atmosphere

Supplementary Material for Characterization of Aerosol Physical and Optical Properties at The Observatoire Pérenne de l'Environnement (OPE) Site

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Table 1. Median values of different aerosol optical and physical properties at OPE as a function of seasons.

	Full Period	Winter	Spring	Summer	Autumn
EBC (μg m^{-3})	Median = 0.3 Perc$_{25}$ = 0.17 Perc$_{75}$ = 0.47	Median = 0.32 Perc$_{25}$ = 0.18 Perc$_{75}$ = 0.56	Median = 0.24 Perc$_{25}$ = 0.16 Perc$_{75}$ = 0.41	Median = 0.25 Perc$_{25}$ = 0.17 Perc$_{75}$ = 0.37	Median = 0.34 Perc$_{25}$ = 0.21 Perc$_{75}$ = 0.54
EBC$_{bb}$ (μg m^{-3})	Median = 0.09 Perc$_{25}$ = 0.04 Perc$_{75}$ = 0.16	Median = 0.12 Perc$_{25}$ = 0.06 Perc$_{75}$ = 0.2	Median = 0.08 Perc$_{25}$ = 0.04 Perc$_{75}$ = 0.15	Median = 0.05 Perc$_{25}$ = 0.02 Perc$_{75}$ = 0.1	Median = 0.1 Perc$_{25}$ = 0.05 Perc$_{75}$ = 0.18
EBC$_{ff}$ (μg m^{-3})	Median = 0.24 Perc$_{25}$ = 0.13 Perc$_{75}$ = 0.4	Median = 0.2 Perc$_{25}$ = 0.11 Perc$_{75}$ = 0.35	Median = 0.2 Perc$_{25}$ = 0.12 Perc$_{75}$ = 0.34	Median = 0.27 Perc$_{25}$ = 0.15 Perc$_{75}$ = 0.4	Median = 0.3 Perc$_{25}$ = 0.17 Perc$_{75}$ = 0.47
α	Median = 0.95 Perc$_{25}$ = 0.76 Perc$_{75}$ = 1.11	Median = 1.03 Perc$_{25}$ = 0.93 Perc$_{75}$ = 1.14	Median = 0.96 Perc$_{25}$ = 0.78 Perc$_{75}$ = 1.11	Median = 0.8 Perc$_{25}$ = 0.62 Perc$_{75}$ = 1.02	Median = 0.9 Perc$_{25}$ = 0.72 Perc$_{75}$ = 1.09
b_{scat} (Mm^{-1})	Median = 19 Perc$_{25}$ = 11 Perc$_{75}$ = 41	Median = 24 Perc$_{25}$ = 13 Perc$_{75}$ = 53	Median = 19 Perc$_{25}$ = 10 Perc$_{75}$ = 40	Median = 14 Perc$_{25}$ = 10 Perc$_{75}$ = 22	Median = 21 Perc$_{25}$ = 12 Perc$_{75}$ = 47
SSA	Median = 0.86 Perc$_{25}$ = 0.82 Perc$_{75}$ = 0.9	Median = 0.87 Perc$_{25}$ = 0.83 Perc$_{75}$ = 0.9	Median = 0.86 Perc$_{25}$ = 0.81 Perc$_{75}$ = 0.9	Median = 0.86 Perc$_{25}$ = 0.82 Perc$_{75}$ = 0.89	Median = 0.85 Perc$_{25}$ = 0.81 Perc$_{75}$ = 0.89
N$_{10\text{-}550}$ (cm^{-3})	Median = 2155 Perc$_{25}$ = 1377 Perc$_{75}$ = 3176	Median = 1828 Perc$_{25}$ = 1099 Perc$_{75}$ = 2826	Median = 2600 Perc$_{25}$ = 1734 Perc$_{75}$ = 3632	Median = 2500 Perc$_{25}$ = 1650 Perc$_{75}$ = 3537	Median = 1870 Perc$_{25}$ = 1225 Perc$_{75}$ = 2695
N$_{0.54\text{–}1.15}$ (cm^{-3})	Median = 0.63 Perc$_{25}$ = 0.23 Perc$_{75}$ = 1.4	Median = 0.7 Perc$_{25}$ = 0.1 Perc$_{75}$ = 2	Median = 0.56 Perc$_{25}$ = 0.21 Perc$_{75}$ = 1.15	Median = 0.54 Perc$_{25}$ = 0.33 Perc$_{75}$ = 0.88	Median = 0.73 Perc$_{25}$ = 0.23 Perc$_{75}$ = 1.41
N$_{1.15\text{–}4.5}$ (cm^{-3})	Median = 0.03 Perc$_{25}$ = 0.01 Perc$_{75}$ = 0.06	Median = 0.01 Perc$_{25}$ = 0.001 Perc$_{75}$ = 0.35	Median = 0.03 Perc$_{25}$ = 0.01 Perc$_{75}$ = 0.06	Median = 0.05 Perc$_{25}$ = 0.03 Perc$_{75}$ = 0.07	Median = 0.02 Perc$_{25}$ = 0.01 Perc$_{75}$ = 0.05
Nuc$_{fresh}$ (cm^{-3})	Median = 67 Perc$_{25}$ = 20 Perc$_{75}$ = 172	Median = 51 Perc$_{25}$ = 17 Perc$_{75}$ = 123	Median = 90 Perc$_{25}$ = 26 Perc$_{75}$ = 217	Median = 90 Perc$_{25}$ = 29 Perc$_{75}$ = 222	Median = 50 Perc$_{25}$ = 13 Perc$_{75}$ = 148
Nuc$_{aged}$ (cm^{-3})	Median = 302 Perc$_{25}$ = 147 Perc$_{75}$ = 593	Median = 257 Perc$_{25}$ = 122 Perc$_{75}$ = 483	Median = 370 Perc$_{25}$ = 185 Perc$_{75}$ = 715	Median = 332 Perc$_{25}$ = 147 Perc$_{75}$ = 667	Median = 277 Perc$_{25}$ = 139 Perc$_{75}$ = 540

