

Supplemental Data.

## **Long Term Trends in New York: PM<sub>2.5</sub> Mass and Particle Components**

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### **Forest Fire episode July 2002**

As mentioned in the PM<sub>2.5</sub> discussion section a major air pollution event occurred across the northeastern United States during July 6-7, 2002, as a result of smoke from wildfires in Quebec, Canada (DeBell et al., 2004). The event is shown in Fig. S11. Hourly data show elevated PM<sub>2.5</sub> mass occurred on the morning of July 6 at upstate sites versus the afternoon for NYC. Hourly PM<sub>2.5</sub> mass reached 200  $\mu\text{g}/\text{m}^3$  at WFM and 130  $\mu\text{g}/\text{m}^3$  in NYC around 10:00 AM on July 7, Fig. S11a. Peak values around 100-120  $\mu\text{g}/\text{m}^3$  were observed at sites in western New York on the evening of July 6 to early morning of July 7. At WFM although the FRM sample was invalid on July 7, the 24h CSN PM<sub>2.5</sub> mass measured 127  $\mu\text{g}/\text{m}^3$ . Particle SO<sub>4</sub> and NO<sub>3</sub> were relatively low across the state on July 7<sup>th</sup> (1-3  $\mu\text{g}/\text{m}^3$ ) but elevated amounts of OC of approximately 35-45  $\mu\text{g}/\text{m}^3$  were observed in the NYC 24h CSN filter samples versus 15-20  $\mu\text{g}/\text{m}^3$  at other New York sites consistent with the particle mass being mostly organic matter from woodsmoke. Soluble K (a marker for vegetative burning) was also elevated by factors of 3-7 across the state, Fig. S11b.

Fig. S1. Map showing locations of monitoring sites listed in Table 1. Full circles represent sites currently collecting samples and open circles represent sites where measurements have ceased.

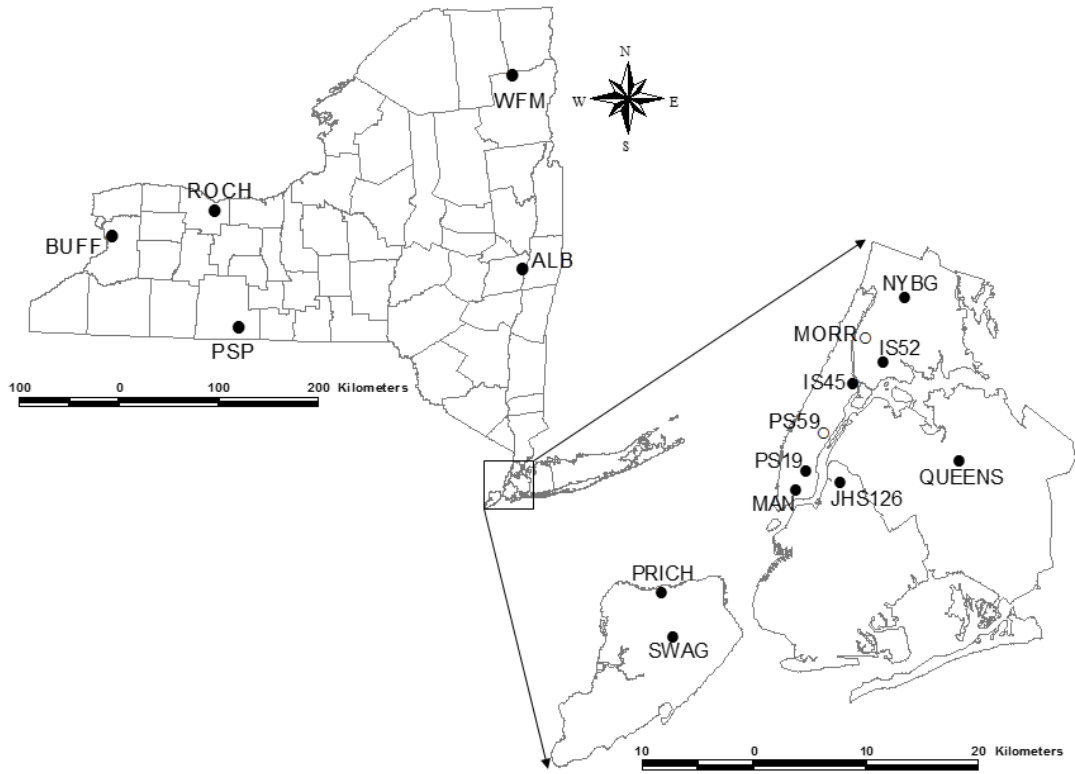


Fig. S2. Annual emissions of (a) SO<sub>2</sub> and (b) NO<sub>x</sub> from the National Emissions Inventory (USEPA, 2014).

