Source apportionment

Tagging and Brut Force:

Similar, complementary or designed for different purposes ?

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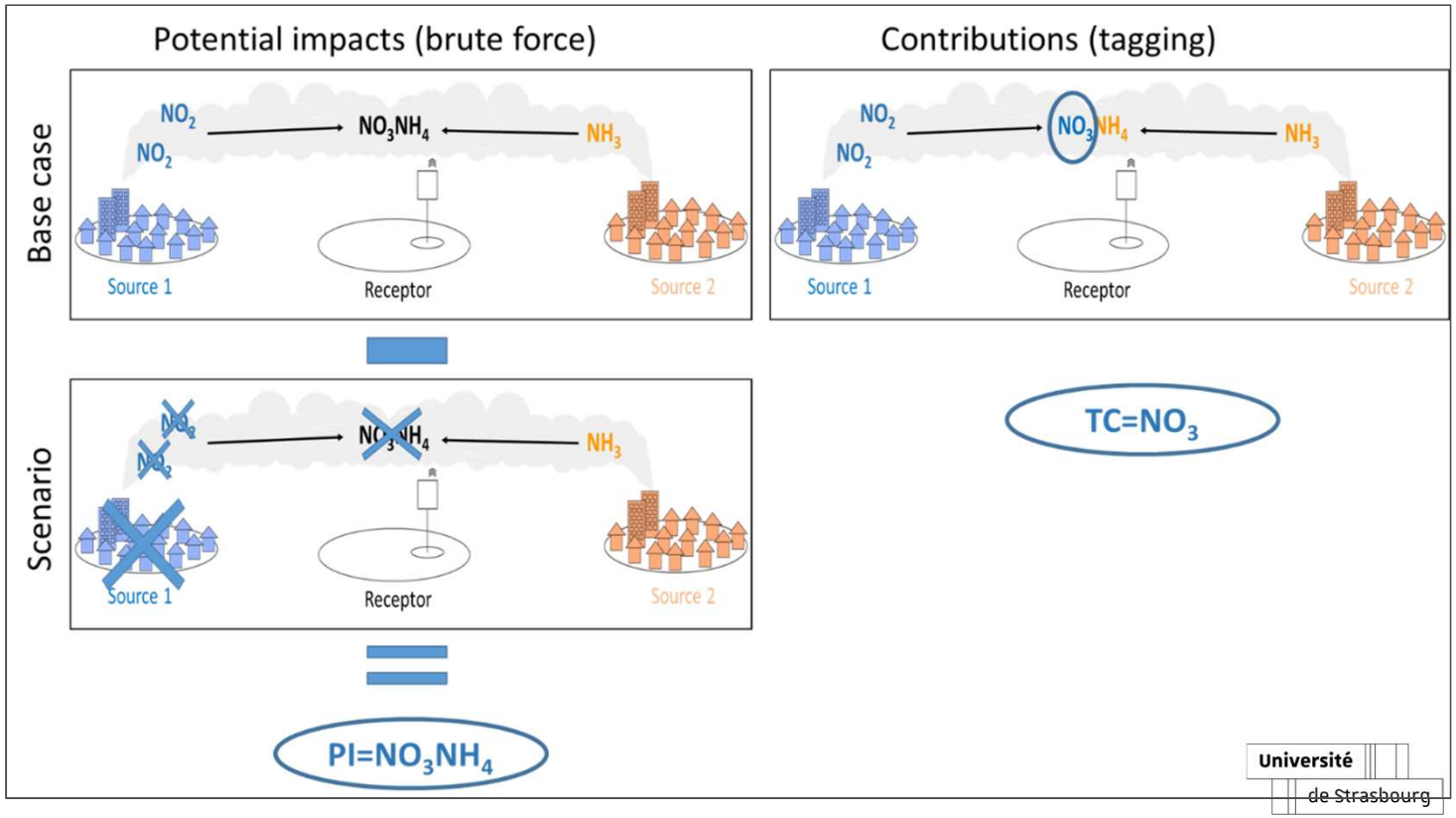
Brute Force (PI) and Tagging (TC)