Ait (cm^{-3})	Median = 507 $Perc_{25}$ = 291 $Perc_{75}$ = 871	Median = 402 $Perc_{25}$ = 237 $Perc_{75}$ = 686	Median = 647 $Perc_{25}$ = 389 $Perc_{75}$ = 1063	Median = 586 $Perc_{25}$ = 312 $Perc_{75}$ = 1089	Median = 444 $Perc_{25}$ = 273 $Perc_{75}$ = 733
Acc1 (cm^{-3})	Median = 762 $Perc_{25}$ = 407 $Perc_{75}$ = 1240	Median = 700 $Perc_{25}$ = 347 $Perc_{75}$ = 1265	Median = 864 $Perc_{25}$ = 479 $Perc_{75}$ = 1339	Median = 829 $Perc_{25}$ = 445 $Perc_{75}$ = 1293	Median = 675 $Perc_{25}$ = 360 $Perc_{75}$ = 1083
Acc2 (cm^{-3})	Median = 120 $Perc_{25}$ = 53 $Perc_{75}$ = 228	Median = 142 $Perc_{25}$ = 51 $Perc_{75}$ = 286	Median = 127 $Perc_{25}$ = 59 $Perc_{75}$ = 228	Median = 91 $Perc_{25}$ = 48 $Perc_{75}$ = 159	Median = 136 $Perc_{25}$ = 53 $Perc_{75}$ = 240

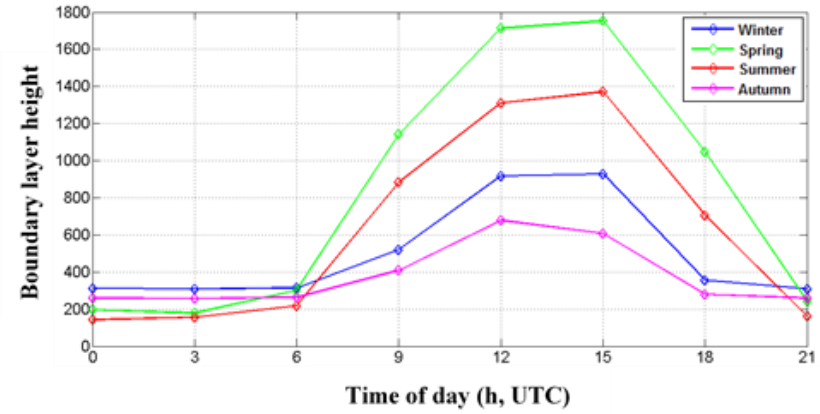

Figure S1. Diurnal variation of the boundary layer height at OPE (computed with ECMWF ERA-Interim data for the year 2012 to 2018) averaged over the four seasons.

