ATMOSTREET, SOURCE APPORTIONEMENT OF NO_2

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KEY QUESTIONS 1/2

- **Are your SA results for NO_2 consistent?**
- In other words, if your SA result are based on “brute force” impacts, are these behaving linearly over the whole range of emission reductions (0-100%)? If not, to what extent can it be considered consistent?

- **Are your SA results additive?**
- In other words, is the sum of the impacts/contributions of two sources equal to the impact/contribution of the combined sources. I.e. for two sources A and B: $C_{AB}=C_A+C_B$?
- Is this property influenced by the emission reduction strength?

- ***Are your results influenced by the chemical profile of the considered sources?***
- *In other words, do you obtain different results if you reduce, for a specific source, only NOX emissions instead of all emitted chemical compounds (e.g. VOC, SO2,…)*

KEY QUESTIONS 2/2

- ***How sensitive are your results to the regional background?*** Not tested

- ***Can you identify any relationship between NO2 and NOX concentrations in your modelling results?***
- *In other words, can you perform your SA analysis in terms of NOX and then "convert" them to NO_2?*

- ***Are "tagging contributions" comparable to "impacts" for NO_2?***
- *If yes, under which conditions? (i.e. emission reduction strength, chemical regime, boundary conditions…)*
- Unanswerable with current set-up

AVAILABLE DATA

- 6 Locations

	sector red/tag	Emission red/tag	Red/tag strength
SCEN01	A	NOX	100
SCEN02	B	NOX	100
SCEN03	A&B	NOX	100
SCEN04			
SCEN05			
SCEN06			
SCEN07	A	NOX	75
SCEN08	B	NOX	75
SCEN09	A&B	NOX	75
SCEN10			
SCEN11			
SCEN12			
SCEN13	A	NOX	50
SCEN14	B	NOX	50
SCEN15	A&B	NOX	50
SCEN16			
SCEN17			
SCEN18			
SCEN19	A	NOX	25
SCEN20	B	NOX	25
SCEN21	A&B	NOX	25
SCEN22			
SCEN23			
SCEN24			

Emissions = NOX

Period = 1/1/2017 – 31/12/2017

Cities = HOOGST (RB07, RB08, RT03, RT04, RT05, SB06)

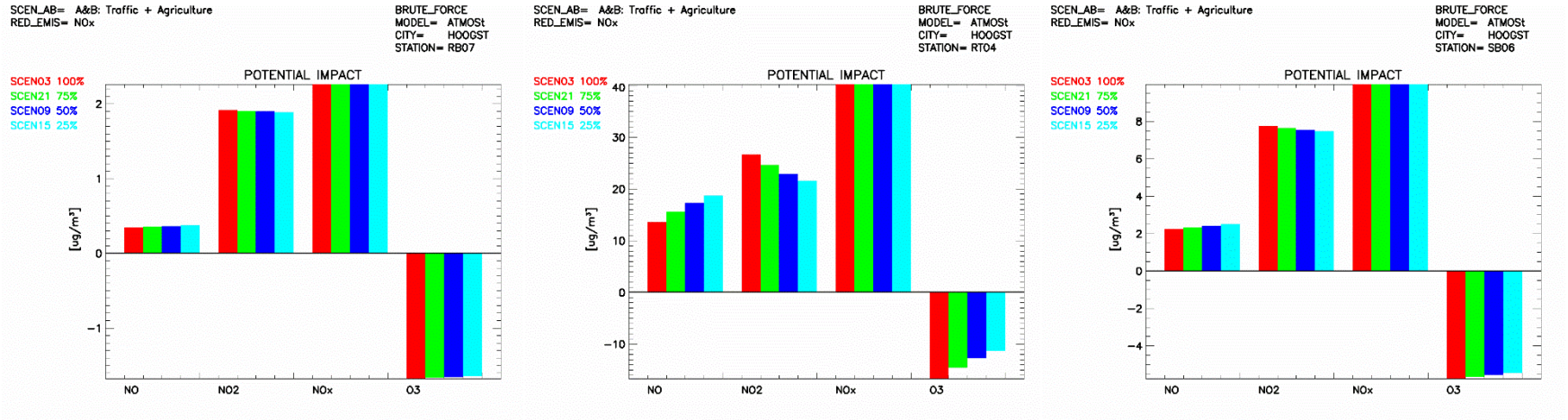
Sectors = Road Transport (A), Agriculture (B)

