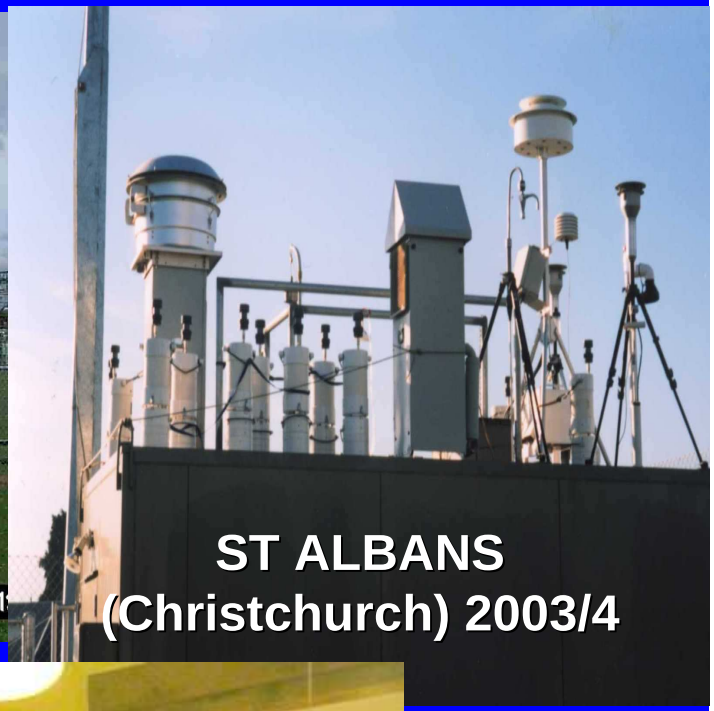
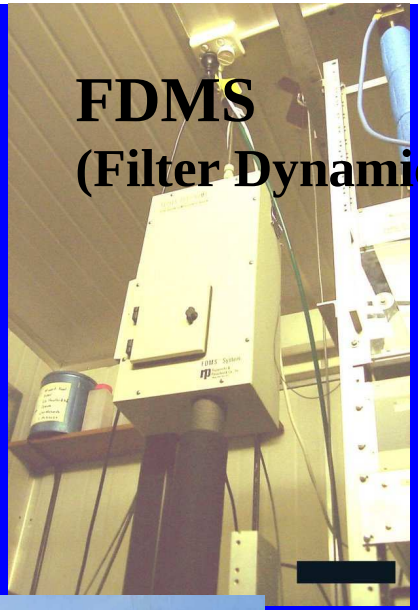
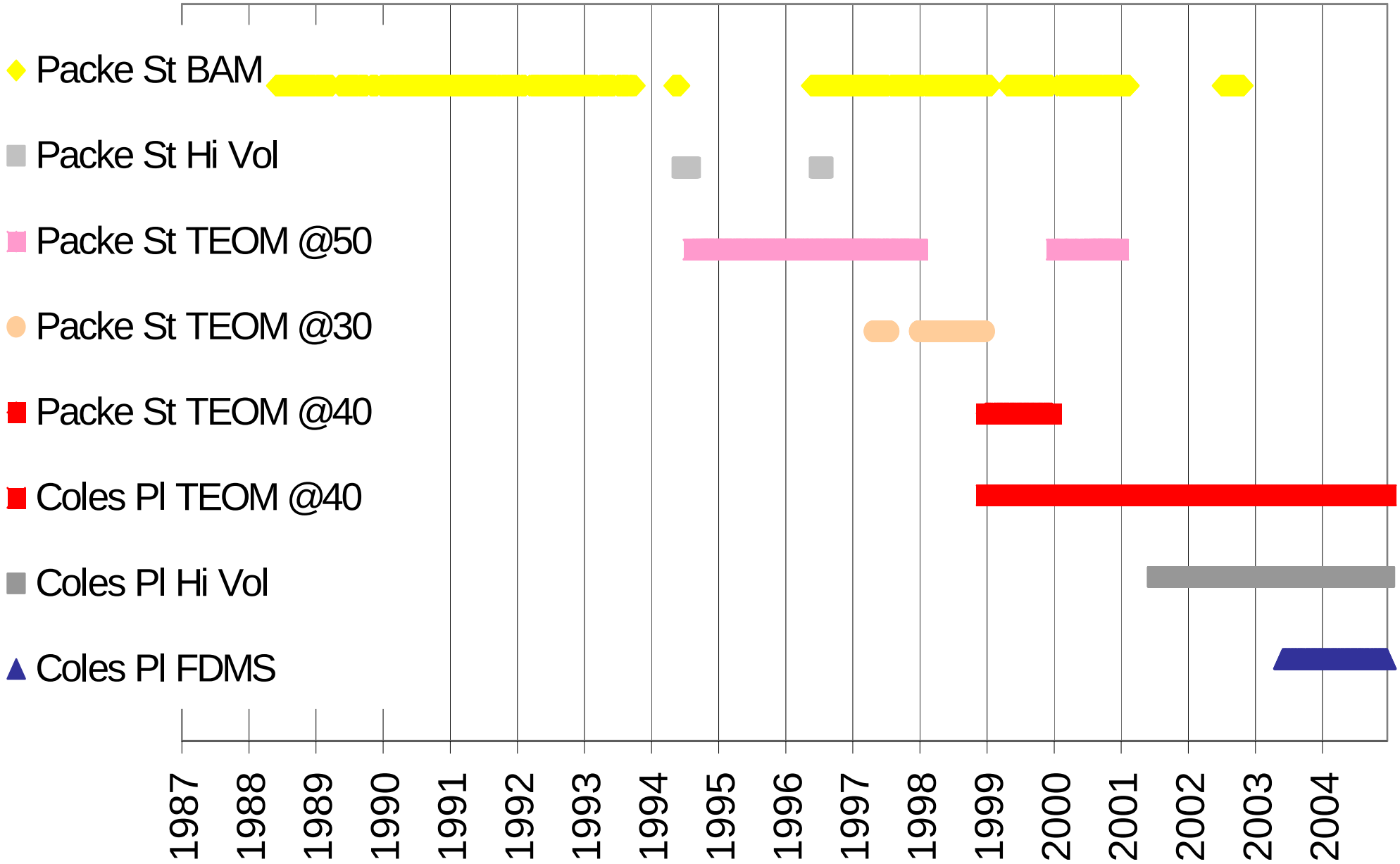
PM_{10} measurement in Canterbury

