



Supplement of

Intercomparison and characterization of 23 Aethalometers under laboratory and ambient air conditions: procedures and unit-to-unit variabilities

Andrea Cuesta-Mosquera et al.

Correspondence to: Andrea Cuesta-Mosquera (cuesta@tropos.de)

The copyright of individual parts of the supplement might differ from the article licence.

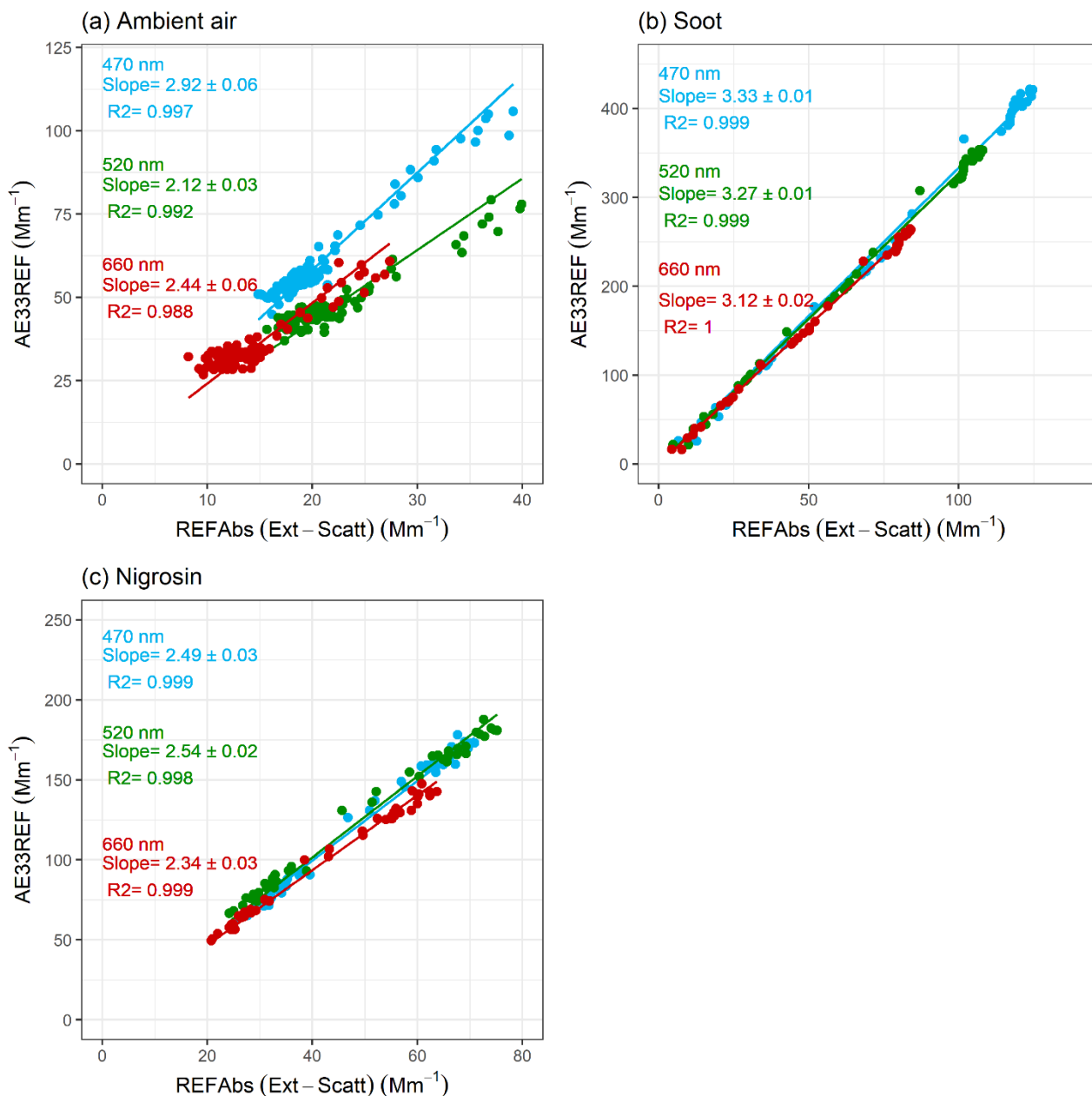
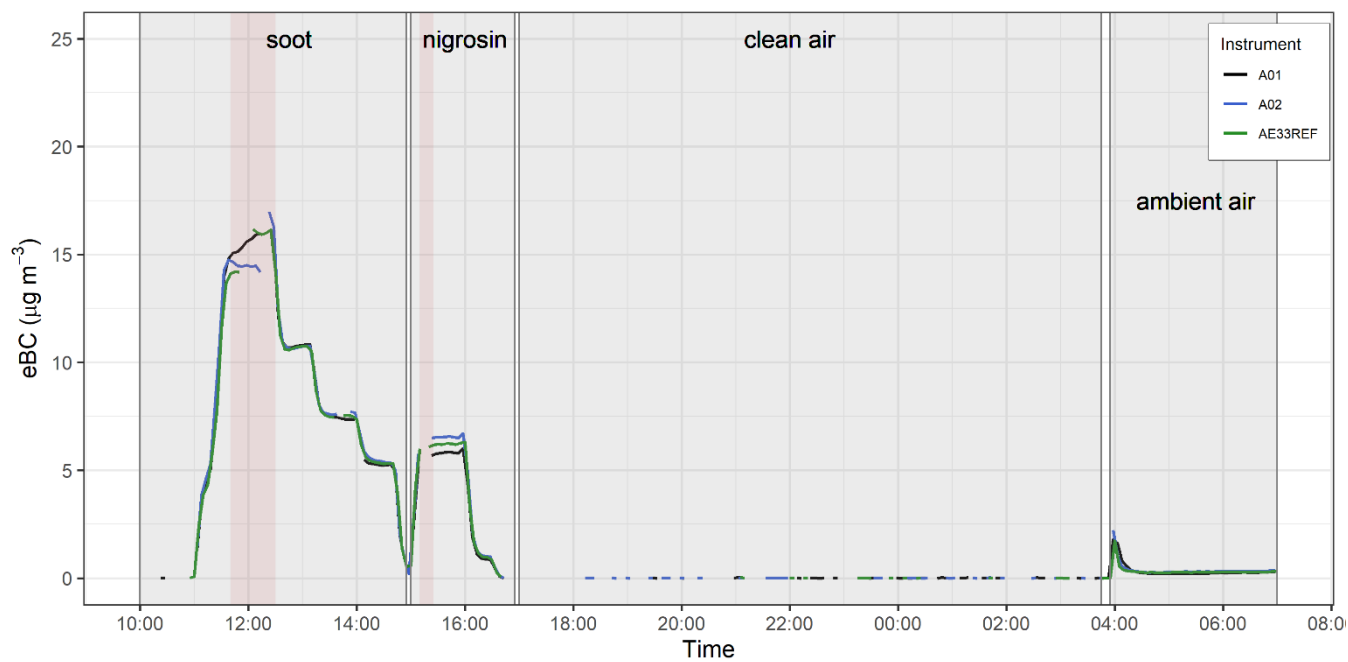