Methods =Brute Force

AVAILABLE DATA

- Importance of local sectors in Hoogstraten-Wuustwezel for NOx.
- Only road traffic is important, other sectors are small
- Used the largest ‘other’ sector as second one => Agriculture

CONSISTENCY (LINEAR OVER WHOLE EMISSION REDUCTION SCALE?



Traffic site

Consistent for NOx, logical due to Gaussian model setup

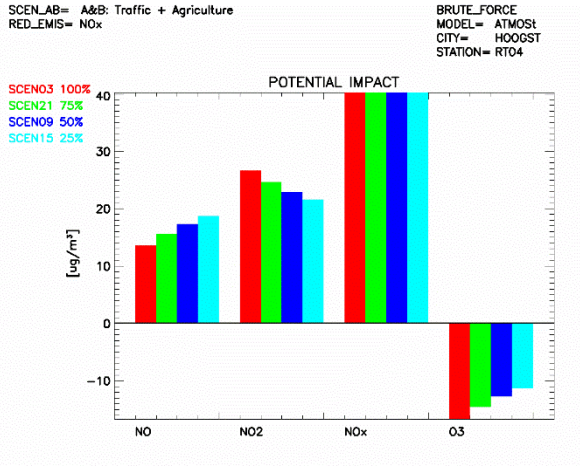
Slightly inconsistent for NO, NO_2 and O_3 at traffic locations. Why?

CONSISTENCY

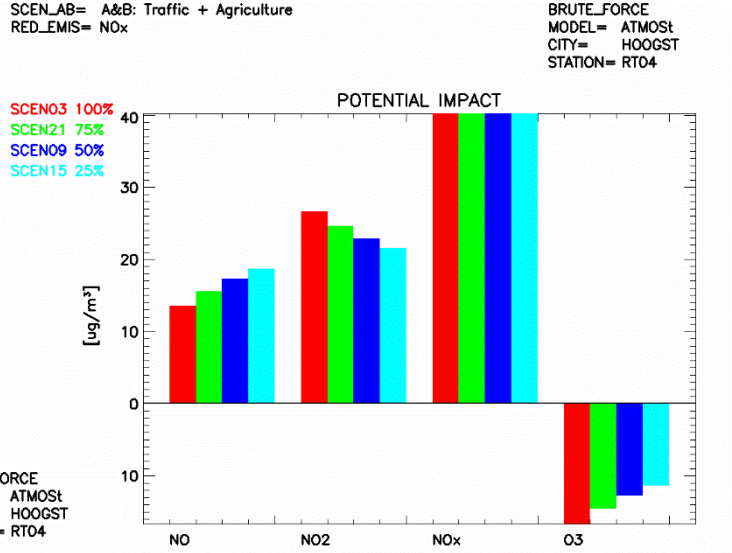
- Traffic locations: high NO, high NO_2, low O_3.
- Several hours where O_3 is depleted, but would not be without traffic emissions.
- Reduction with large amount of emissions => formation of O_3 in these hours
- More NO than expected, less NO_2, more effect on ozone with high reduction scenarios.
- Thus: higher expected impact of NO_2 and lower for NO with high emission reduction scenarios.
- If so, should be visible in traffic reduction results only.

