Ansto ENVIRONMENT

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fine particle aerosol sampling

NEWSLETTER

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aerosol *n.* a colloidal dispersion of solid or liquid particles in a gas (air).

Aerosol Sampling Information at ANSTO on the WEB

Ion Beam Analysis (IBA) information and key data related to the characterisation of fine particulate air pollution using nuclear methods at ANSTO has been on our WEB site now for over 2 years. If you spend a little time surfing this site you will find comprehensive descriptions of these IBA methods and their capabilities. The site also contains extensive descriptions of ***air pollution*** fine particle sampling methods used by ANSTO as well **as *recent key publications*** and ***News*** which includes copies of recent **ASP Newsletters** as well as some fine particle ***summary data sheets*** for the Wollongong, Newcastle and Sydney areas. We hope you find this both informative as well as a useful reference. The WEB site can be found at,

http://www.ansto.gov.au/ansto/environment1/iba/index.html ..... Happy surfing!

Fine Particle ($PM_{2.5}$) Goals and Measurements in Key NSW Cities

In July 1997, the US Environmental Protection Agency introduced a national air quality standard for $PM_{2.5}$ fine particles. This was an annual average of 15 μg/m^3 with a maximum 24 hour average, at the 2% percentile, of no more than 65 μg/m^3, depending on the sampling frequency. Table 1 adjacent shows the US EPA short term air quality standards, together with their defined index ranges for $PM_{2.5}$, PM_{10} and total suspended particulate matter (TSP). These definitions are based on health related issues.

Short Term US EPA NAAQS Standards for Airborne Particulate Matter

Index (NAAQS)	TSP (μg/m^3)	PM_{10} (μg/m^3)	PM_2 (μg/m^3)	Air Quality
0 to 50	0 – 75	0 to 50	0 – 15	Good
51 to 100	76 – 260	51 to 150	16 – 65	Moderate
101 to 200	261 – 375	151 to 350	66 – 150	Unhealthy
201 to 300	376 – 625	351 to 420	151 – 250	V/Unhealthy
>300	>626	>421	>251	Hazardous

Source: US EPA July 1997 Documents.

- **The Australian National Environment Protection Council (NEPC) proposes a fine $PM_{2.5}$ goal of 8 μg/m^3 annual average and 25 μg/m^3 for 24 hour average for Australia in 2005.**

Fig. 1, on the reverse side of this Newsletter, shows box and whisker plots for each month for daily $PM_{2.5}$ data from January 2001 to December 2003 for the urban/ industrial sites at Sydney, Wollongong and Newcastle. Equivalent data from the global baseline site at Cape Grim in Northwestern Tasmania are also provided as a baseline comparison. Cape Grim is a very clean site, dominated by sea spray. The box represents the 25% to 75% distribution of data, the horizontal bar within the box is the median of the data for that month and the dots are outlier events for that month. All four plots are on the same vertical scale (0 to 60 μg/m^3) for comparison purposes. Generally, the data were below US EPA annual goal of 15 μg/m^3 for all sites and the winter values (June) were larger than the summer (December) values.

In Tables 2, 3 and 4 we provide typical fine particle ($PM_{2.5}$) masses and concentrations of major and trace components averaged over three years for four sampling sites selected within the ASP network.

2001-03 $PM_{2.5}$ (μg/m^3)	Mascot Sydney	Warrawong Wollongong	Mayfield Newcastle	Cape Grim Tasmania
Fine Mass	8.5±5.5	7.1±5.4	8.5±7.5	5.8±3.1
24hr Max in 3 yrs	51	43	96	23
# Samples	264	296	247	272

Table 2. *Three year fine particle average masses ($PM_{2.5}$) for the sites, Mascot, Warrawong, Mayfield and the global baseline site at Cape Grim in Tasmania.*