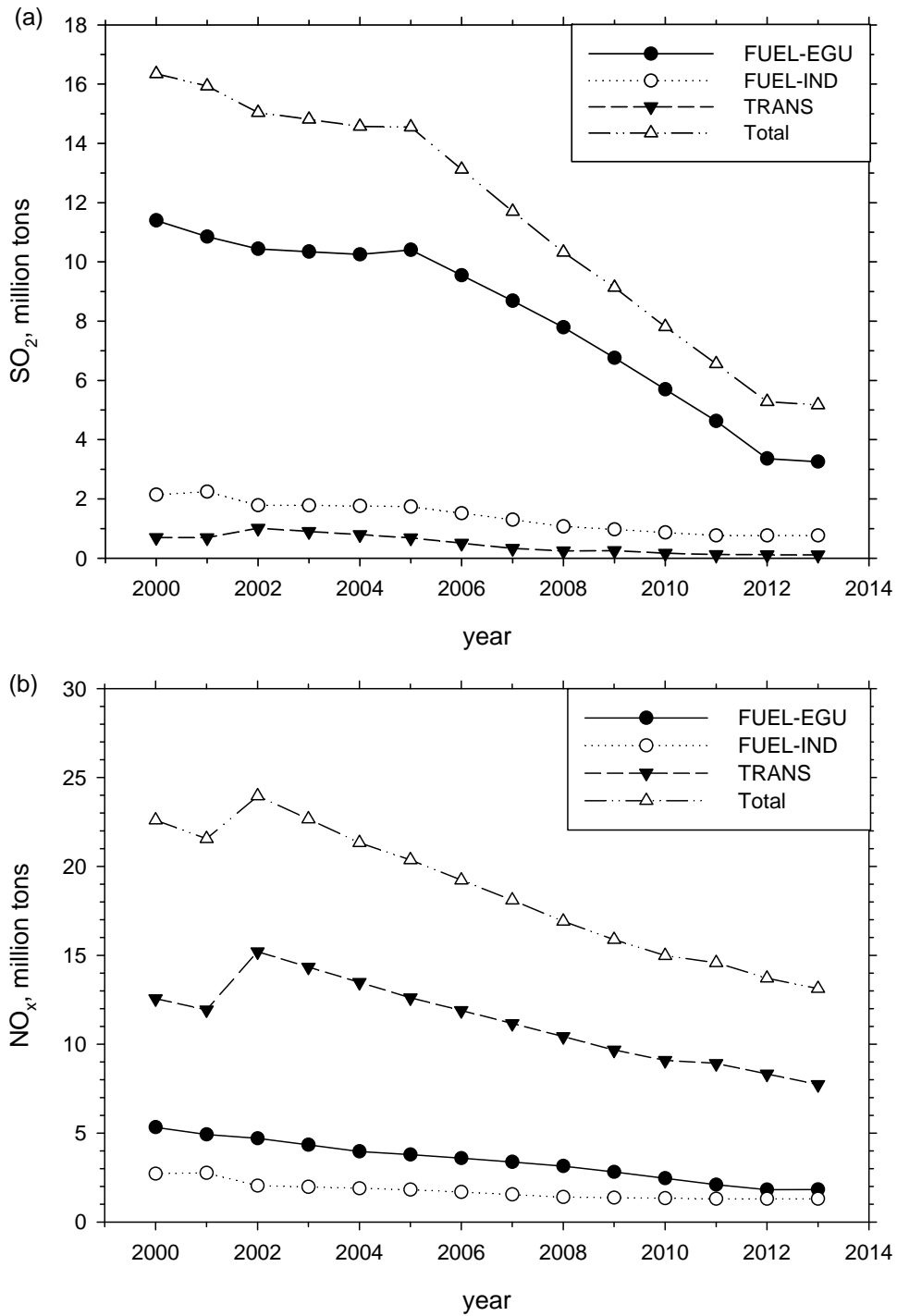


Fig.S3. Mean seasonal SO<sub>4</sub> concentration at various sites during (a) 2002-2003 and (b) 2013-2014. Error bars show 95% confidence intervals on QUEENS and WFM data. Note different y-axis scale in (b). No data for IS52 in 2012-2013 due to site maintenance.

