



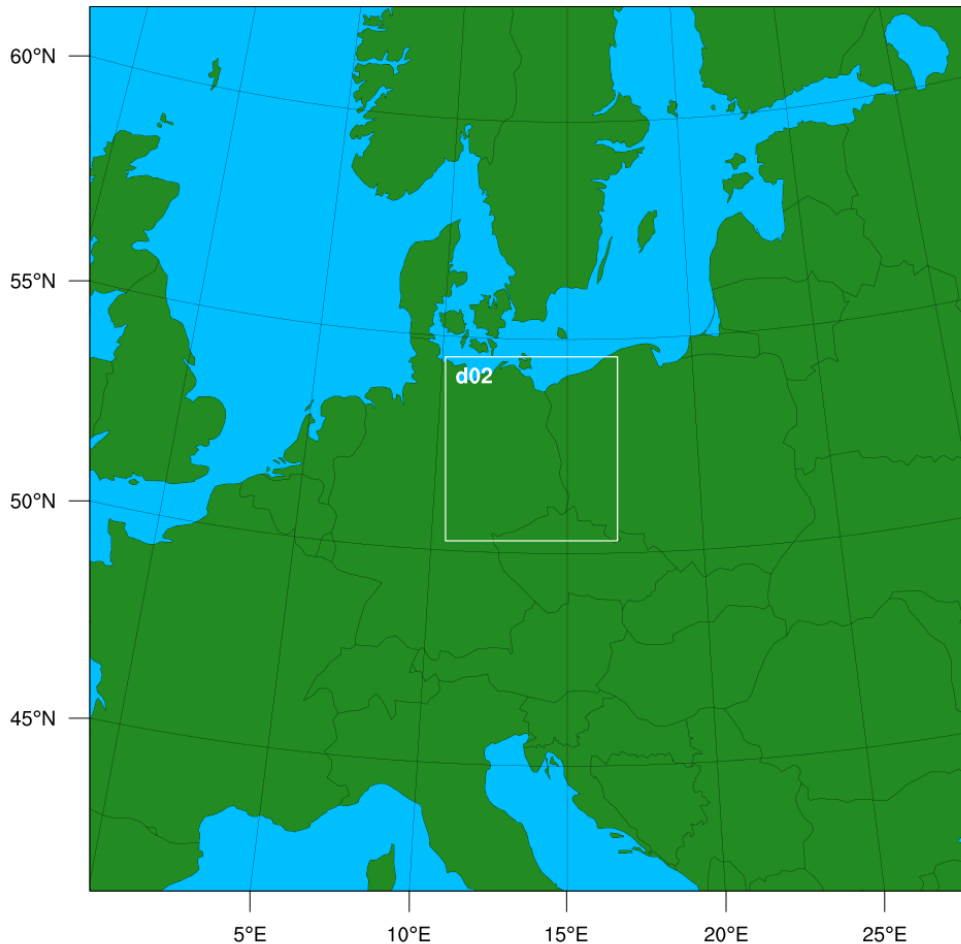
NO₂ source-attribution within WRF-Chem

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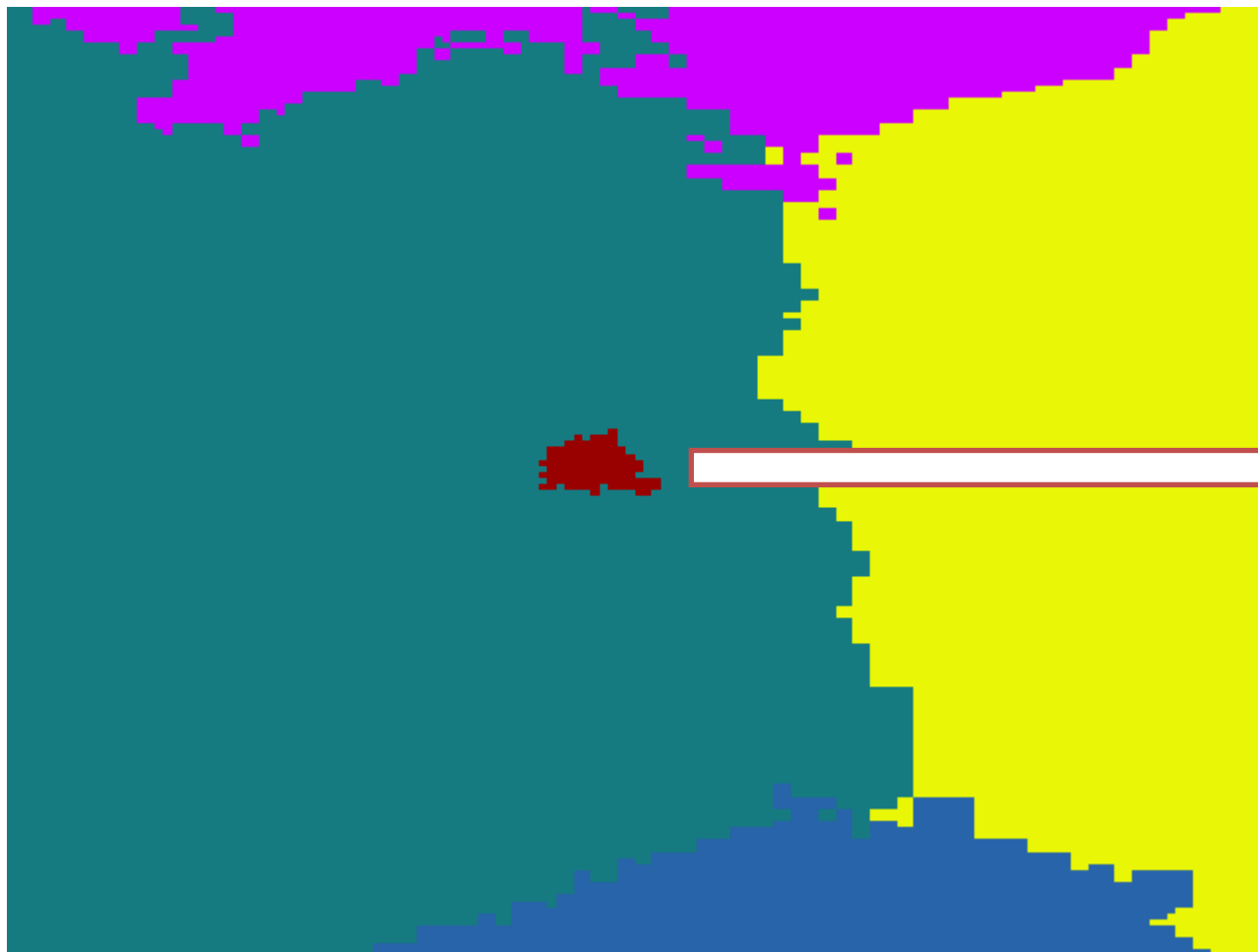
(aura.lupascu@iass-potsdam.de)

WPS Domain Configuration



- Height of first model level: **~25 m**
- Chemistry: **MOZART-4**
- Emissions:
 - **CAMS-REG_v2.2.1 outside Germany**
 - **UBA-GRETA for Germany**
 - distributed into 7 layers
- Land use: **CORINE**
- Meteorology: **ERA-Interim**
- Chemical IC&BC: **MOZART-4 global model**