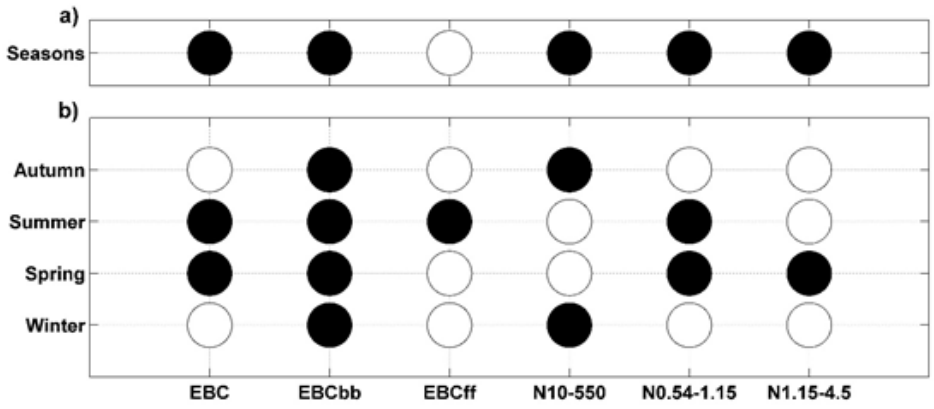

Figure S2. The Wilcoxon–Mann–Whitney test applied on EBC, EBC_{bb}, EBC_{ff}, $N_{10\text{-}550}$, $N_{0.54\text{-}1.15}$, $N_{1.15\text{-}4.5}$ concentrations measured for each season. The circles are black (white) when: (**a**) the cold seasons median are significantly different (equal) from the warm seasons medians; (**b**) the daytime medians are significantly different (equal) from the nighttime medians, with a threshold of 5%.

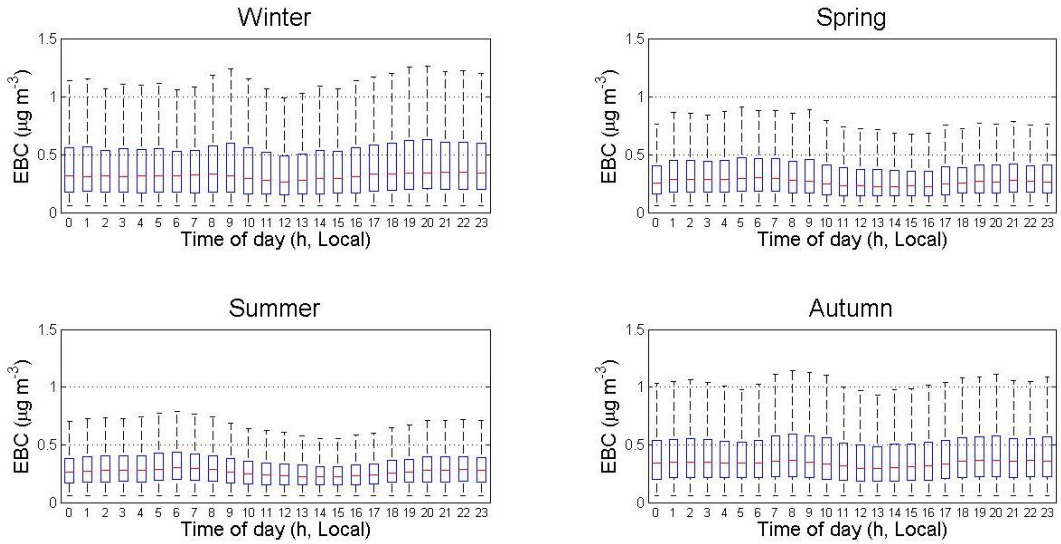

Figure S3. Seasonal median daily variation of EBC (μgm^{-3}) for each season at OPE. Red lines represent the median value, bottom and top sides of the boxes symbolize the 25th and 75th percentile respectively. The length of the whiskers represent 1.5× interquartile range which includes 99.3% of the data.