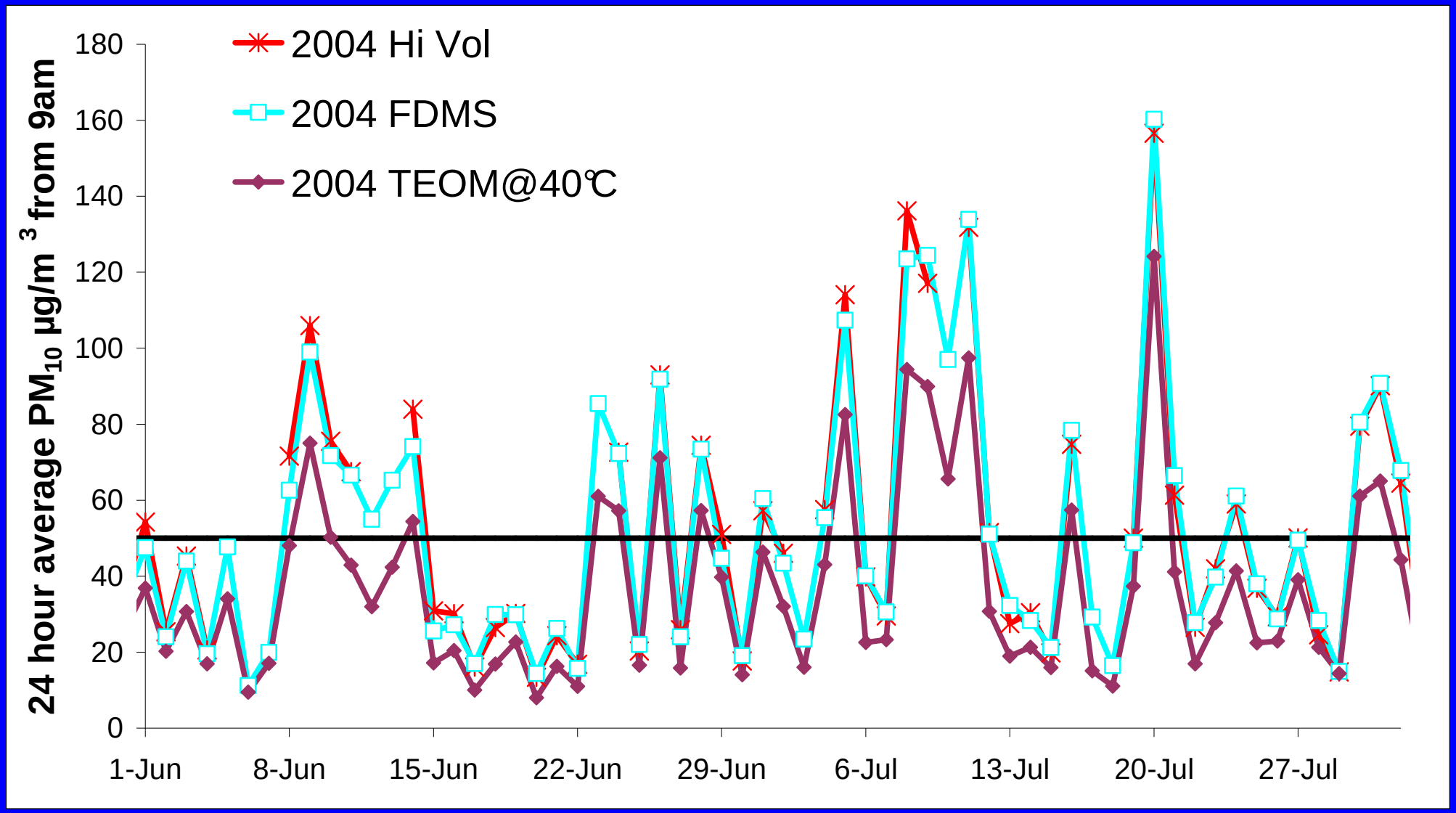


PM_{10} methods

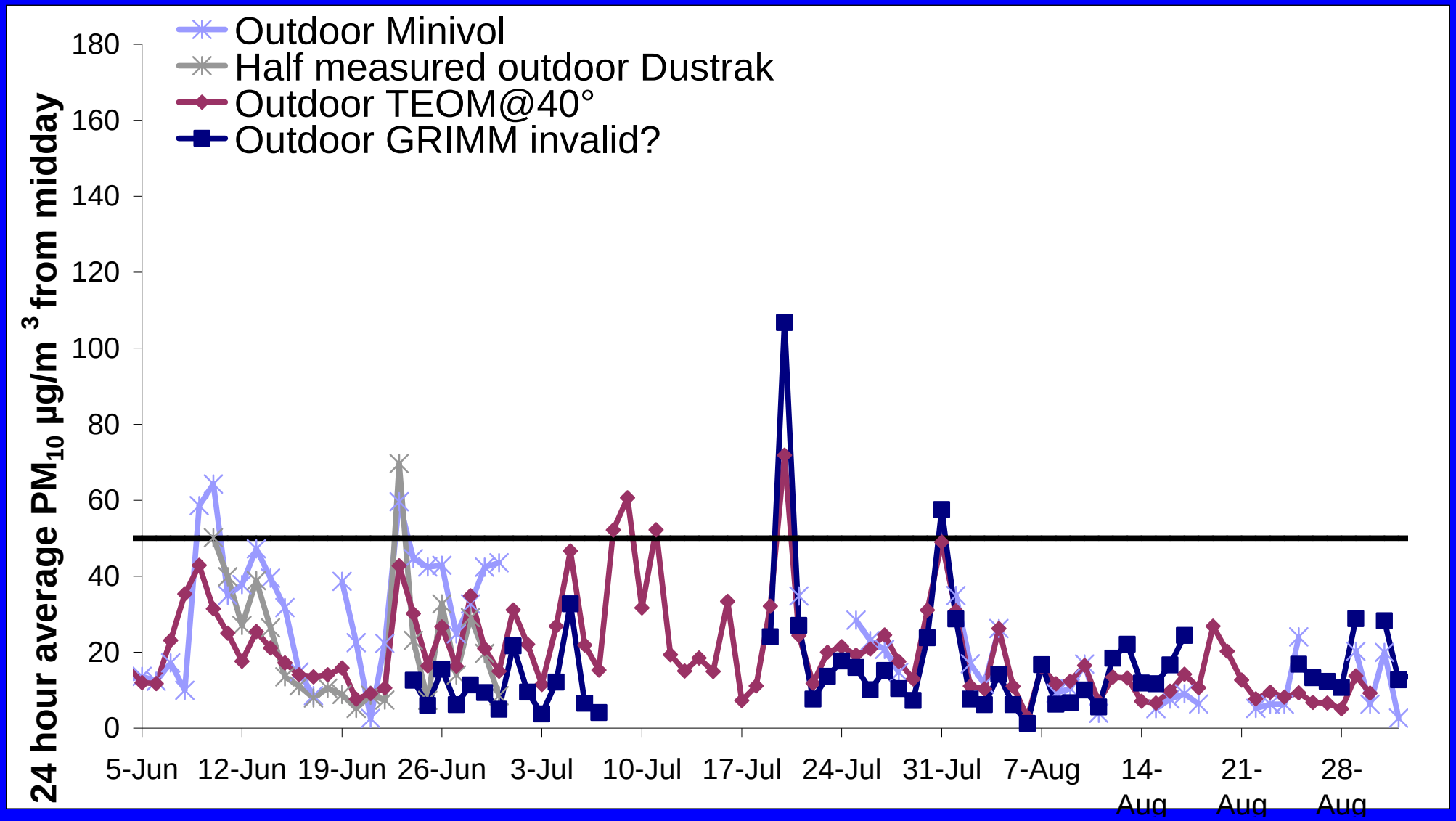



Packe St BAM
Packe St Hi Vol
