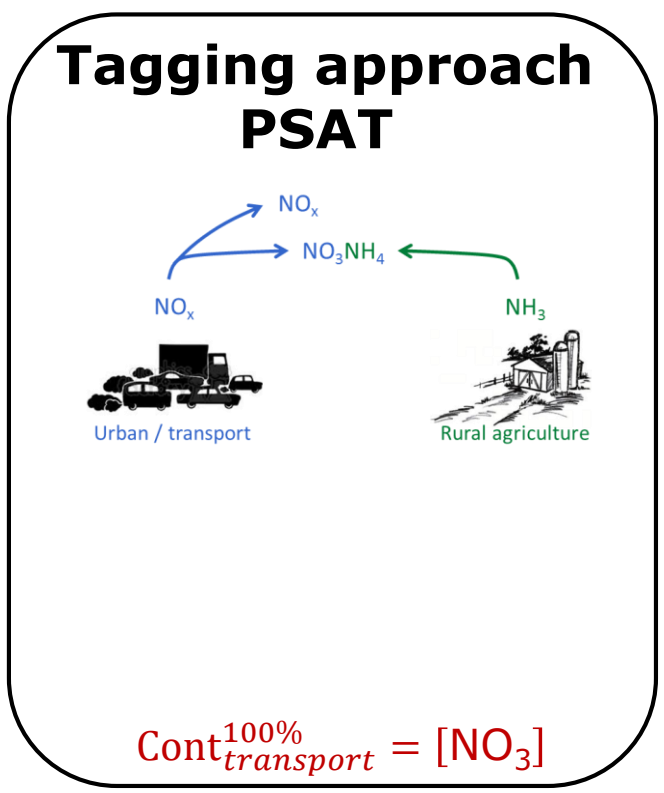
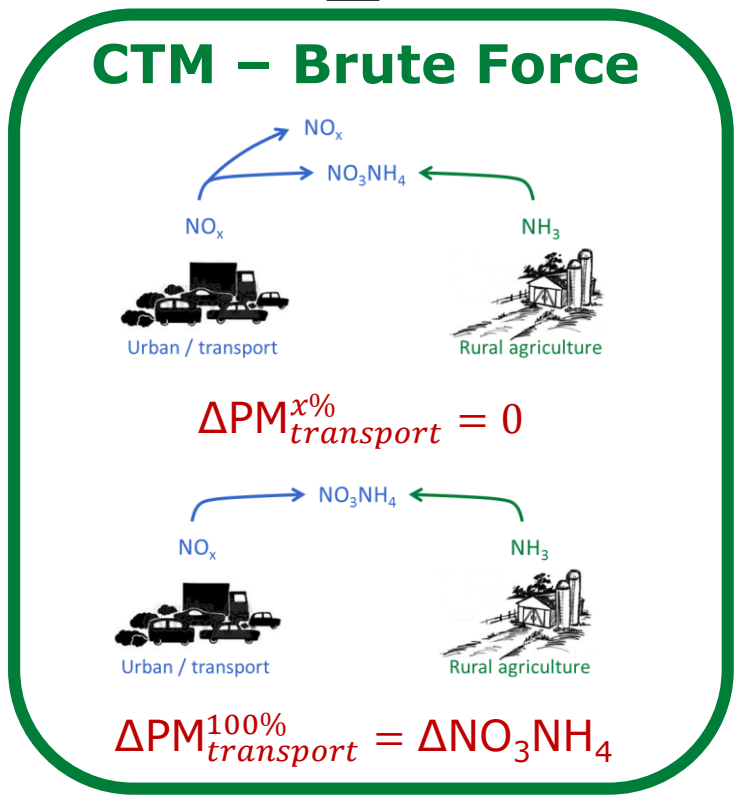