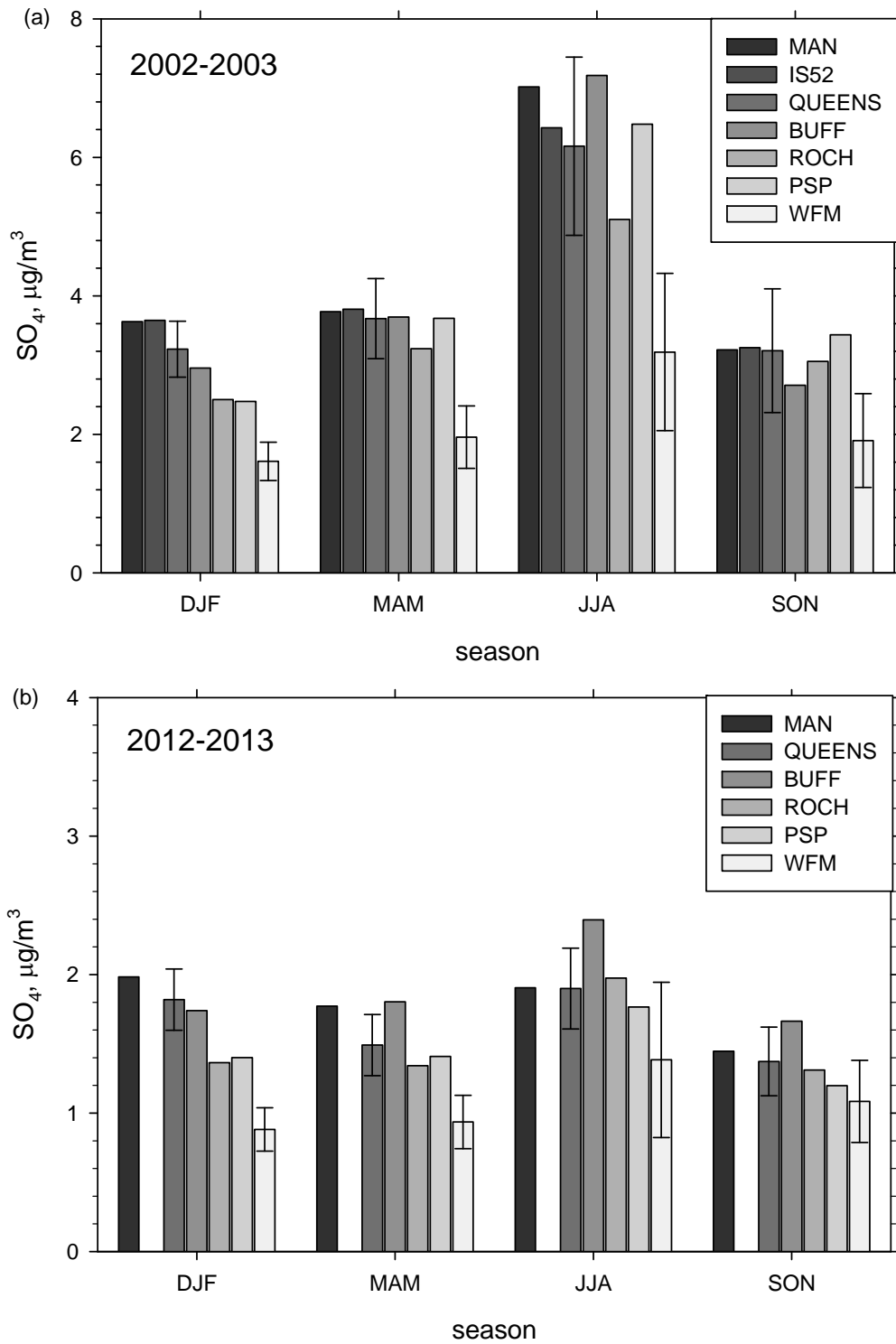


Fig.S4. Mean seasonal  $\text{NO}_3$  concentration at sites in New York during (a) 2002-2003 and (b) 2012-2013. Error bars denote the 95% confidence intervals on QUEENS and WFM data.

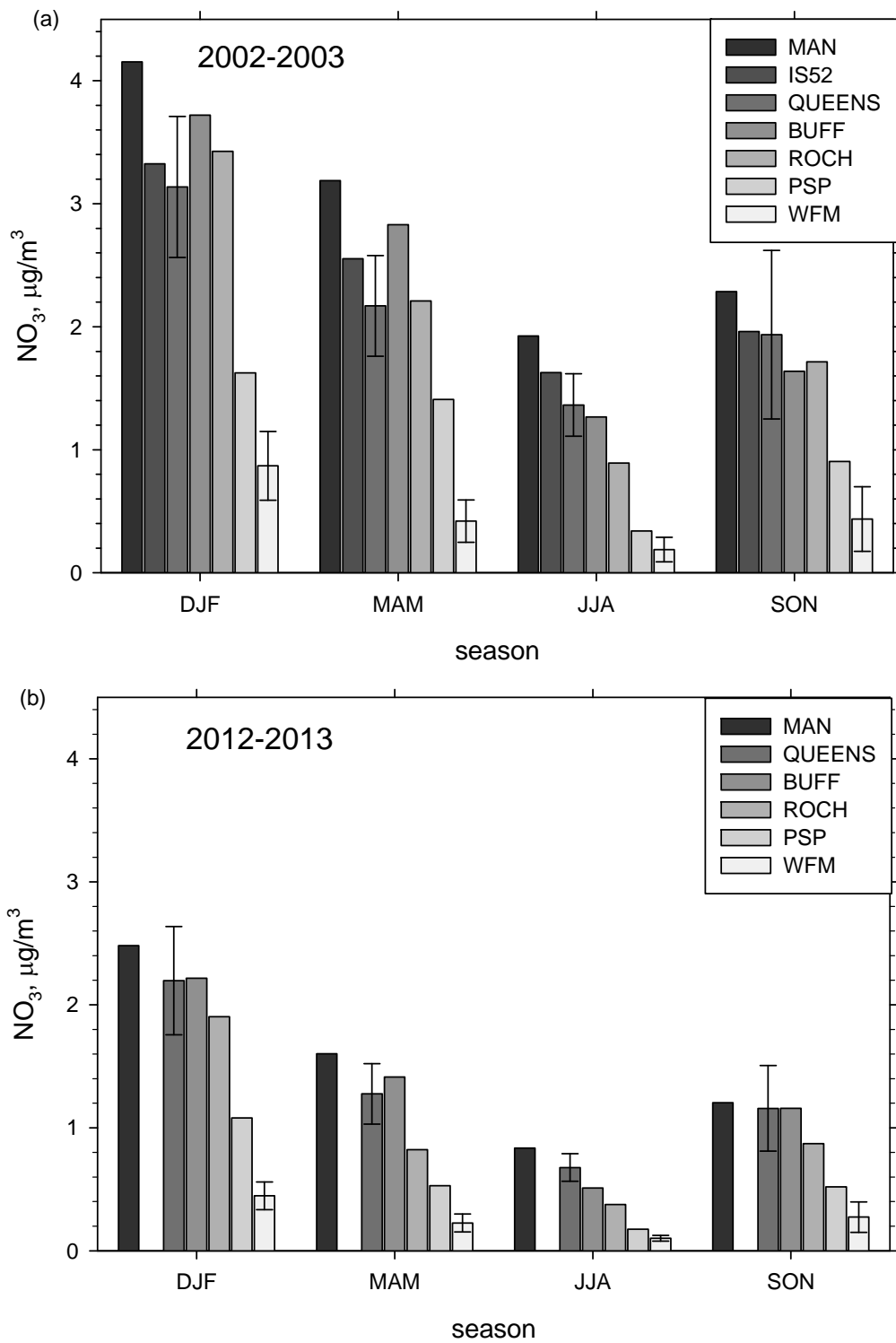


Fig.S5. Mean Seasonal  $\text{NH}_4$  concentration at sites in New York during (a) 2002-2003 and (b) 2012-2013. Error bars indicate the 95% confidence interval on QUEENS and WFM data.

