

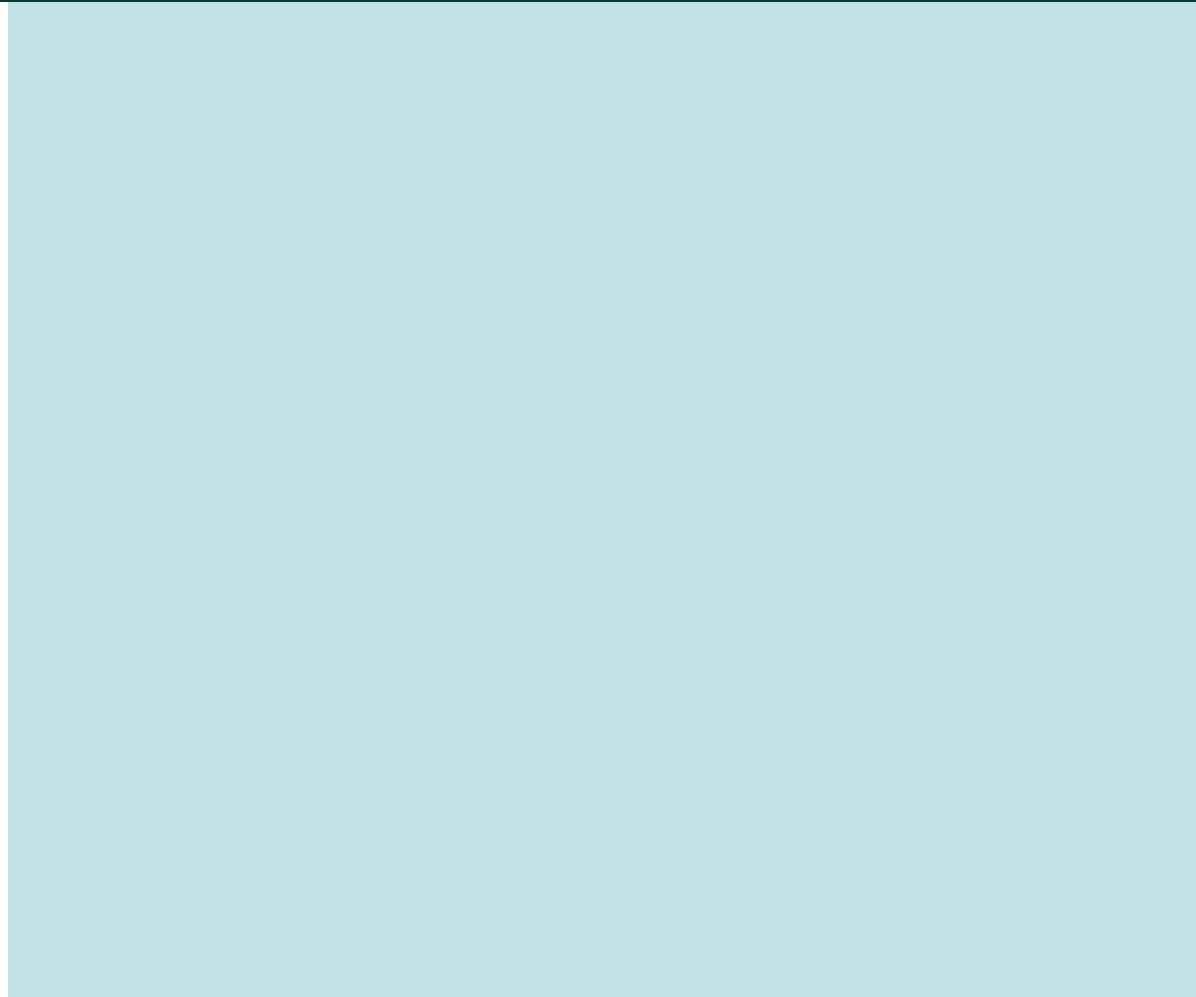
One of the FAIRMODE activities: Source apportionment methods for the AAQD

Clappier A., University of Strasbourg

5th CAMS Policy User Workshop, 29th June 2021

FAIRMODE: <https://fairmode.jrc.ec.europa.eu/>

The screenshot shows the FAIRMODE website homepage. At the top, the logo 'FAIRMODE' is displayed with the tagline 'Forum for air quality modelling in Europe'. Below the logo are navigation buttons for 'Home' and 'Contact'. A 'News and events' section features a prominent announcement for a videoconference on '30/09 - 02/10/2020' regarding the 'FAIRMODE Technical meeting'. The main content area is organized into a grid of activity tiles, each with an icon and a title: 'QA/QC Protocol for assessment (CT2)', 'Site appointment (CT3)', 'Microscale modelling (CT4)', 'Low-cost sensors (CT6)', 'Best practices for AQ management (CT5)', 'Emissions (CT7)', 'Robustness of AQ projections (CT8)', 'Forecast indicators (CT9)', and 'Exposure & coincidence indicators (CT8)'. On the right side, a vertical menu lists various resources and documents, including 'Recent Activities & Revised Approaches', 'FAIRMODE recommendations', 'About FAIRMODE', 'Terms of Reference', 'Steering Committee', 'National Experts', 'Roadmap', 'Strategy', and a 'Tools' section containing 'A - Benchmarking Tool', 'SHORA', and 'EU Composite Map'. A 'Join FAIRMODE' button is located at the bottom right of the page.



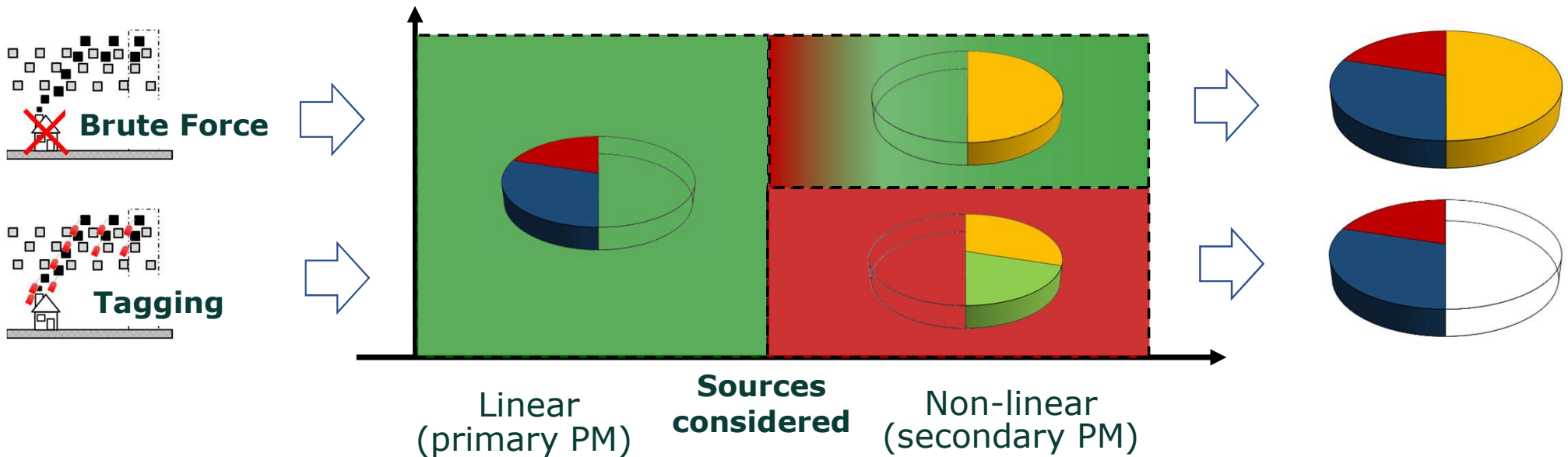
FAIRMODE: <https://fairmode.jrc.ec.europa.eu/>

