Supplementary Information of

Long-term air quality trends of regulated pollutants in the Helsinki metropolitan area from 1994–2019 and its implications to the Air Quality Index

Salla Sillanpää *et al.*

*Correspondence to*: Tuukka Petäjä (tuukka.petaja@helsinki.fi)

Meteorological observations (Figs. S1–S3)

To support our analysis on air quality, we explored first the meteorological conditions. For air quality, the most relevant parameter is the mixing layer height as it relates to the air quality exposure within urban environment. In practice, the mixing layer height is descriptive of the volume of the layer in troposphere containing the surface emitted trace gases and aerosol particles. The trend analysis of the meteorological observations in Kaisaniemi observation site is presented in Figure 2. Temperature, wind speed, mixing layer height and monthly rainfall showed increasing trends in the HMA and first three were statistically significant ($p < 0.001$).
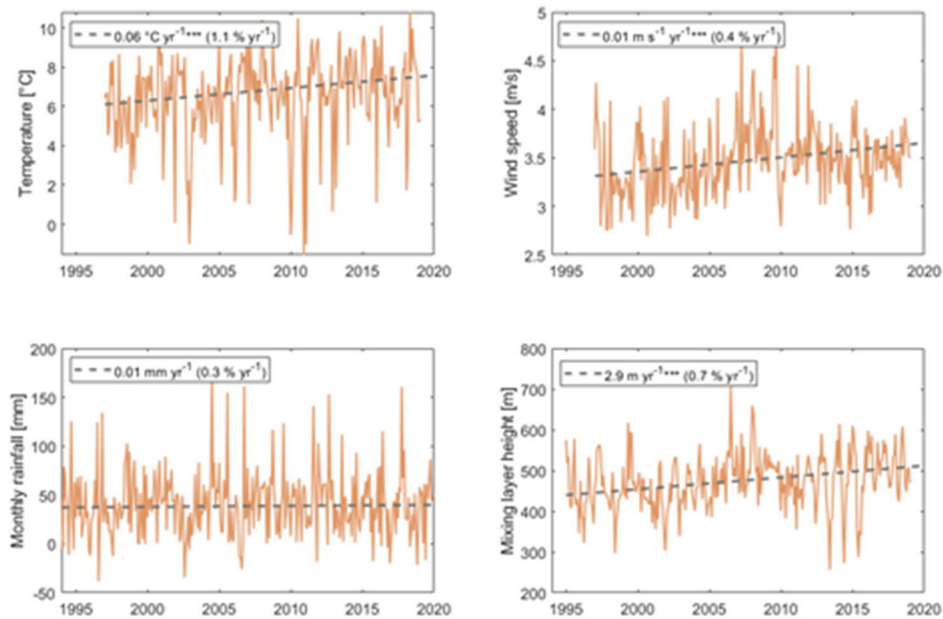

Figure S1. Trends for monthly mean a) temperature [°C], b) wind speed [m/s], c) monthly rainfall [mm] and d) mixing layer height [m].
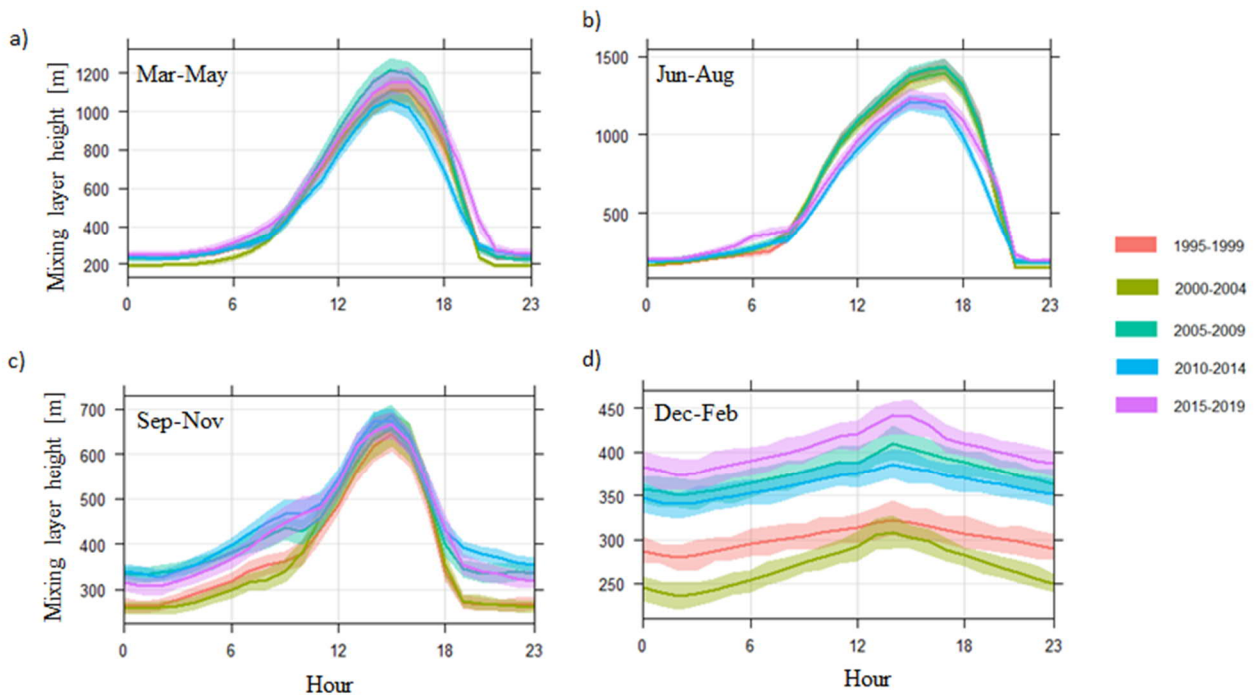
**Figure S2.** Diurnal cycle of mixing layer height during a) spring, b) summer, c) autumn and d) winter.
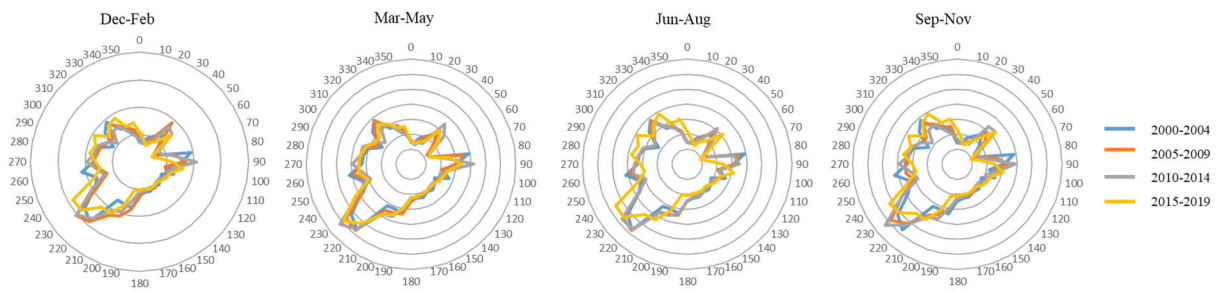
Figure S3. Five-year mean wind direction for four seasons. Note that the location of the wind measurement changed in 2018, which may influence the measured wind direction. Only the wind direction corresponding to wind speed more than 0.5 m/s were taken into account.
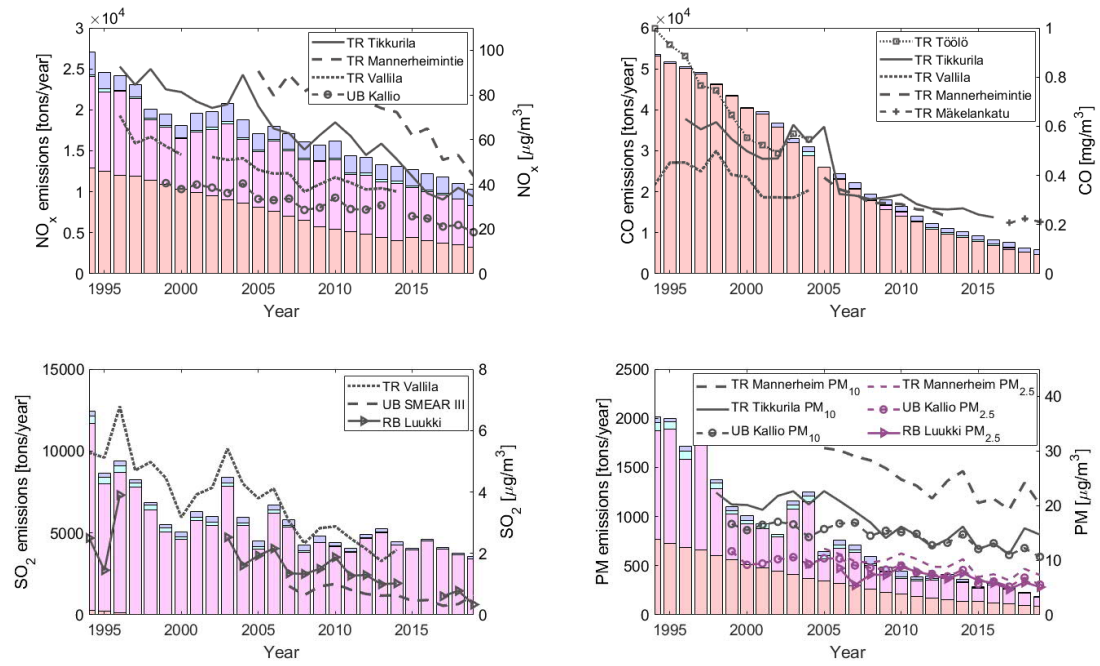
Figure S4. Annual emissions and yearly averaged concentrations of NO_x, CO, SO_2 and PM. The left-hand side y-axis represent the emissions and the right-hand side y-axis is the concentration.