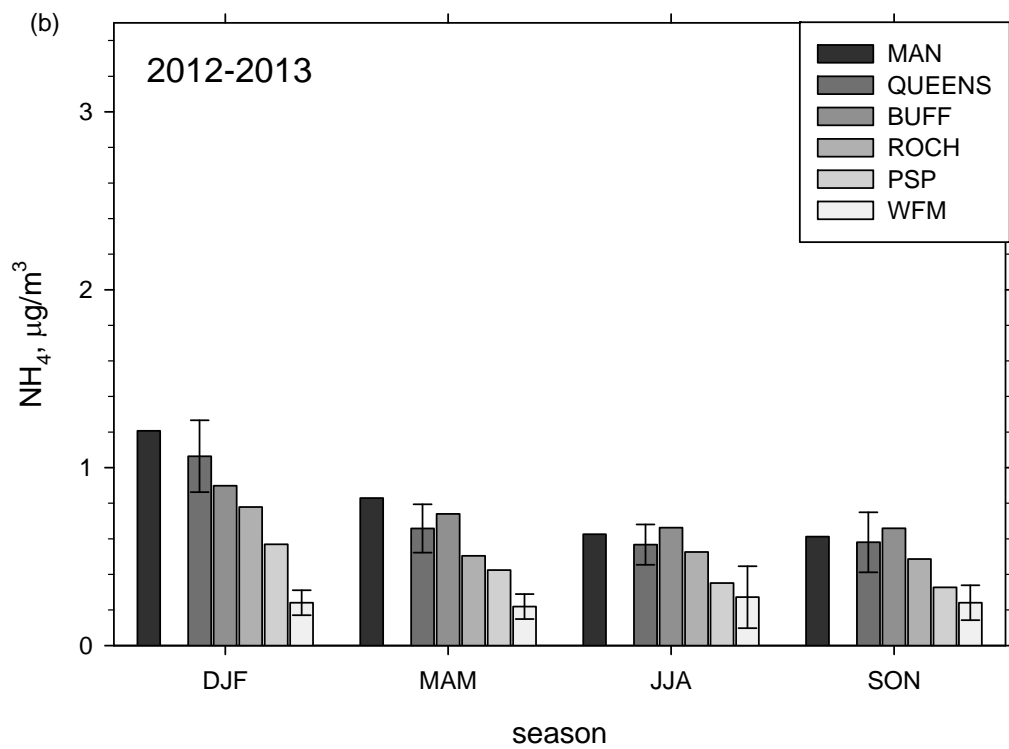
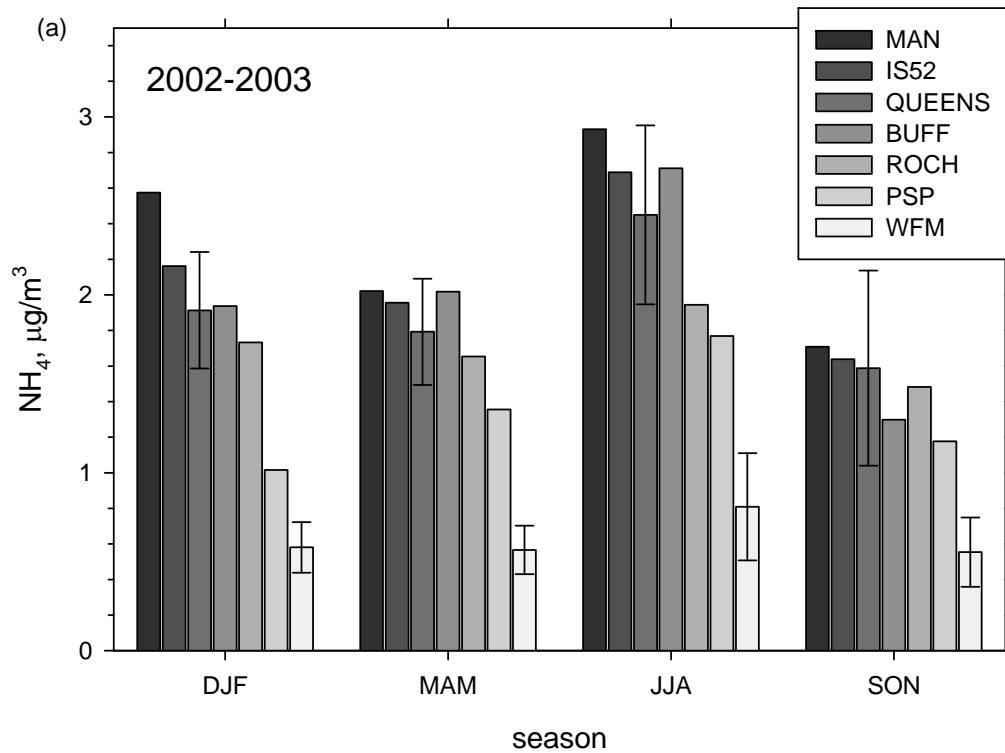


Fig. S6. Annual mean collocated EC from different methods at (a) IS52 and (b) PSP. The IMPROVE (IMP) and URG were scaled to match the CSN as discussed in the text. Gaps in the IS52 measurements from 2010 to 2014 were due to site maintenance. Error bars are the 95% confidence intervals. 2004 IMP and 2010 IMP and URG data are not an entire calendar year.