Figure S1. Comparison of absorption reported by the reference AE33 and the reference set-up (Extinction - Scattering) of the World Calibration Centre for Aerosol Physics (WCCAP), measuring aerosol samples of (a) ambient air, (b) soot, and (c) nigrosin. The regressions were performed using Deming total least squares and forced through zero; the absorption reported by the reference set-up at 470 nm and 660 nm were extrapolated from the original measurement at 450 and 635 nm, to allow comparability with the reference aethalometer. The absorption reported by the reference set-up at 525 nm was directly compared with the absorption reported by the AE33 REF at 520 nm. These wavelengths are not identical, but we consider LEDs have rather wide spectra (Müller et al., 2011). The differences in the slopes are due to different size distributions of sampled particles and due to the wavelength dependent cross-sensitivity to scattering of filter photometers – this is a topic of further investigation.



15 **Figure S2. Time series of eBC mass concentrations at 880 nm before maintenance in group A.**

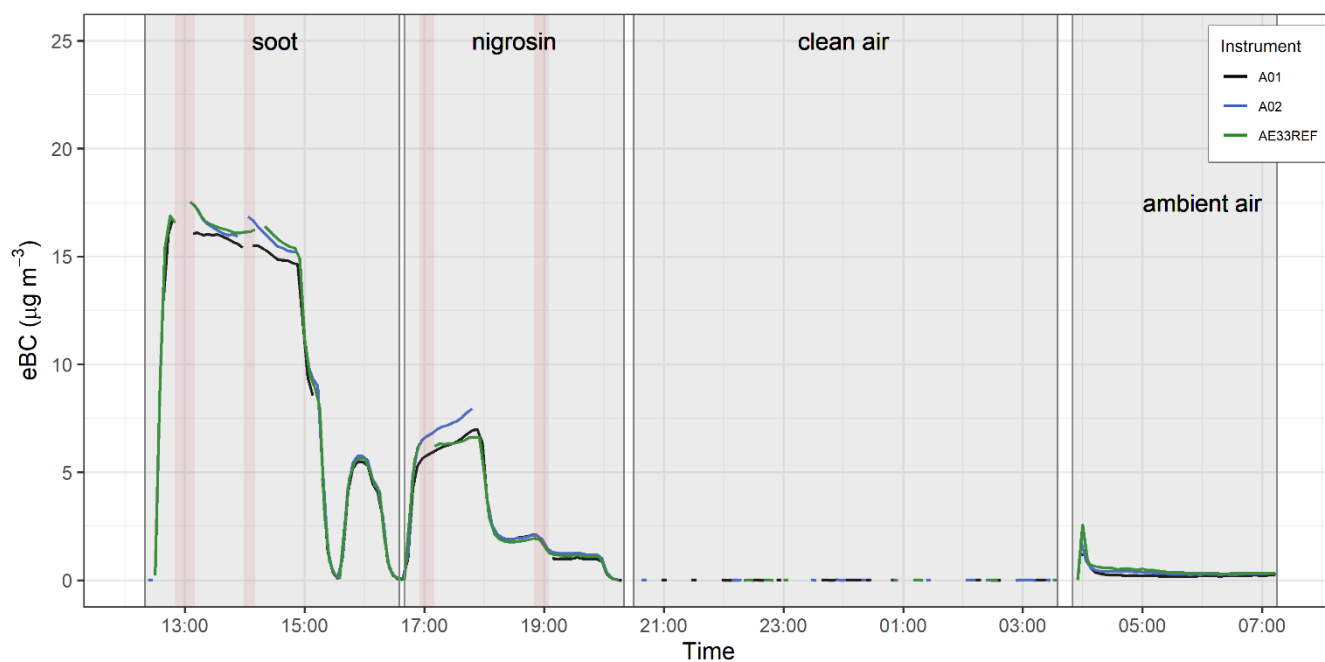


Figure S3. Time series of eBC mass concentrations at 880 nm after maintenance in group A.

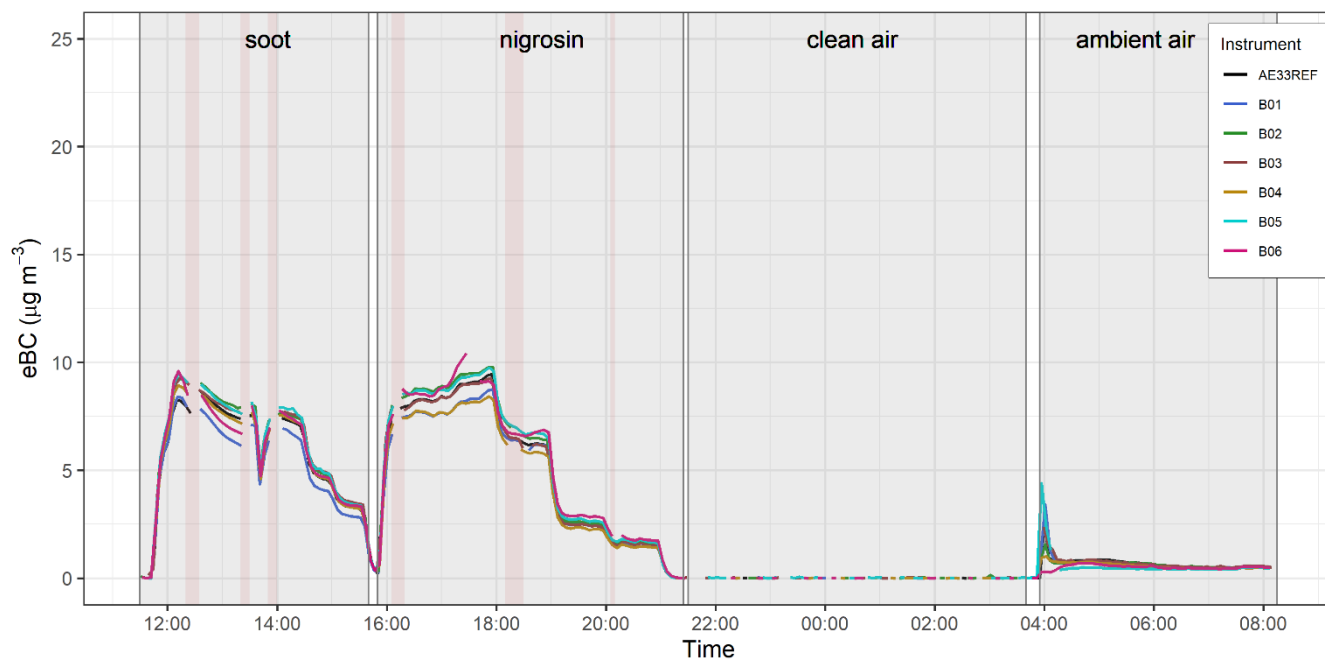


Figure S4. Time series of eBC mass concentrations at 880 nm before maintenance in group B.