The screenshot shows the FAIRMODE website homepage. At the top, it says "FAIRMODE Forum for air quality modelling in Europe". Below this are navigation buttons for "Home" and "Contact". A "News and events" section features a purple banner for a "Check-out the HGO guidance (V3.1) on Model quality objectives and Benchmarking" dated 07/2020. A central announcement for a "FAIRMODE Technical meeting" from 30/09 to 02/10/2020 is displayed. A grid of activity tiles includes "QA/QC Protocol for assessment (CT2)", "Site apportionment (CT3)", "Prognostic modelling (CT4)", "Download sensors (CT6)", "Best practices for AQ management (CT5)", "Emissions (CT7)", "Robustness of AQ projections (CT8)", "Forecast indicators (CT9)", and "Exposure & coincidence indicators (CT8)". A red circle highlights the "Site apportionment (CT3)" tile, with a red arrow pointing from it to the right-hand image.

The image shows the cover of a JRC Technical Report. At the top is the European Commission logo. The title is "JRC TECHNICAL REPORT" followed by "Source apportionment to support air quality management practices". Below the title is the subtitle "A fitness-for-purpose guide (V 3.1)". The authors listed are Thunis, P., Clappier, A., and Pirovano, G. It also lists several contributors: Pisoni, E., Guerreiro, C., Montelero, A., Dupont, H., Riffaut, V., Waersted, E., Hellebust, S., Stocker, J., Gilardini, S., Eriksson, A., Angyal, A., Bonafe, G., Montanari, F., Matejovica, J., and Bartzis, J. The bottom of the cover features a diagram showing air quality sources (house, factory, car) with a question mark and a pie chart, and the FAIRMODE logo and "Joint Research Centre" text.

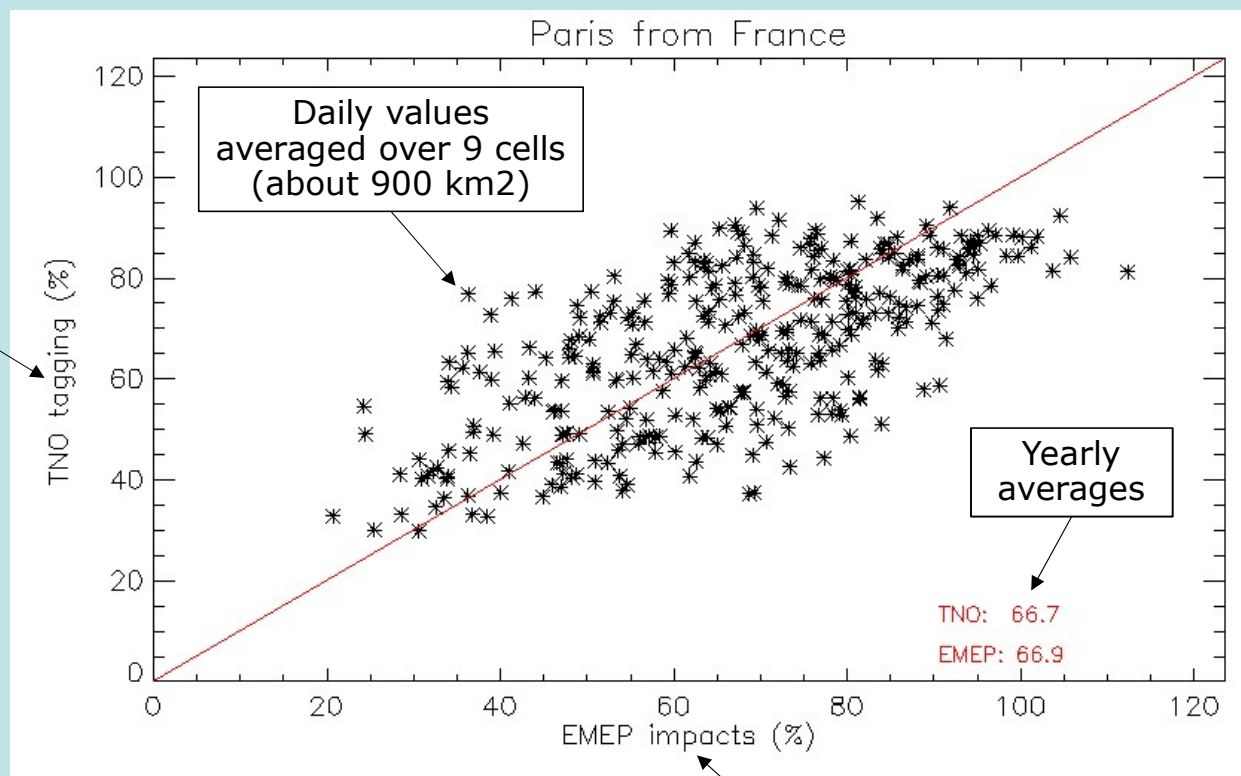
FAIRMODE Recommendations (2019)

concerning



- ❑ **FAIRMODE recommendations about tagging and brut force are based on several comparisons,**
- ❑ **these recommendations seems to be still difficult to apply in practice...**

