PM$_{10}$ measurement in Canterbury

TIMARU 2005 (Christchurch) 2005

BURNSIDE (Christchurch) 2005

ST ALBANS (Christchurch) 2003/4

GARDENS (Christchurch) outdoor and indoor 2004
PM$_{10}$ methods

- High Volume Sampler
- FDMS (Filter Dynamic Measurement System)
- MiniVol
- GRIMM
- DustTrak
- TSI
Methods of monitoring in St Albans in 2004

- 2004 Hi Vol
- 2004 FDMS
- 2004 TEOM@40°C
Methods of monitoring in Gardens in 2004 - Outdoors

The chart shows the 24-hour average PM$_{10}$ concentration (µg/m$^3$) from midday, measured using various methods:

- Outdoor Minivol
- Half measured outdoor Dustrak
- Outdoor TEOM@40°
- Outdoor GRIMM invalid?

The data is plotted from June 5 to August 28, with peaks indicating higher concentrations.

The Y-axis represents the concentration range from 0 to 180 µg/m$^3$, while the X-axis indicates the dates from 5-June to 28-August.
Methods of monitoring in Gardens in 2004 - Indoors

- Indoor Minivol
- Half measured Indoor Dustrak
- Indoor TEOM@40°
- Indoor GRIMM invalid?
Timaru PM$_{10}$ methods 2005
(preliminary data)

24 hour PM$_{10}$ µg/m$^3$ from 9am

Central Minivol
Central FDMS
Central Hi Vol (K2)
Central Hi Vol (Ecan)
Central TEOM @40

Christchurch PM$_{10}$ methods 2005

collaborative project funded by MfE, with Watercare, Landcare and
an FDMS provided by Ecotech

- Burnside FDMS (invalid?)
- Burnside Hi Vol
- Burnside BAM
- Burnside TEOM @40

<table>
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<tr>
<th>6 Jun</th>
<th>10 Jun</th>
<th>14 Jun</th>
<th>18 Jun</th>
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24 hour PM$_{10}$ µg/m$^3$ from midnight
Christchurch St Albans 24 hour PM$_{10}$ concentrations in 2004 measured by FDMS (including volatile component).

- Includes volatiles
- Excludes volatiles

Graph shows PM$_{10}$ concentrations measured in micrograms per cubic meter ($\mu g/m^3$) for each month from January to December. The NES line indicates the national environmental standard.
Monitoring for the future - Equivalence

- Method to use, rather than adjustment factor
- Adjustments seem to differ from year to year and town to town
- Testing equivalence
- [http://europa.eu.int/comm/environment/air/ambient.htm](http://europa.eu.int/comm/environment/air/ambient.htm)

The final version of this Guidance for the Demonstration of Equivalence of Ambient Air Monitoring Methods (pdf ~540Kb) from May 2005 is available right here. In order to facilitate the use of the guidance in particular for checking the equivalence of non-reference methods for PM-monitoring, additionally an Excel sheet to Test the Equivalence has been prepared that only requires the data to be filled in and provided the statistical calculations needed.
Adjusting historic data to current method - Regressions

- Foster, E. 1998: An investigation into the measurement of PM$_{10}$ in Christchurch. ECan Report U98(69)

- Least squares vs Functional analysis (RMA / Orthogonal) “these coincide if, and only if, the independent variable is in error”


- Midnight vs 9am

- Daily vs hourly

- Comparing regressions year to year, seasonally

- Comparing same methods i.e. 2 FDMS, 2 Hi Vols etc
Best model?

- Maximum concentration
- Number of days
- Annual average
- Temperature $>15$, $>13$
- Season April to September, May to August
- Concentration $>50$, $>60$
Current adjustment, SUBJECT TO CHANGE

FDMS equivalent based on TEOM @40 / FDMS comparison at Coles Pl

for days FDMS>60 ~ TEOM @40 > 40.5: (TEOM @40 + 3.15) / 0.75,

for FDMS<60 ~ TEOM @40 < 40.5: (TEOM @40 - 2.23) / 0.74
Recommendations

• Nationwide study that:
  – Quantifies differences produced by varying methods
  – Explains the reasons for differences
  – Develop correction factors to generate an equivalent data set at a particular site
  – Collate data from different sites to develop generic correction factor/s
  – Determine if site specific adjustment factors needed

• By reviewing current study results
• Collaborative study
• FRST standalone study