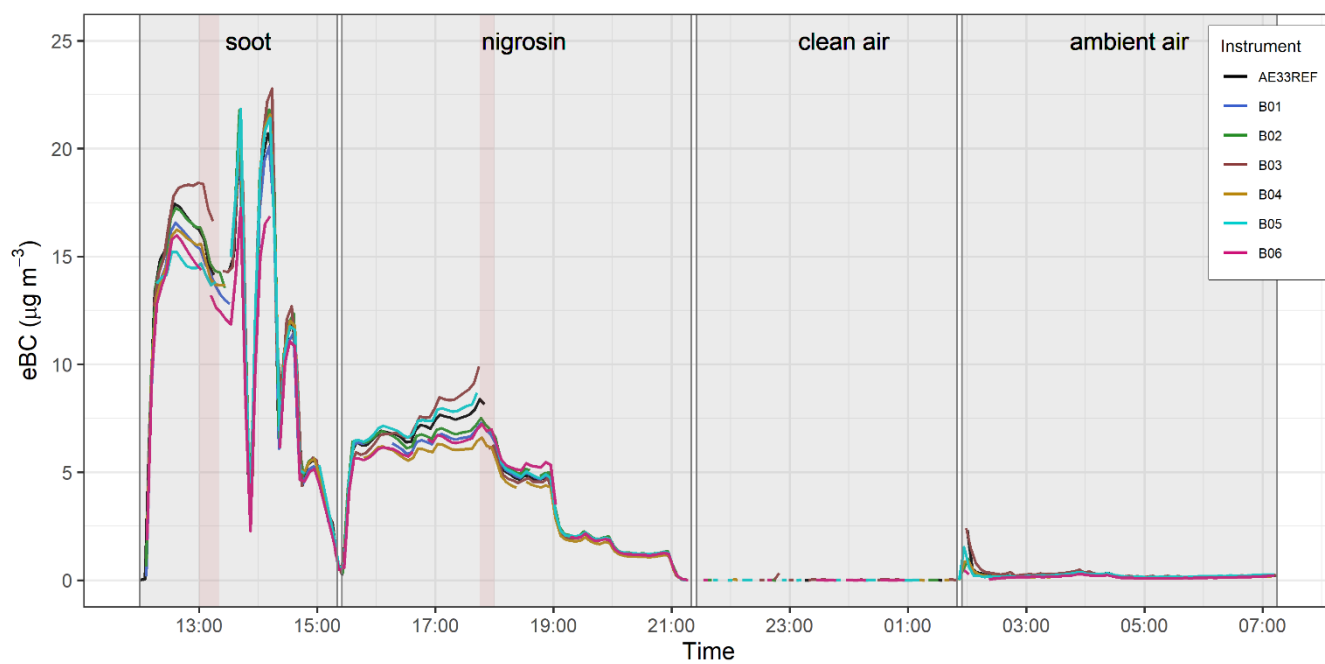


Figure S5. Time series of eBC mass concentrations at 880 nm after maintenance in group B.

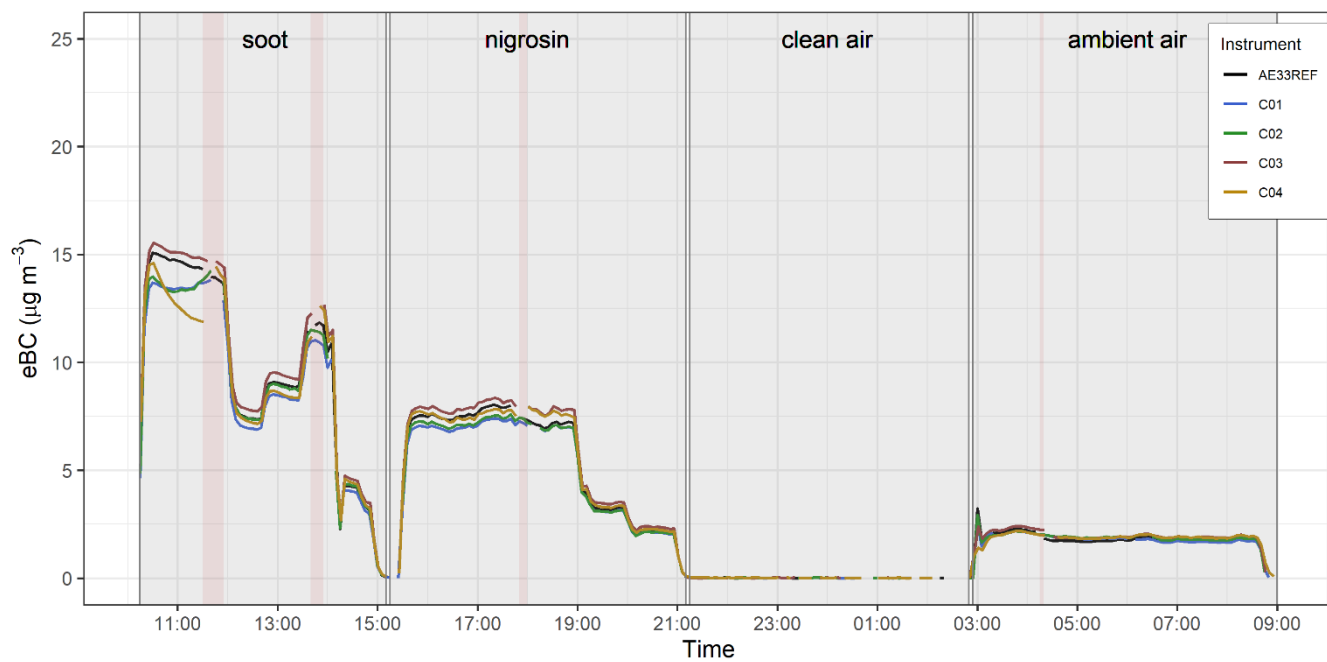
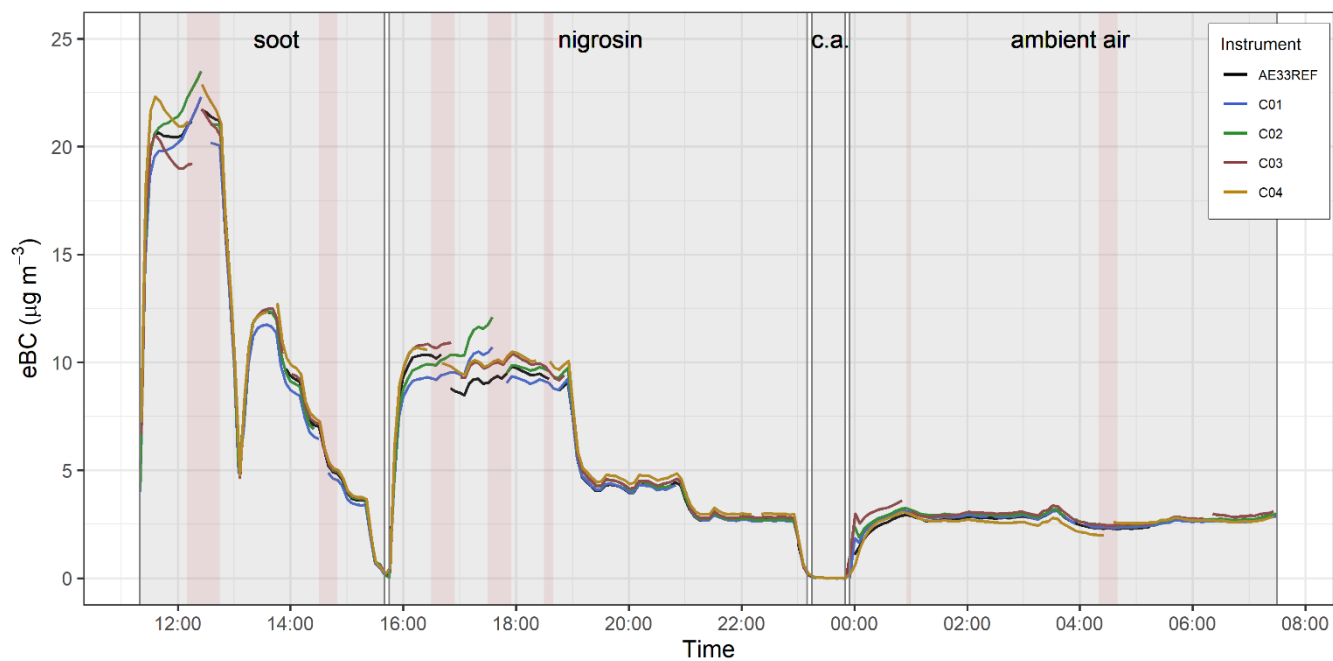