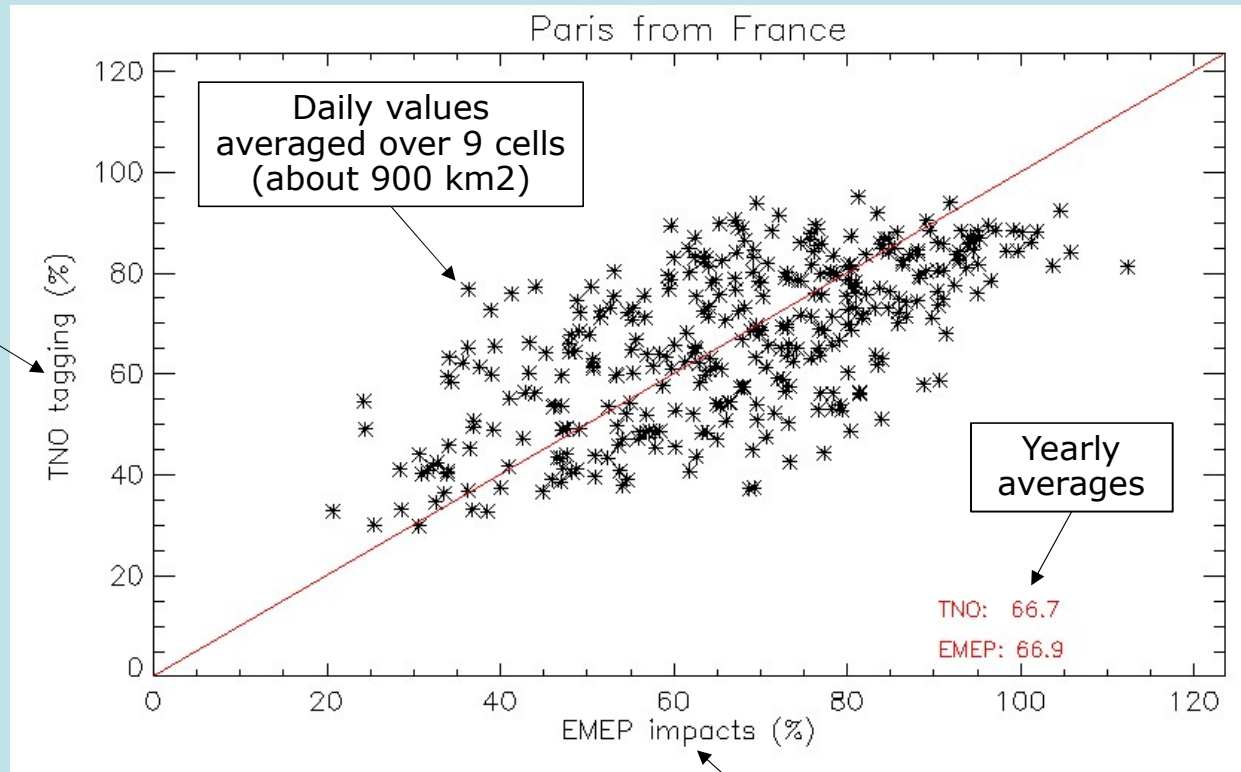
TNO tagging vs. EMEP impacts (CAMS results)



Contribution of French emissions on Paris

Impact of a reduction of French emissions over Paris

TNO tagging vs. EMEP impacts (CAMS results)

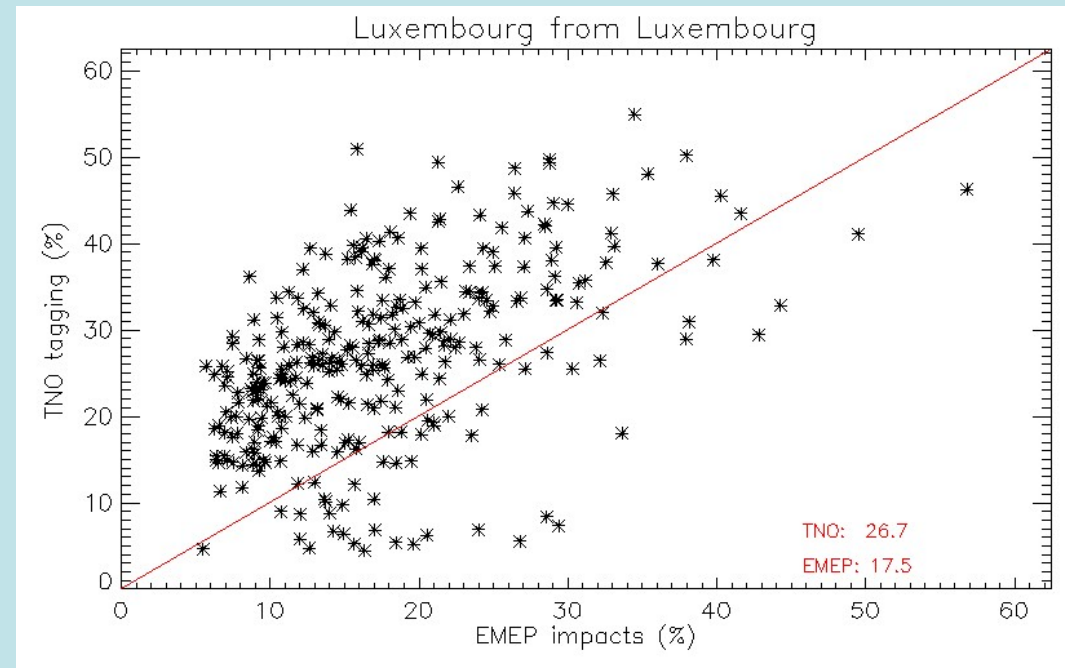
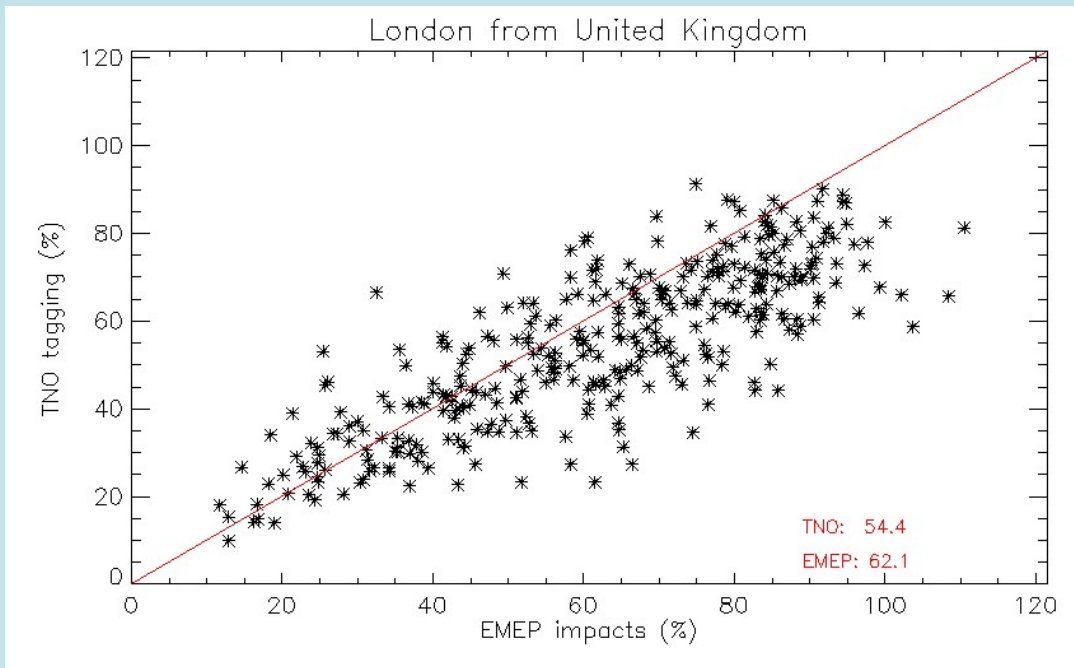