Two source apportionment methods based on Air Quality Models



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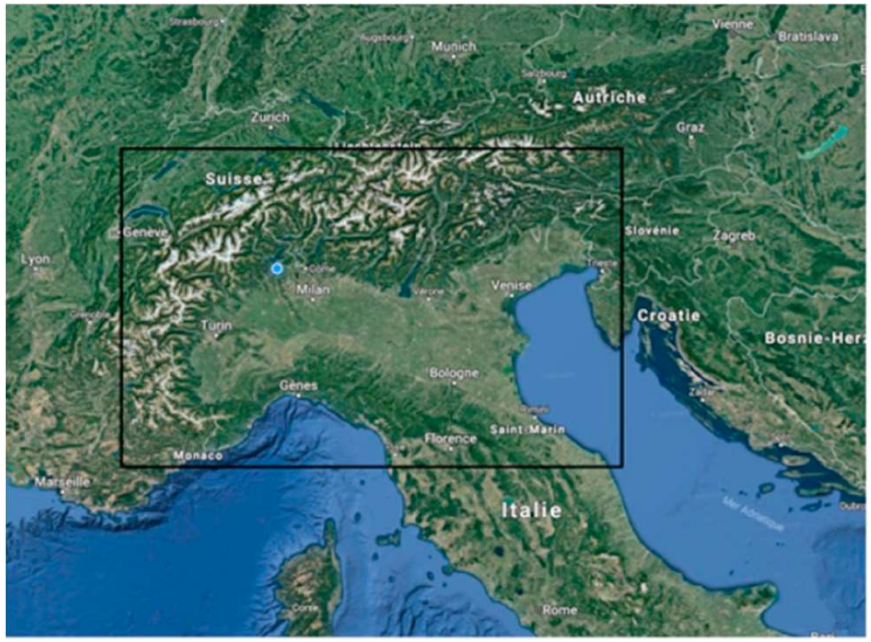
Data Analysis

Data used by **Thunis et al. (2019)** and by **Belis et al. (2021).**

1 year (2010) CAMx simulations over the Po Valley



- Base case (including PSAT)
- Reduction scenarios:
  - at 20%, 50% and 100%,
  - affecting the sectors of transport, industry and agriculture.

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PI and TC produce similar results?

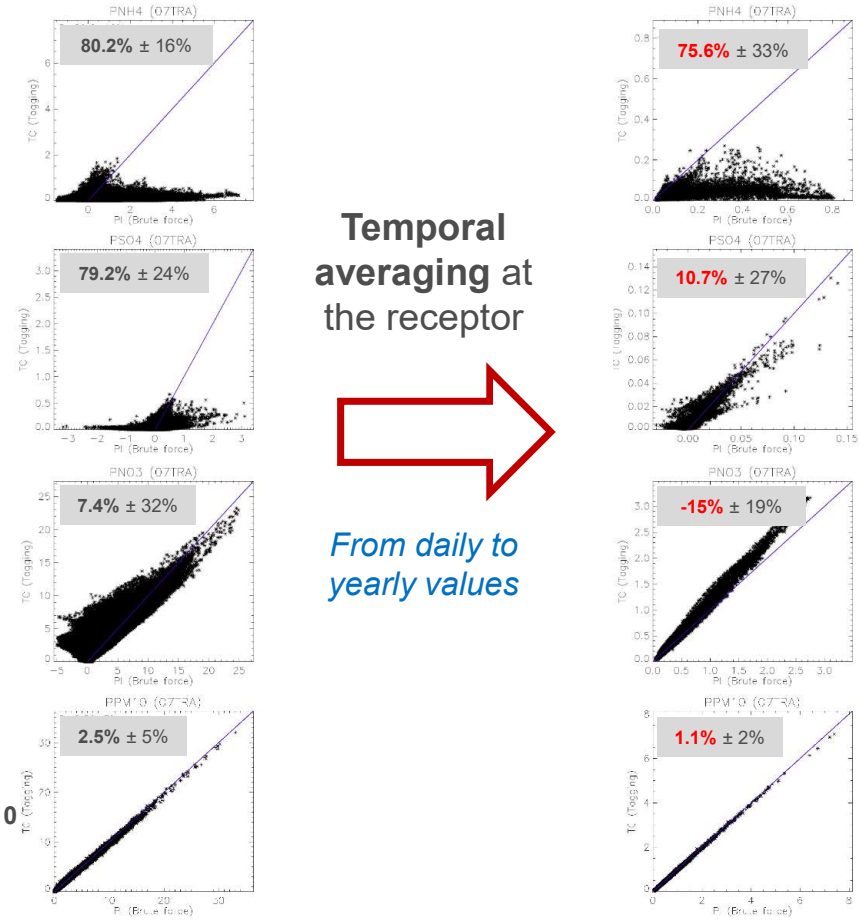
Averages and aggregations end up making the results similar