Figure S6. Time series of eBC mass concentrations at 880 nm before maintenance in group C.



25 Figure S7. Time series of eBC mass concentrations at 880 nm after maintenance in group C. c.a.: clean air.

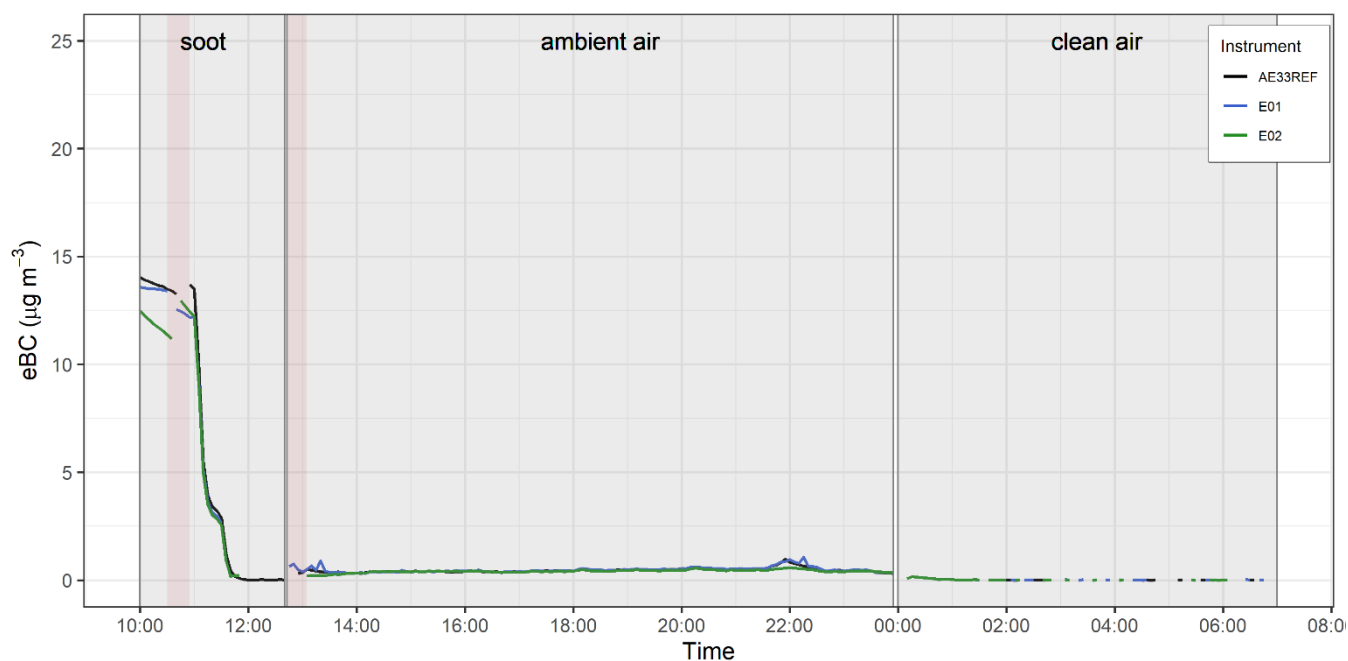
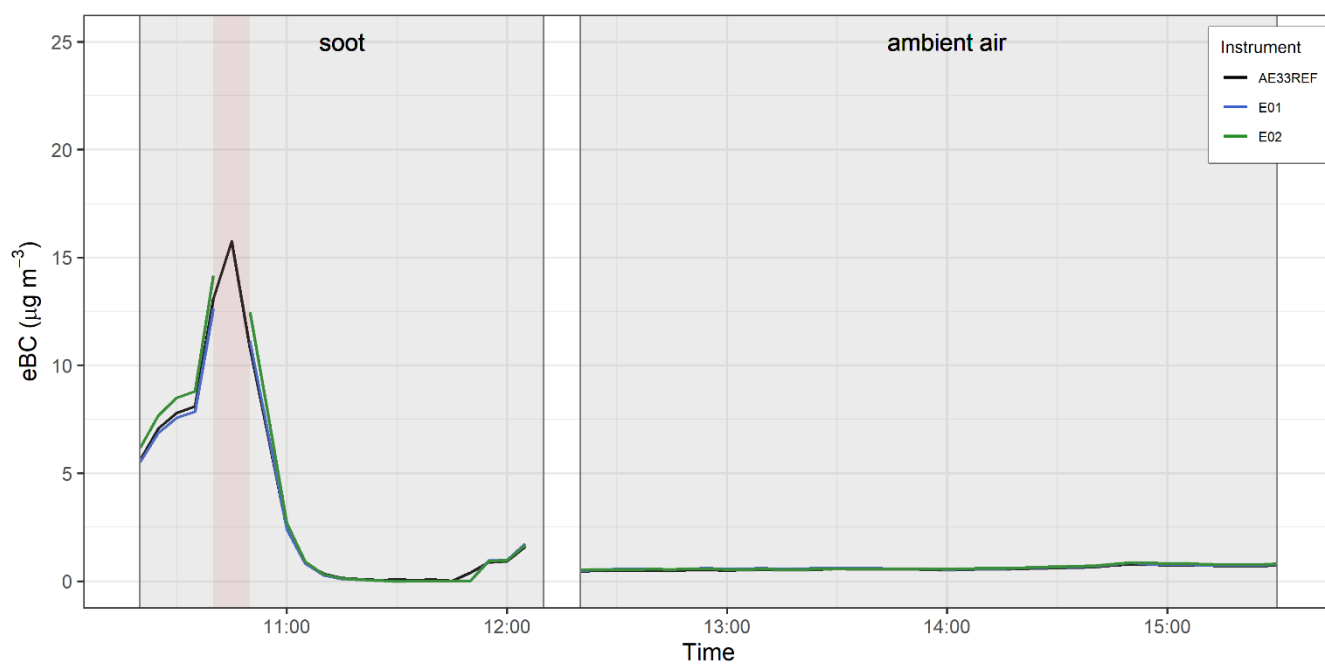
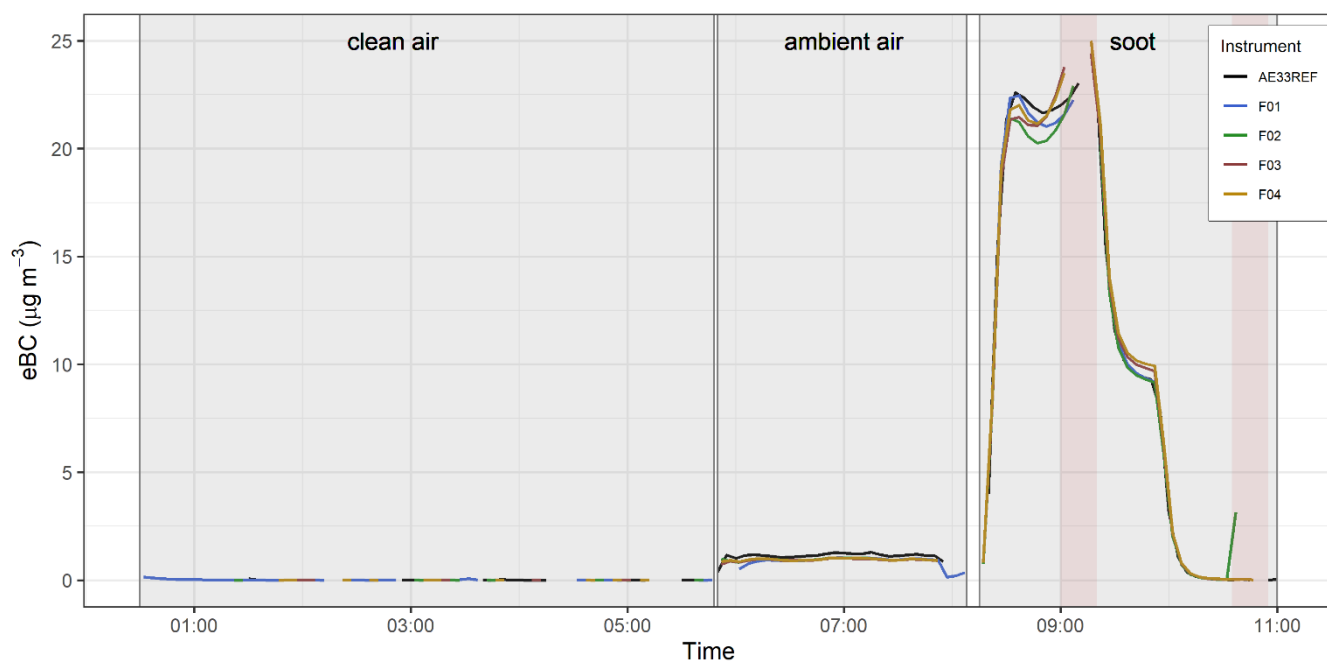


Figure S8. Time series of eBC mass concentrations at 880 nm before maintenance in group E. Note: Instruments from group E did not measure nigrosin particles.



30 **Figure S9. Time series of eBC mass concentrations at 880 nm after maintenance in group E.** Note: Instruments from group E did not measure nigrosin particles, neither clean air after maintenance.



35 **Figure S10. Time series of eBC mass concentrations at 880 nm before maintenance in group F.** Note: the order of the samples was changed because of technical adjustments in the laboratory. Instruments from group F did not measure nigrosin particles.

