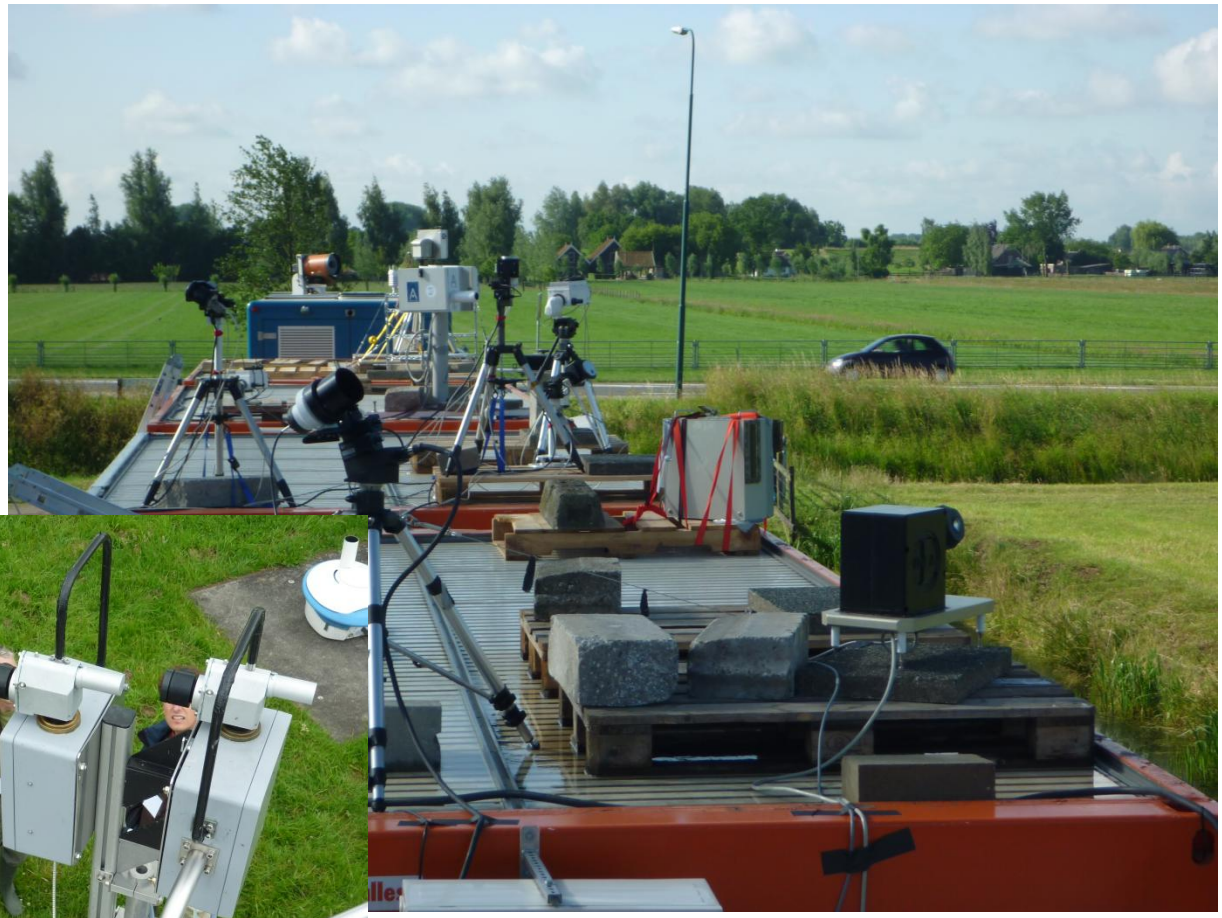
Measurements of NO_2 profiles during CINDI

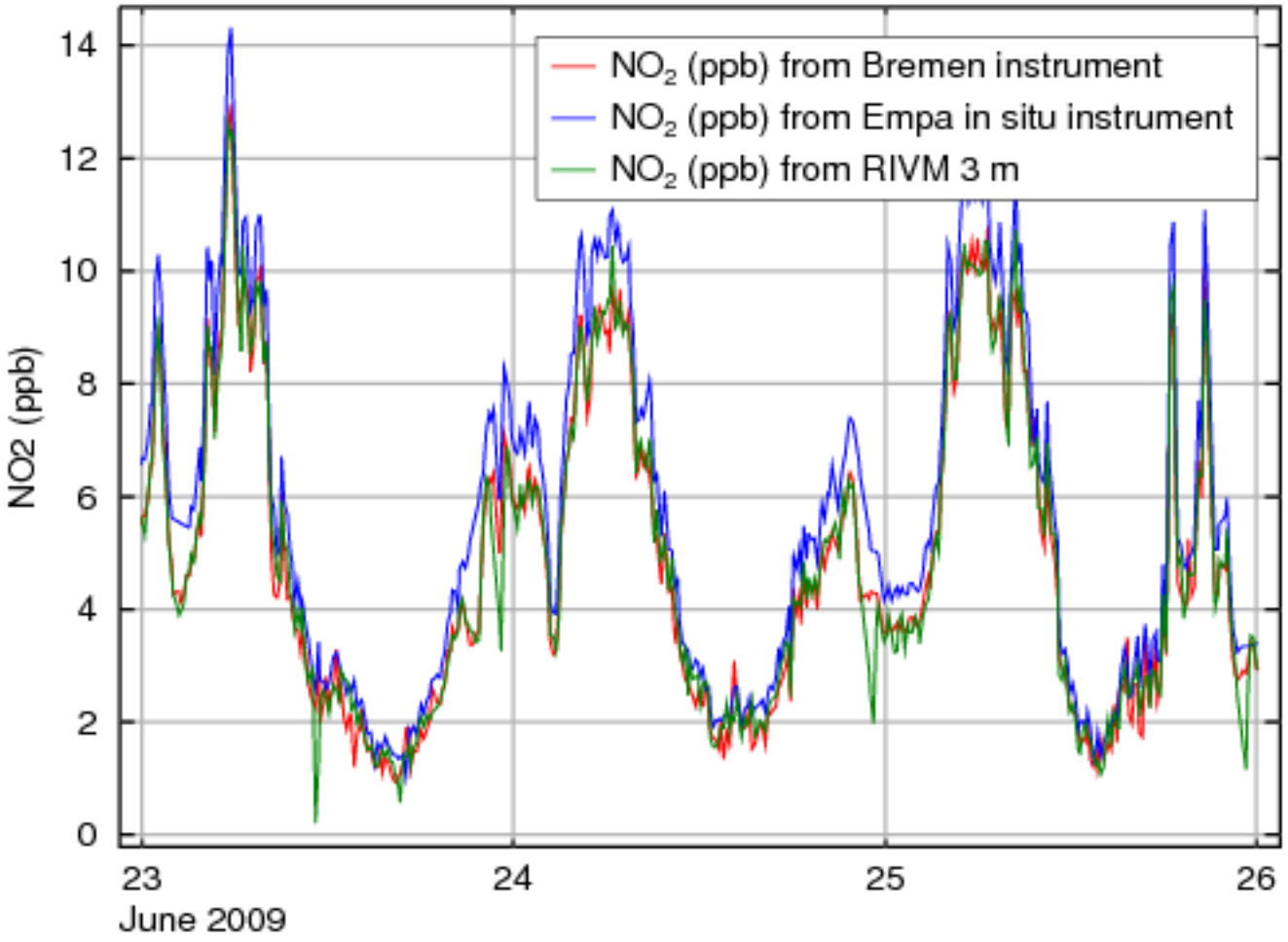
Folkard Wittrock, iup Bremen with input from
Stijn Berkhout, RIVM
Katrijn Clemer, BIRA
Udo Friess, iup Heidelberg
Hitoshi Irie, JAMSTEC
Tim Vlemmix, KNMI