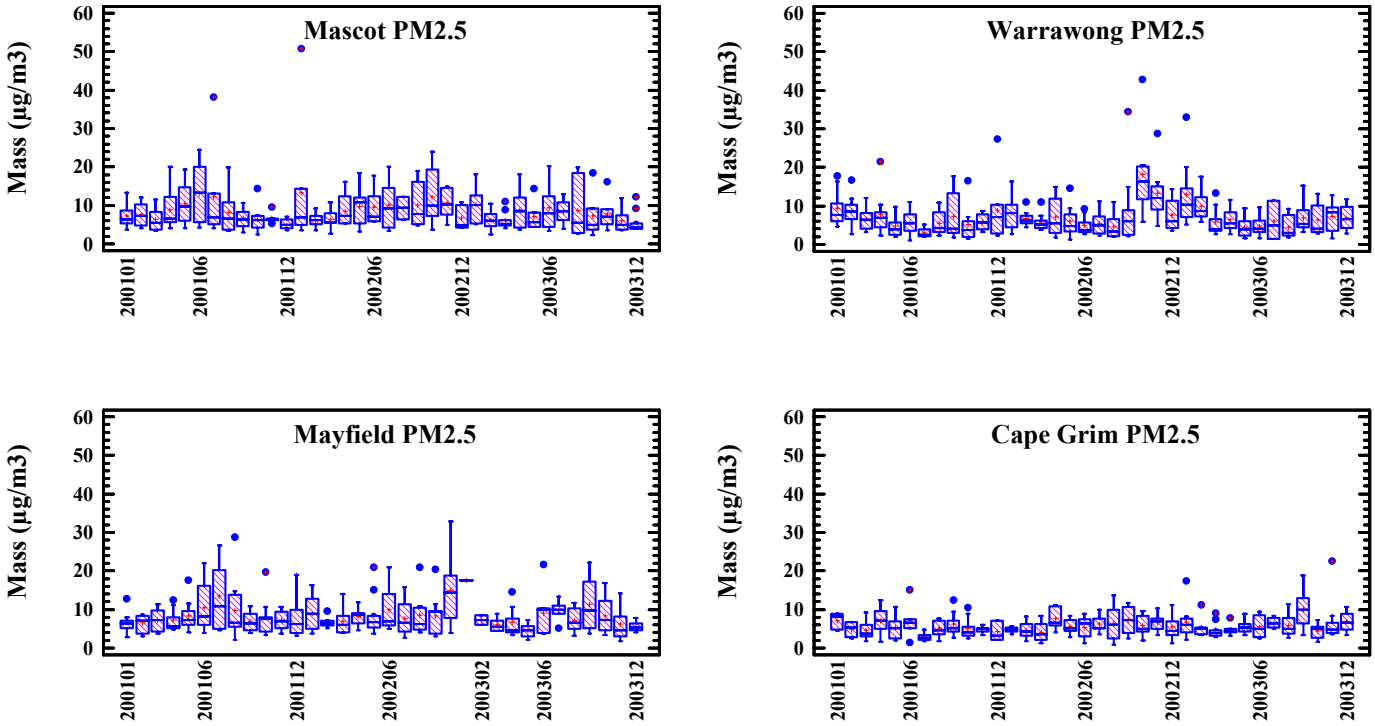

Fig. 1. *Box and whisker plots for the four sites at Mascot, Warrawong, Mayfield and Cape Grim during the sampling period January 2001 to December 2003.*

2001-03 $PM_{2.5}$ Components ($\mu g/m^3$)	Mascot Sydney	Warrawong Wollongong	Mayfield Newcastle	Cape Grim Tasmania
Ammonium sulfate	1.7±1.1	2.0±1.6	1.7±1.2	1.0±0.62
Black carbon	1.7±1.3	0.94±0.55	1.3±0.82	0.28±0.23
Organic matter	2.2±3.0	1.1±1.6	2.3±3.3	0.71±1.2
Soil	0.42±0.40	0.86±0.98	0.67±0.91	0.12±0.08
Sea salt	1.0±1.2	0.97±1.1	0.79±0.94	2.6±2.3

Table 3. *Three year average masses of the major components of fine particle masses given in Table 2 for the same 4 sites as Table 2.*

All data, covering the 3 year sampling period from January 2001 to December 2003 and 24 hour average samples were obtained every Sunday and Wednesday. The large standard deviations of these means reflects the seasonal variations and not the measurement errors which were typically well below ±15%.

Table 4. *Typical three year average trace element concentrations for the fine fraction at the Mascot site in Sydney for the sampling period from January 2001 to December 2003.*

Trace element	Conc. (ng/m^3)	Trace element	Conc. (ng/m^3)
H	306±295	Cr	0.4±0.5
Al	17±25	Mn	4±4
Si	64±80	Fe	67±65
P	6±6	Co	0.6±0.9
Cl	411±448	Ni	0.6±0.7
K	65±48	Cu	3±4
Ca	37±22	Zn	13±17
Ti	4±4	Br	4±4
V	1±1	Pb	14±24

Further information can be obtained from our WEB site or by contacting David Cohen at the addresses given in the header or ad in this Newsletter.