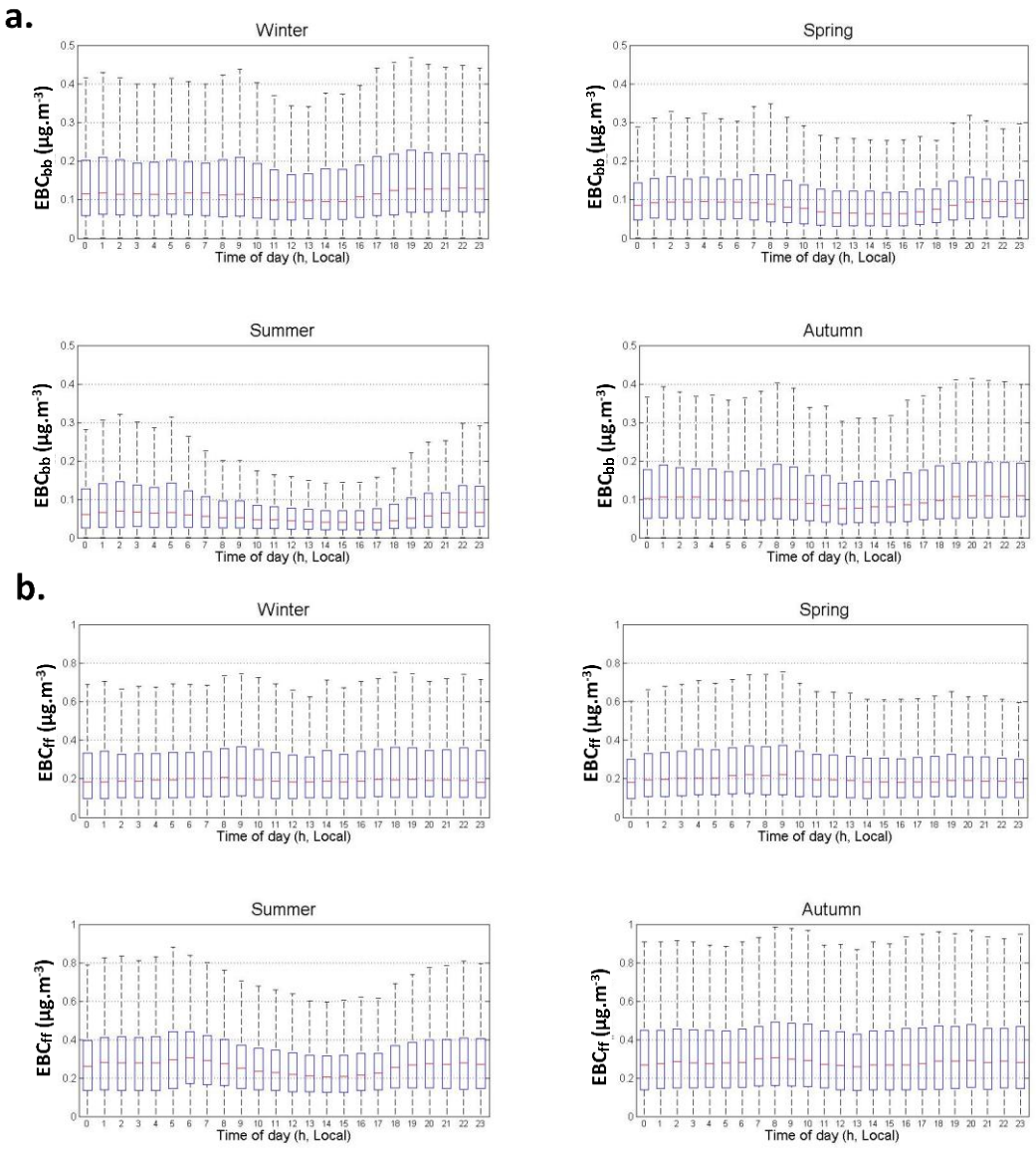

Figure S4. Seasonal median daily variations of (**a**) EBC_{bb} and (**b**) EBC_{ff} for each season. Red lines represent the median value, bottom and top sides of the boxes symbolize the 25th and 75th percentile respectively. The length of the whiskers represent 1.5× interquartile range which includes 99.3% of the data.