- ❑ Outcome of the WG3 inter-comparison exercise
- ❑ Differences between CTM/SHERPA and source apportionment studies (e.g. agriculture contribution in Berlin)
- ❑ Clappier et al. 2017: sensitivity analysis and source apportionment: two methods for two purposes - Theoretical explanations of differences
- ❑ Practice → Generation of a specific modelling dataset (Po-Valley)
  - Comparison of PSAT and CTM-BF based contributions
  - Assessment of non-linearities (50 vs 100%)
  - Understand Stein and Alpert's interaction terms (spatial and temporal)

# Comparison of PSAT with CTM scenario analysis with respect to a specific objective: AQP

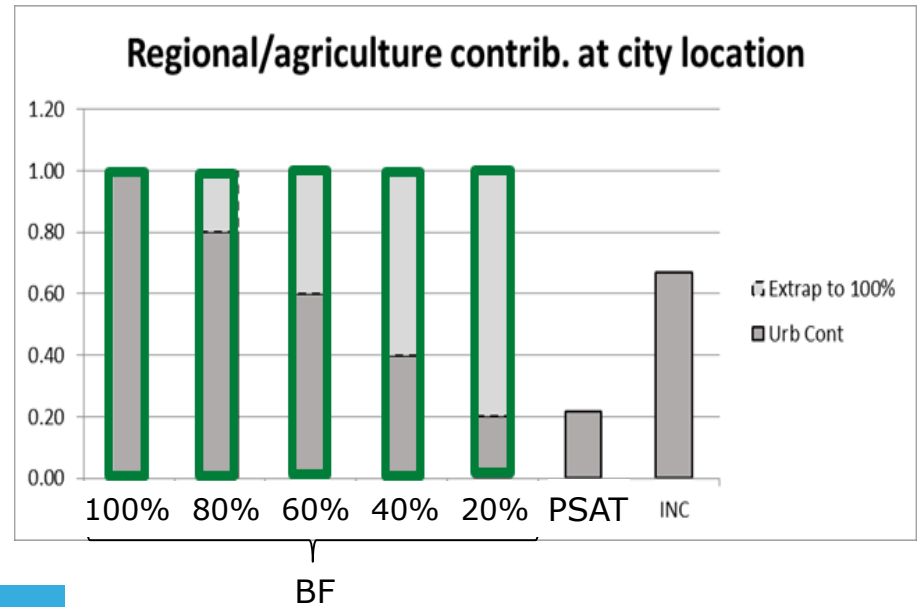
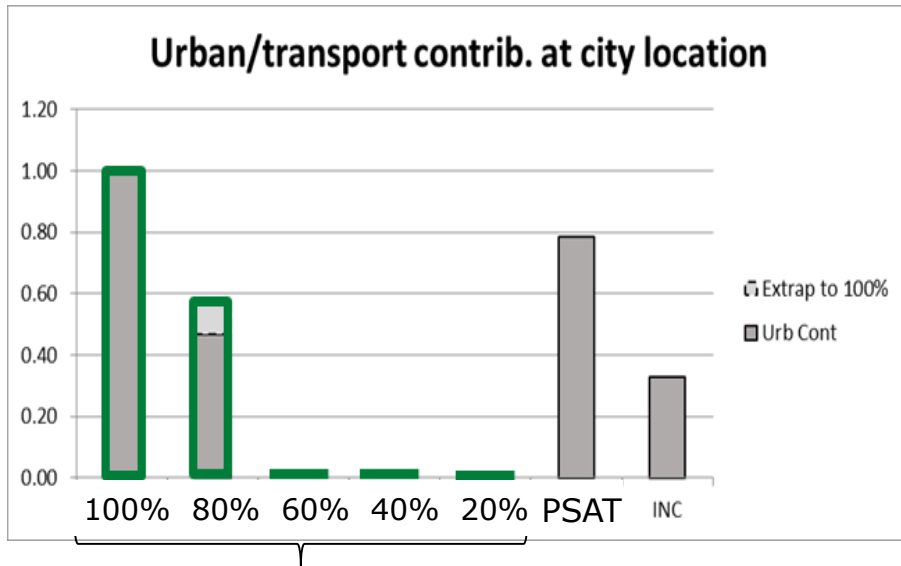
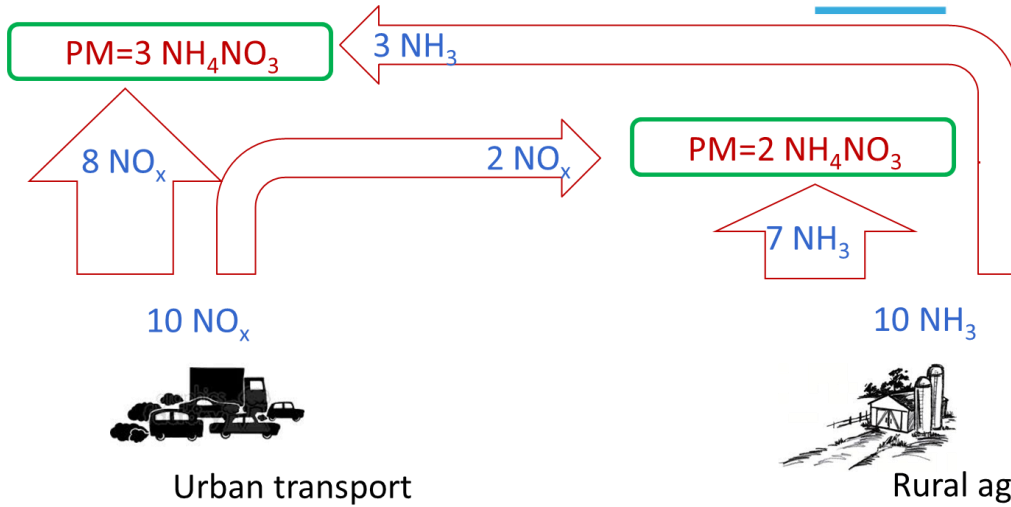