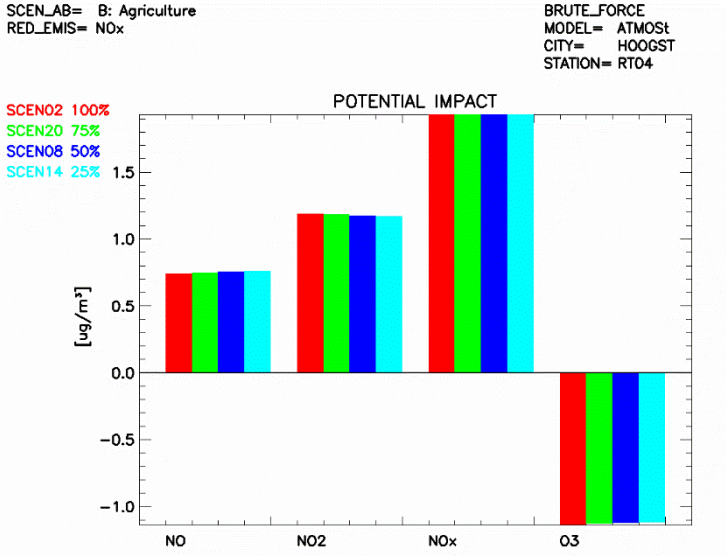
As agricultural NOx emissions are quite small