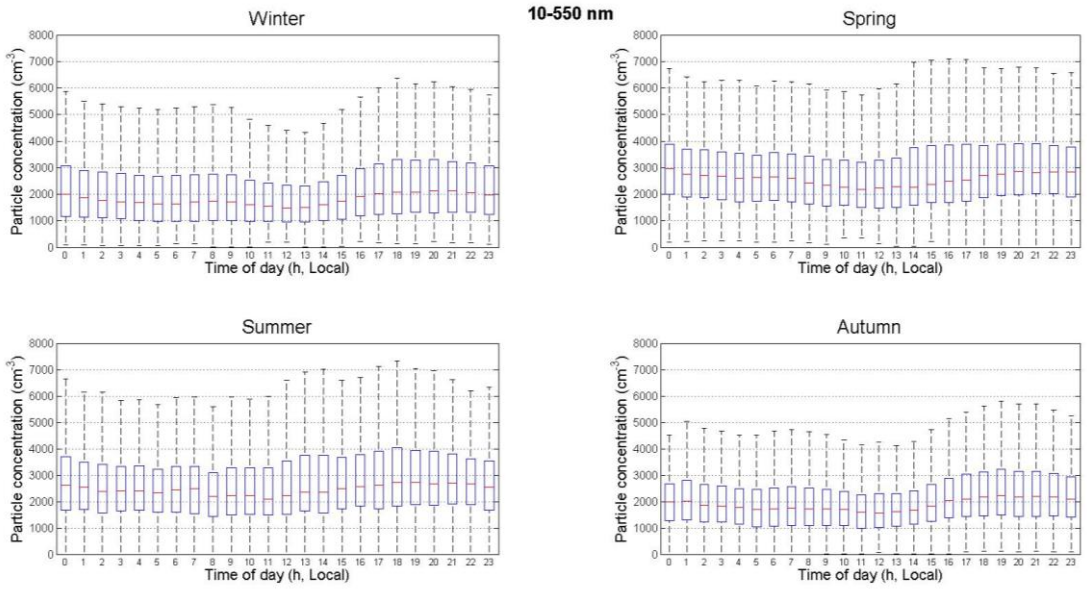

Figure S5. Seasonal median daily variations of the total particle concentration cm^{-3} of diameter between 10 and 550 nm for each season. Red lines represent the median value, bottom and top sides of the boxes symbolize the 25th and 75th percentile respectively. The length of the whiskers represent 1.5× interquartile range which includes 99.3% of the data.

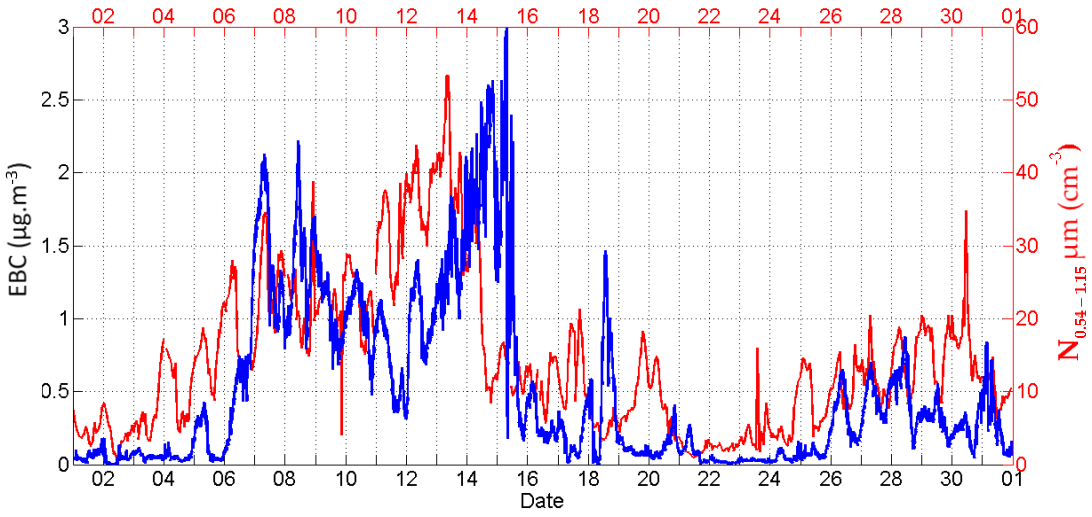

Figure S6. Time series of EBC (Blue) and total particle number concentration of diameter between 0.54 and 1.15 µm ($N_{0.54\text{-}1.15}$ µm): Red, in March 2014 at OPE.