Quantify the contributions of pollution sources **to support AQP\***



- \* {
- Provide information on priority sectors/areas to target
  - Assess the efficiency of abatement measures (past/future)
  - Explain the causes of exceedances

# Theoretical examples: differences are large...

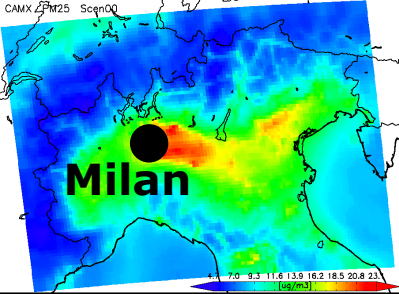


**Dataset:** A series of CAMx simulations with emission reduction scenarios for one full meteorological year over the Po valley (Italy)

## Simulations:

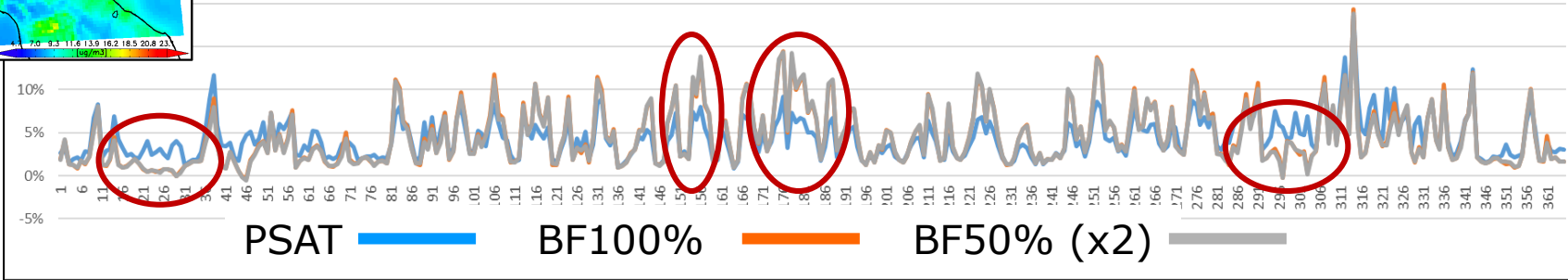
- ✓ Base case
- ✓ Reductions at **50 & 100%**
  - Agriculture (**AGR**)
  - Transport (**TRA**)
  - Industry (**IND**)
  - AGR & TRA
  - AGR & IND
  - IND & TRA
  - AGR & IND & TRA
- ✓ **PSAT simulations** → IND, AGR and TRA contributions



