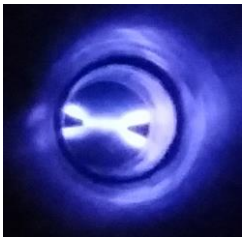
Chemical ionisation quadrupole mass spectrometer with an electrical discharge ion source for atmospheric trace gas measurement

Philipp G. Eger[1], Frank Helleis[1], Gerhard Schuster[1], Gavin J. Phillips[1,2], Jos Lelieveld[1] and John N. Crowley[1]

[1]Atmospheric Chemistry Department, Max-Planck-Institut für Chemie, 55128 Mainz, Germany
[2]Department of Natural Sciences, University of Chester, CH2 4NU, UK

Correspondence to: John N. Crowley (john.crowley@mpic.de)

Supplement



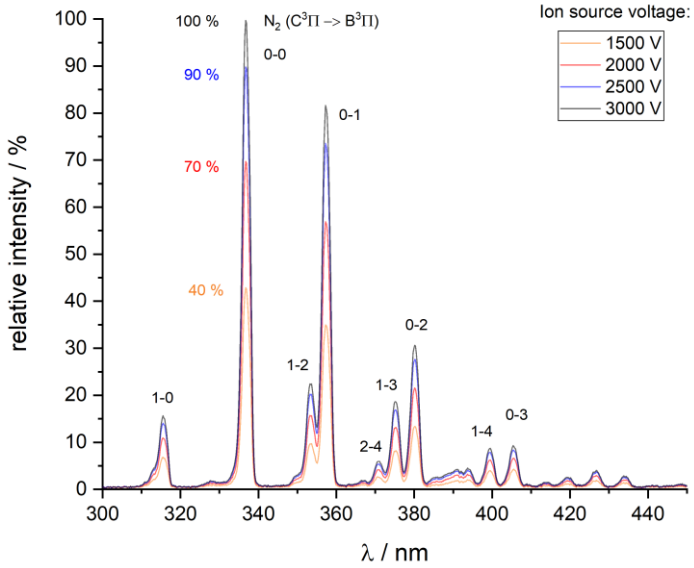


Figure S1. Photo: N_2 emission observed between and around the pointed tungsten tips of the electrodes of the RF discharge source. Right: The emission spectrum was recorded with an Ocean-Optics USB-4000 spectrometer with optical fibre at various high-voltages. The strongest features (not fully resolved using the low-resolution ($\Delta\lambda \approx 1.5$ nm) spectrograph) can be assigned to transitions from the ground vibrational level of the electronically excited N_2 ($C^3\Pi_u$) state to the $B^3\Pi_g$ state.

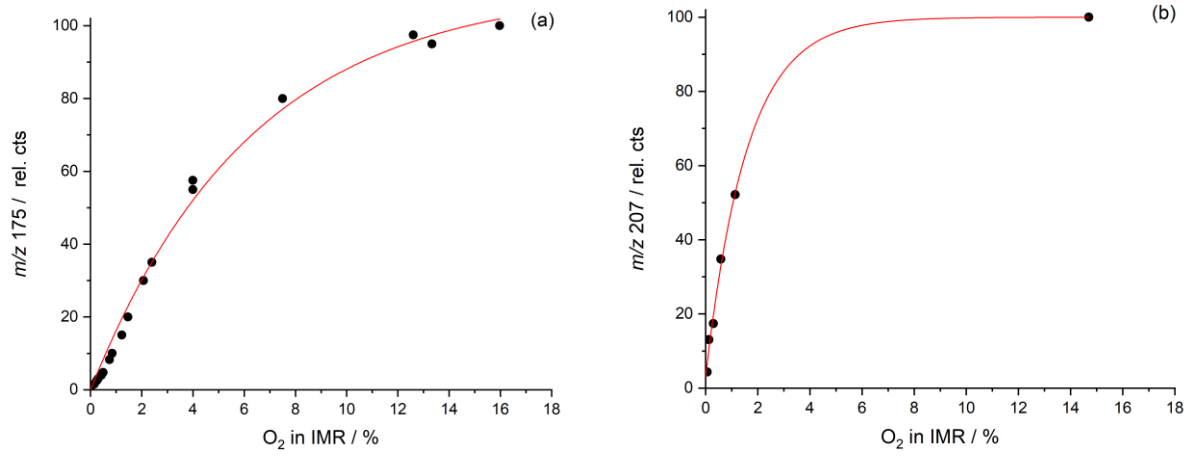


Figure S2. (a): Dependence of IO_3^- signal (*m/z* 175) on the fractional pressure of O_2 in the IMR when adding 800 sccm N_2 / CH_3I through the RF discharge region. (b): Signal at *m/z* 207 (ISO_3^-) for a constant amount of SO_2 over the same range of O_2 partial pressures.