**Uncertainties
or
not uncertainties?**

Contribution of French emissions on Paris

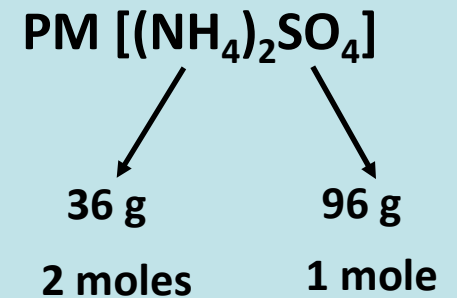
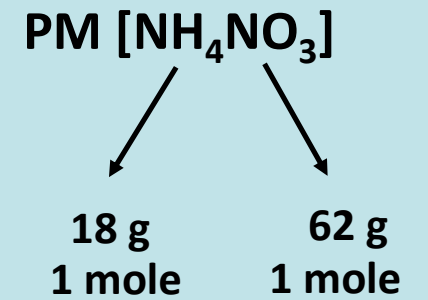
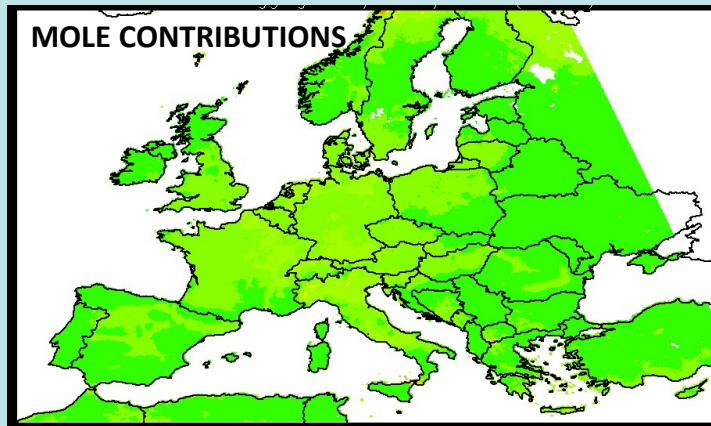
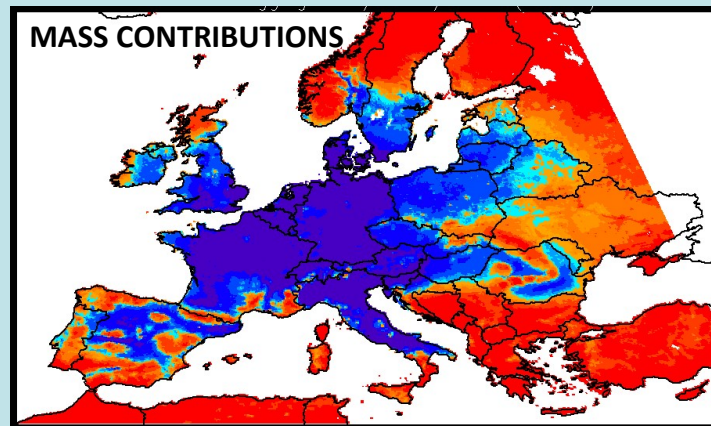
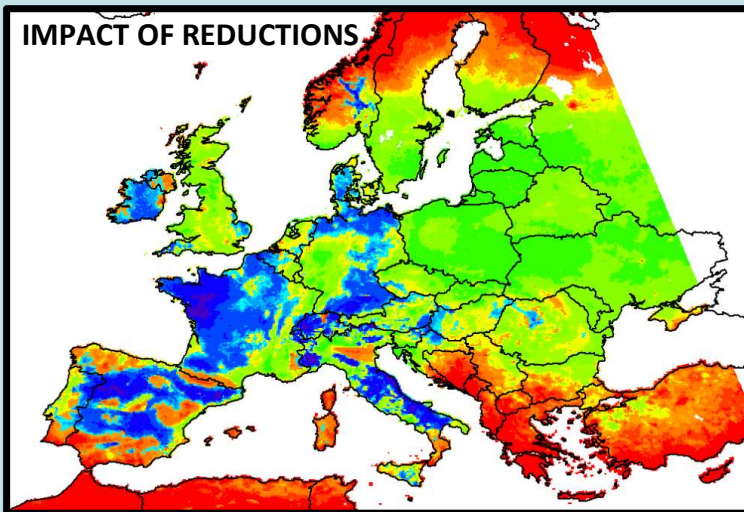
Impact of a reduction of French emissions over Paris

TNO tagging vs. EMEP impacts



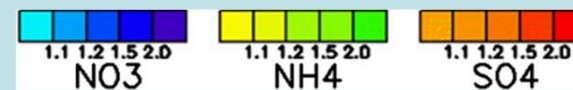
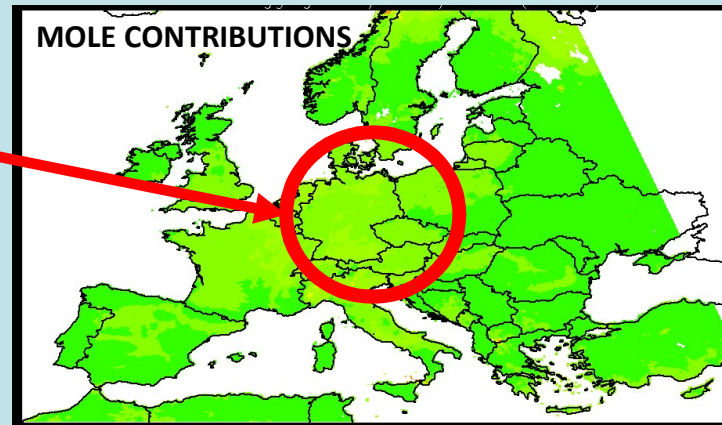
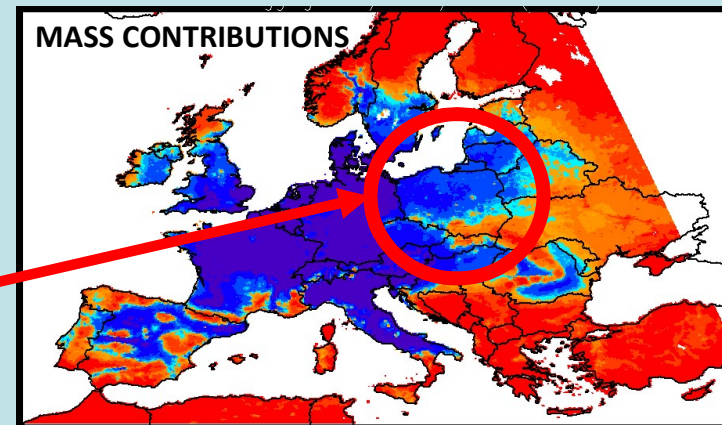
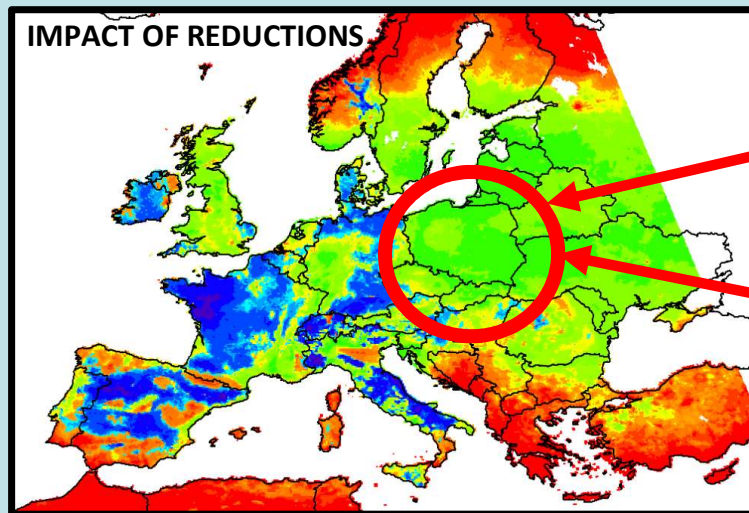
A simple case: Abatement Strategies in Europe