NH_4

SO_4

NO_3

PPM_{10}



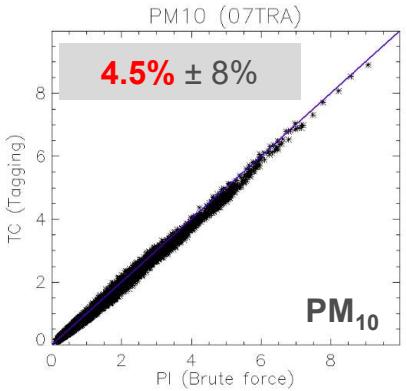
Temporal averaging at the receptor

From daily to yearly values

Towards to **aggregated indicators**

From individual species to PM_{10}

Transport sector



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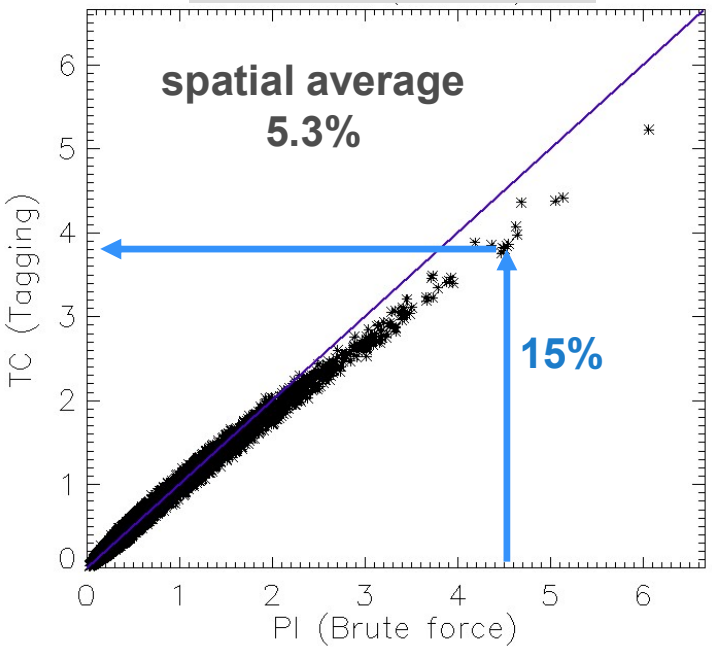
PI and TC produce similar results?

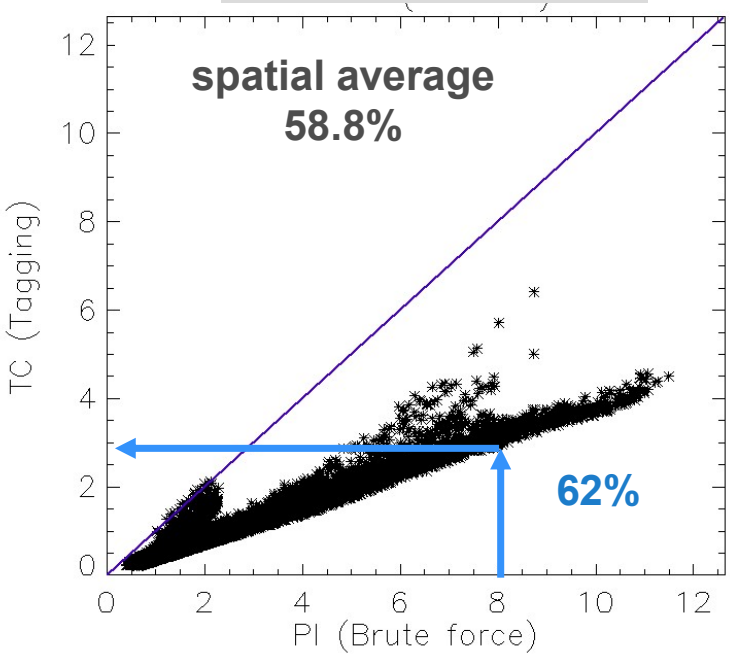
Averages and aggregations end up making **NOT ALL** results similar