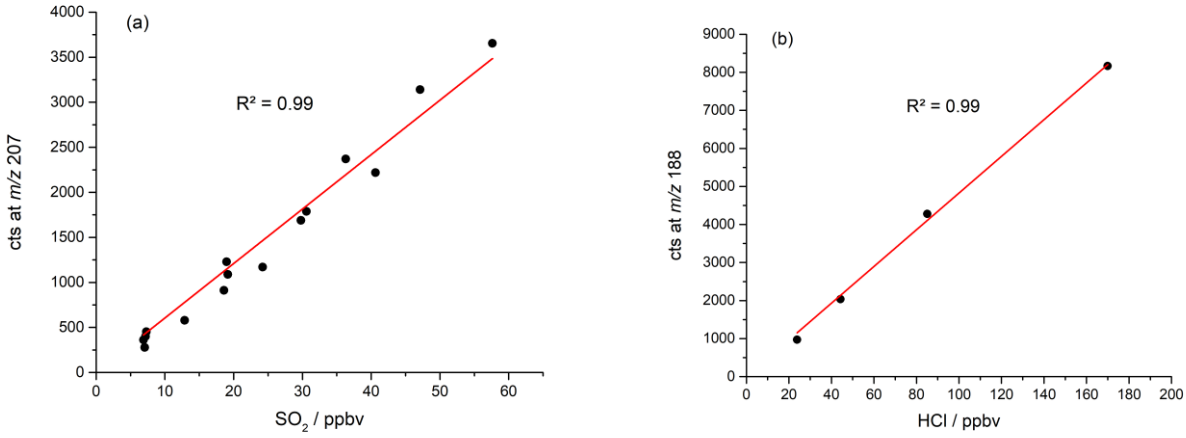


Figure S3. (a) Linear dependence of count rate at *m/z* 207 (ISO_3^-) on the SO_2 mixing ratio of the sample measured. (b) Linear dependence of count rate at *m/z* 188 ($I(CN)Cl^-$) on the HCl mixing ratio.

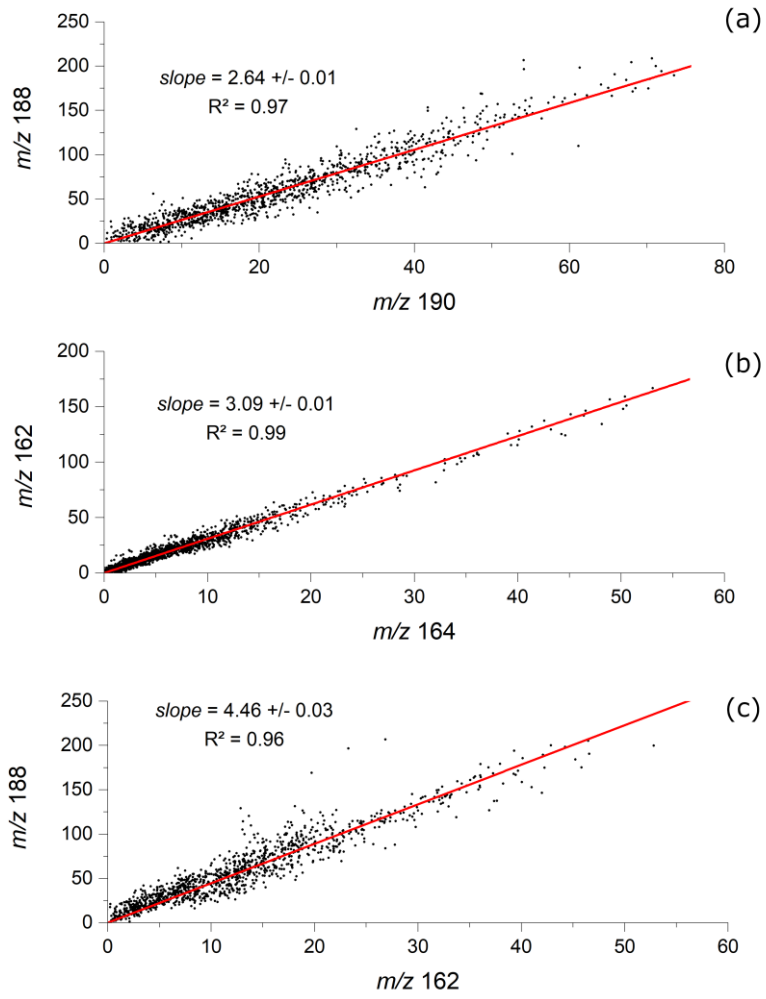


Figure S4. (a) and (b): Correlation of ion signals at *m/z* 162 versus *m/z* 164 (ICl^-) and *m/z* 188 versus *m/z* 190 ($I(CN)Cl^-$) during CYPHEX. The expected slope resulting from the isotopic abundance of ^{35}Cl to ^{37}Cl is 3.13. (c) Signal at *m/z* 188 versus *m/z* 162. The linear correlation indicates that both ions are from the same trace gas, HCl.