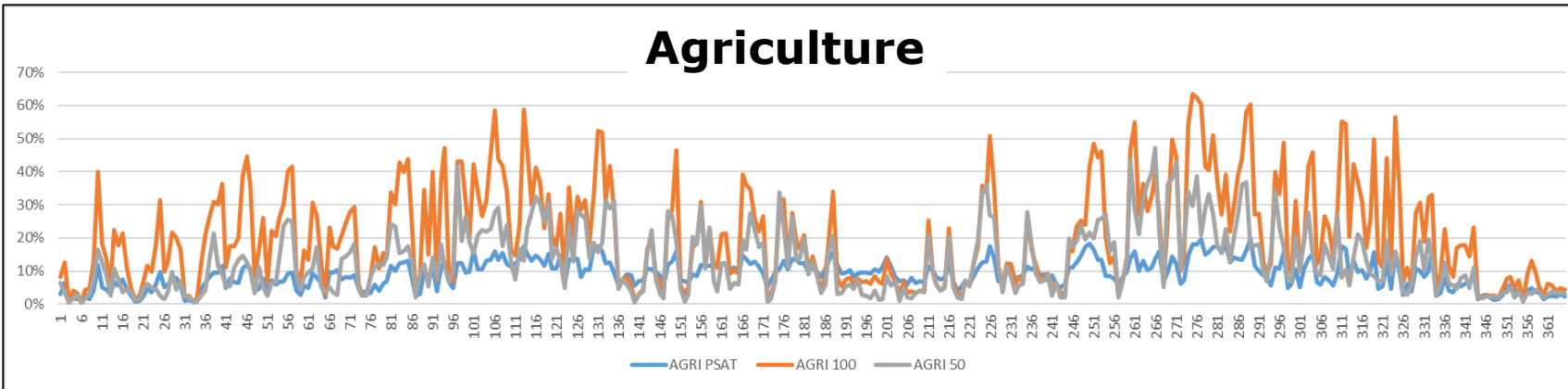


# Time series: Milan

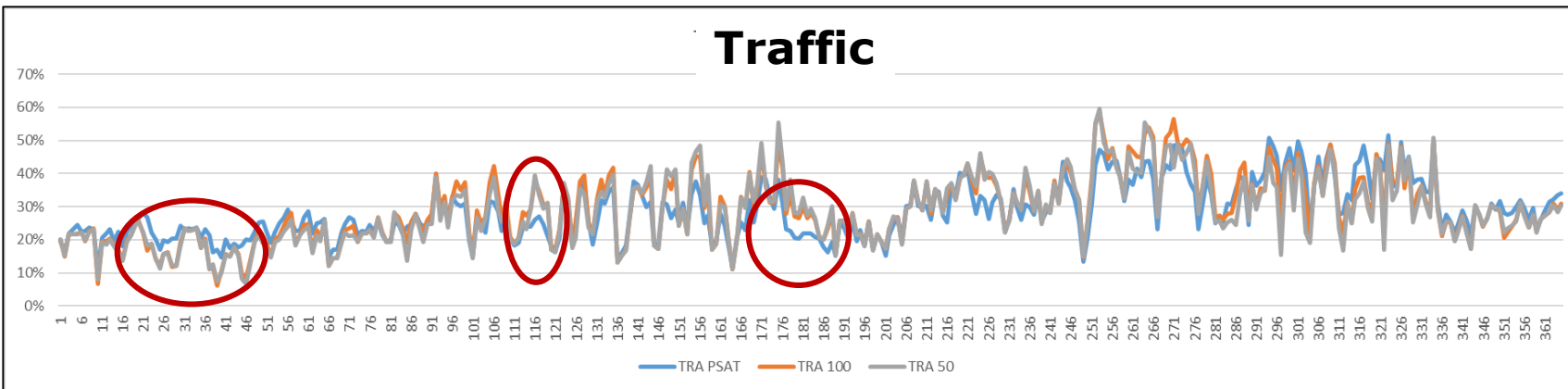
## Industry



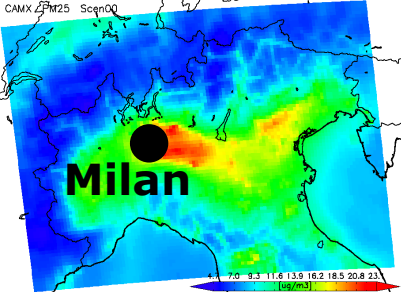