NO₂ source attribution for Berlin

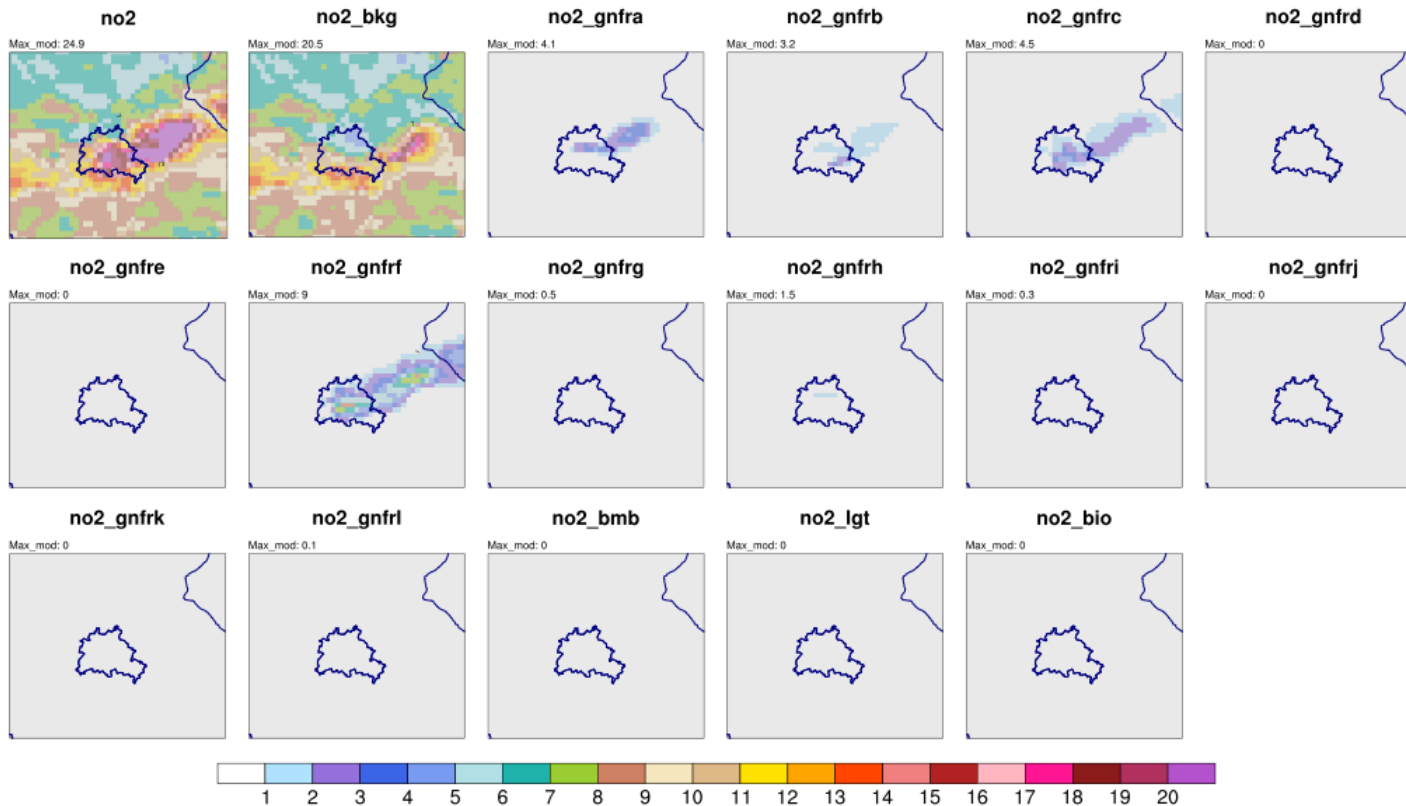


Background
Biogenic
Lightning
(outside Berlin)

Inside Berlin
GNFR_A
.....
....
GNFR_L

Surface maps of NO₂ from different sources

NO₂ 2015-02-02 11UTC ($\mu\text{g m}^{-3}$)