WINTER



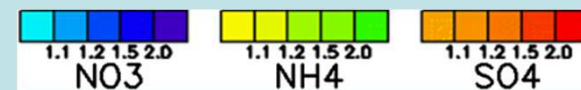
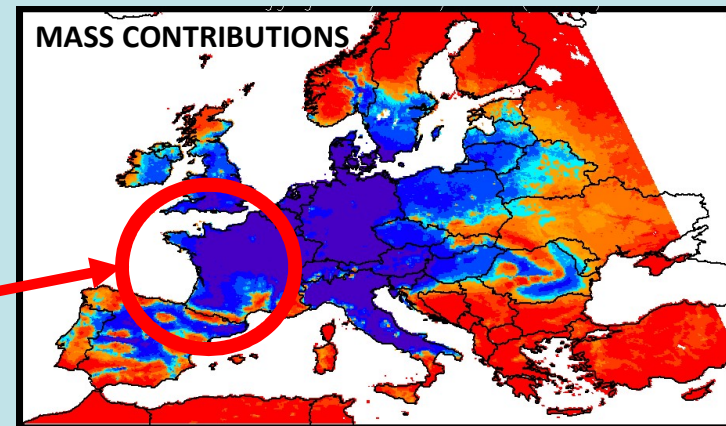
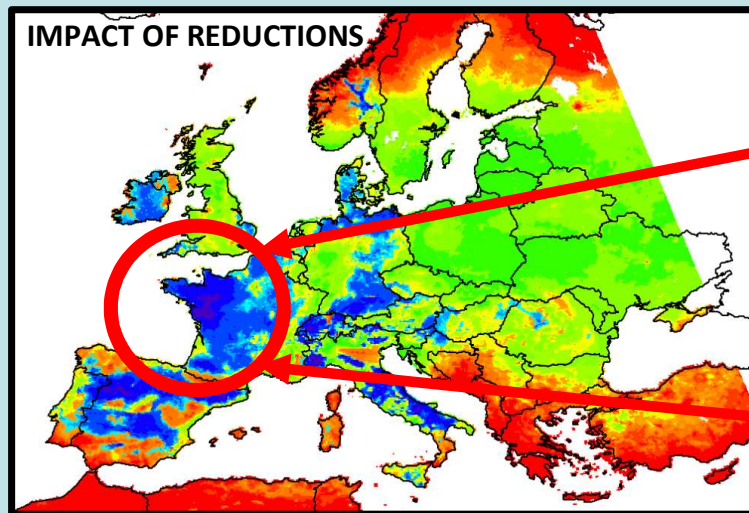
A simple case: Abatement Strategies in Europe

WINTER

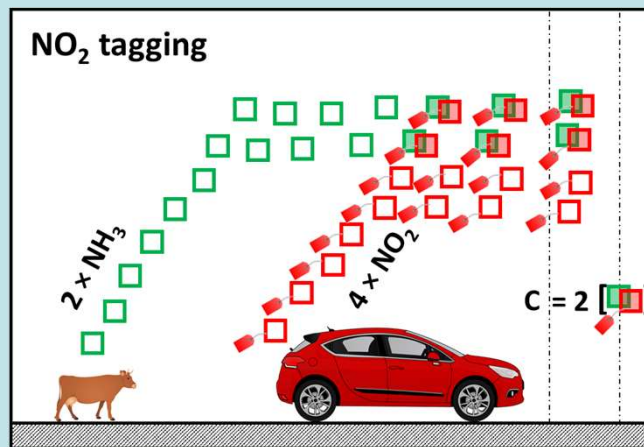
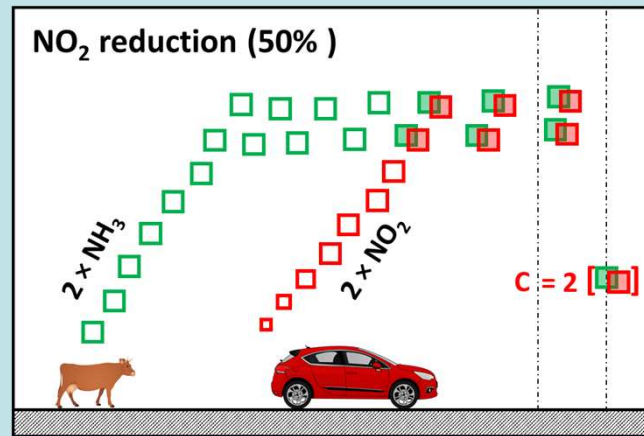
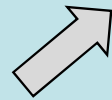
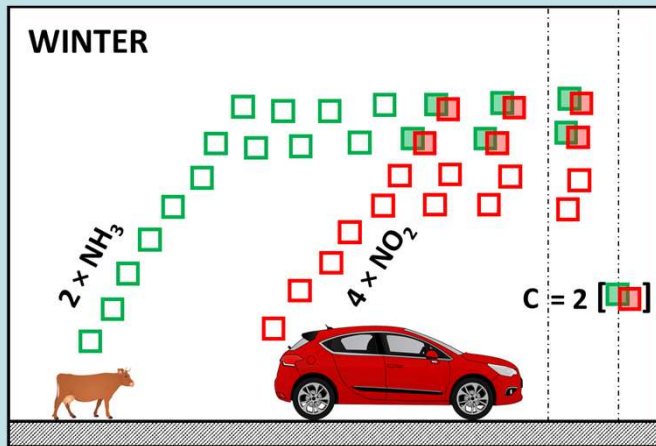
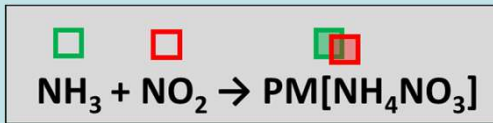