## Agriculture



## Traffic

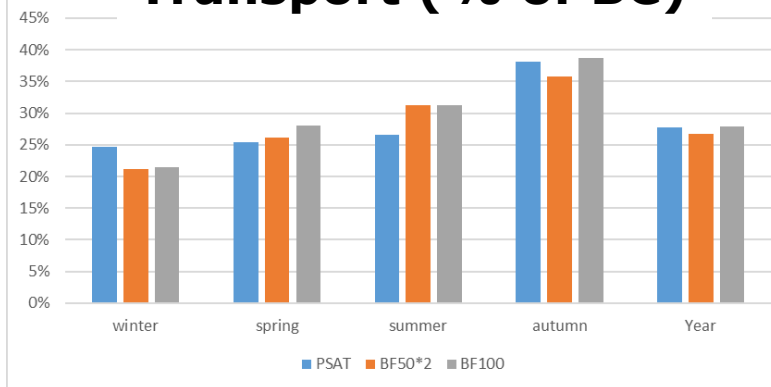






# Seasonal averages: Milan

## Transport (% of BC)

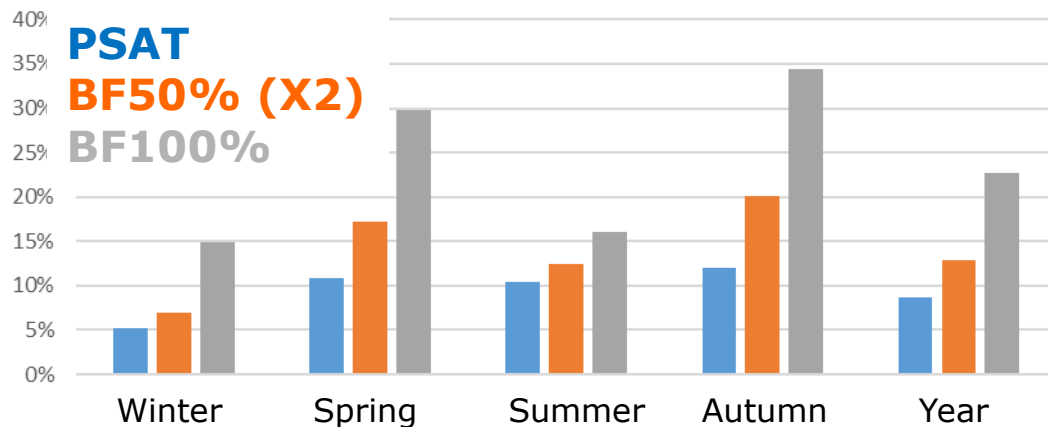


## Agriculture (% of BC)

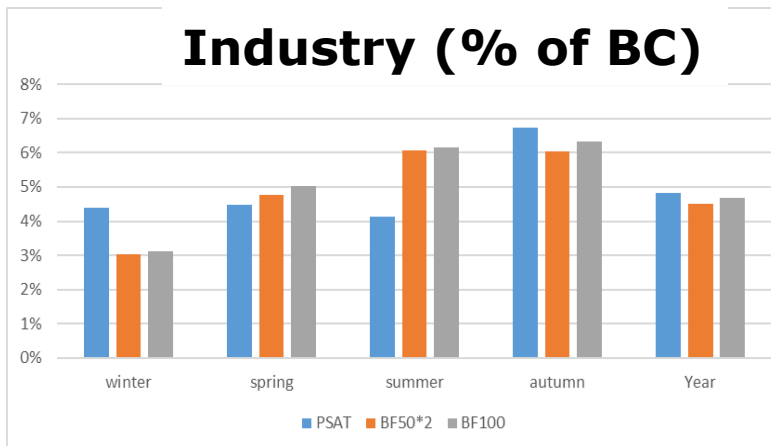
PSAT

BF50% (X2)

BF100%