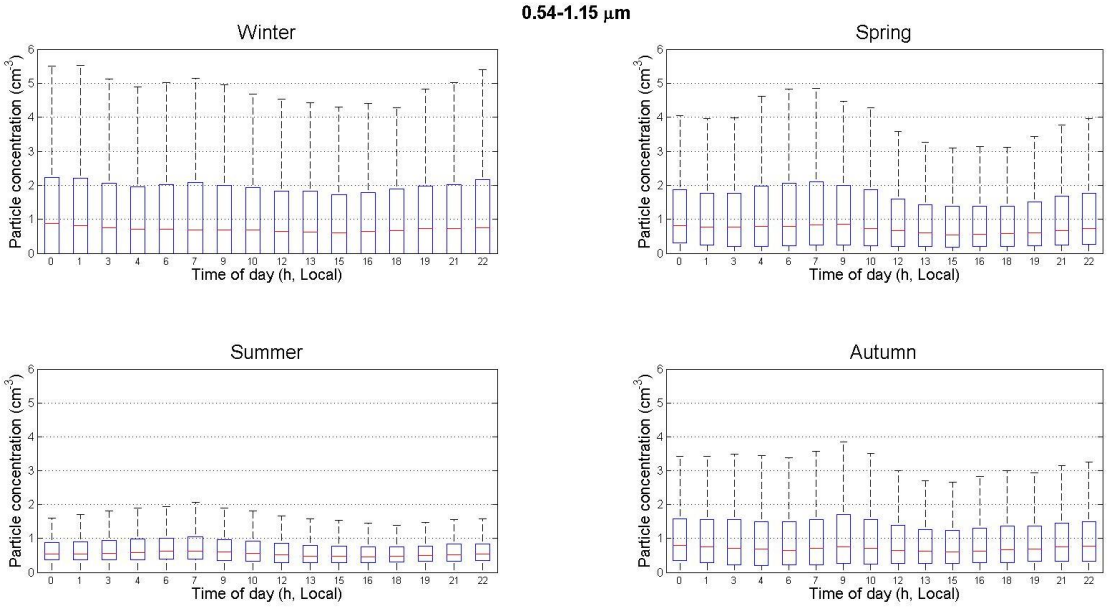

Figure S7. Seasonal median daily variations of the total particle number concentration of diameter between 0.54 and 1.15 μm for each season. Red lines represent the median value, bottom and top sides of the boxes symbolize the 25th and 75th percentile respectively. The length of the whiskers represent 1.5× interquartile range which includes 99.3% of the data.

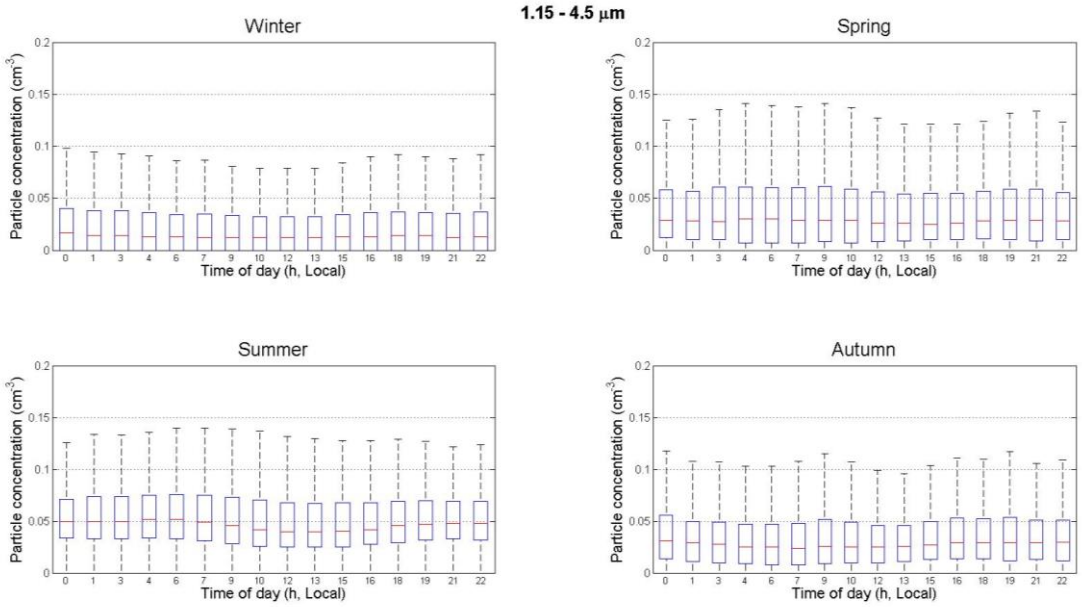

Figure S8. Seasonal median daily variations of the total particle number concentration of diameter between 1.15 and 4.5 μm for each season. Red lines represent the median value, bottom and top sides of the boxes symbolize the 25th and 75th percentile respectively. The length of the whiskers represent 1.5× interquartile range which includes 99.3% of the data.