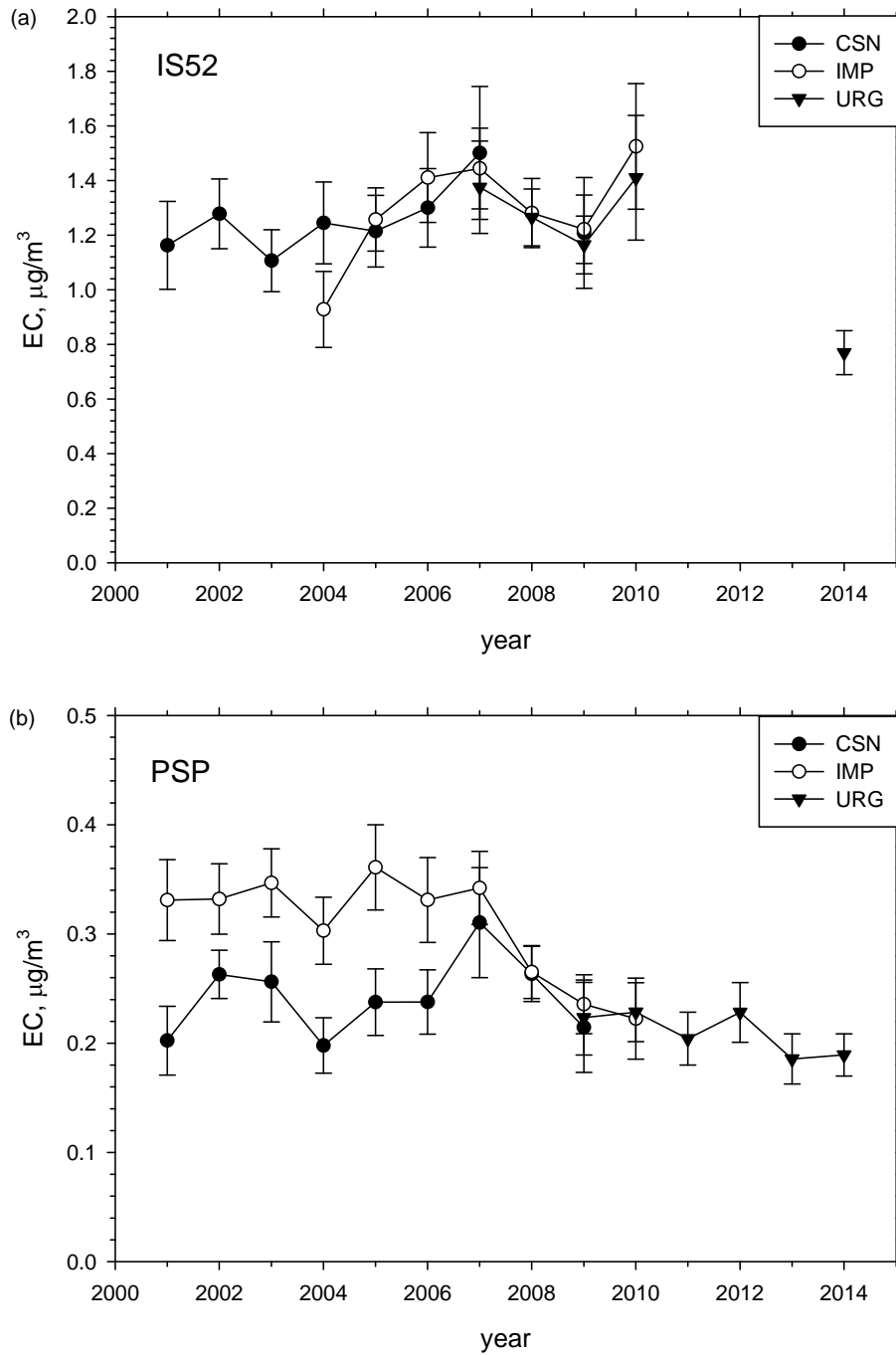


Fig.S7. Mean Seasonal EC concentrations at various sites during (a) 2002-2003 and (b) 2012-2013.