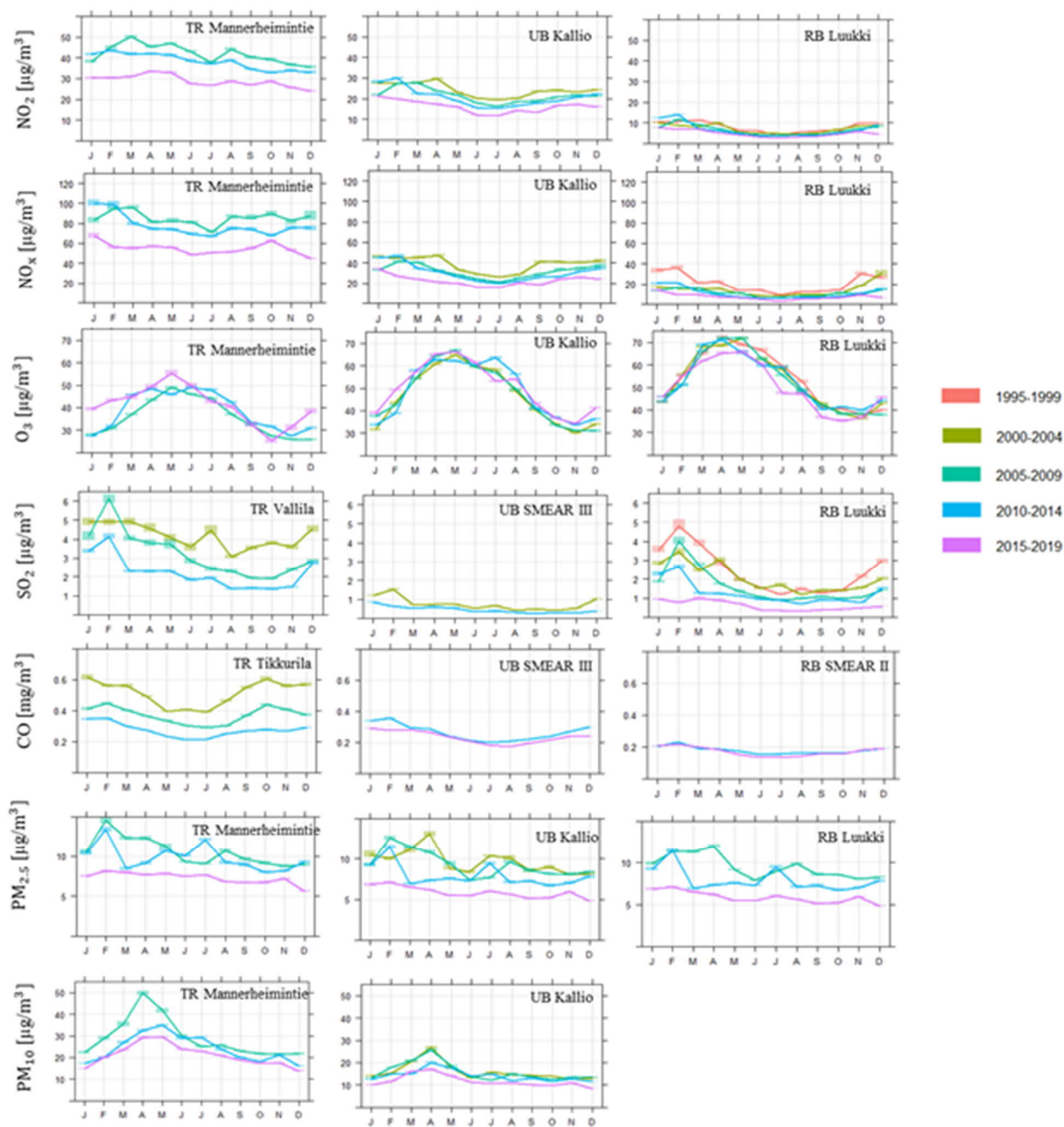
Figure S5. The average monthly cycle of air pollutants. The right-hand side column is for traffic sites, the middle column for urban background sites and the left-hand side column is for rural background sites.