Industry sector



Aggregation of a group of emitted species: PPM & others

Agriculture sector



One emitted specie: NH_3

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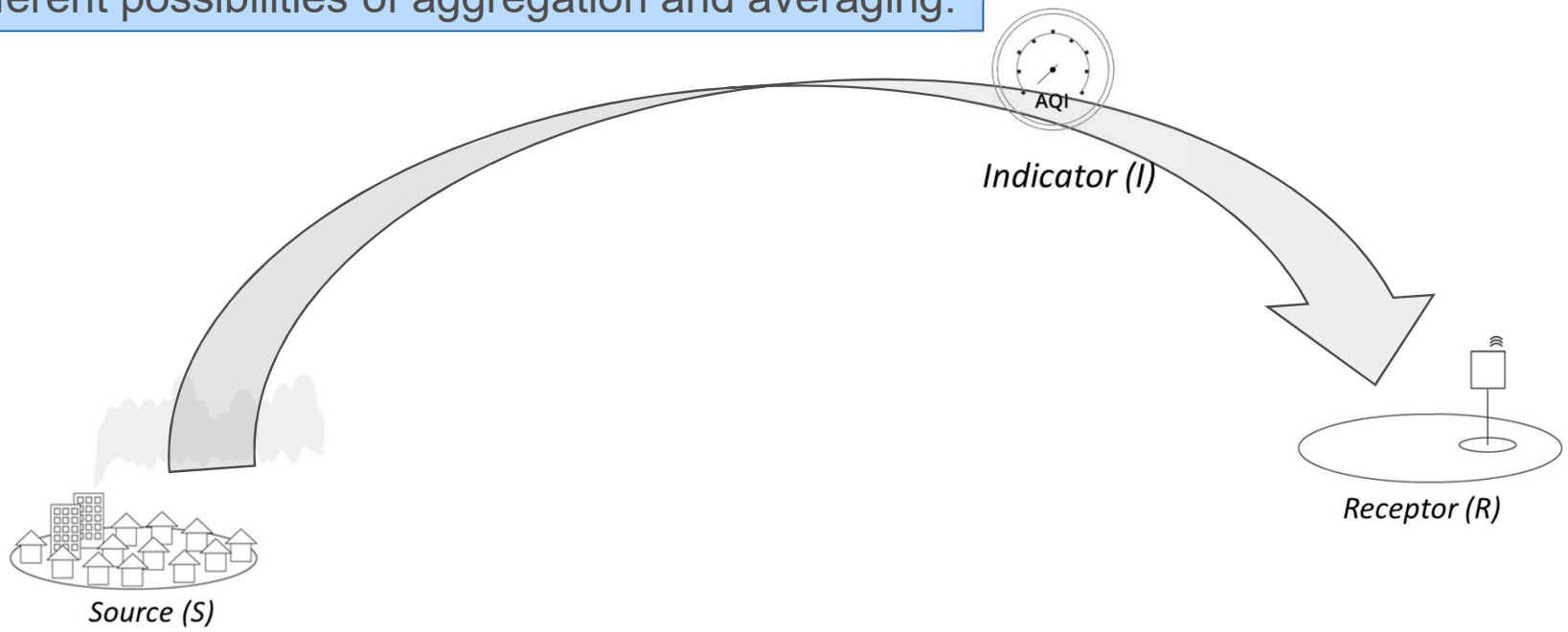
PI and TC produce similar results?

Different possibilities of aggregation and averaging:



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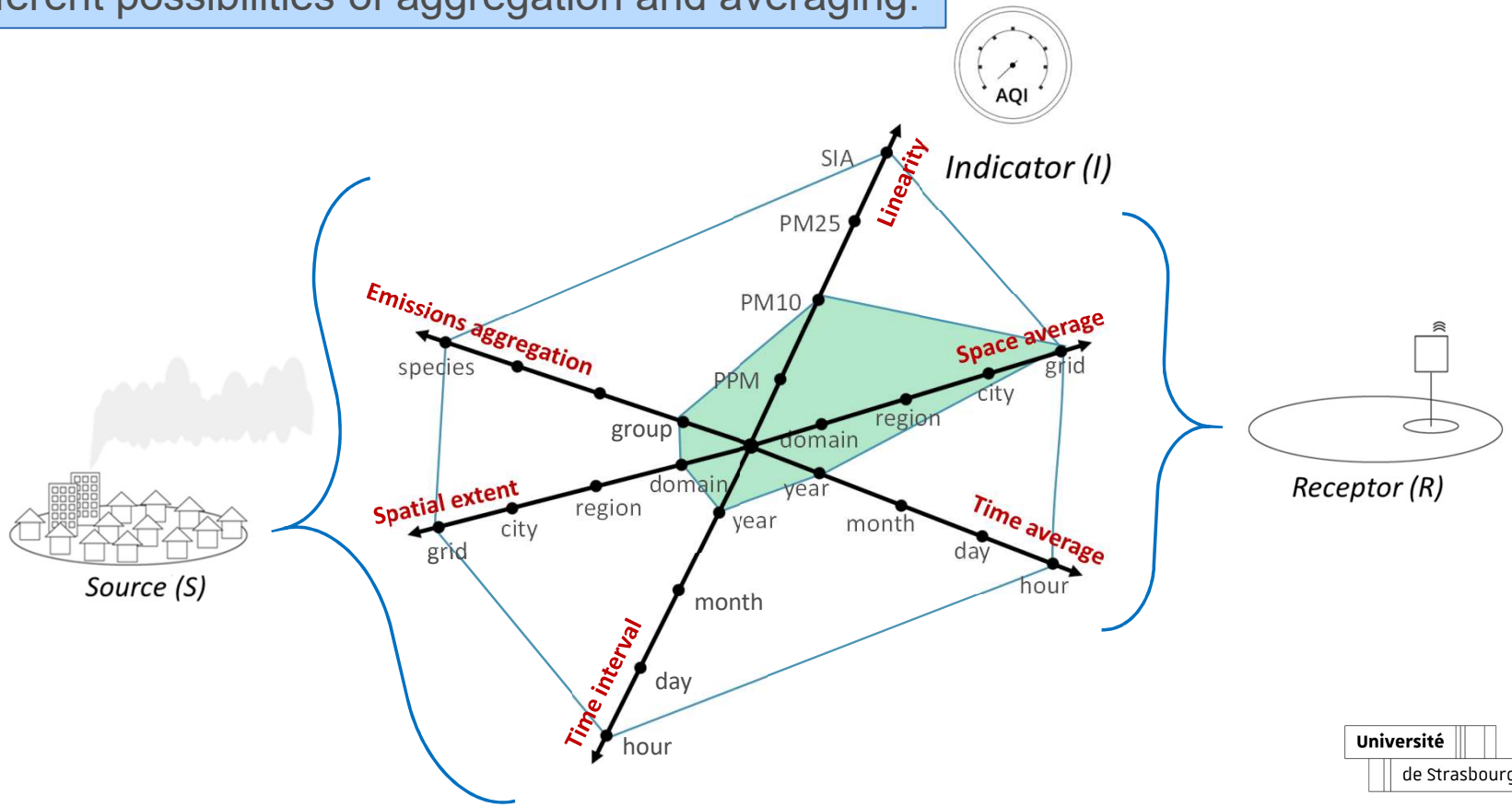
PI and TC produce similar results?