A simple case: Abatement Strategies in Europe

WINTER



Contributions vs. Impacts

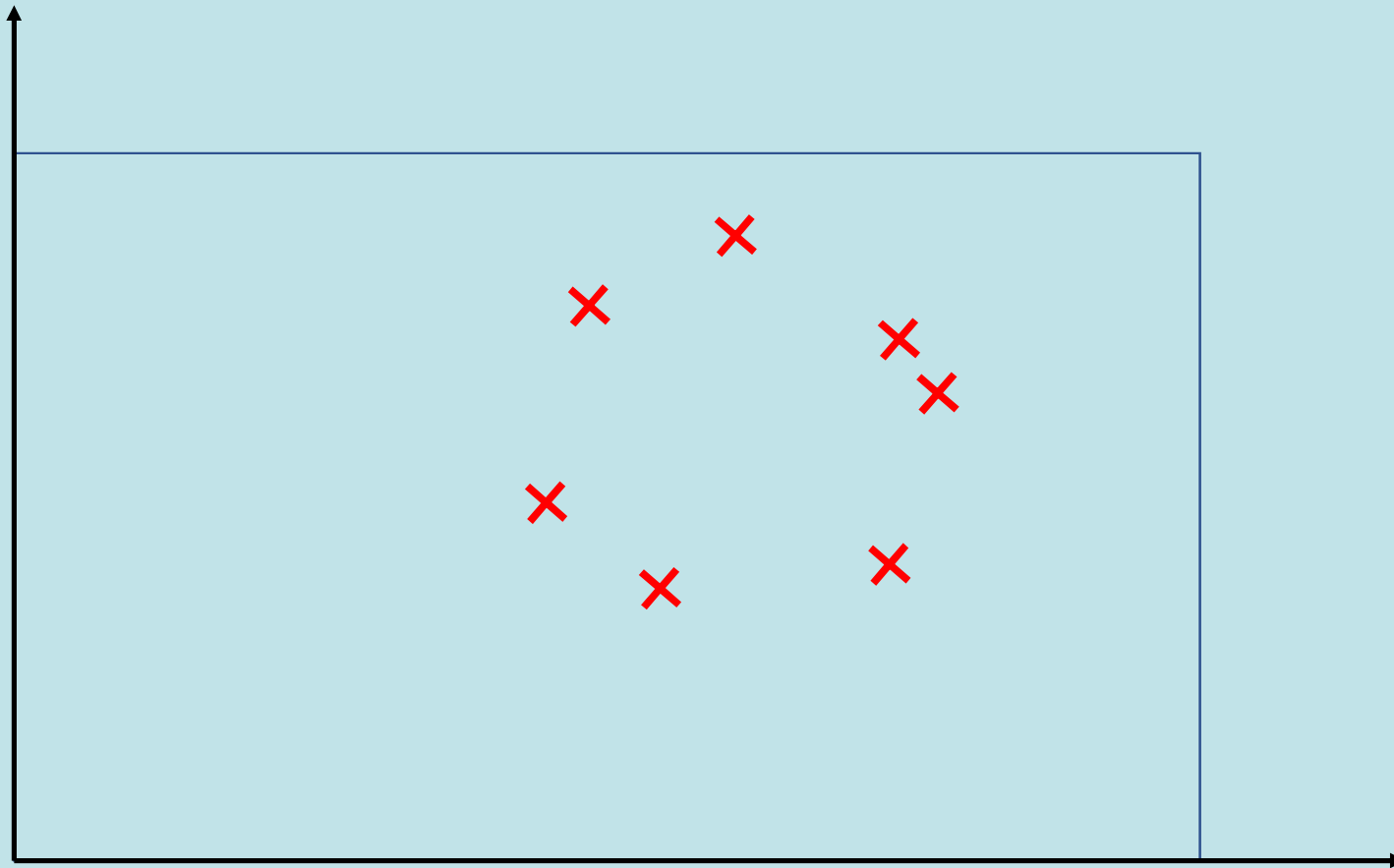


Potential impact (NO₂) = $\frac{C - C}{0.5} = \frac{0 [\text{NH}_3 + \text{NO}_2]}{0.5} = 0 [\text{NH}_3 + \text{NO}_2]$

Contribution (NO₂) = 2 [NH₃ + NO₂]

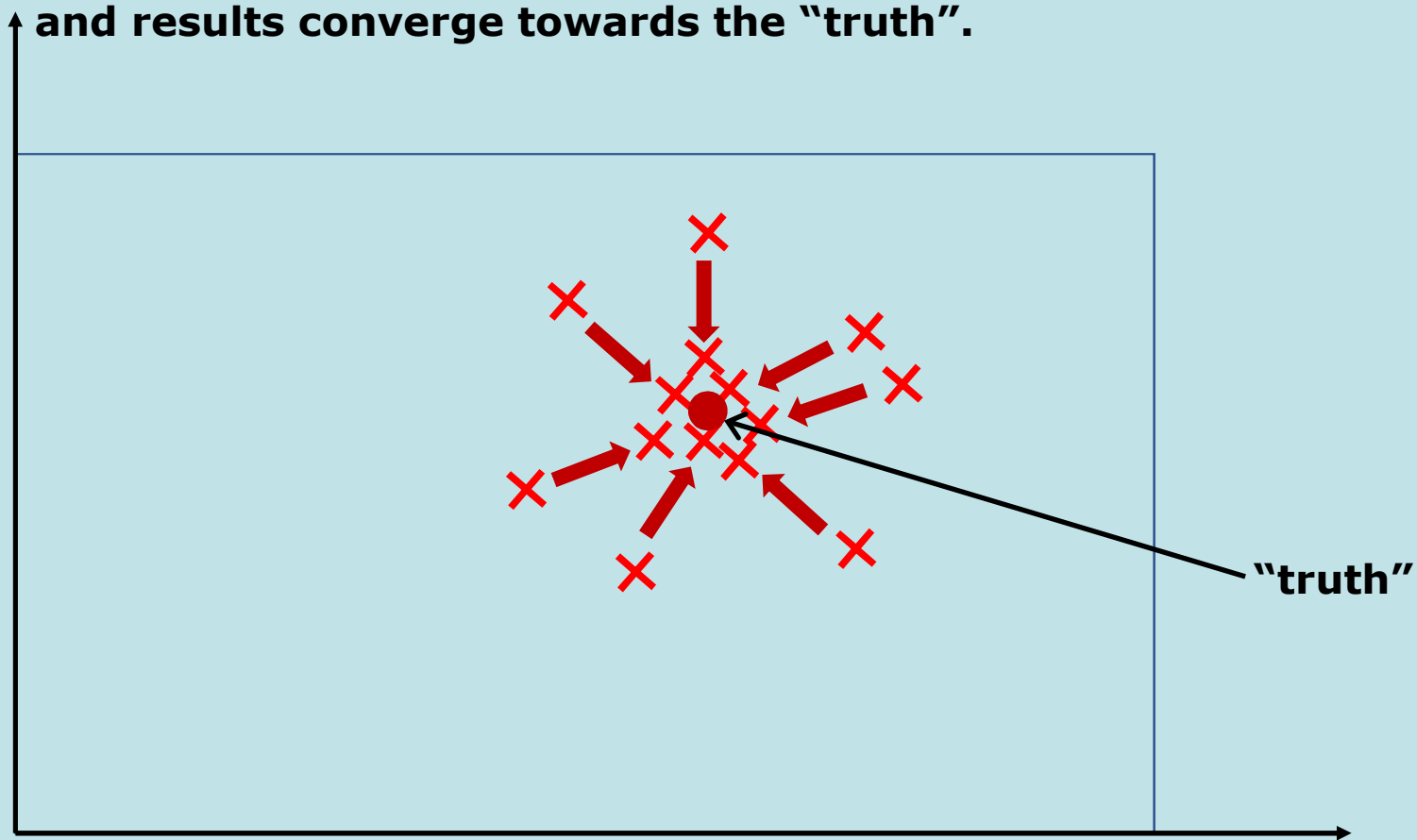
Uncertainties vs. Bias

Results obtained with different models and data sets.