Instruments



CINDI campaign – in situ instruments

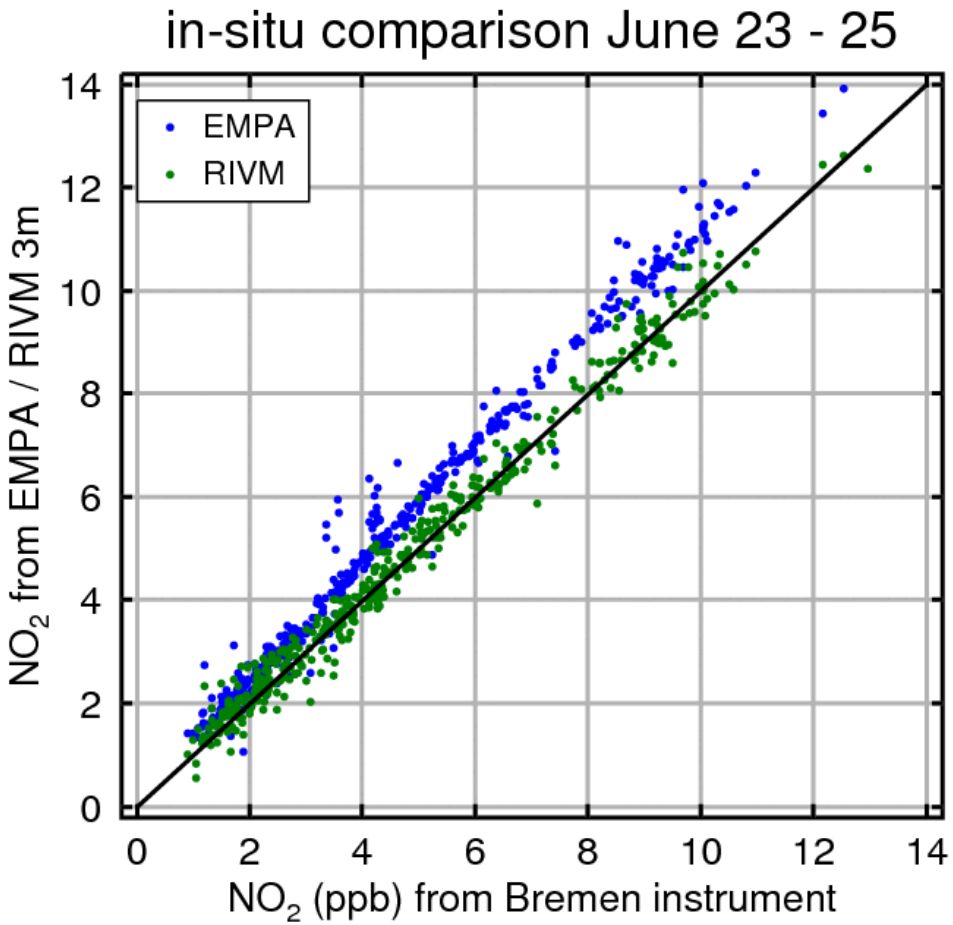
During CINDI: 3 in situ instruments at ground (and 1 in 200 m at tower)



3 in situ instruments at ground

CINDI campaign – in situ instruments

Comparison of Bremen in situ Instrument with Empa and RIVM (at ground level)

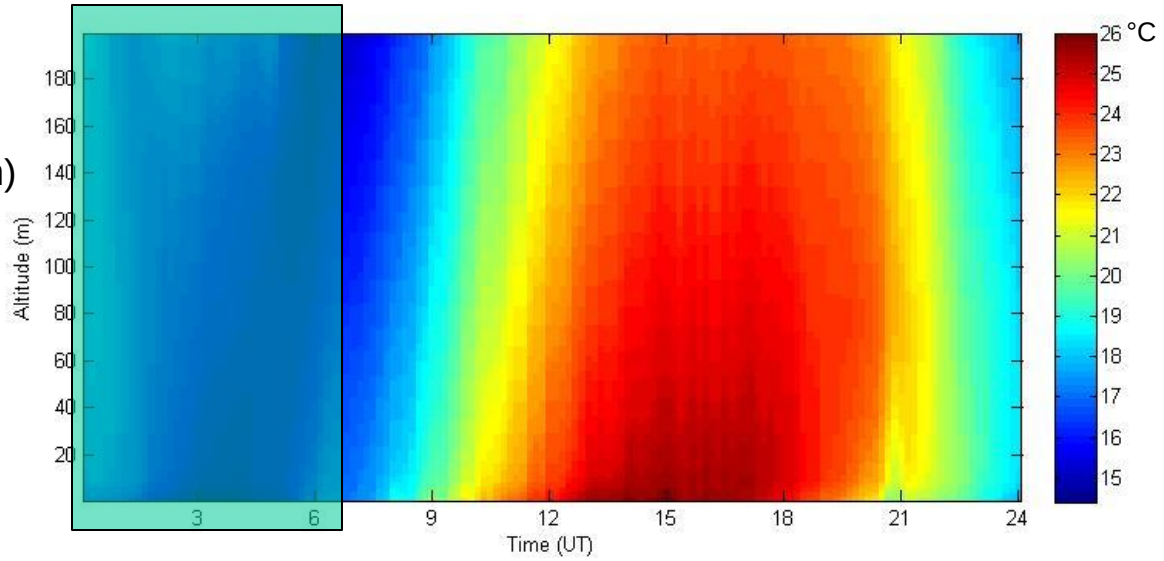


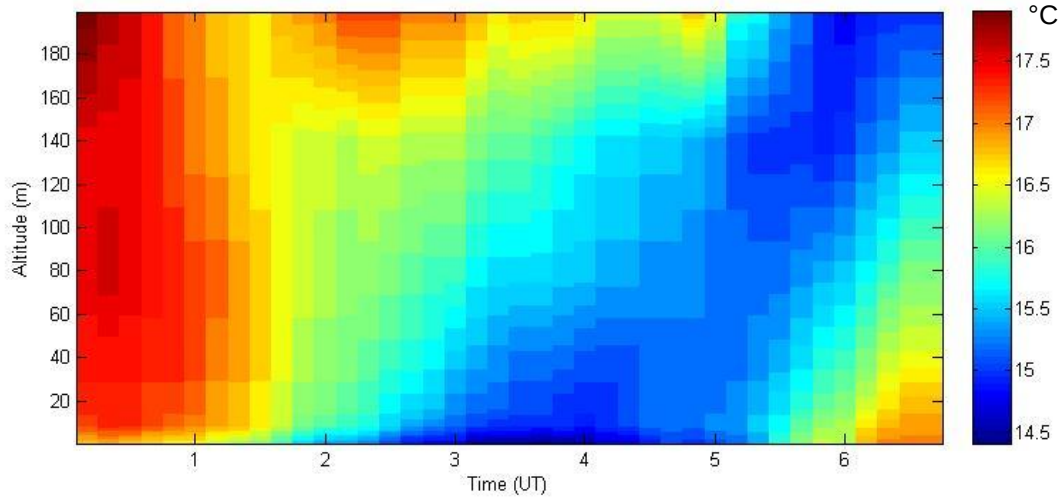
Bremen - EMPA
Slope : 1.11
Correlation : 0.993