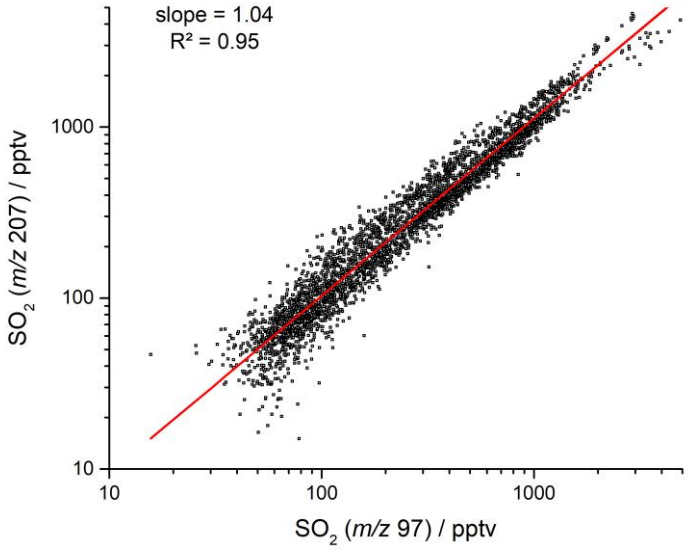


Figure S5: Correlation between the CI-QMS measurement of SO_2 at *m/z* 207 (ISO_3^-) vs. *m/z* 97 (HSO_4^-) during NOTOMO.

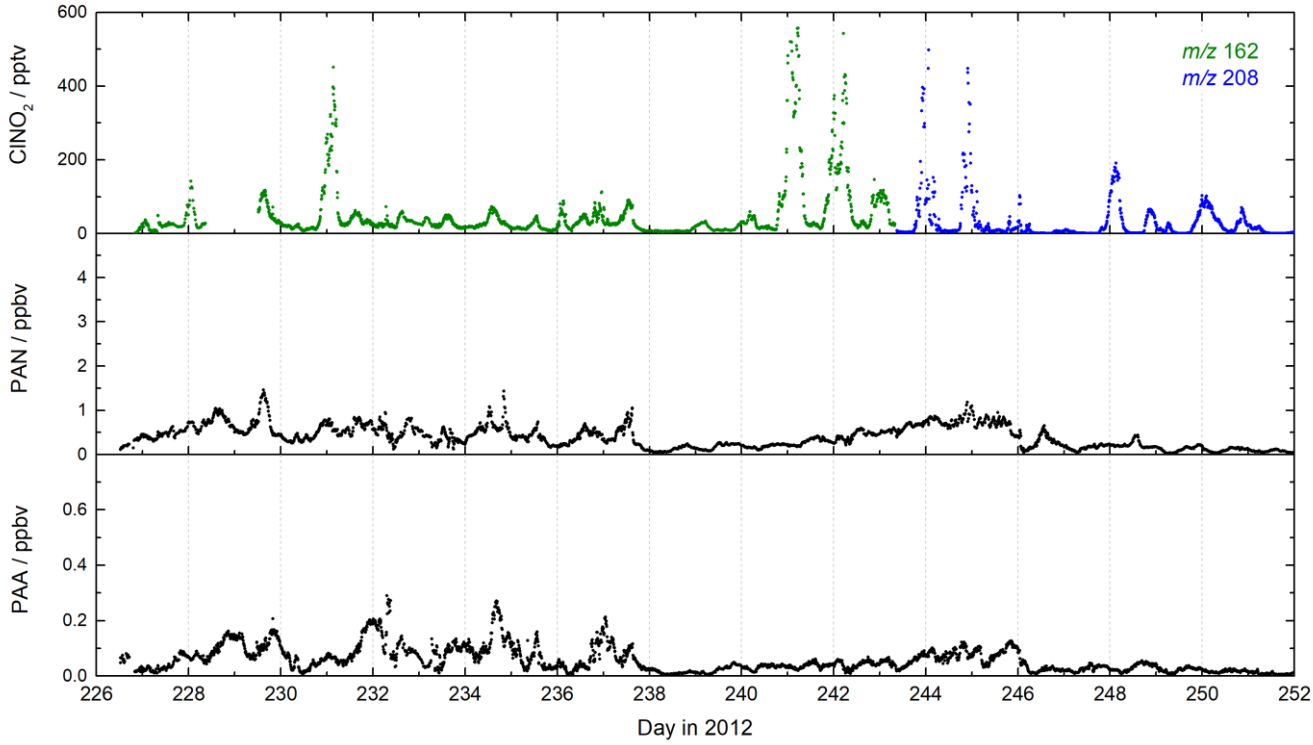


Figure S6: Measurements of $ClNO_2$, PAN and PAA using CI-QMS with a ^{210}Po-ionisation source during the PARADE campaign, which took place at the same location and similar time of year as the NOTOMO campaign in which the RF discharge was deployed. The $ClNO_2$ data during PARADE has been reported by Phillips et al. (2012).