Different possibilities of aggregation and averaging:



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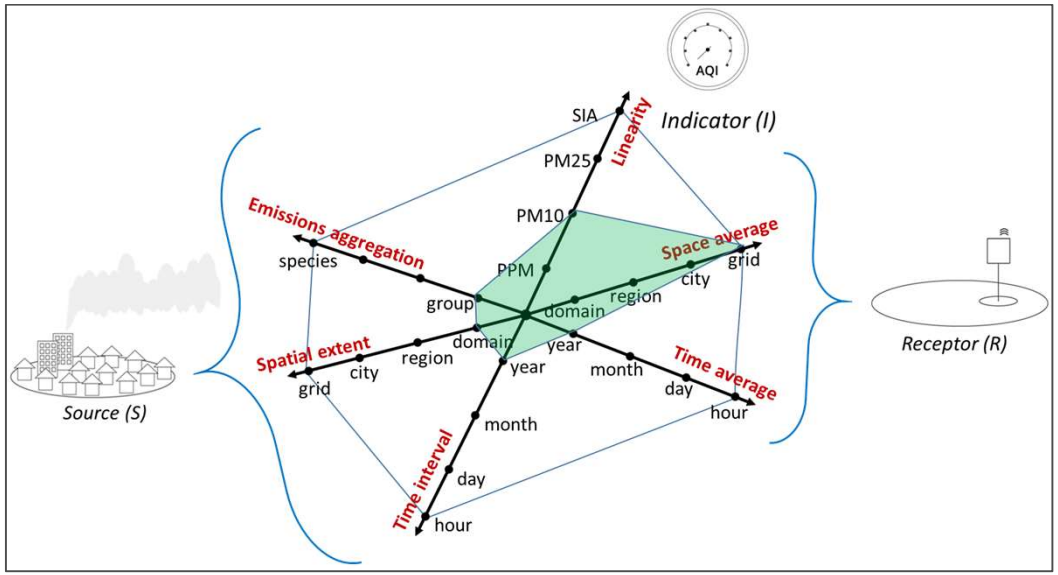
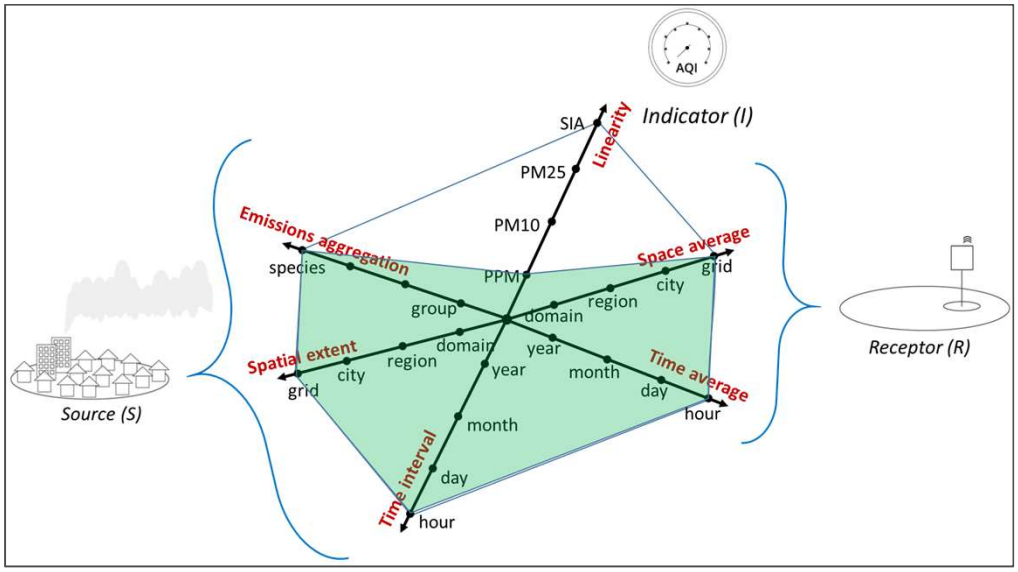
PI and TC produce similar results?