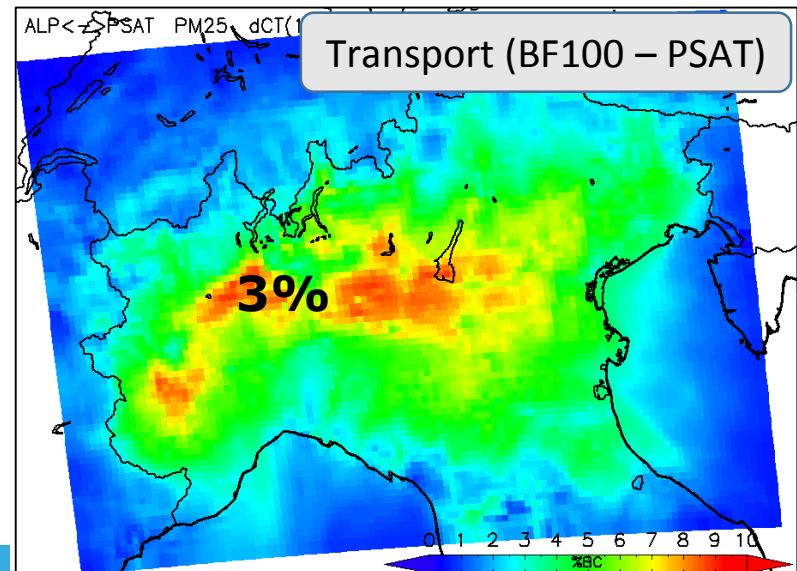
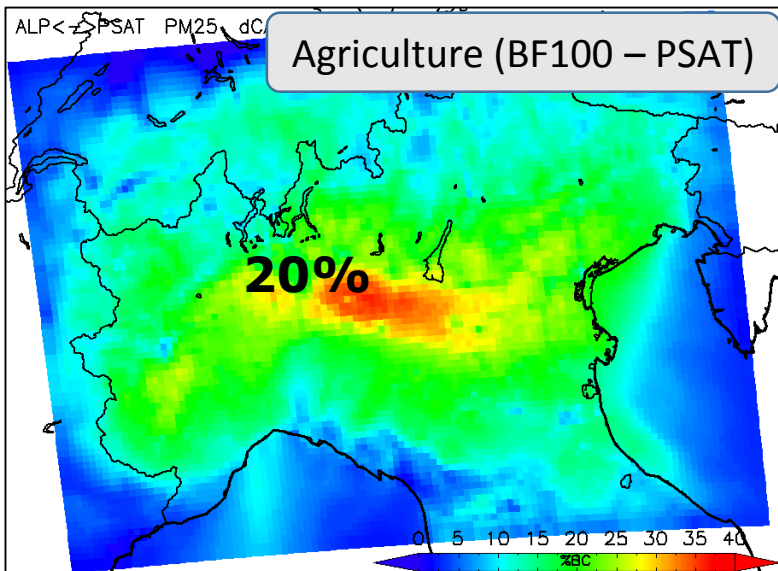
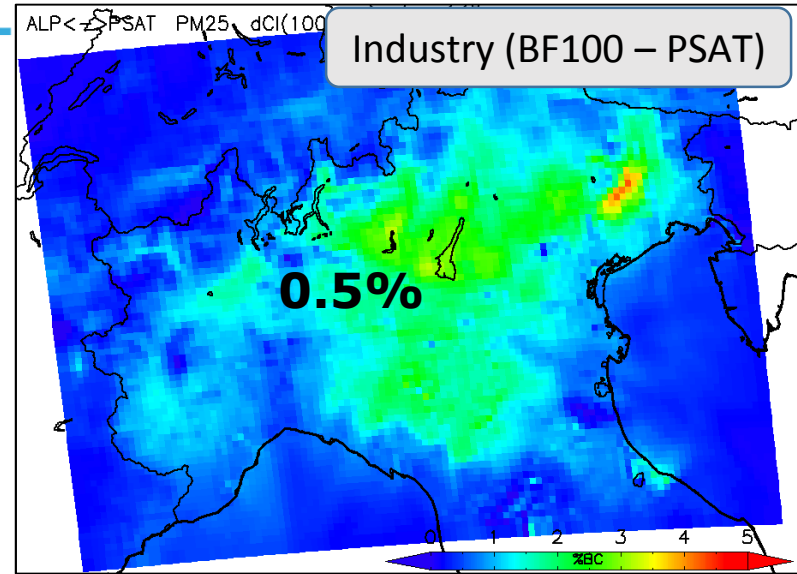
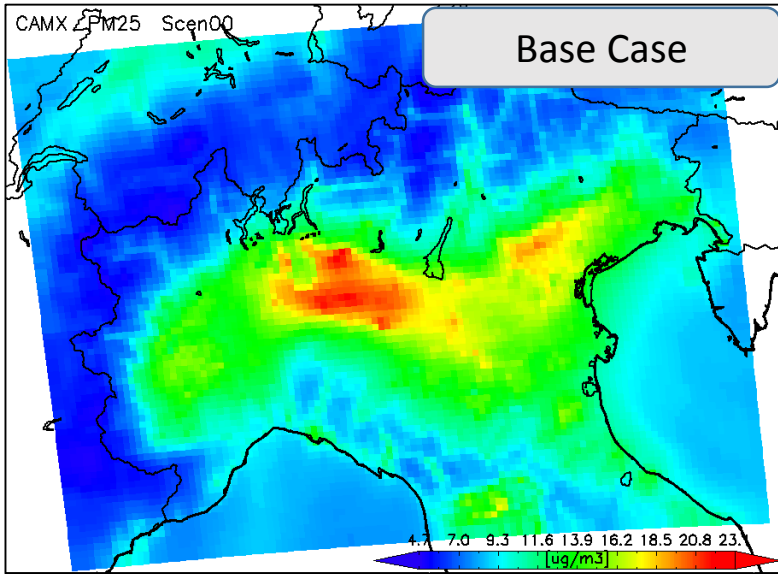