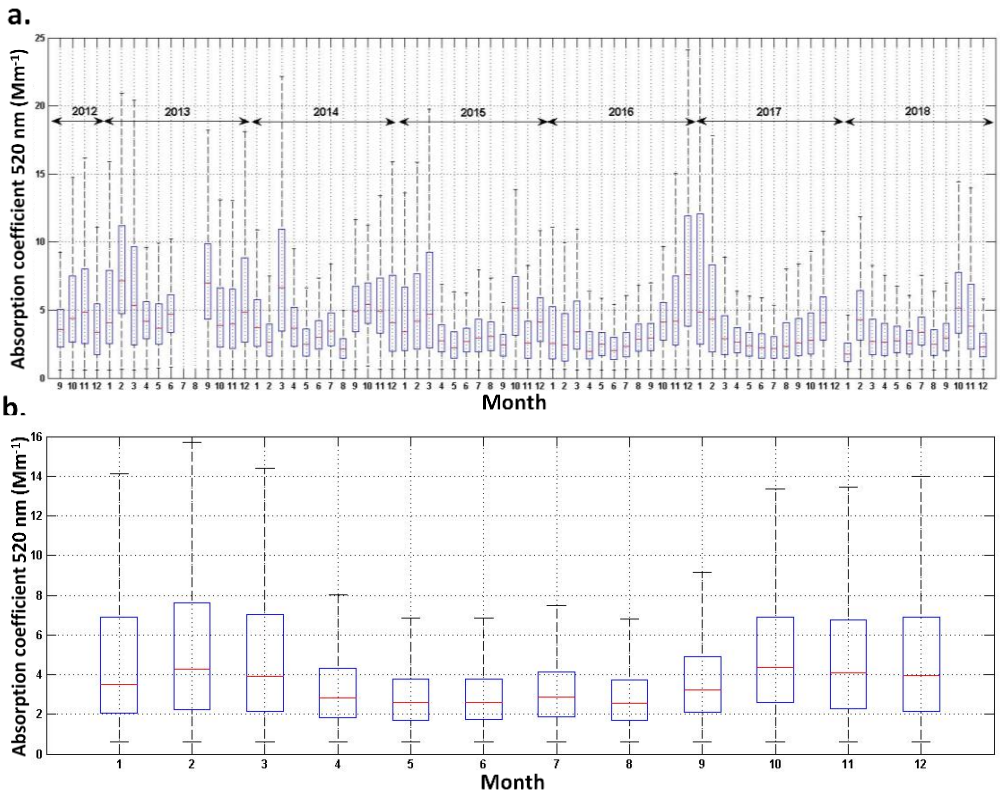

Figure S9. (**a**) Evolution of the absorption coefficient at 520 nm over the entire measurement period; (**b**) seasonal median variations of this same parameter. Red lines represent the median value, bottom and top sides of the boxes symbolize the 25th and 75th percentile respectively and the extremities of the black lines are the 10th and 90th percentile.