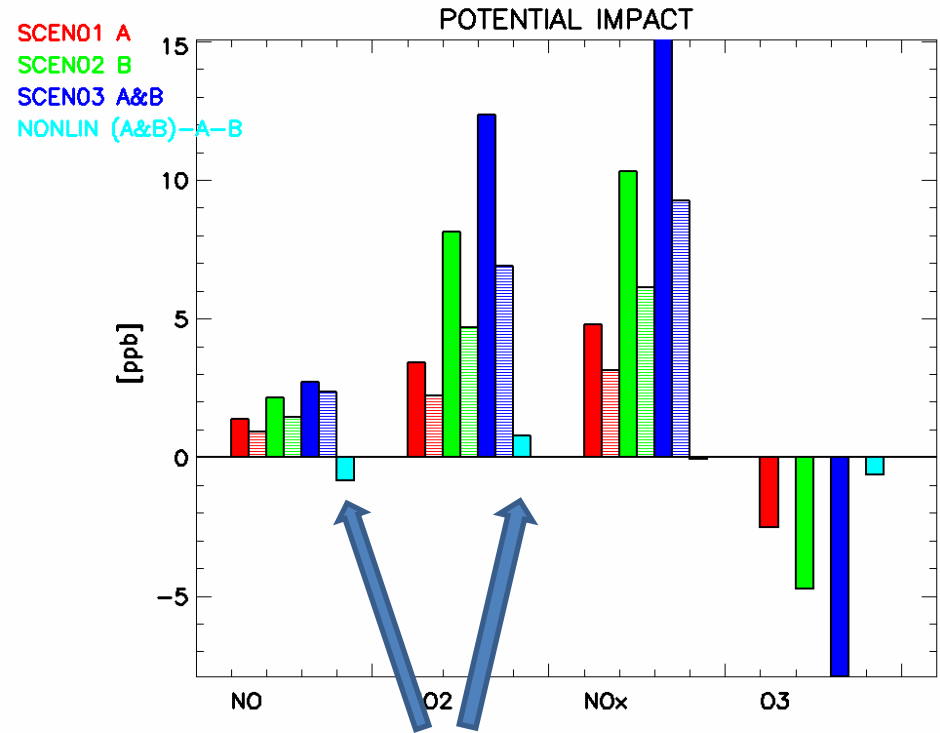
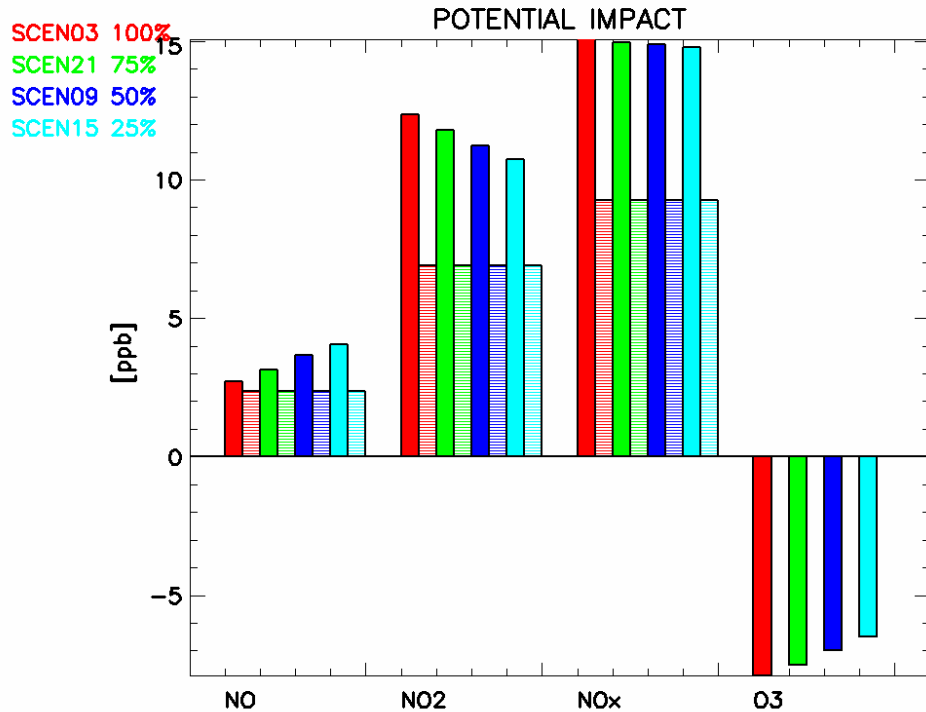
Consistency and additivity