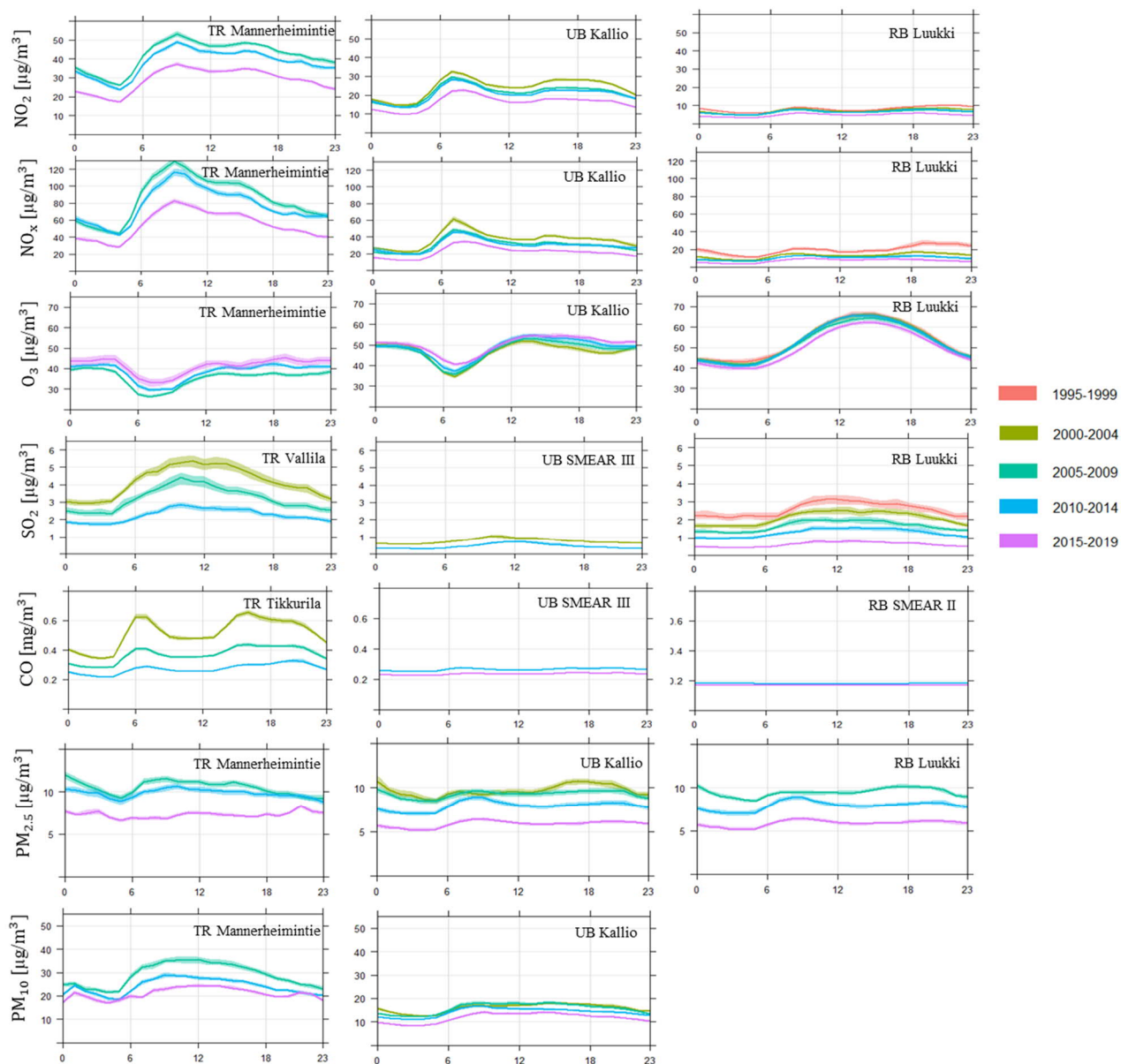
Figure S6. Average diurnal cycle of air pollutants. The right-hand side column is for traffic sites, the middle column for urban background sites and the left-hand side column is for rural background sites.