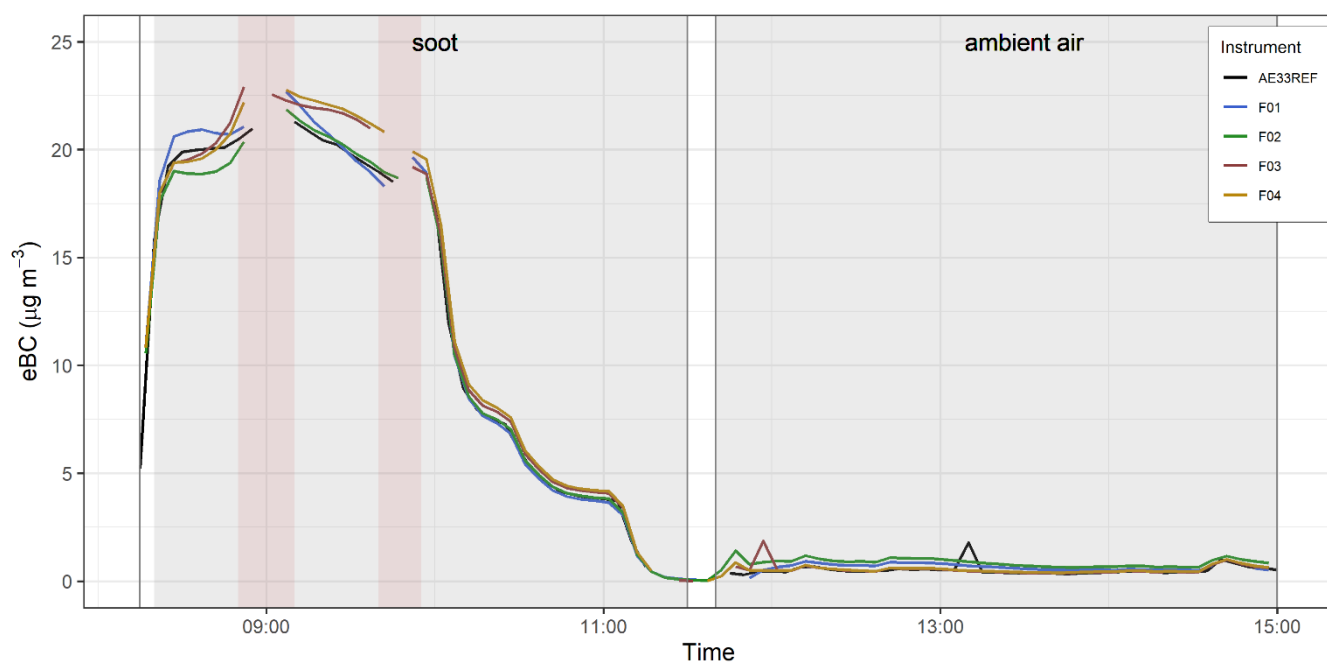


Figure S11. Time series of eBC mass concentrations at 880 nm after maintenance in group F. Note: Instruments from group F did not measure nigrosin particles, neither clean air after maintenance.

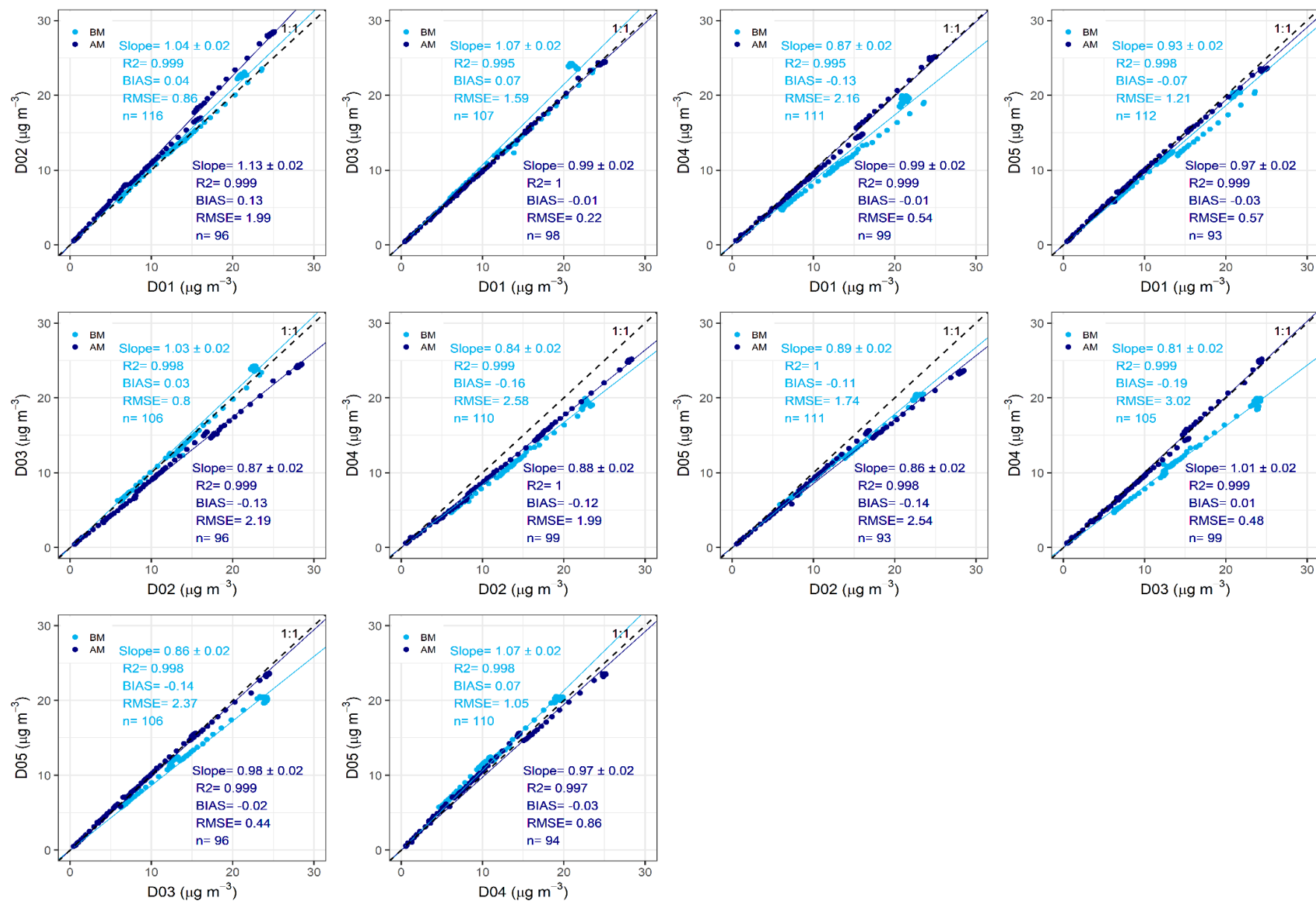


Figure S12. Scatter plot matrix for the comparison of measurements of BC at 880 nm from instruments in group D, before and after maintenance during soot measurements. The intercept was forced through zero. BM: Before maintenance, AM: After maintenance.