Bremen – RIVM
Slope : 0.985
Correlation : 0.992

CINDI campaign: Case study 25.06.2009

Temperature at 25.06.2009
in Cabauw, Netherlands
Data from Cabauw tower
(200m, 140m, 80m, 40m, 20m, 10m, 2m)

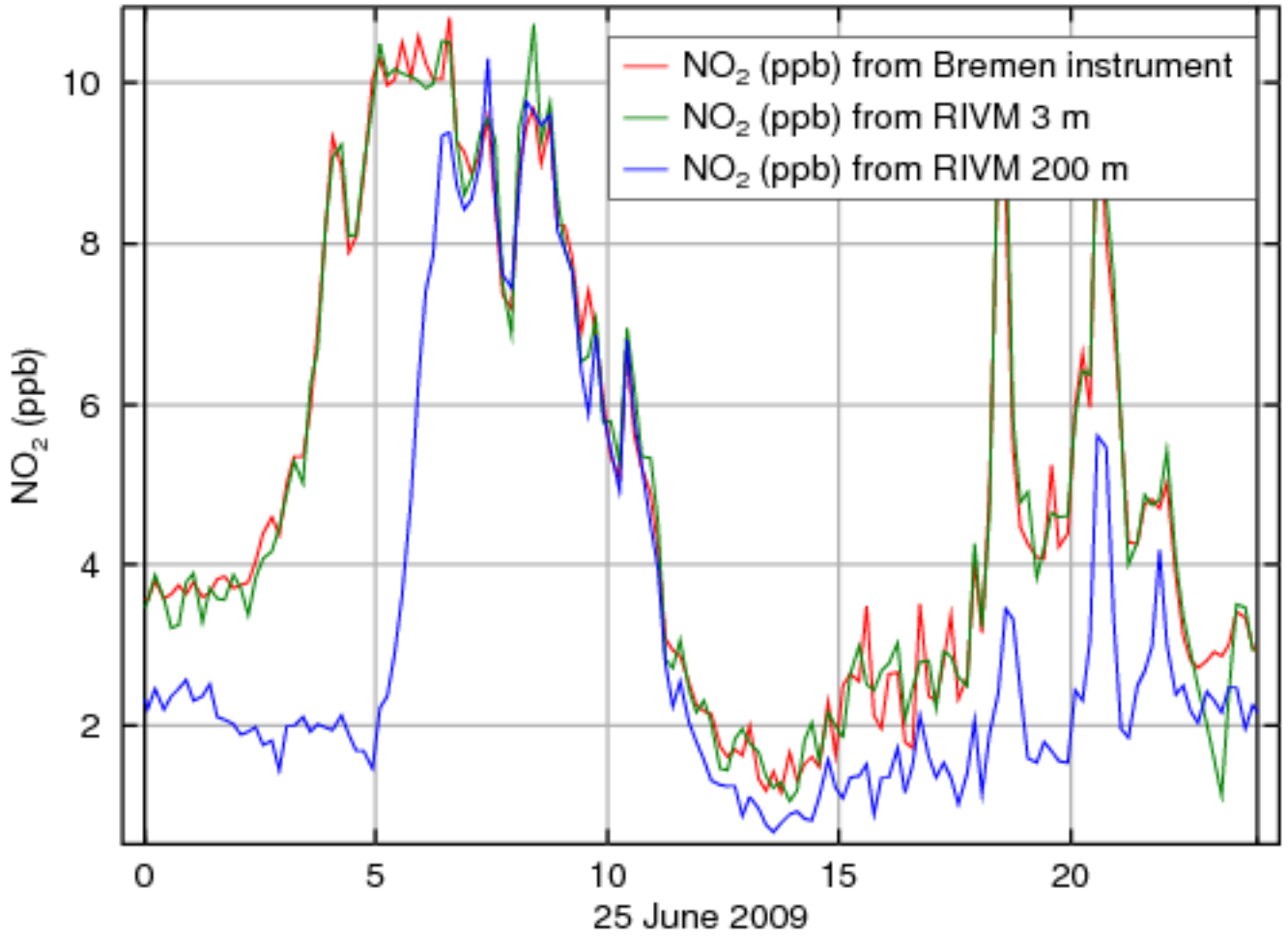




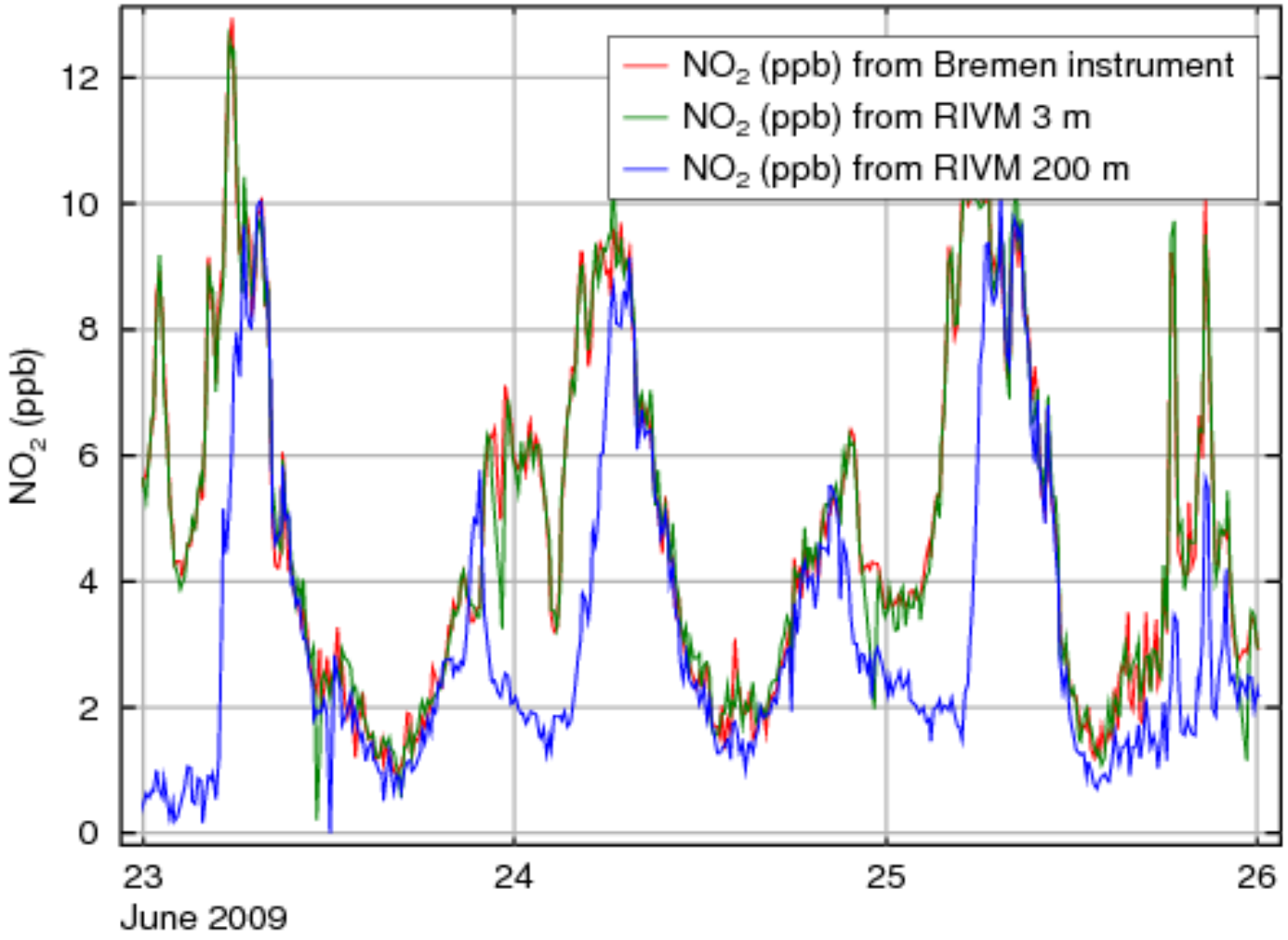