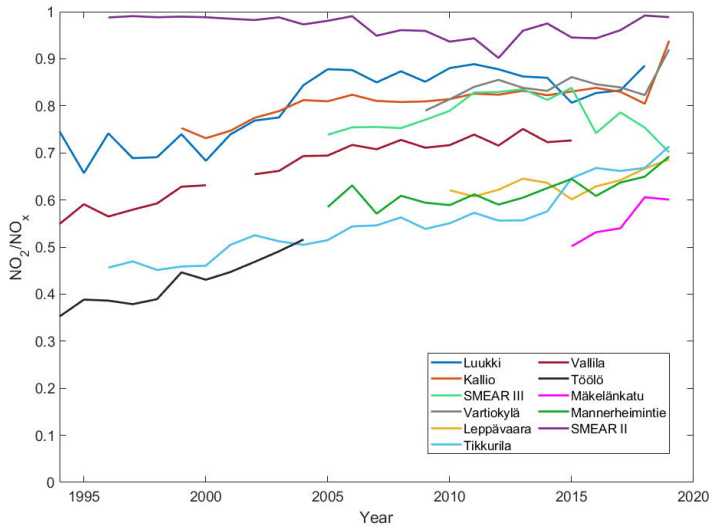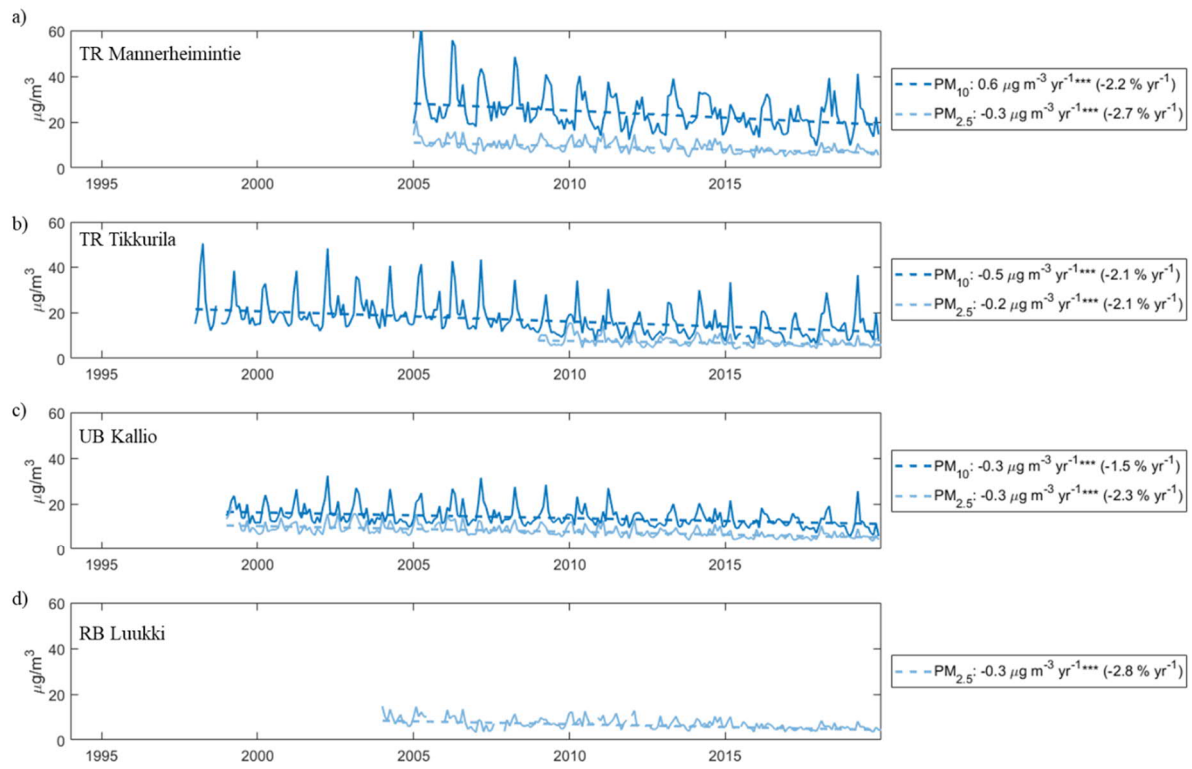
Figure S7. Annual mean NO_2/NO_x ratio.