Packe St TEOM @50
Packe St TEOM @30
Packe St TEOM @40
Coles Pl TEOM @40
Coles Pl Hi Vol
Coles Pl FDMS
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004

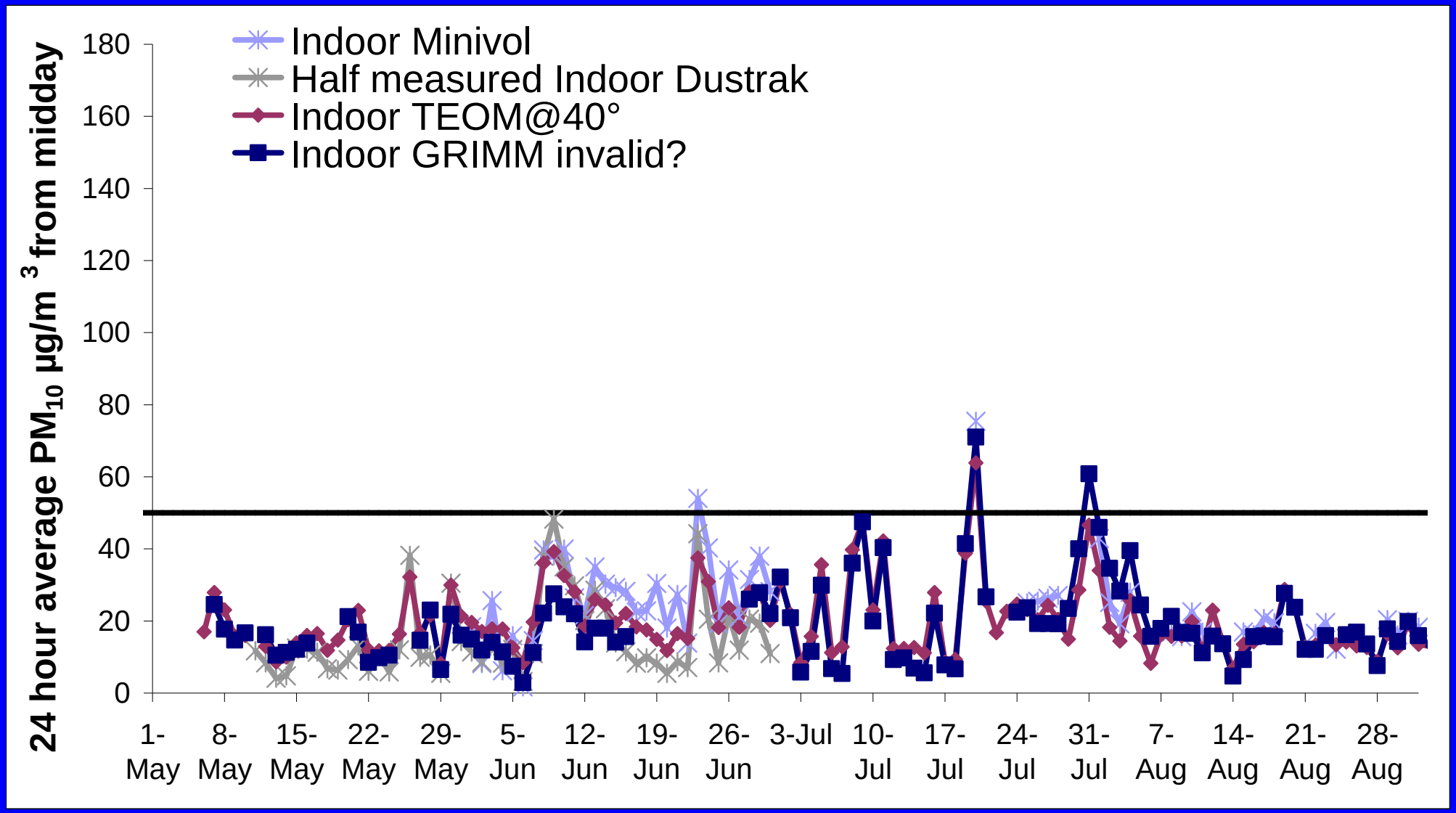
Methods of monitoring in St Albans in 2004