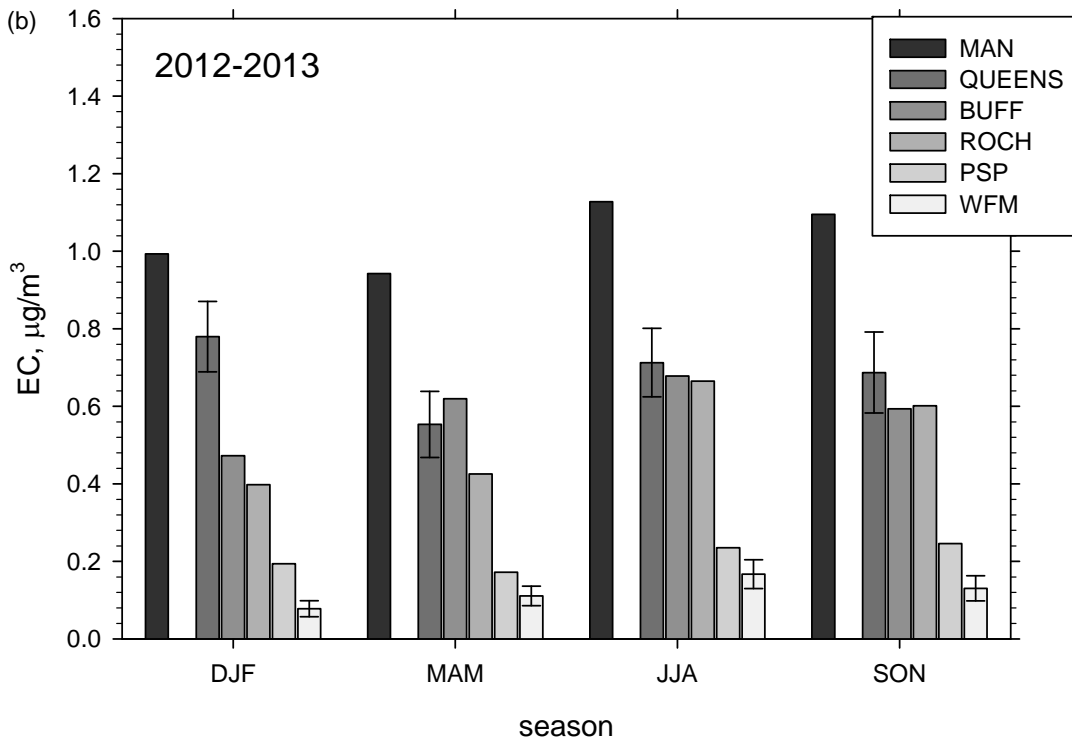
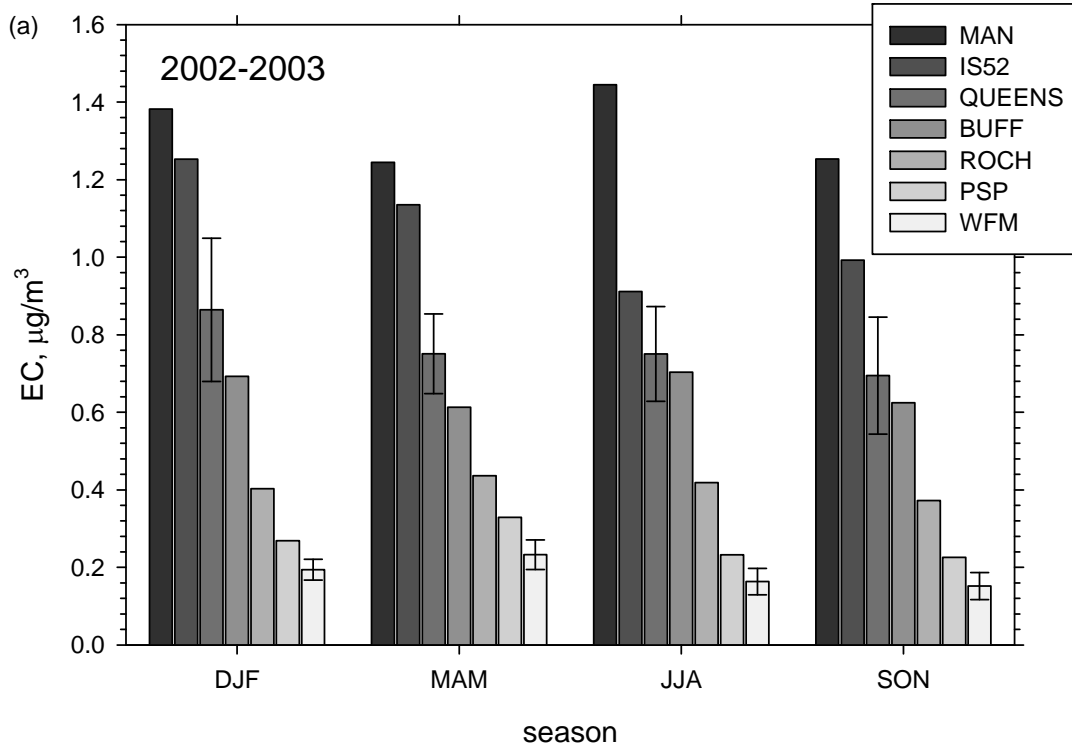




Fig.S8. Mean seasonal OC concentration at various sites during (a) 2002-2003 and (b) 2012-2013.