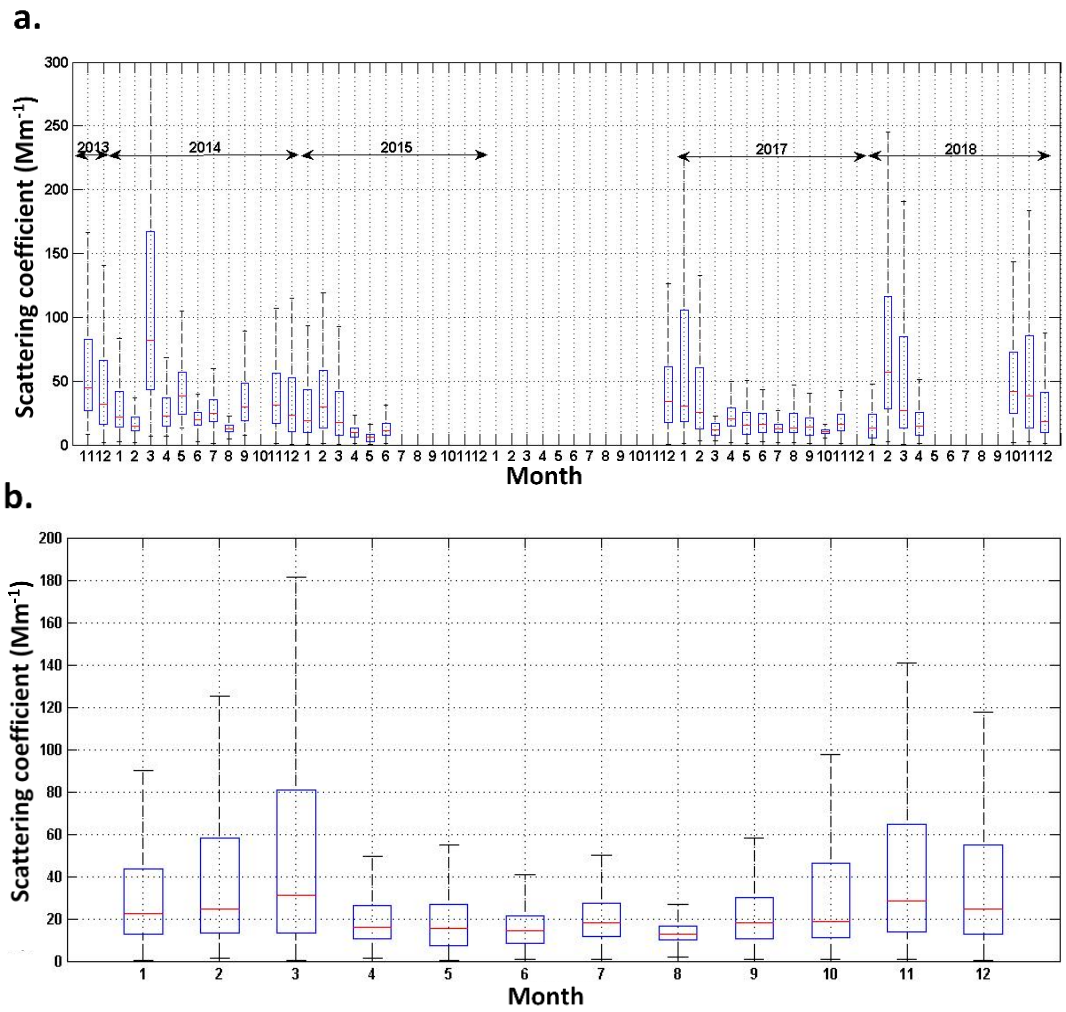

Figure S10. (**a**) Evolution of the scattering coefficient at 525 nm over the entire measurement period; (**b**) seasonal median variations of this same parameter. Red lines represent the median value, bottom and top sides of the boxes symbolize the 25th and 75th percentile respectively. The length of the whiskers represent 1.5× interquartile range which includes 99.3% of the data.

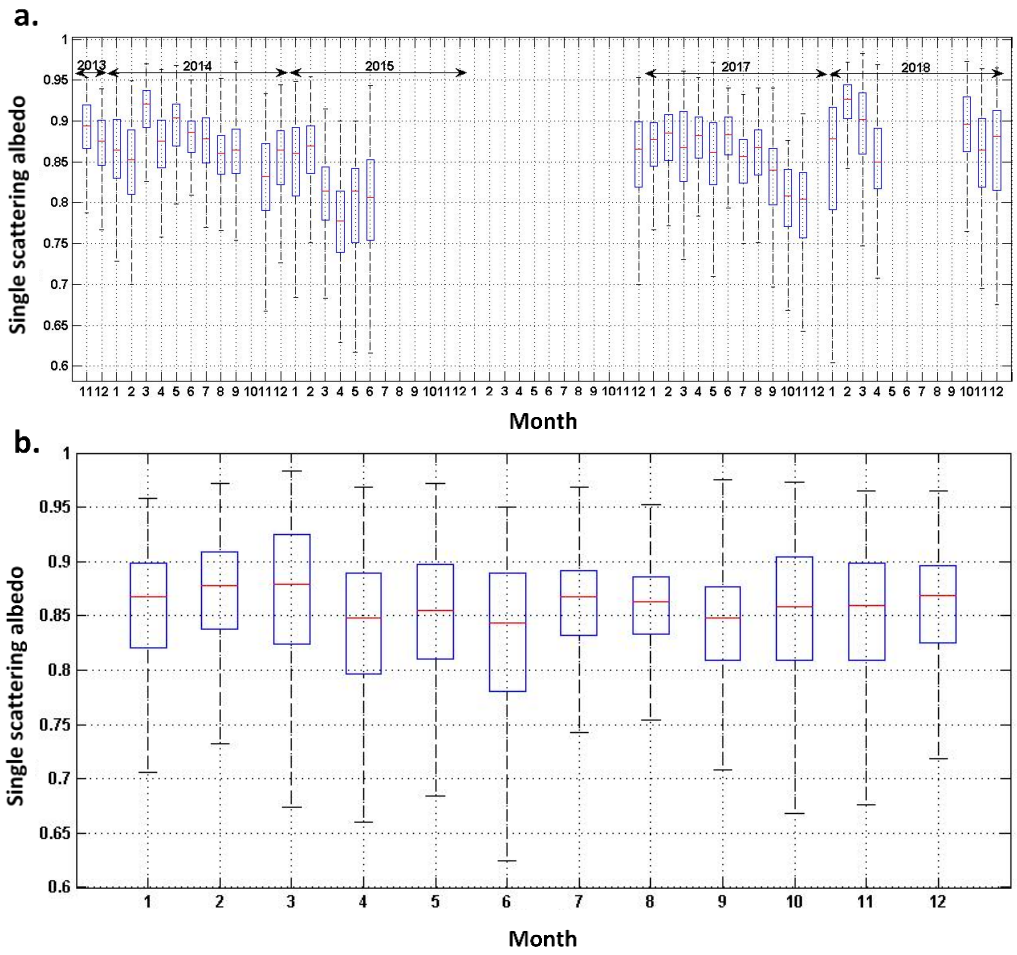

Figure S11. (**a**) Evolution of the single scattering albedo over the entire measurement period; (**b**) seasonal median variations of this same parameter. Red lines represent the median value, bottom and top sides of the boxes symbolize the 25th and 75th percentile respectively. The length of the whiskers represent 1.5× interquartile range which includes 99.3% of the data.