## Industry (% of BC)



# Spatial differences: Spring

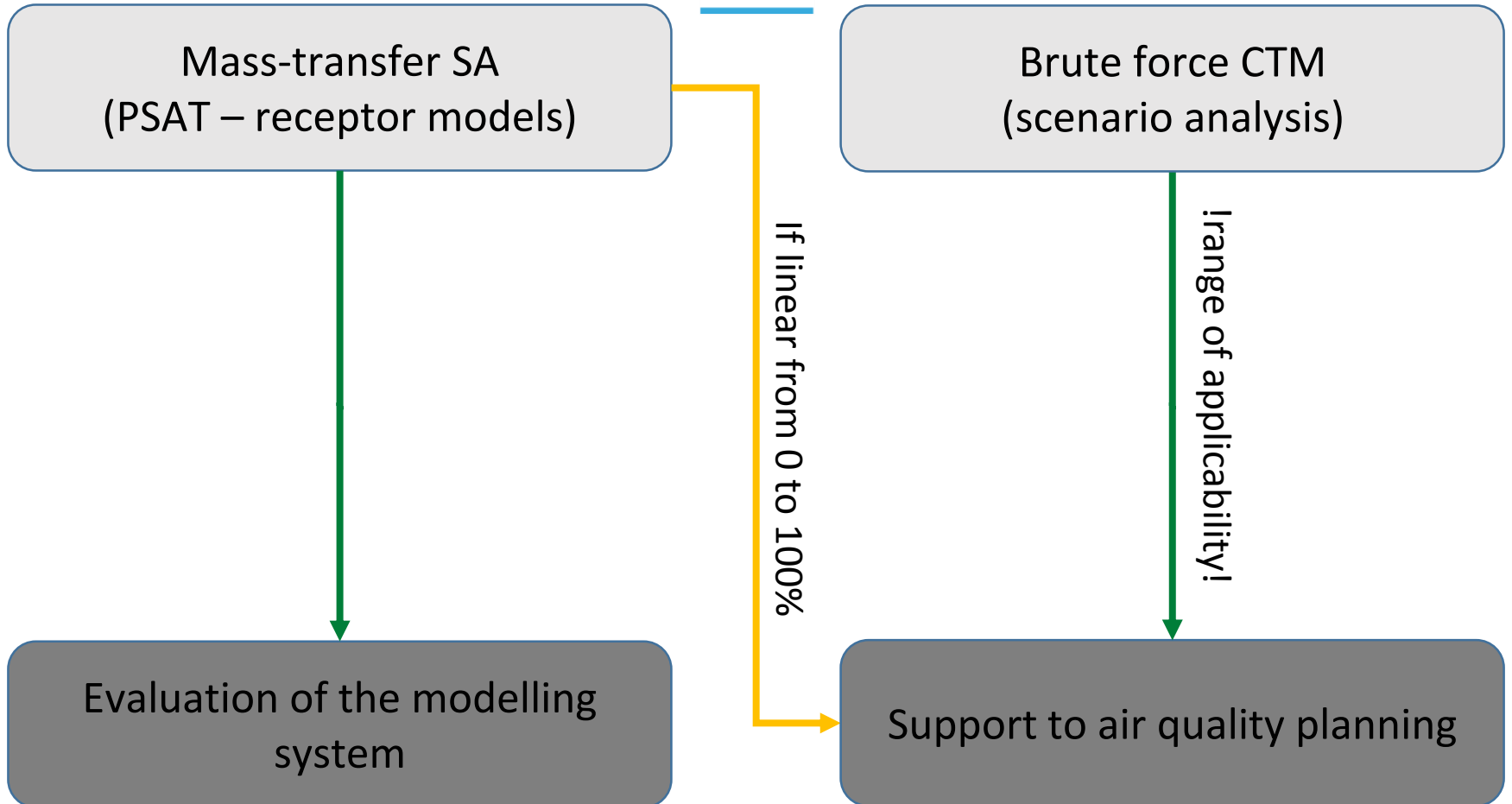
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# Conclusions

- Important differences between PSAT and BF approaches
  - Differences for all sectors but more important for agriculture
  - Differences are larger for sectors dominated by secondary species
  - Differences tend to reduce with longer time average
  
- Differences between PSAT and BF are the consequence of the methodology and assumptions underlying them:
  - Multilevel partial reductions vs. unique 100% contribution
  - Mass-transfer approach to split non-linear interaction terms
  
- Similar assumptions are at the basis of other approaches (e.g. receptor modelling)



# The JRC-CAMx dataset and associated tool is available to the FAIRMODE community (contact: Claudio Belis)

**Dataset:** A series of CAMx emission reduction scenarios for one full meteorological year over the Po valley (Italy)



## Simulations:

- ✓ Base case
- ✓ Reductions **at 50 & 100%**
  - Agriculture (**AGR**)
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  - Industry (**IND**)
  - AGR & TRA
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