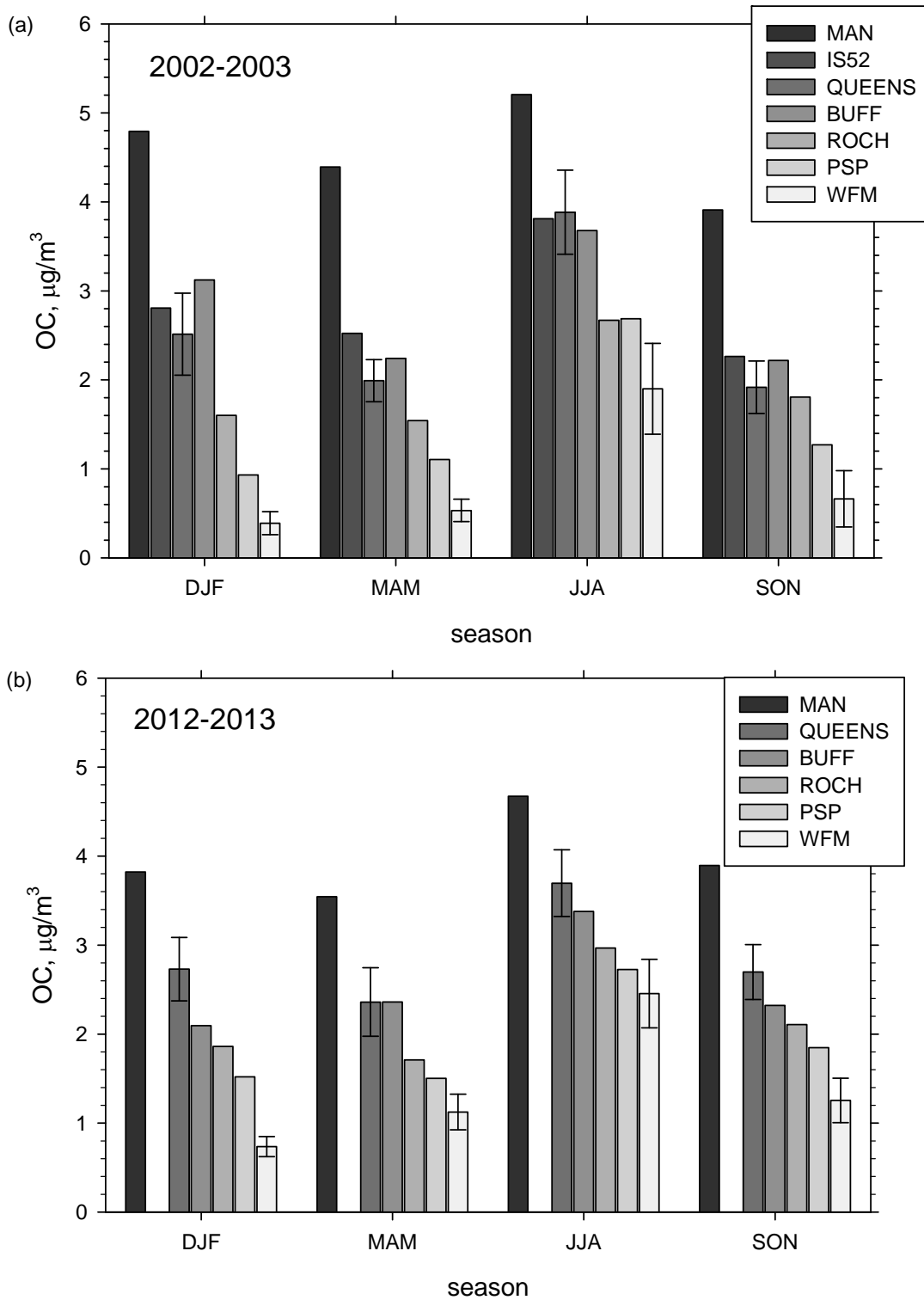


Fig.S9. Mean seasonal Se concentrations at various sites during (a) 2002-2003 and (b) 2012-2013. Error bars indicate the 95% confidence intervals. Note different y-axis scale in (b).