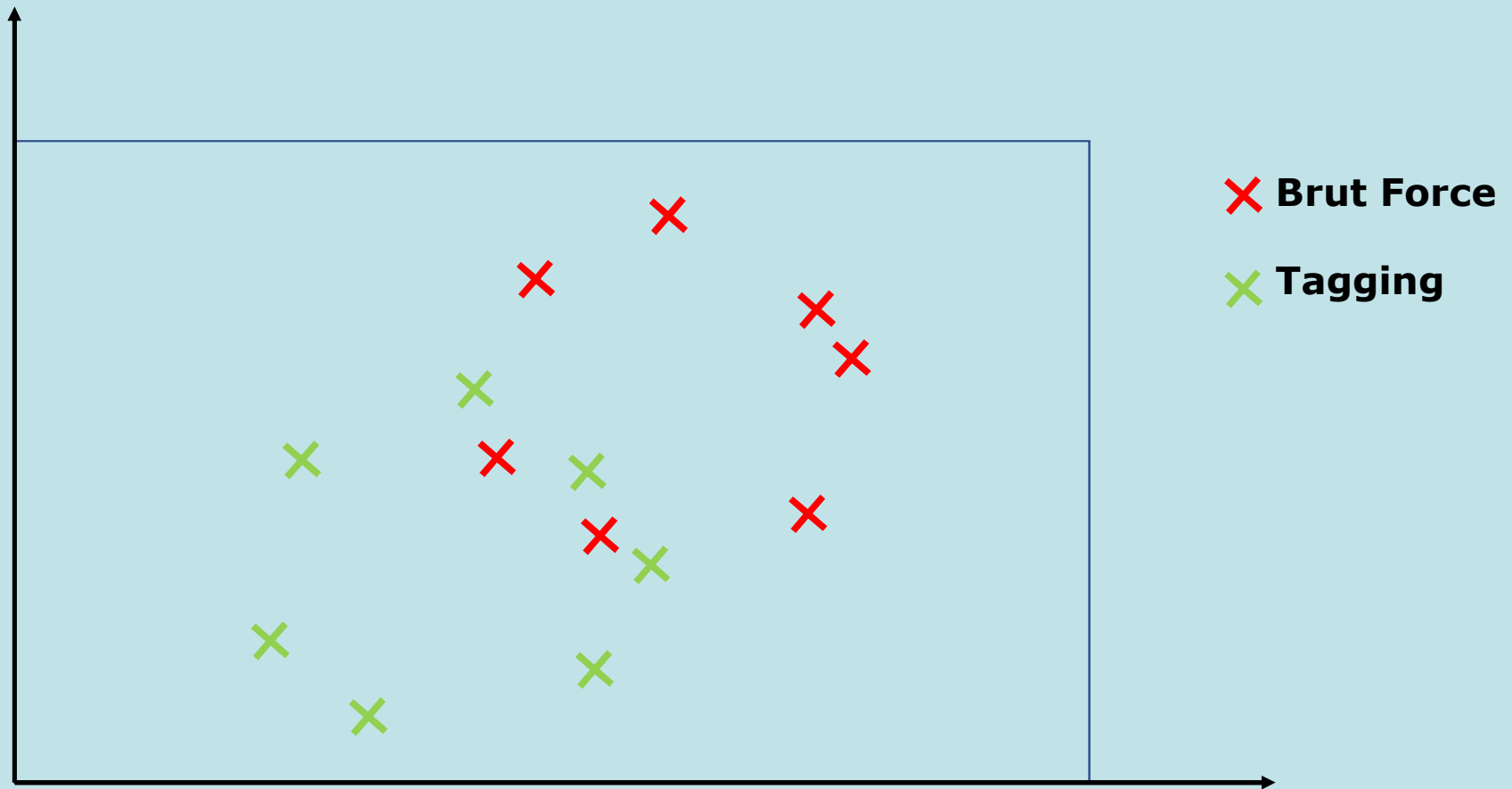
Uncertainties vs. Bias

As the accuracy of methods and models increases, the uncertainties decrease and results converge towards the "truth".



Uncertainties vs. Bias

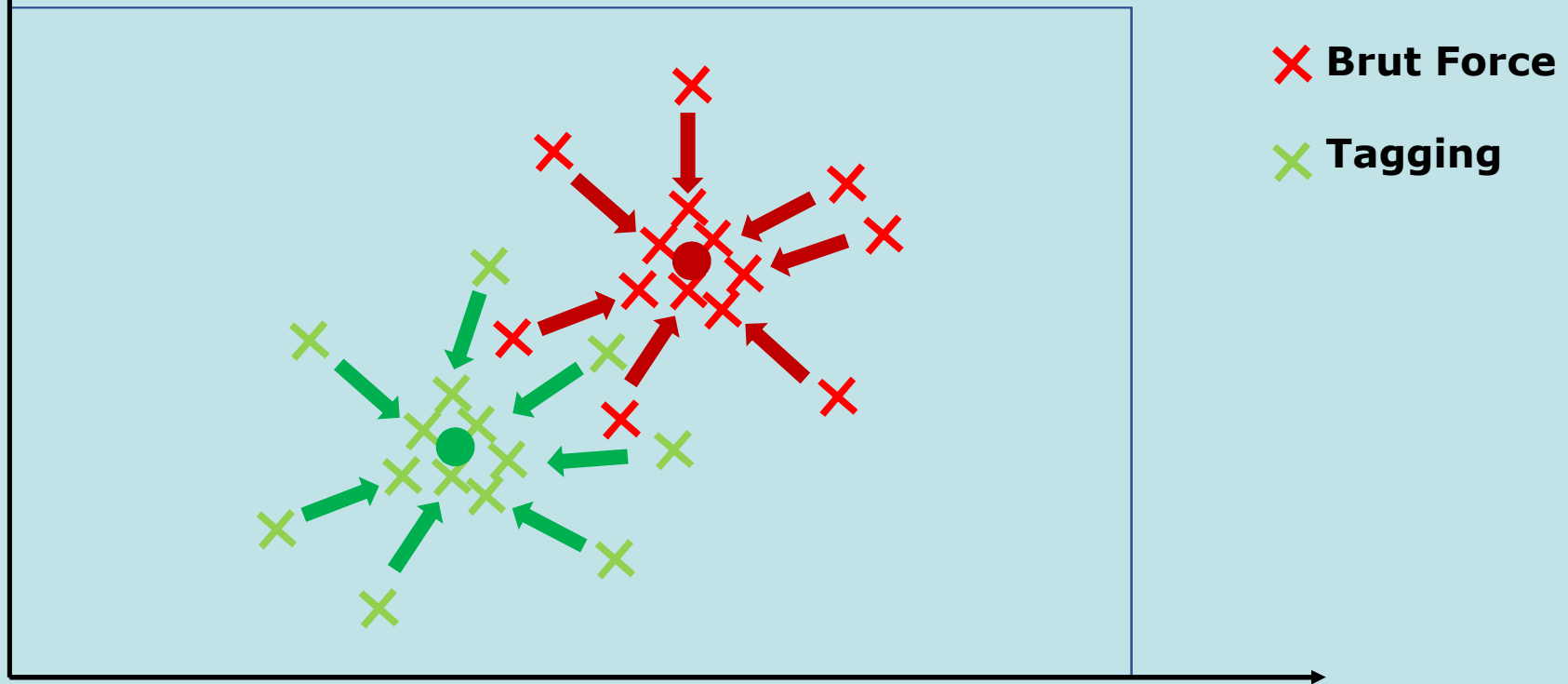
Different models using Brut Force and Tagging methods