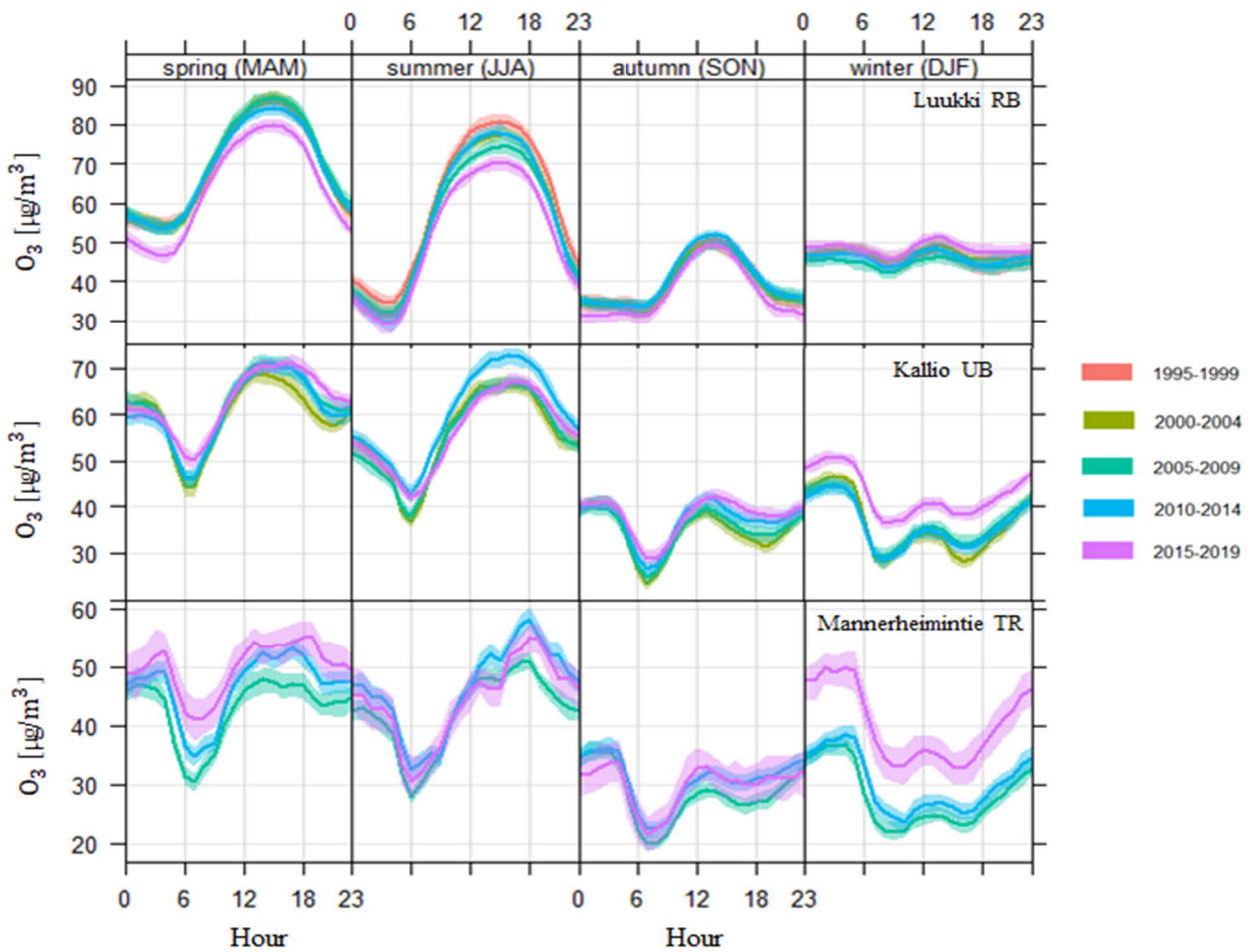
Figure S8. Diurnal cycle of O_3 concentration in Luukki (rural background), Kallio (urban background) and Mannerheimintie (traffic) sites.

Figure S9. Monthly mean PM$_{2.5}$ and PM$_{10}$ concentrations.