Zoom in 25.06.09 0 – 7 h

Inversion (→ no convection) in lowest 200 m until 5 – 6 h

CINDI campaign: Case study 25.06.2009

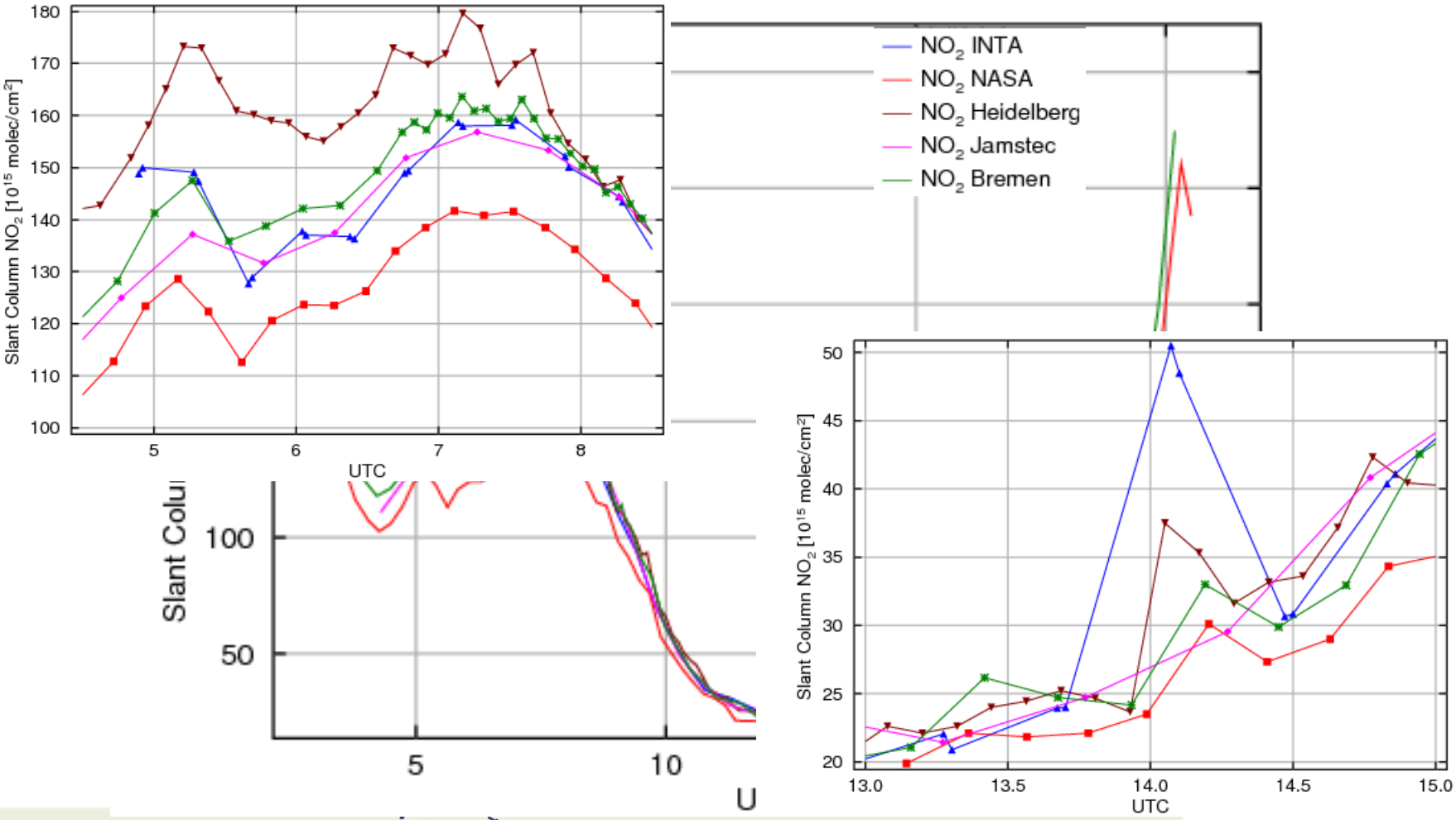


CINDI campaign: Case study 25.06.2009



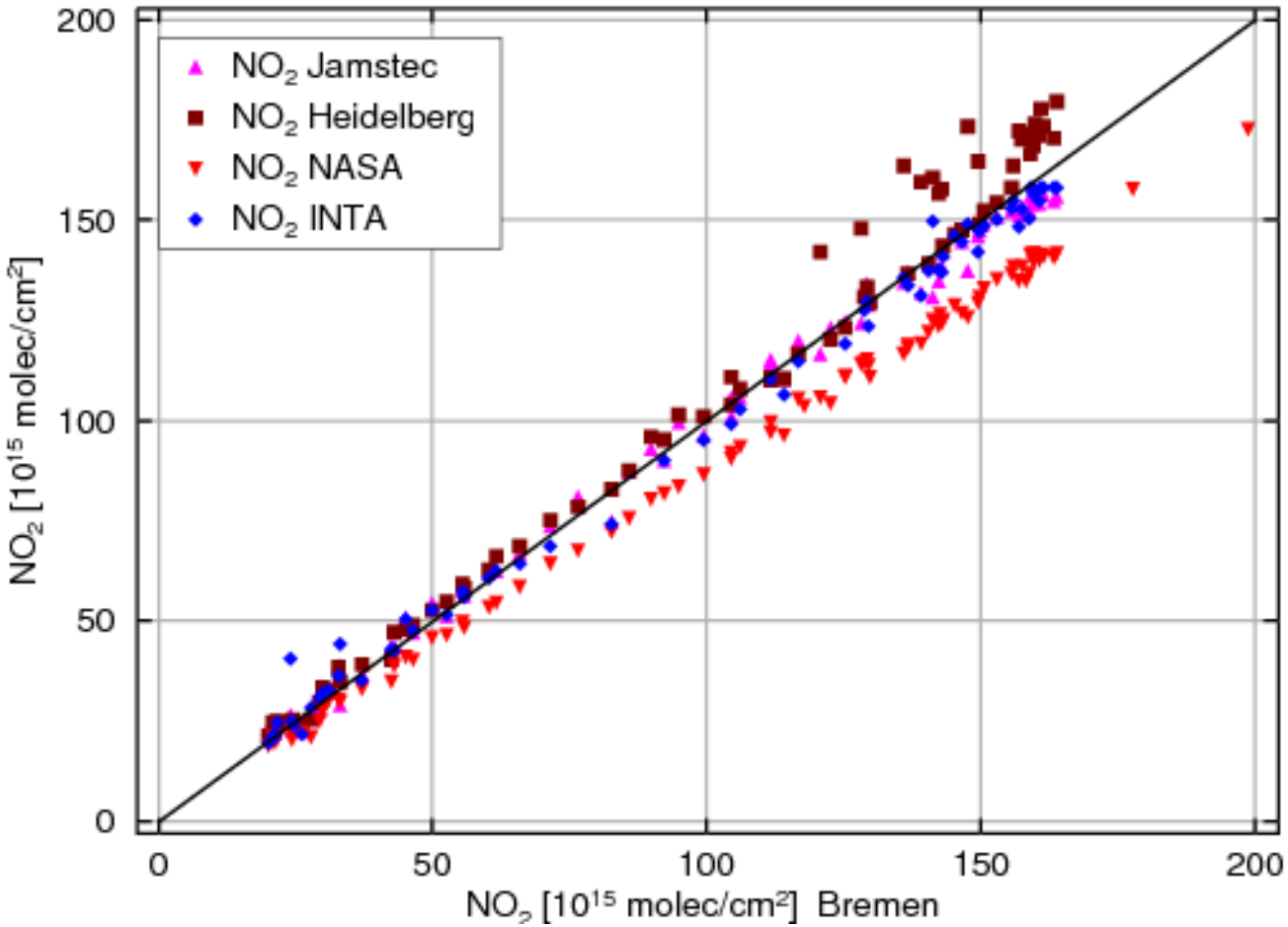
CINDI campaign – Intercomparison results