Methods of monitoring in Gardens in 2004 - Outdoors

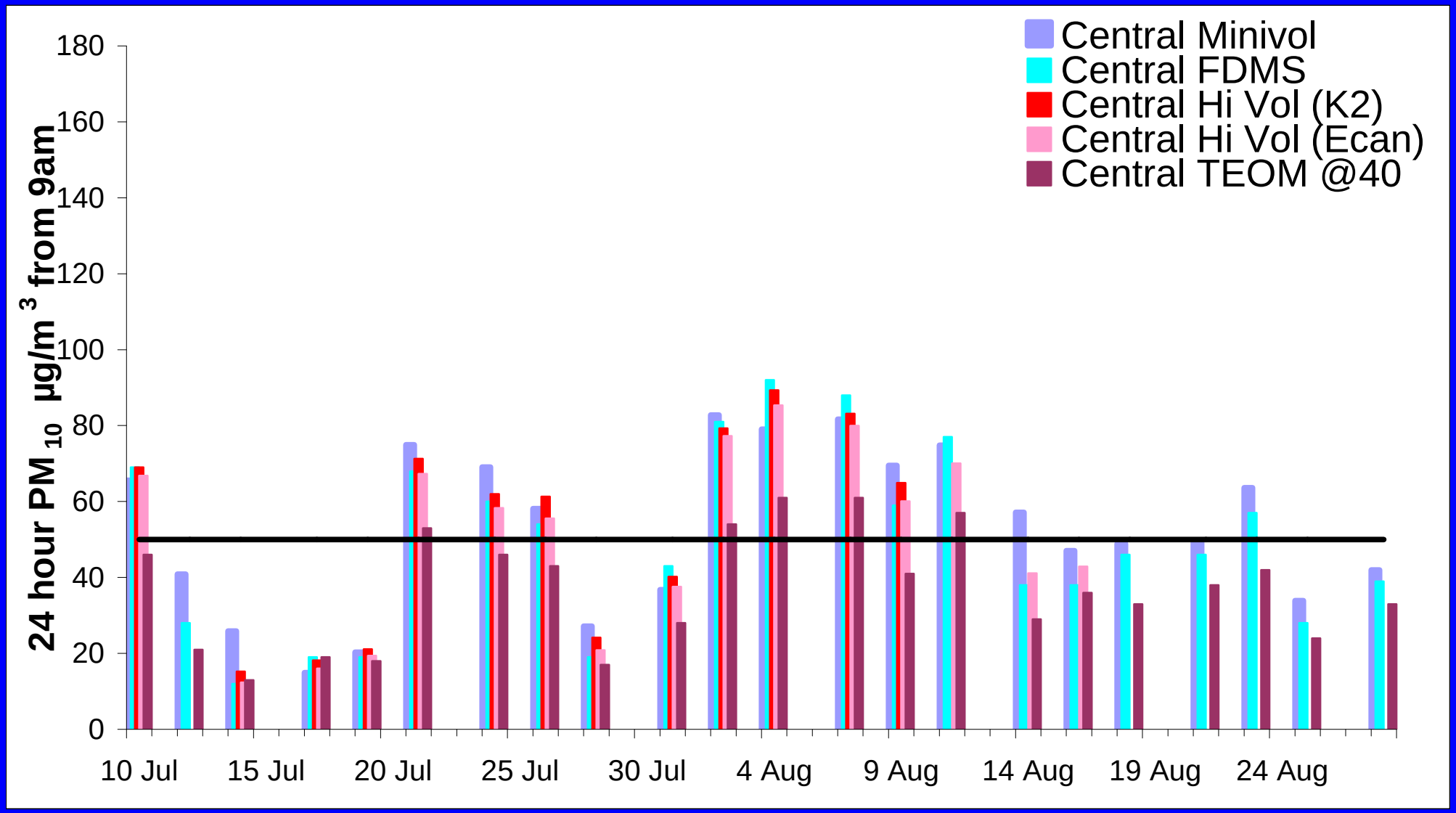


Methods of monitoring in Gardens in 2004 - Indoors



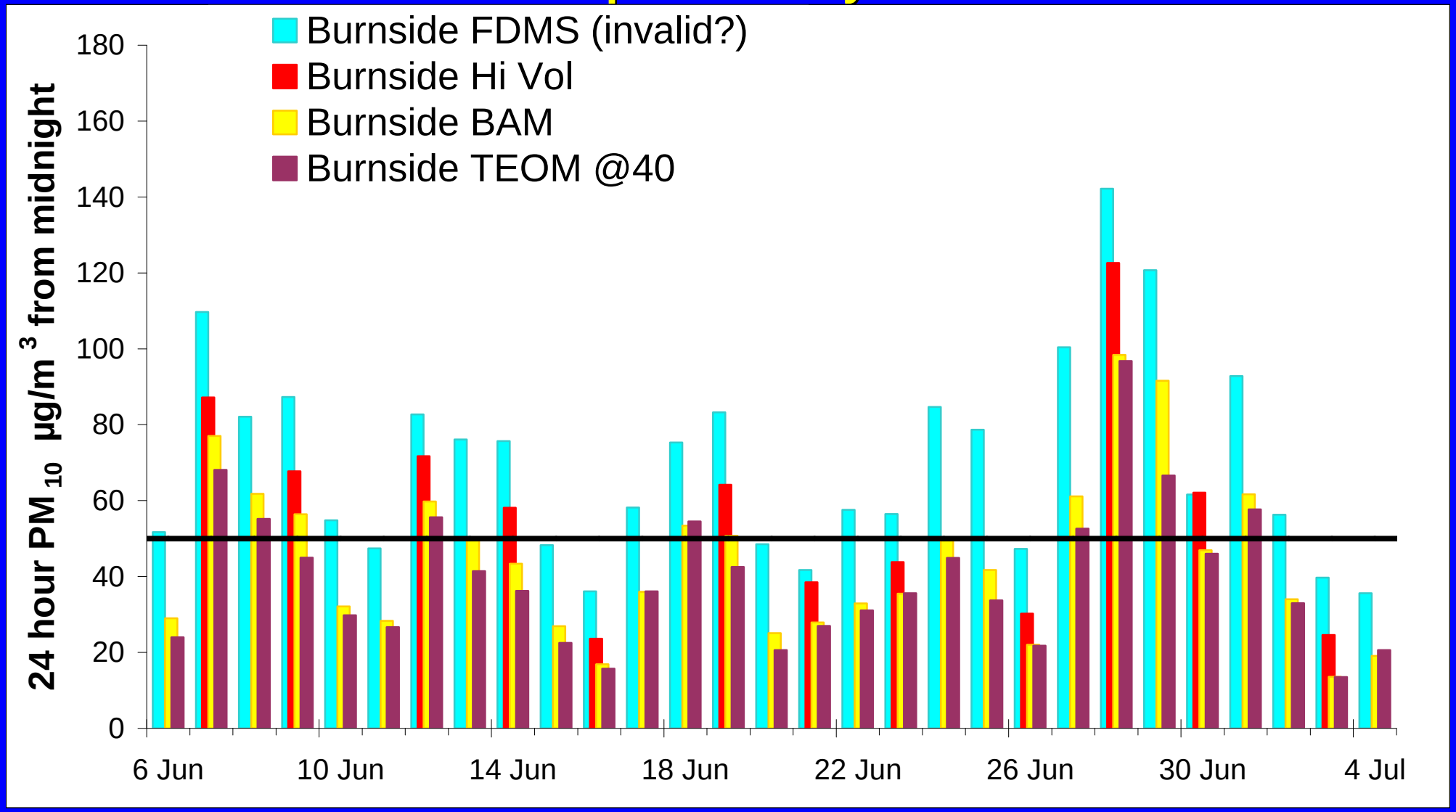
Timaru PM_{10} methods 2005