The two methods give similar results for non reactive species (linearity for 0 to 100% reduction):

Indicator → PM10



Indicator → PPM



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PI and TC produce similar results?

Belis et al. (2021) conclude:

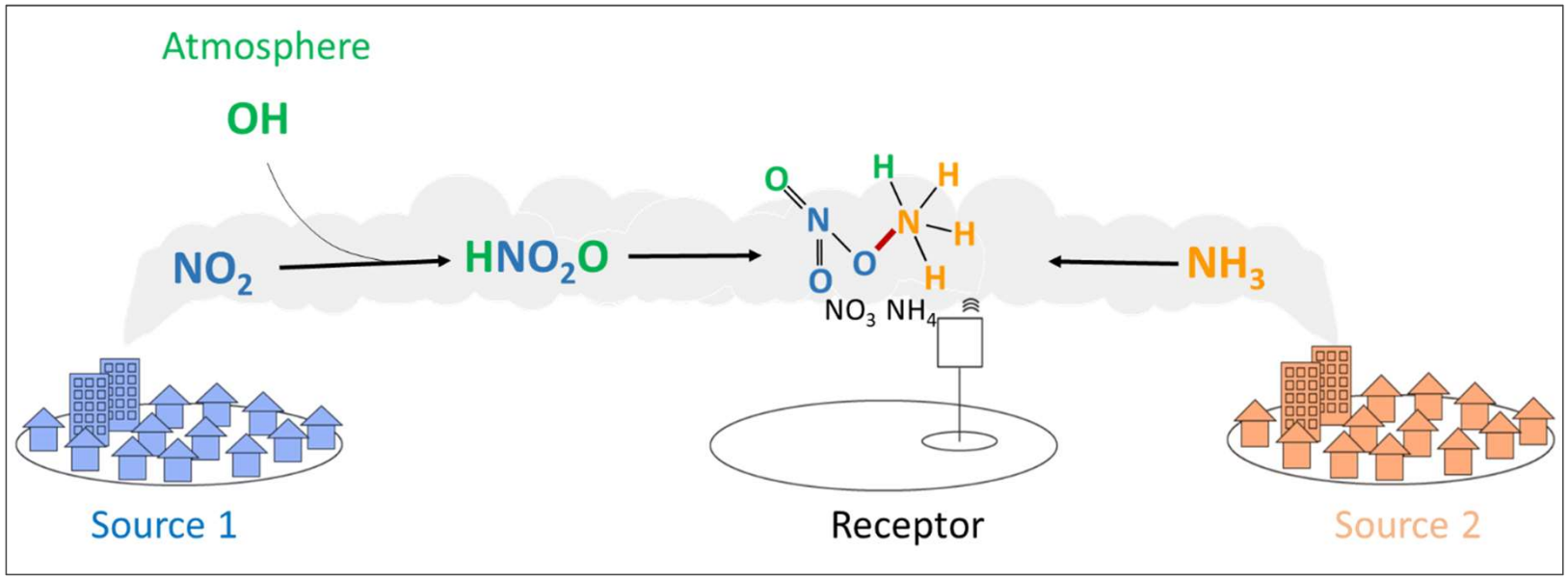
> *"in most situations the two approaches (i.e. TC and PI) provide similar results for annual averages"*

but an analysis of the situation as a whole leads to a slightly different conclusion:

> *"PI and TC results differ in most of cases"* (Thunis et al. ; 2019)

Other options for TC

Belis et al. (2019): *« An option emphasize the role of agriculture with this approach (i.e. TC) would be to develop a version based on the molar ratio instead of the mass »*



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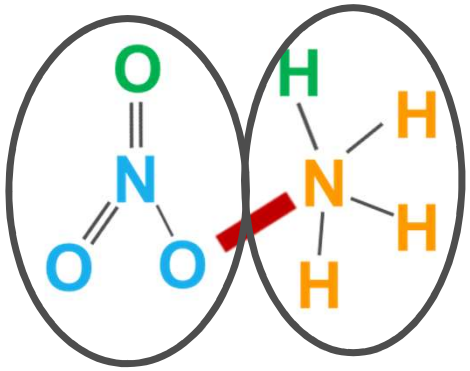
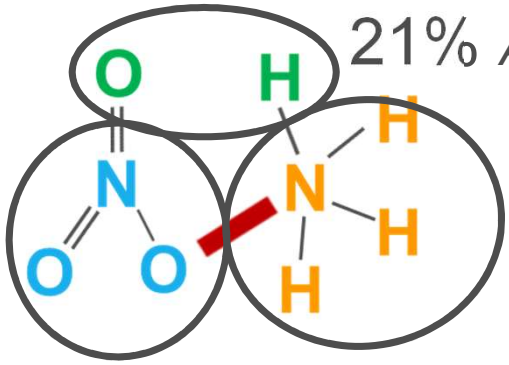
Other options for TC