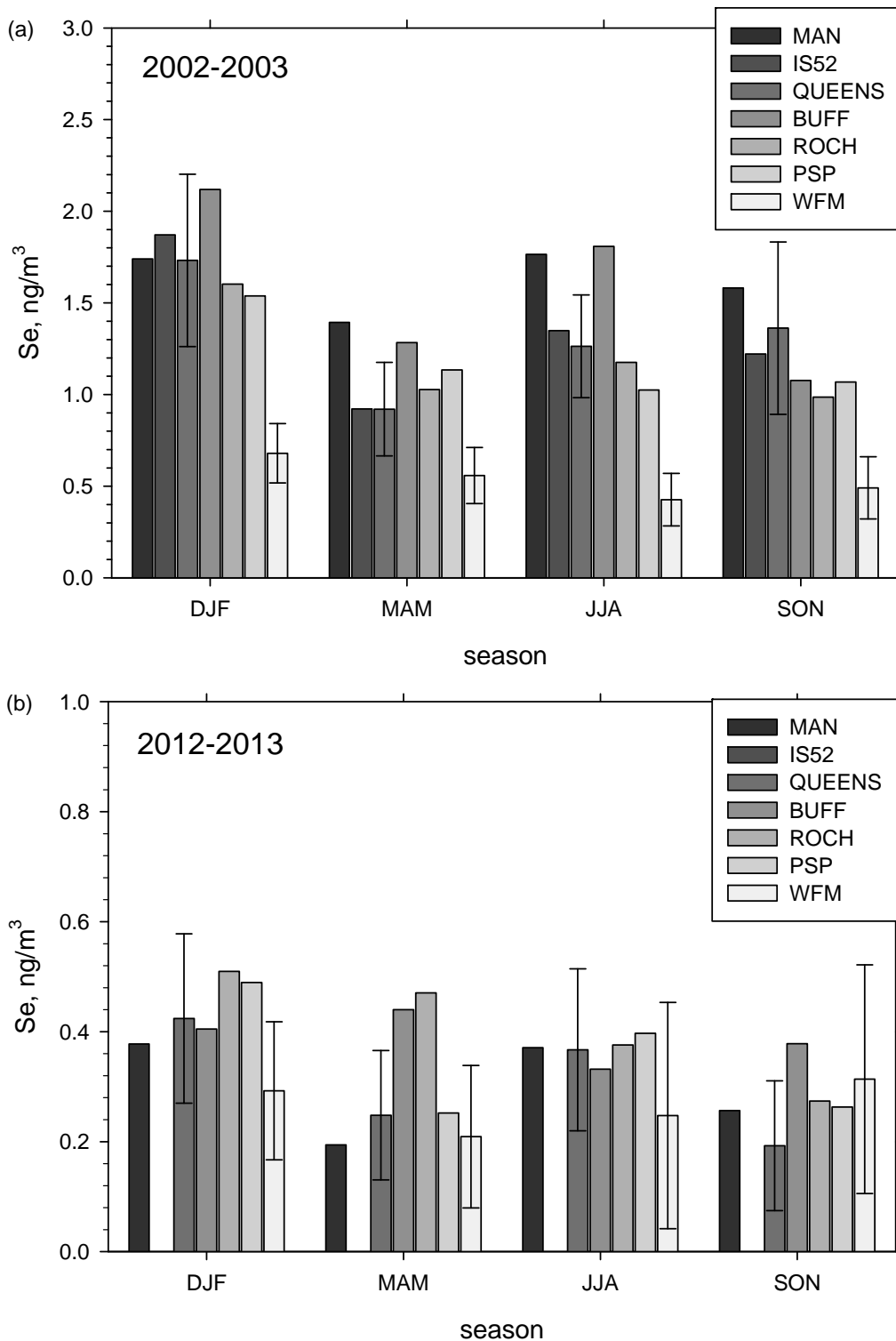


Fig.S10. Mean seasonal Ni concentration at sites in NYC during (a) 2002-2003 and (b) 2012-2013. Error bars show the 95% confidence intervals on the QUEENS data.

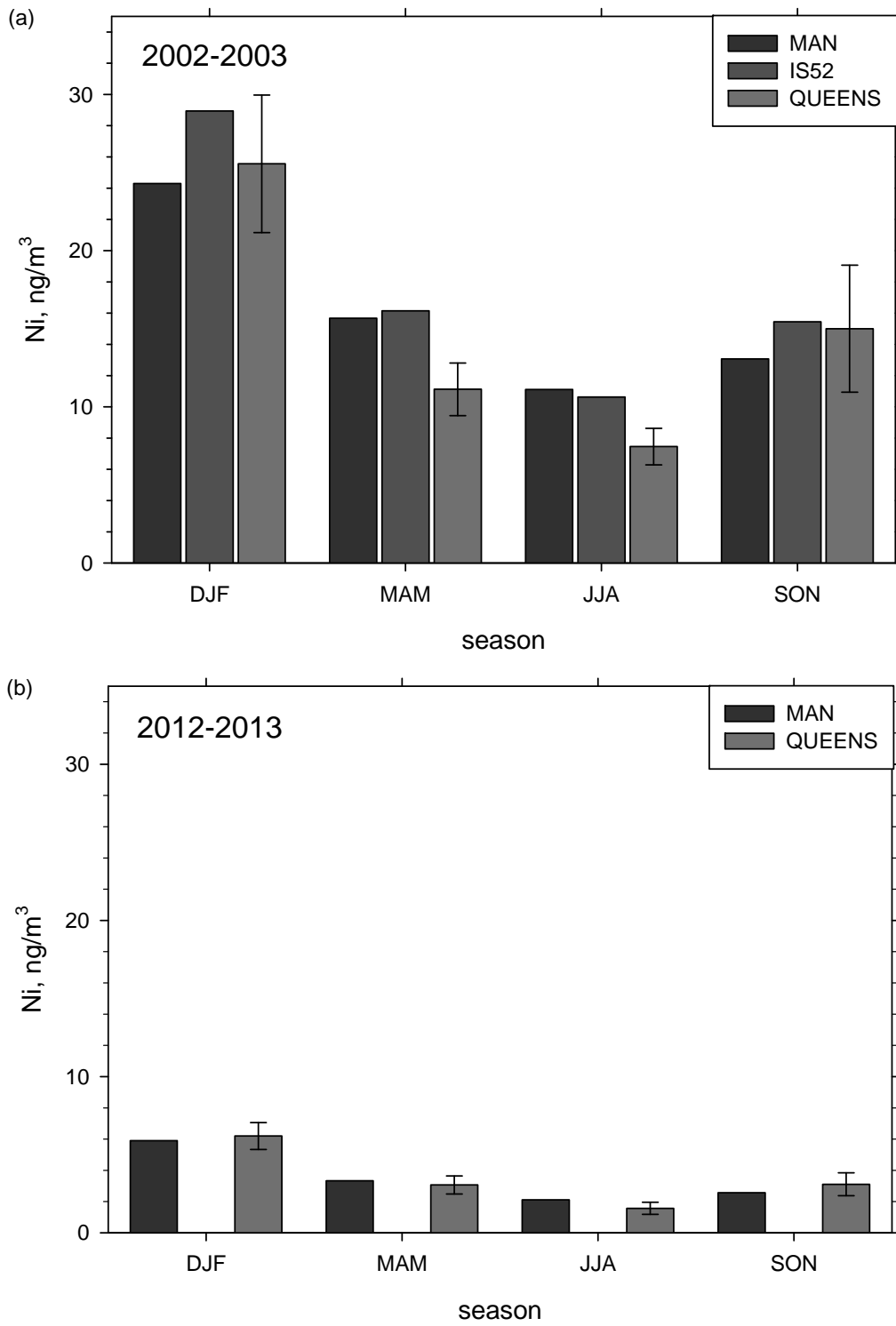


Fig. S11. Measurements from various sites in New York of (a) hourly  $PM_{2.5}$  mass during July 6-7, 2002 and (b) 24h integrated soluble K from July 1-14, 2002.