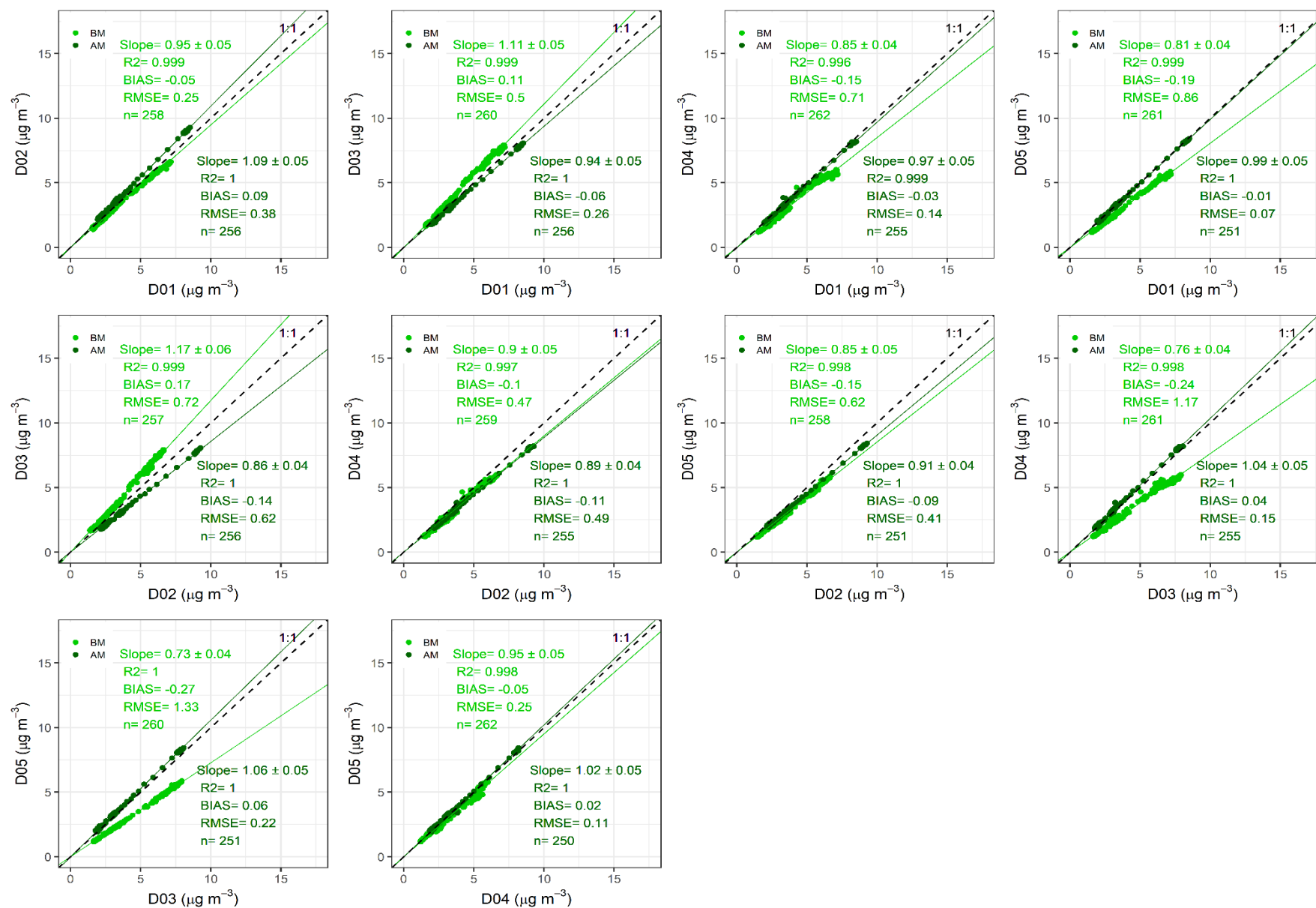


Figure S13. Scatter plot matrix for the comparison of measurements of BC at 880 nm from instruments in group D, before and after maintenance during nigrosin measurements. The intercept was forced through zero. BM: Before maintenance, AM: After maintenance.

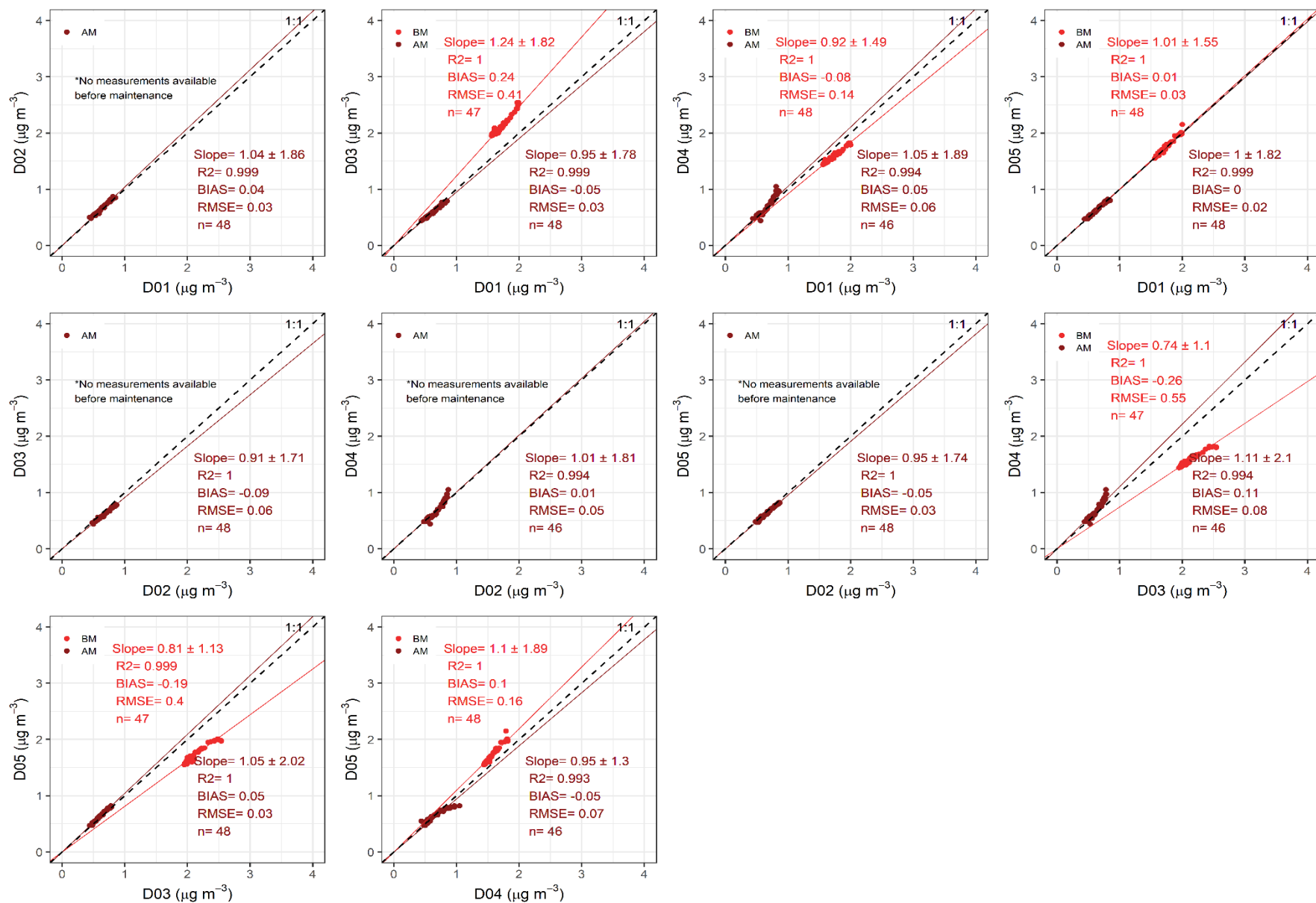


Figure S14. Scatter plot matrix for the comparison of measurements of BC at 880 nm from instruments in group D, before and after maintenance during ambient air measurements. The intercept was forced through zero. BM: Before maintenance, AM: After maintenance.