Mass	78% *Source 1*	22% *Source 2*
Moles	50% *Source 1*	50% *Source 2*

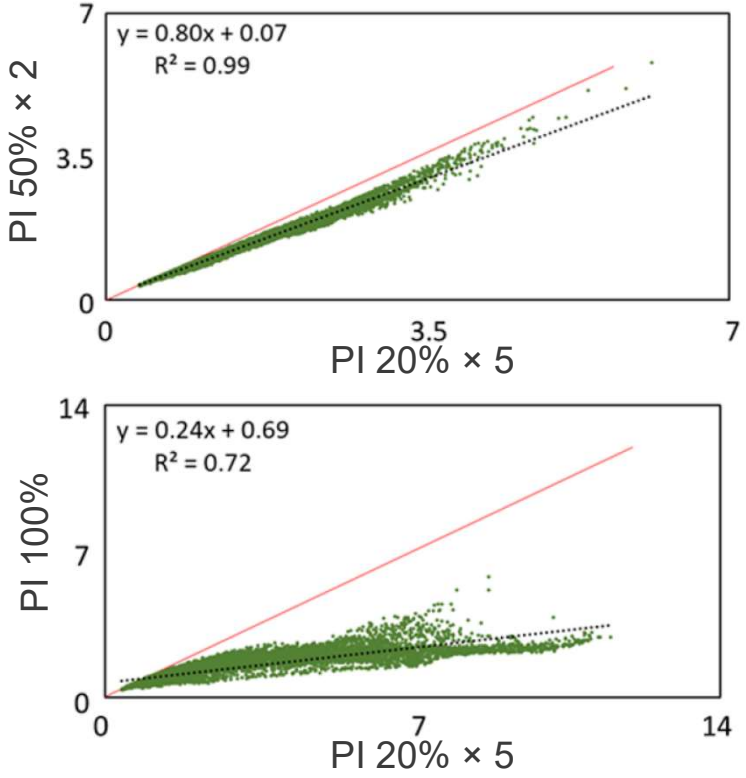


Mass	58% *Source 1*	21% *Source 2*
Atmosphere mass balance	68% *Source 1*	32% *Source 2*

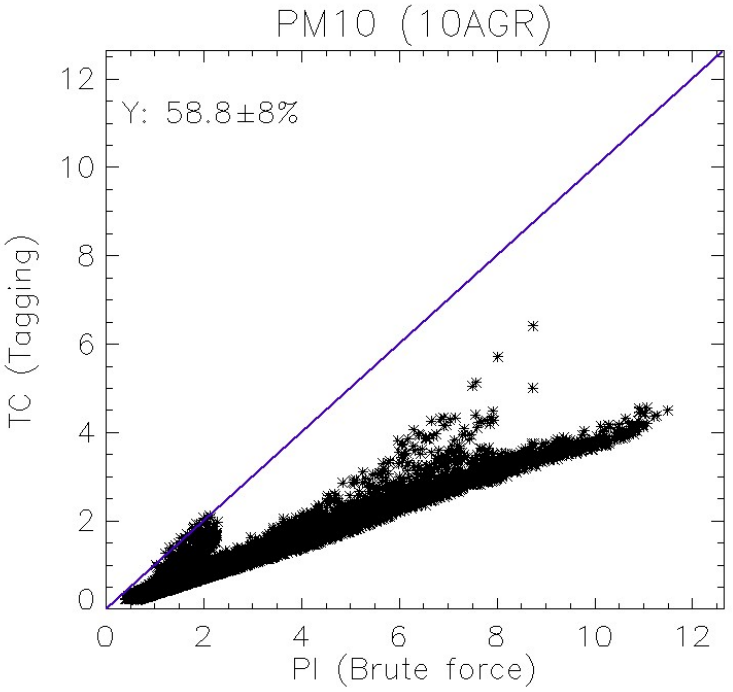
The choice for the source repartition could change arbitrary

Other options for PI

Belis et al. (2021): *"in the majority of the tested scenarios at 50% and 20% ERLs (i.e. Emission Reduction Levels), interaction terms are either negligible or remain low. In these conditions, the TC and PI approaches provide comparable results".*