NO_2 differential slant columns for 02.07.2009 and 2° elevation angle



CINDI campaign – Intercomparison results

NO2 differential slant columns for 02.07.2009 and 2° elevation angle



Statistics:

Bremen – Jamstec
Slope : 0.96
Correlation : 0.998

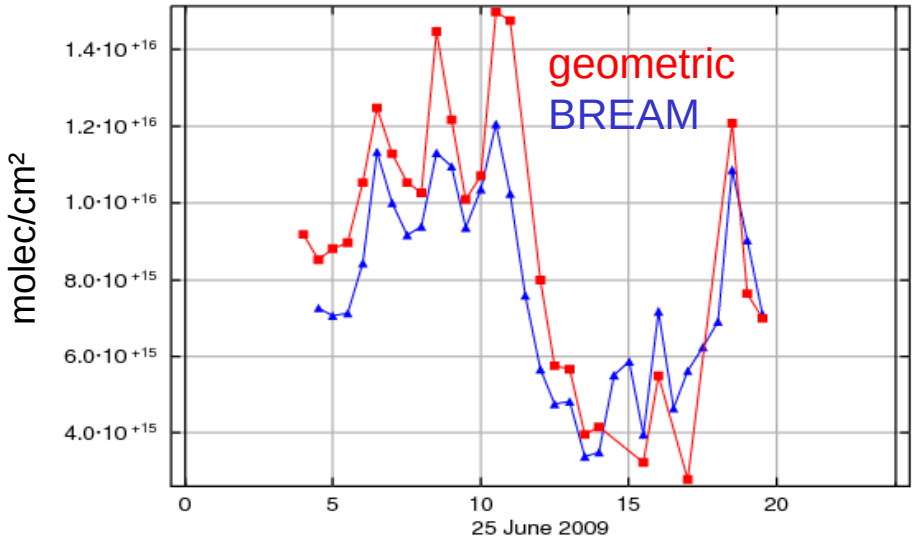
Bremen - Heidelberg
Slope: 1.06
Correlation : 0.993

Bremen - NASA
Slope : 0.86
Correlation : 0.999

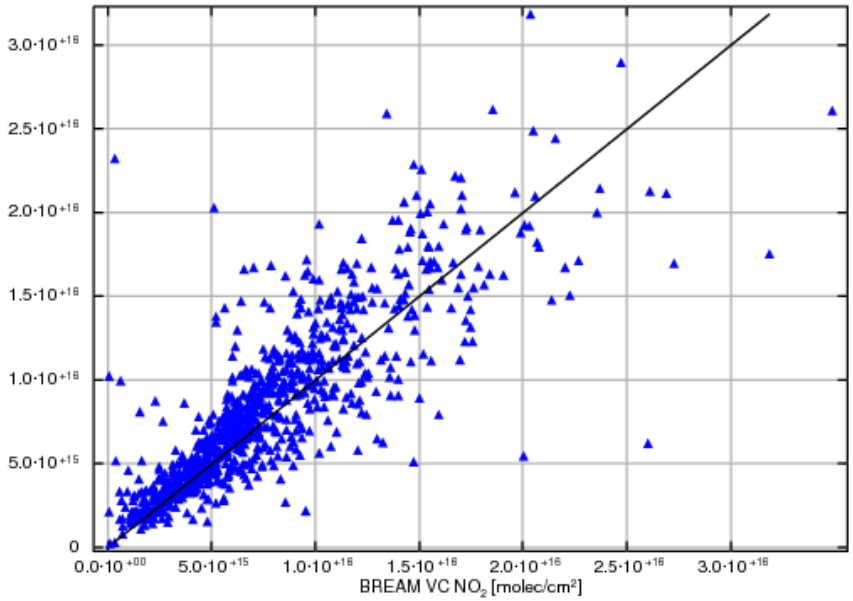
Bremen – INTA
Slope : 0.96
Correlation : 0.997

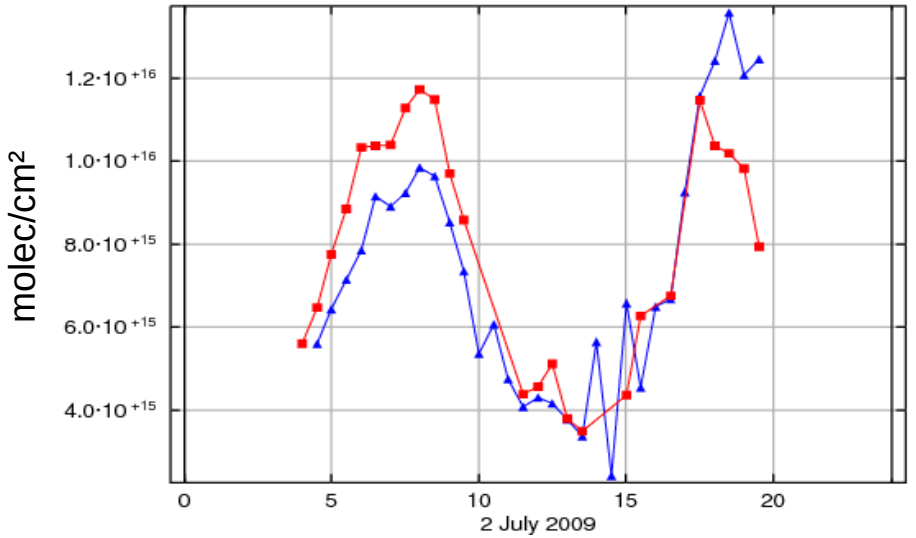
CINDI campaign – BREAM (profiling)