Table S1. Valid statuses of data used in the analysis.

| Status | Description |
|--------|--|
| 0 | Measurement |
| 8 | Check flow status history (warning) |
| 128 | Tape warning (less than 30 spots left) |
| 136 | Tape warning (less than 30 spots left) + check flow status history |
| 256 | Tape last warning (less than 5 spots left) |
| 65535 | Database bigger than 2×10^6 lines, i.e., a warning because the memory of the instrument is getting full - the user has to make sure the data are recorded correctly, in some cases data with this status are not valid because overwriting conflicts. |

50

Table S2. Instrumental noise before and after maintenance.

| Instrument | Noise ($\mu\text{g m}^{-3}$) | | | | | | | | | | | | | |
|------------|--------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | 370nm | | 470nm | | 520nm | | 590nm | | 660nm | | 880nm | | 950nm | |
| | BM | AM | BM | AM | BM | AM | BM | AM | BM | AM | BM | AM | BM | AM |
| Group A | | | | | | | | | | | | | | |
| A01 | 0.022 | 0.013 | 0.029 | 0.021 | 0.034 | 0.051 | 0.041 | 0.021 | 0.035 | 0.019 | 0.029 | 0.025 | 0.027 | 0.027 |
| A02 | 0.015 | 0.013 | 0.022 | 0.017 | 0.023 | 0.02 | 0.035 | 0.024 | 0.025 | 0.021 | 0.025 | 0.024 | 0.027 | 0.022 |
| Group B | | | | | | | | | | | | | | |
| B01 | 0.026 | ND | 0.035 | ND | 0.05 | ND | 0.038 | ND | 0.042 | ND | 0.026 | ND | 0.026 | ND |
| B02 | 0.028 | 0.019 | 0.032 | 0.023 | 0.039 | 0.025 | 0.044 | 0.025 | 0.041 | 0.024 | 0.031 | 0.026 | 0.032 | 0.027 |
| B03 | 0.033 | 0.043 | 0.052 | 0.061 | 0.059 | 0.074 | 0.057 | 0.071 | 0.062 | 0.071 | 0.063 | 0.062 | 0.05 | 0.058 |
| B04 | 0.026 | 0.021 | 0.043 | 0.034 | 0.049 | 0.036 | 0.053 | 0.032 | 0.069 | 0.034 | 0.032 | 0.029 | 0.029 | 0.025 |
| B05 | 0.099 | 0.02 | 0.141 | 0.033 | 0.161 | 0.039 | 0.176 | 0.042 | 0.134 | 0.035 | 0.068 | 0.03 | 0.053 | 0.029 |
| B06 | 0.012 | 0.014 | 0.021 | 0.02 | 0.019 | 0.022 | 0.02 | 0.024 | 0.018 | 0.022 | 0.022 | 0.017 | 0.02 | 0.023 |
| Group C | | | | | | | | | | | | | | |
| C01 | 0.02 | 0.013 | 0.03 | 0.027 | 0.029 | 0.016 | 0.037 | 0.026 | 0.032 | 0.015 | 0.026 | 0.017 | 0.025 | 0.016 |
| C02 | 0.032 | 0.022 | 0.092 | 0.036 | 0.051 | 0.031 | 0.045 | 0.034 | 0.042 | 0.03 | 0.031 | 0.021 | 0.031 | 0.037 |
| C03 | 0.038 | 0.046 | 0.053 | 0.057 | 0.053 | 0.064 | 0.062 | 0.062 | 0.051 | 0.063 | 0.037 | 0.038 | 0.038 | 0.037 |
| C04 | 0.032 | 0.013 | 0.048 | 0.016 | 0.047 | 0.019 | 0.06 | 0.016 | 0.049 | 0.017 | 0.028 | 0.025 | 0.03 | 0.02 |
| Group D | | | | | | | | | | | | | | |
| D01 | 0.022 | 0.013 | 0.024 | 0.017 | 0.028 | 0.017 | 0.03 | 0.028 | 0.029 | 0.025 | 0.032 | 0.034 | 0.038 | 0.036 |
| D02 | 0.015 | 0.066 | 0.026 | 0.06 | 0.02 | 0.087 | 0.022 | 0.092 | 0.018 | 0.06 | 0.025 | 0.04 | 0.022 | 0.038 |
| D03 | 0.055 | 0.014 | 0.058 | 0.021 | 0.073 | 0.016 | 0.074 | 0.021 | 0.17 | 0.029 | 0.042 | 0.044 | 0.043 | 0.048 |
| D04 | 0.044 | 0.018 | 0.051 | 0.029 | 0.054 | 0.028 | 0.062 | 0.03 | 0.063 | 0.028 | 0.056 | 0.032 | 0.06 | 0.033 |
| D05 | 0.073 | 0.034 | 0.068 | 0.045 | 0.069 | 0.05 | 0.052 | 0.046 | 0.056 | 0.038 | 0.035 | 0.035 | 0.031 | 0.041 |
| Group E | | | | | | | | | | | | | | |
| E01 | 0.017 | ND | 0.034 | ND | 0.03 | ND | 0.026 | ND | 0.024 | ND | 0.022 | ND | 0.022 | ND |
| E02 | 0.019 | ND | 0.019 | ND | 0.023 | ND | 0.023 | ND | 0.021 | ND | 0.023 | ND | 0.028 | ND |
| Group F | | | | | | | | | | | | | | |
| F01 | 0.023 | ND | 0.023 | ND | 0.024 | ND | 0.027 | ND | 0.028 | ND | 0.031 | ND | 0.035 | ND |
| F02 | 0.013 | ND | 0.013 | ND | 0.016 | ND | 0.017 | ND | 0.017 | ND | 0.021 | ND | 0.022 | ND |
| F03 | 0.012 | ND | 0.013 | ND | 0.014 | ND | 0.017 | ND | 0.014 | ND | 0.019 | ND | 0.022 | ND |
| F04 | 0.011 | ND | 0.012 | ND | 0.012 | ND | 0.014 | ND | 0.015 | ND | 0.022 | ND | 0.025 | ND |

BM: Before maintenance; AM: After maintenance; ND: No data.