Agriculture sector



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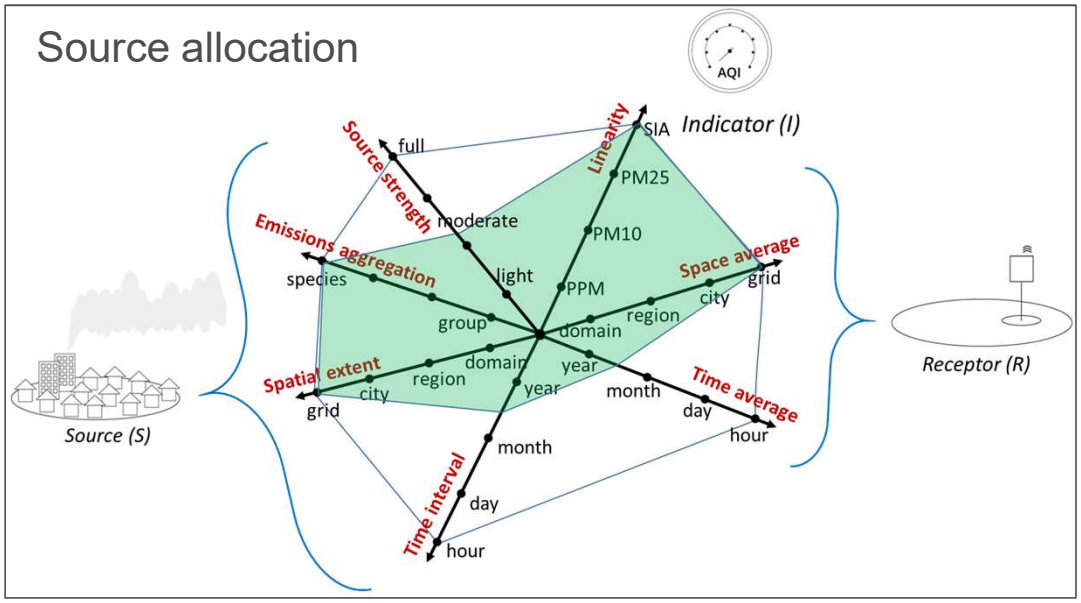
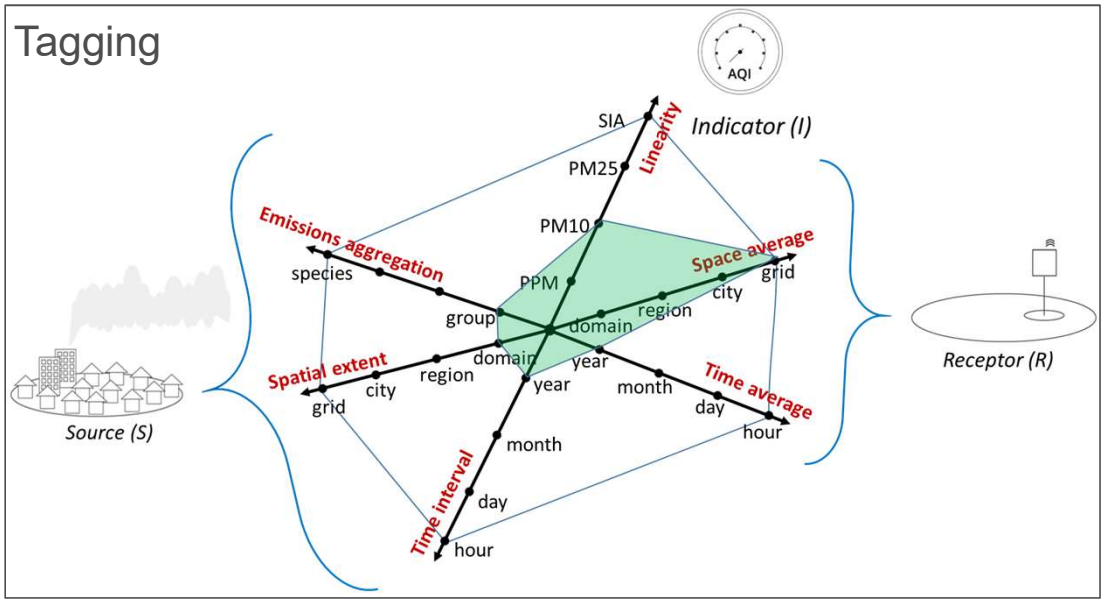
Other options for PI

Source allocation (& DDM) = PI for « low » emission reduction levels





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Conclusions?

- PI and TC results differ in most of cases.
  - Results are similar only in case of linearity from 0 to 100% emission reductions
- TC are based on source repartitions that could change arbitrary.
  - How to choose between the different options and for what purpose?
- Source allocation (DDM) is the best alternative to compute source apportionment components related to reduction impacts.

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Next steps?

Further investigation to clarify the limitations and purposes of the different source apportionment methods

Volunteers to participate in a new publication?

clappier@unistra.fr

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Thank you for your attention

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