Uncertainties vs. Bias

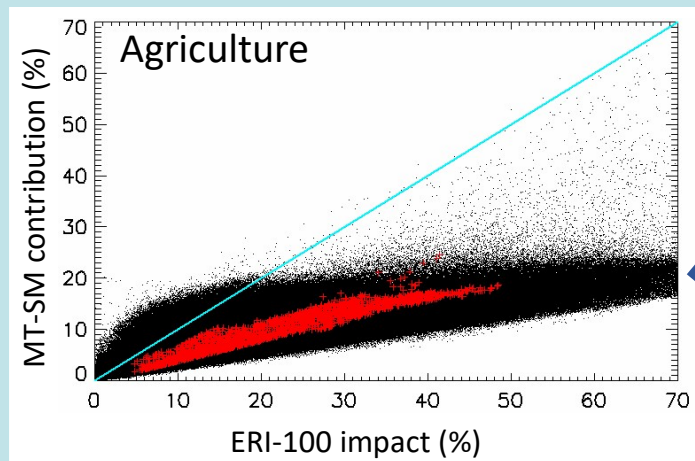
The simple examples show us that the Brut Force and Tagging methods are converging on two different "truths".

The differences between are not uncertainties but biases.



Contributions vs. Impacts

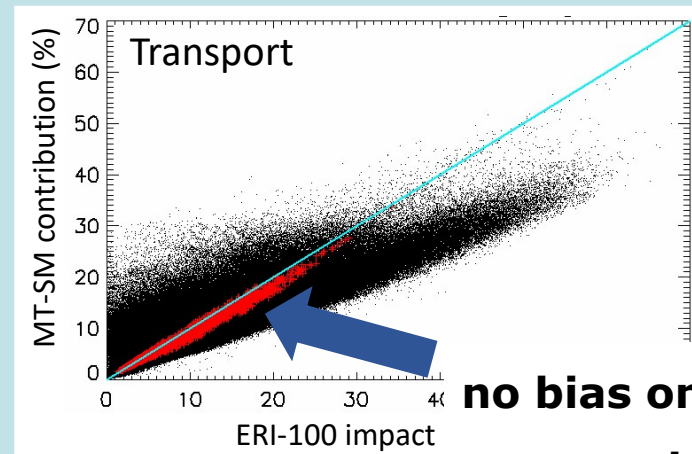
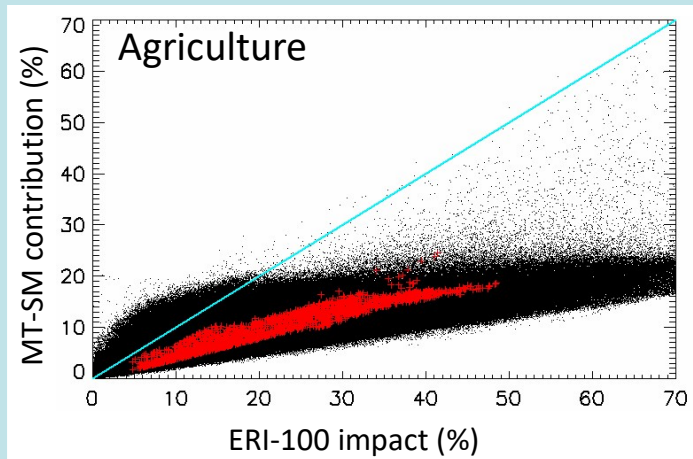
Simulation of the Po Valley with CAMx model



**clear bias on the yearly averaged (red)
as well on the daily values (black)**

Contributions vs. Impacts

Simulation of the Po Valley with CAMx model



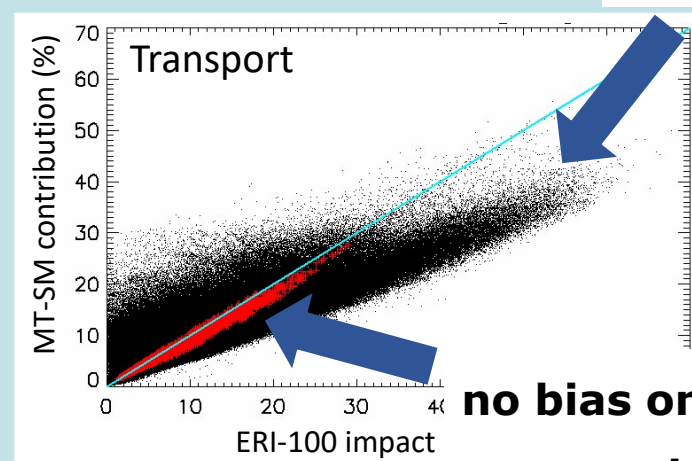
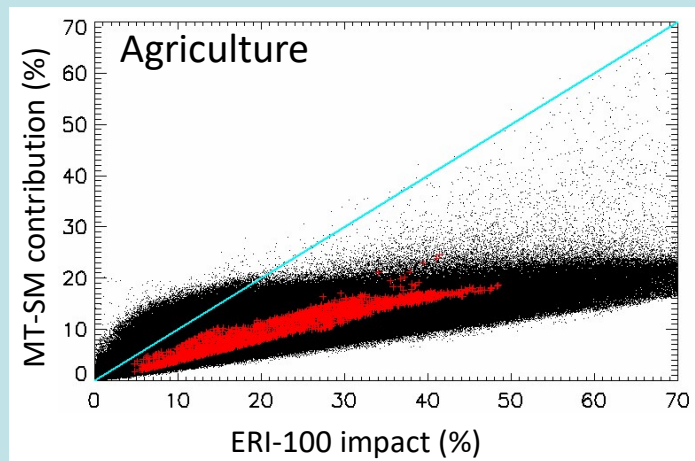
no bias on the yearly averaged (red)

Contributions vs. Impacts

Simulation of the Po Valley with CAMx model



Bias on the daily values (black)



no bias on the yearly averaged (red)

Conclusions

- Differences between Brut Force and Tagging are not uncertainties but biases.**
- Averages can be misleading**
- Complex situations with a lot of different sources mixing primary and secondary PM can also be also be misleading to design air quality plans (except for primaries alone...)**

then, how the tagging can be used is not clear yet ?

Current CT1 work items

- ❑ **Source apportionment for NO₂,**
- ❑ **Preparation of a guide for receptor models (CMB, PMF),**
- ❑ **Evaluate the possible complementarities between the Brute Force (impacts) and Tagging (contributions) methods.**

Thank-you