Geometrical calculated VCDs compared to BREAM VCDs



Correlation plot for whole campaign

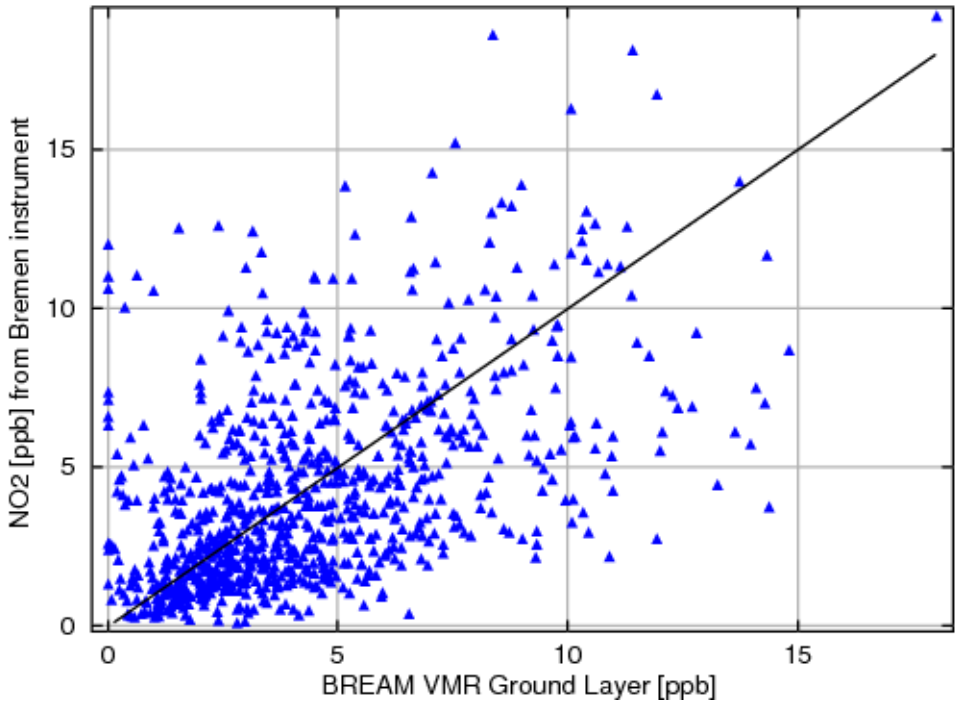


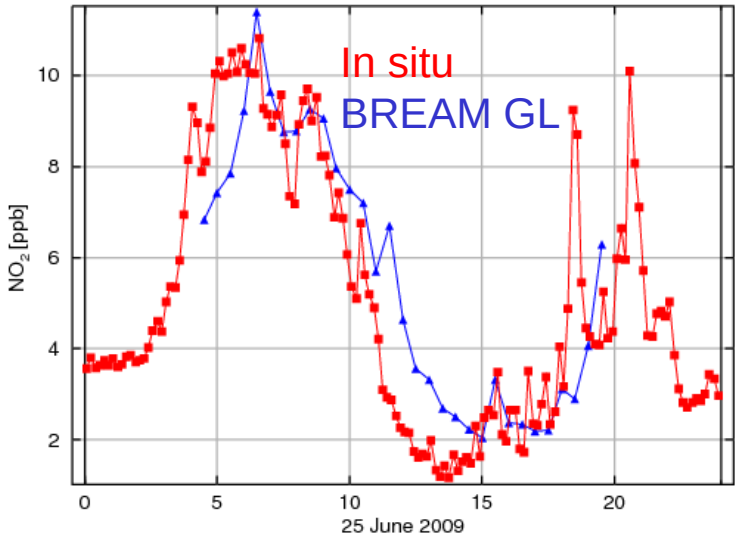


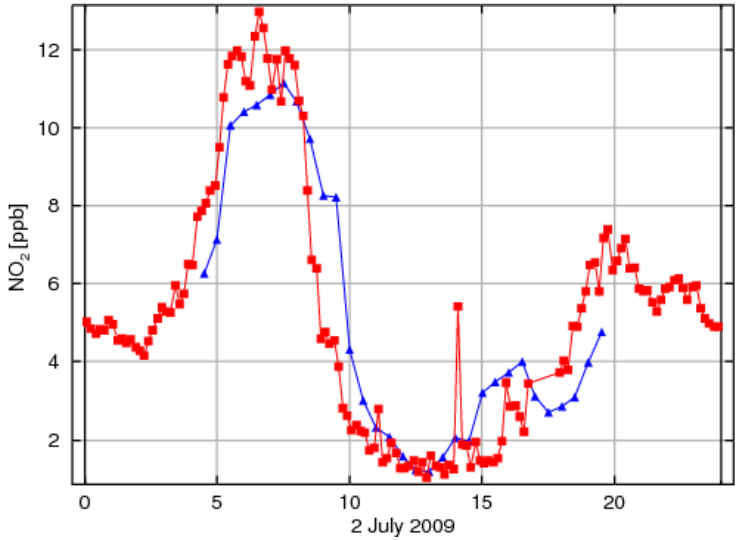
CINDI campaign – BREAM (profiling)