SCEN_AB= A&B: GNFR_C + GNFR_F
RED_EMIS= NO_x

■ BF ■ TAG
MODEL= WRFChem
CITY= BERLIN
STATION=UB02

RED_EMIS= NO_x A= GNFR_C
RED_%= 100% B= GNFR_F

■ BF ■ TAG
MODEL= WRFChem
CITY= BERLIN
STATION=UB02



Tagging contribution is linear
Brute force almost linear

Close to linearity

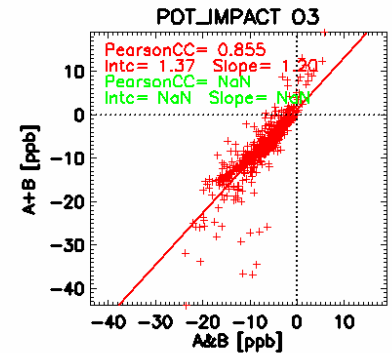
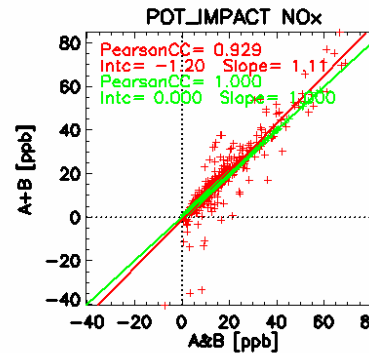
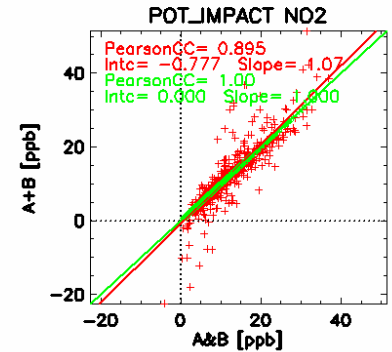
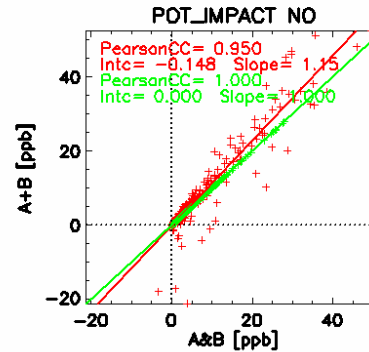
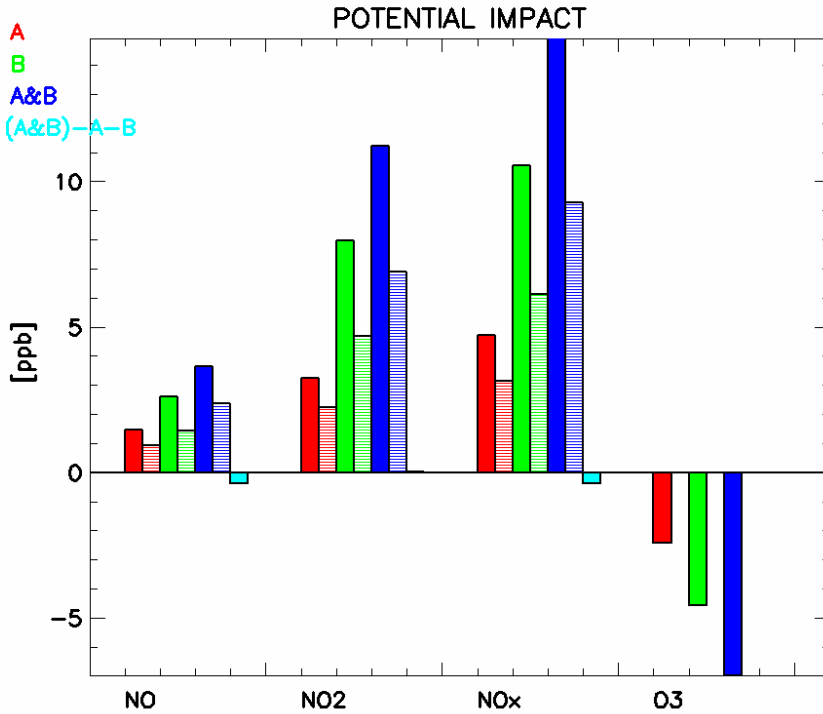
Tagging vs brute force 50% reduction