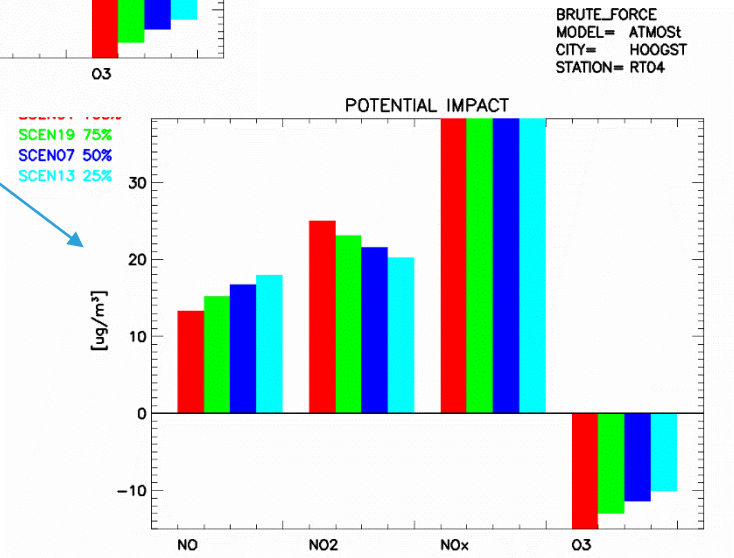
- Will depend from hour to hour



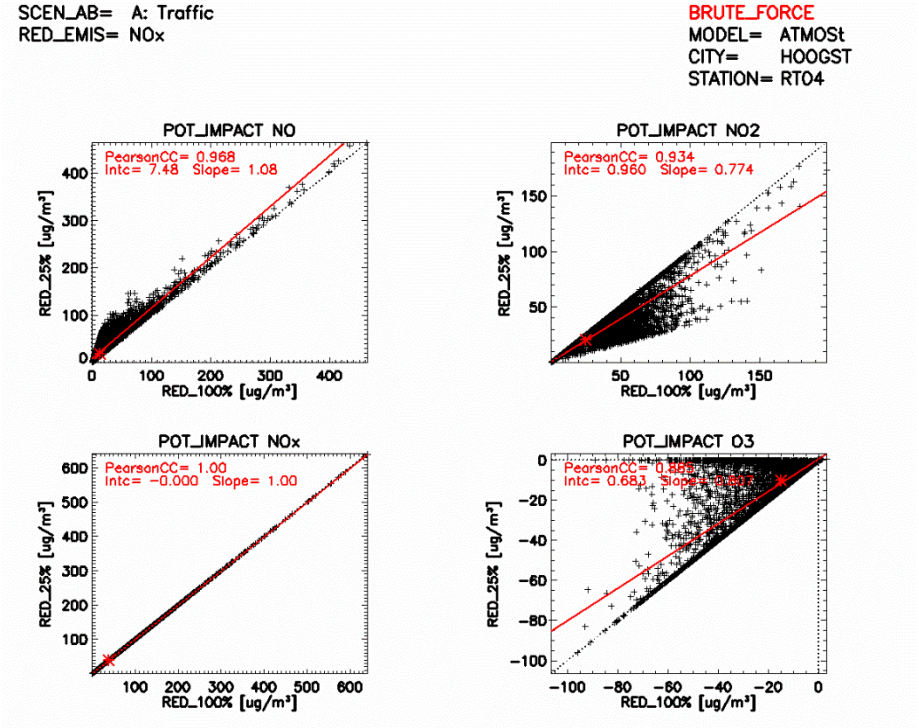
CONSISTENCY TRAFFIC SIT



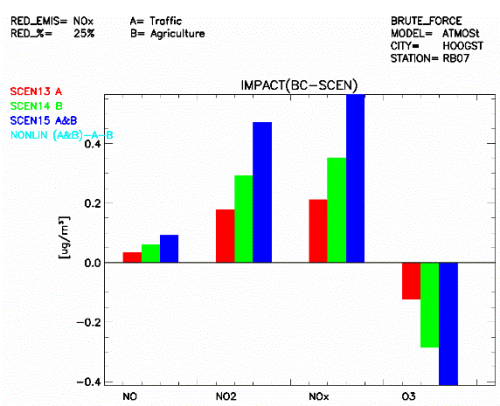


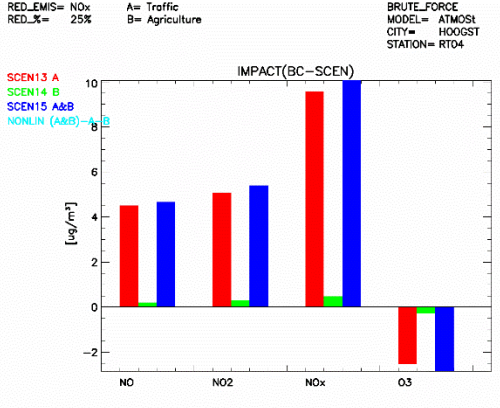


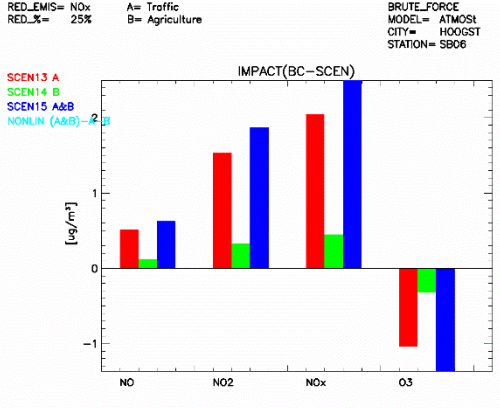
CONSISTENCY

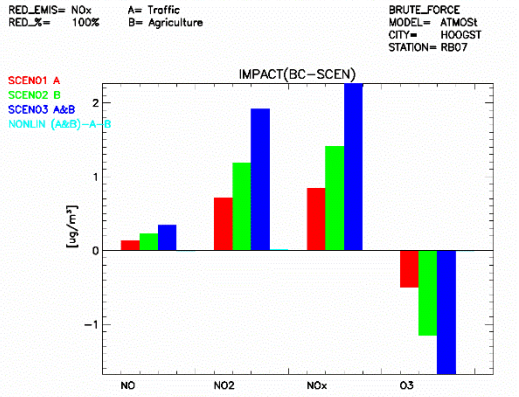


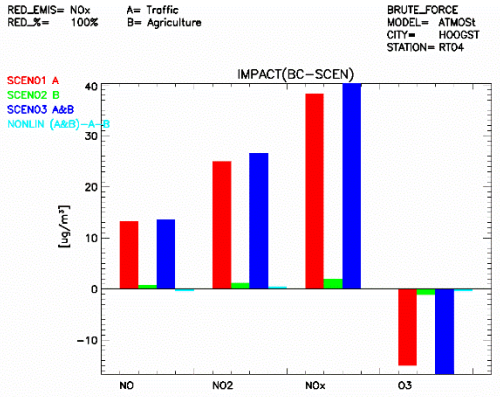
ADDITIVITY

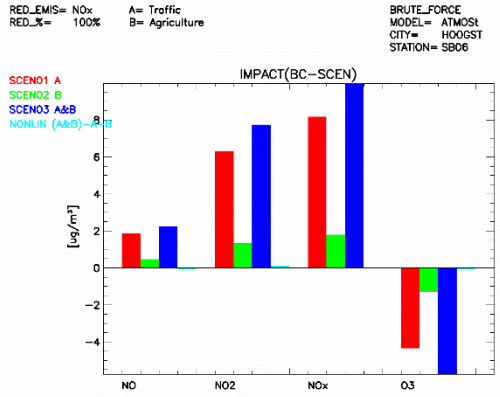








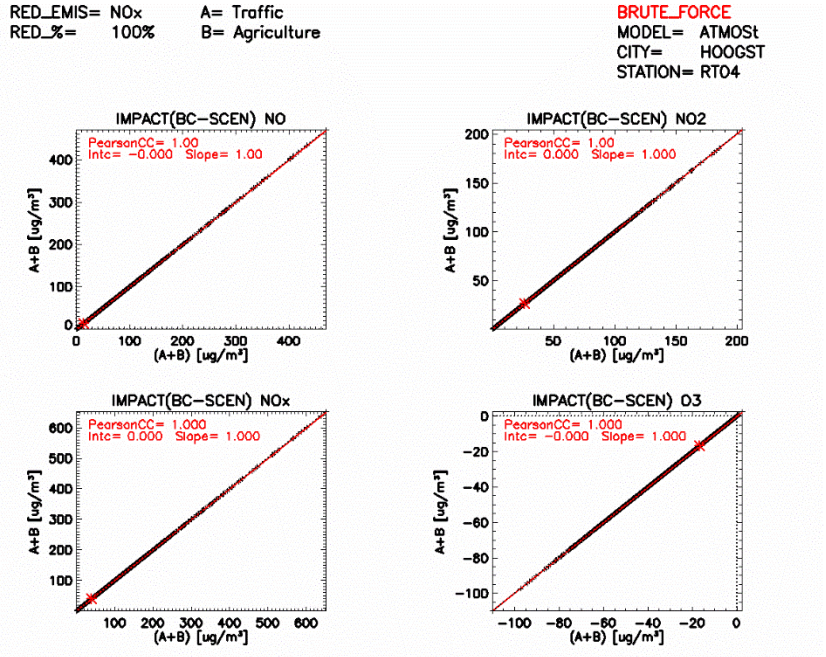




NO_2 results are additive at all reduction strenghts with minor non linearities at 100% in RT04.

ADDITIVITY

- Same logic as for consistency.
- Additivity would be broken if other very large sector existed due to ozone depletion
- NOx additivity is perfect
- Same on hourly as sector B is small…



CONCLUSIONS

- NO_2 brute force results are consistent at sites showing low concentrations (and low impacts), while clear differences arise at higher concentration sites
- Discrepancies are not related to peak values, but to a wide range of NO_2 values (depends on ozone values, not on NO_2)
- NO_2 results at 25% are generally lower than corresponding P.I. at 100%, but without showing a clear temporal correlation (as it depends on ozone)
- ATMO-Street is fully consistent and additive for NO_X
- NO_2 results are additive at all reduction strenghts with minor non linearities at 100% in RT04. This is due to the low impact of sector B. One would expect non-additivity in the same range as the consistency if both sectors are major.
- NO_2 results are additive also on hourly basis over all concentration range. This is due to the low impact of sector B. One would expect non-additivity in the same range as the consistency if both sectors are major.