BREAM VMR Ground Layer compared to In situ instruments

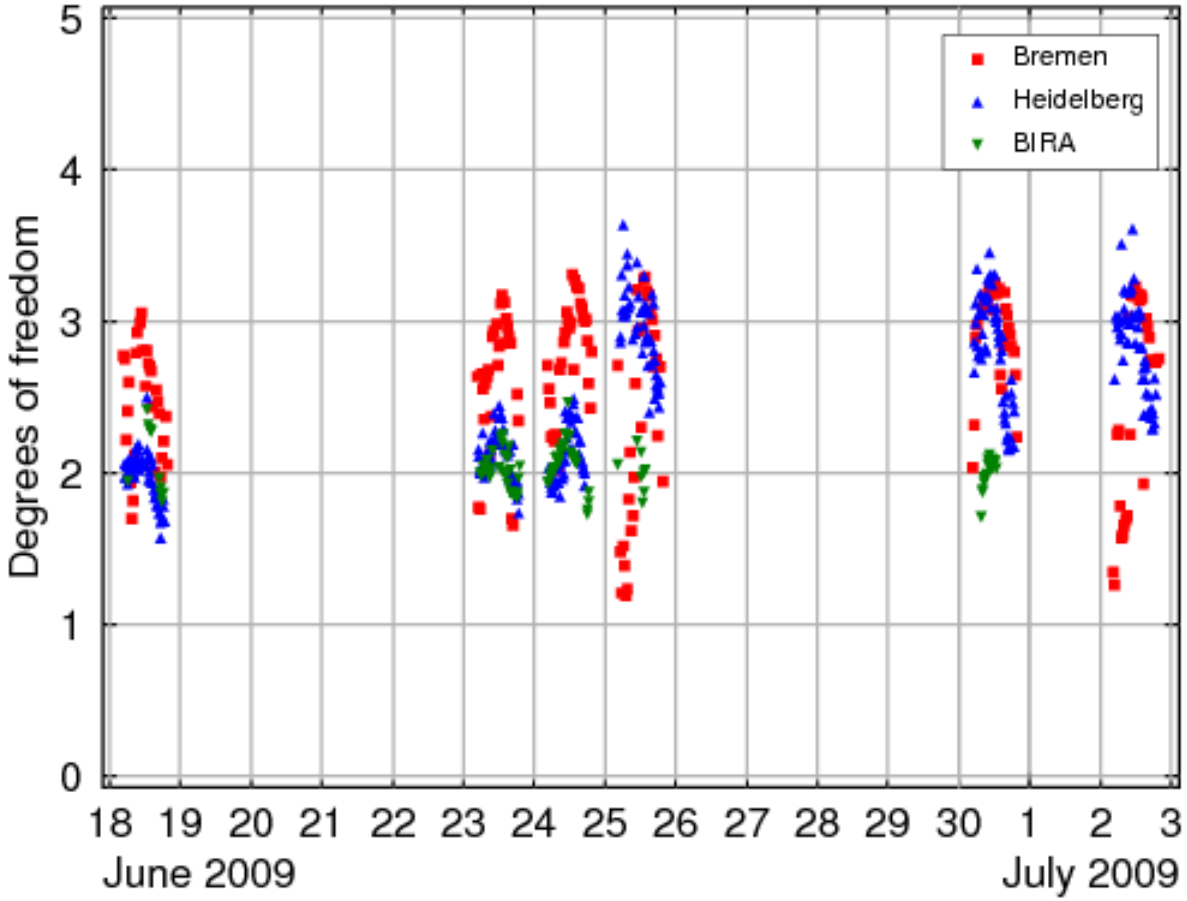
Correlation plot for whole campaign



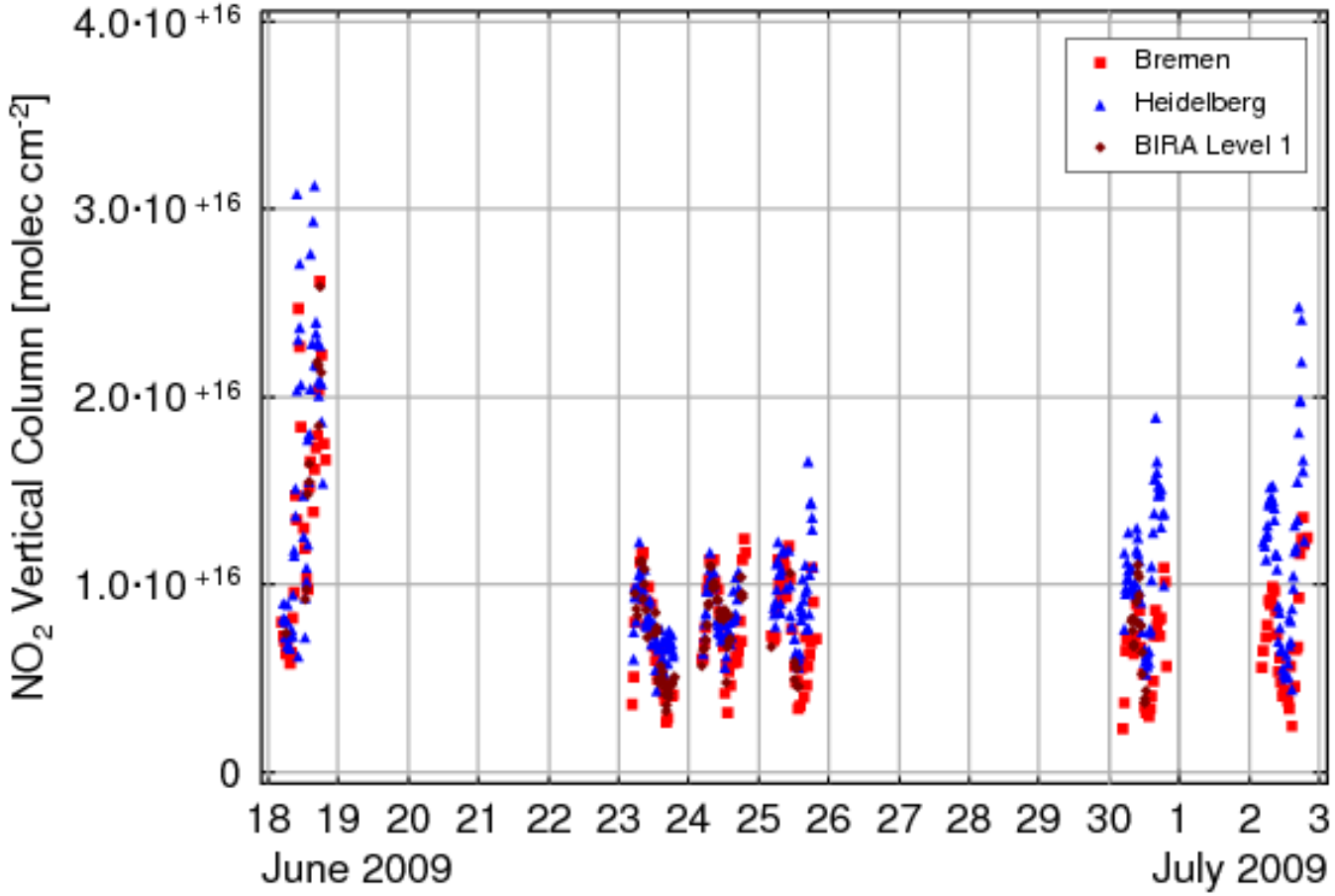




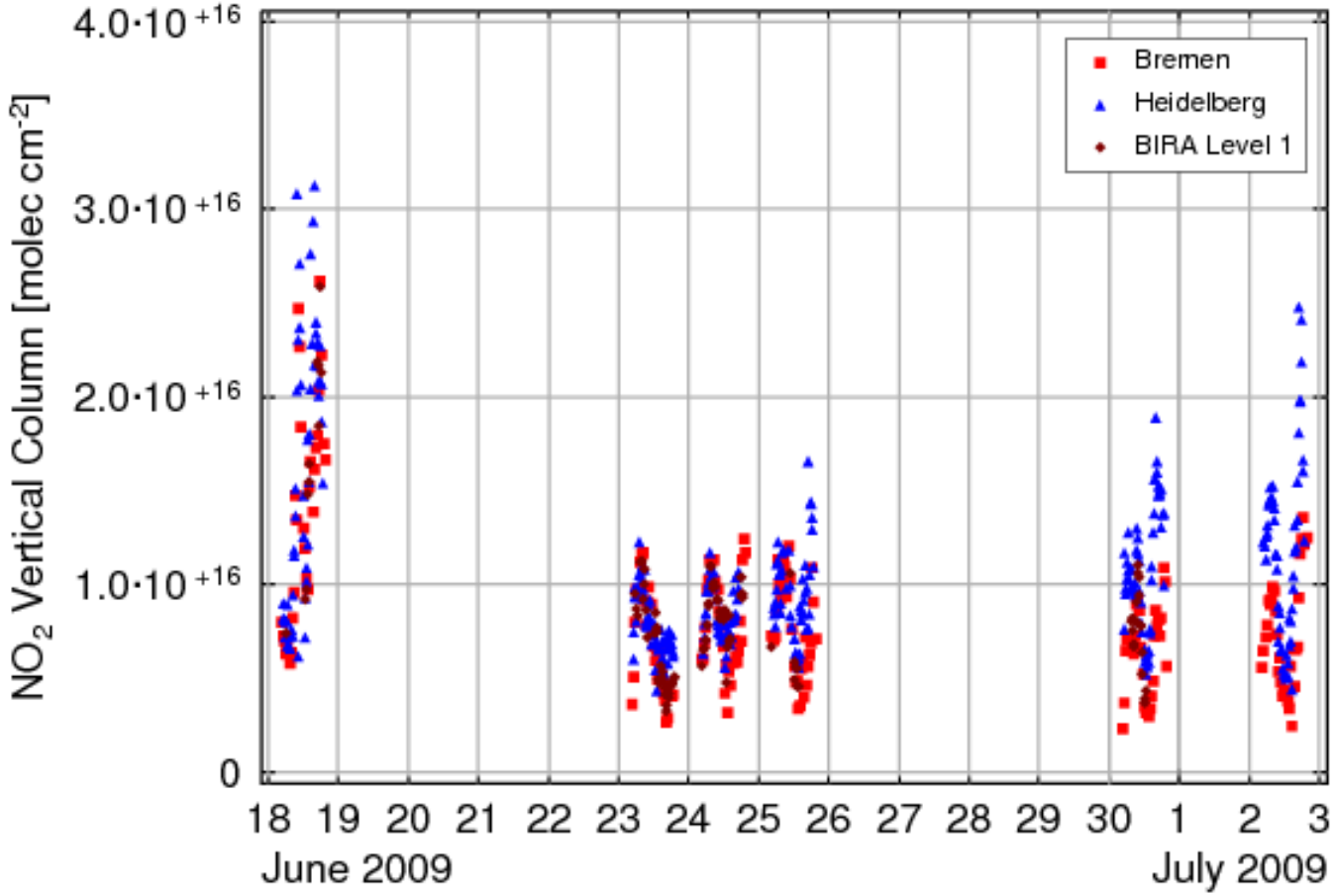
Degrees of freedom from profile algorithms