RED_EMIS= NOx A= GNFR_C
 RED_% = 50% B= GNFR_F

■ BF ▨ TAG
 MODEL= WRFChem
 CITY= BERLIN
 STATION=UB02

RED_EMIS= NOx A= GNFR_C
 RED_% = 50% B= GNFR_F

SCEN07 A
 SCEN08 B
 SCEN09 A&B
 NONLIN (A&B) - A-B



February 2015

NOx vs VOC reduction – BF



SCEN_AB= A&B: GNFR_C + GNFR_F
RED_EMIS= NOx

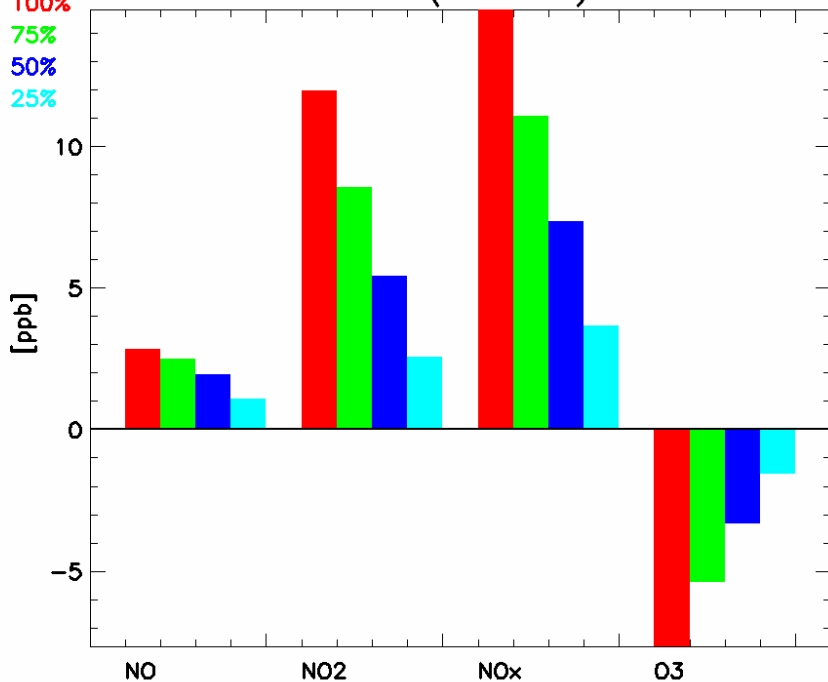
BRUTE_FORCE
MODEL= WRFChem
CITY= BERLIN
STATION=UBO3

SCEN_AB= A&B: GNFR_C + GNFR_F
RED_EMIS= ALL

BRUTE_FORCE
MODEL= WRFChem
CITY= BERLIN
STATION=UBO3

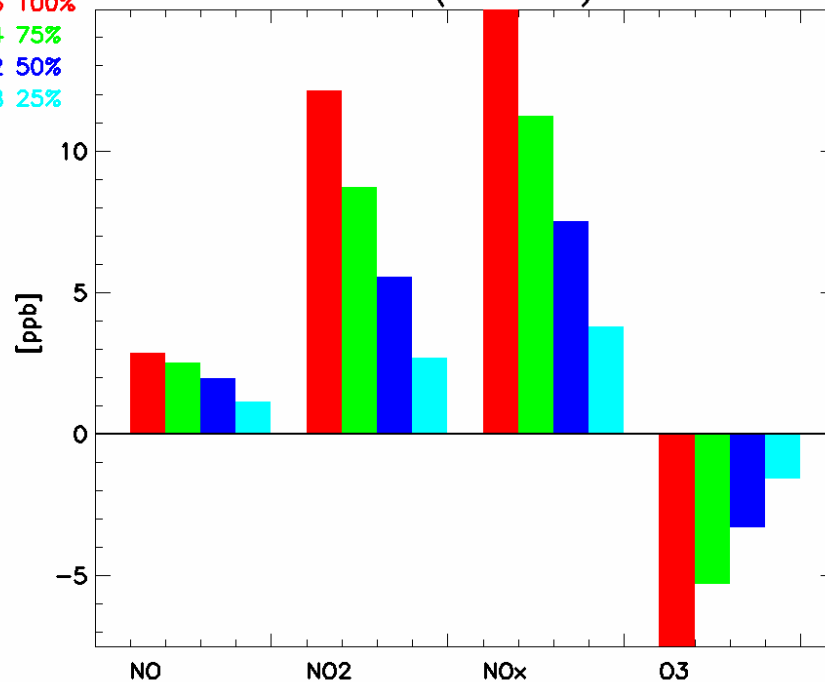
SCEN03 100%
SCEN21 75%
SCEN09 50%
SCEN15 25%

IMPACT(BC-SCEN)



SCEN06 100%
SCEN24 75%
SCEN12 50%
SCEN18 25%

IMPACT(BC-SCEN)