NO_2 vertical column (from profiles)

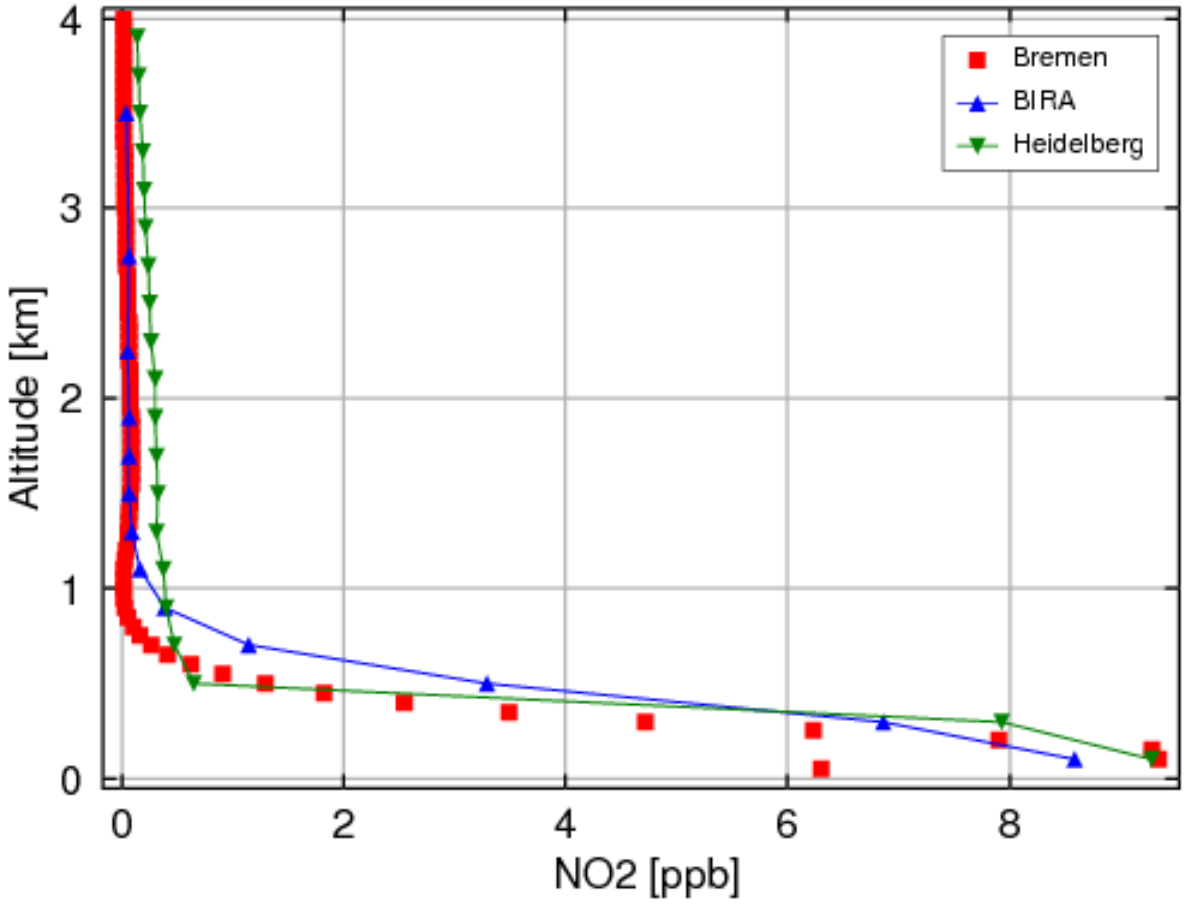


NO_2 surface


4.0·10 +16
3.0·10 +16
2.0·10 +16
1.0·10 +16
0
NO2 Vertical Column [molec cm-2]
Bremen
Heidelberg
BIRA Level 1
18 19 20 21 22 23 24 25 26 27 28 29 30 1 2 3
June 2009
July 2009

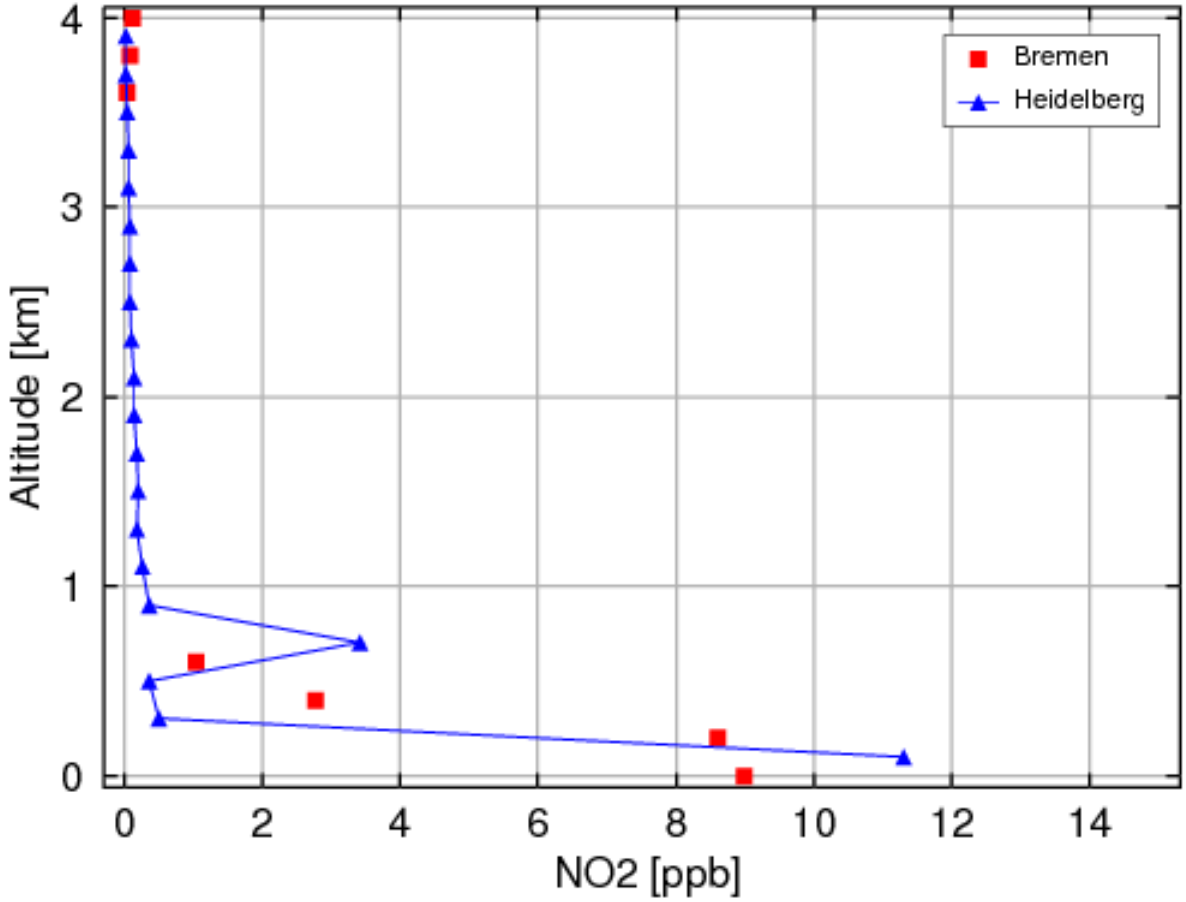
NO_2 profiles

July 2, 9.5 am



NO_2 profiles

July 2, 9.5 am



NO_2 profiles

July 2, 9.5 am