February 2015

NOx vs VOC reduction – BF

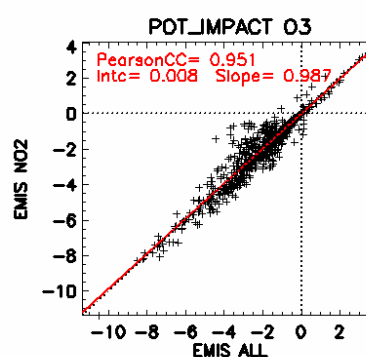
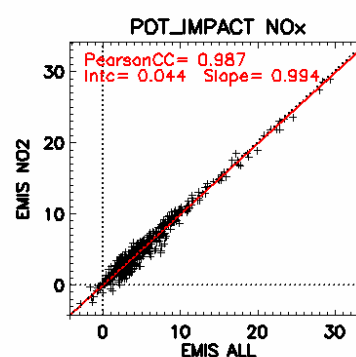
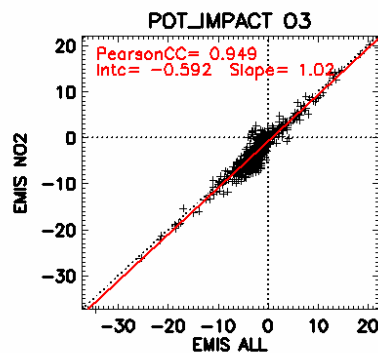
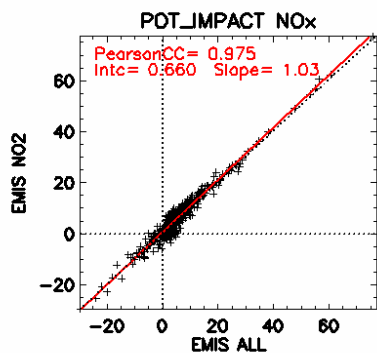
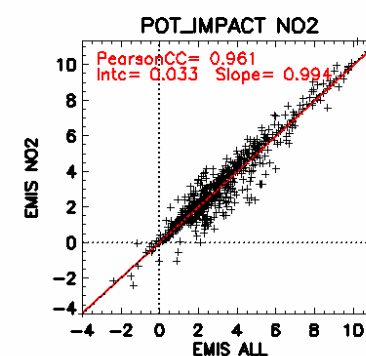
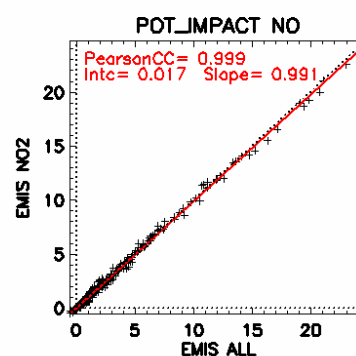
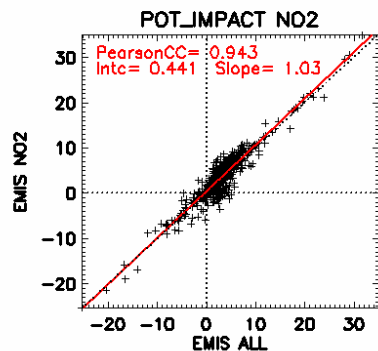
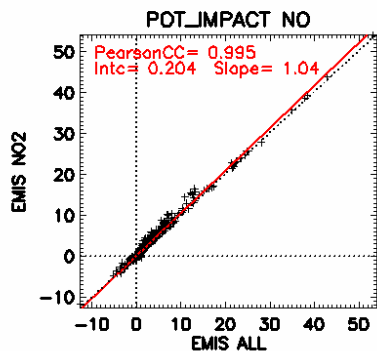


SCEN_AB= A: GNFR_C
RED_%= 25%

BRUTE_FORCE
MODEL= WRFChem
CITY= BERLIN
STATION=JBO1

SCEN_AB= A: GNFR_C
RED_%= 100%

BRUTE_FORCE
MODEL= WRFChem
CITY= BERLIN
STATION=JBO1



Summary



- The results from tagging are consistent and additive by definition
- The results from brute force approach are close to linearity

Thank you for your attention!