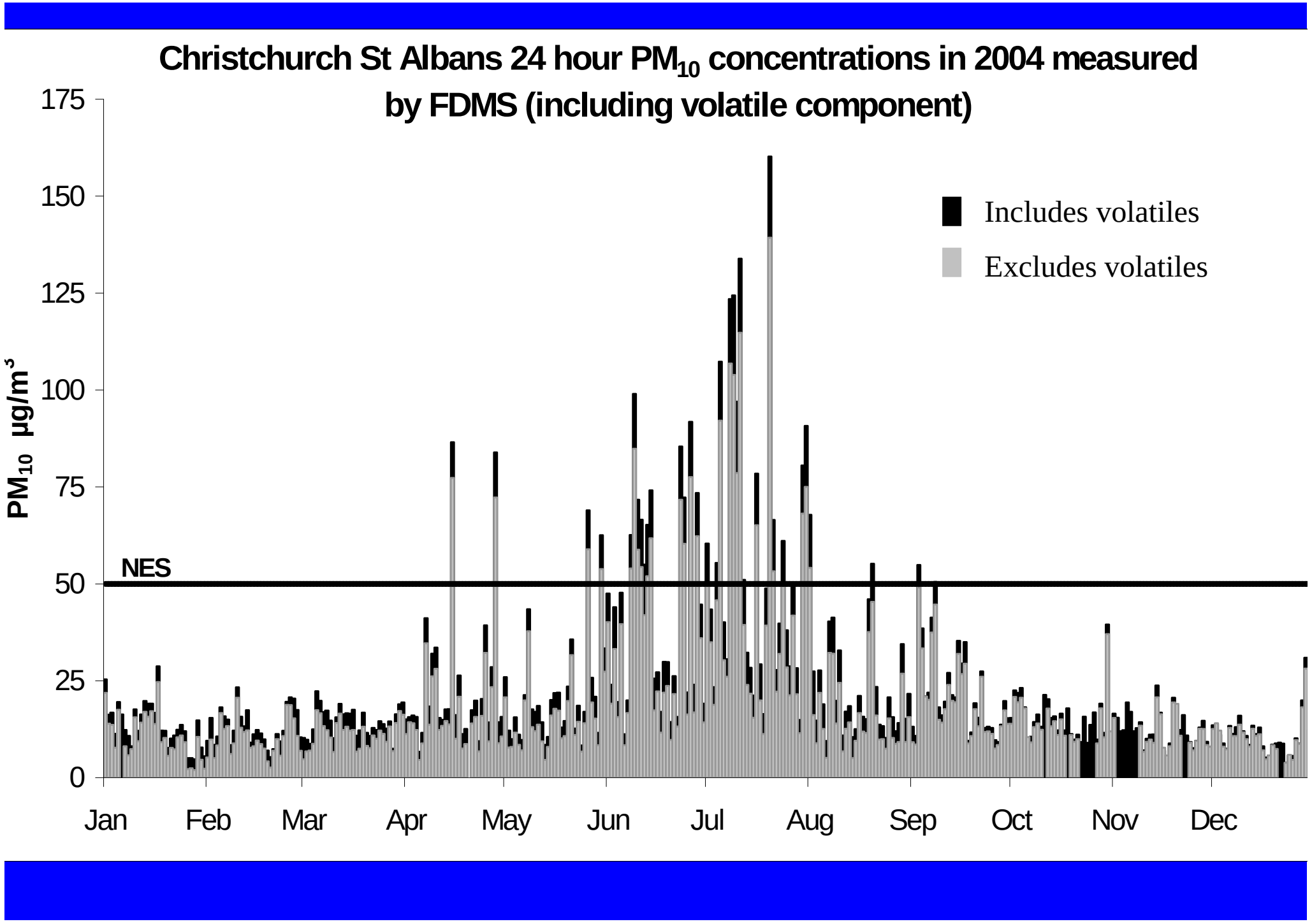
(preliminary data)



Christchurch PM_{10} methods 2005

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




Christchurch St Albans 24 hour PM10 concentrations in 2004 measured by FDMS (including volatile component)
PM10 µg/m3
175
150
125
100
75
50
25
0
NES
Includes volatiles
Excludes volatiles
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

Monitoring for the future - Equivalence

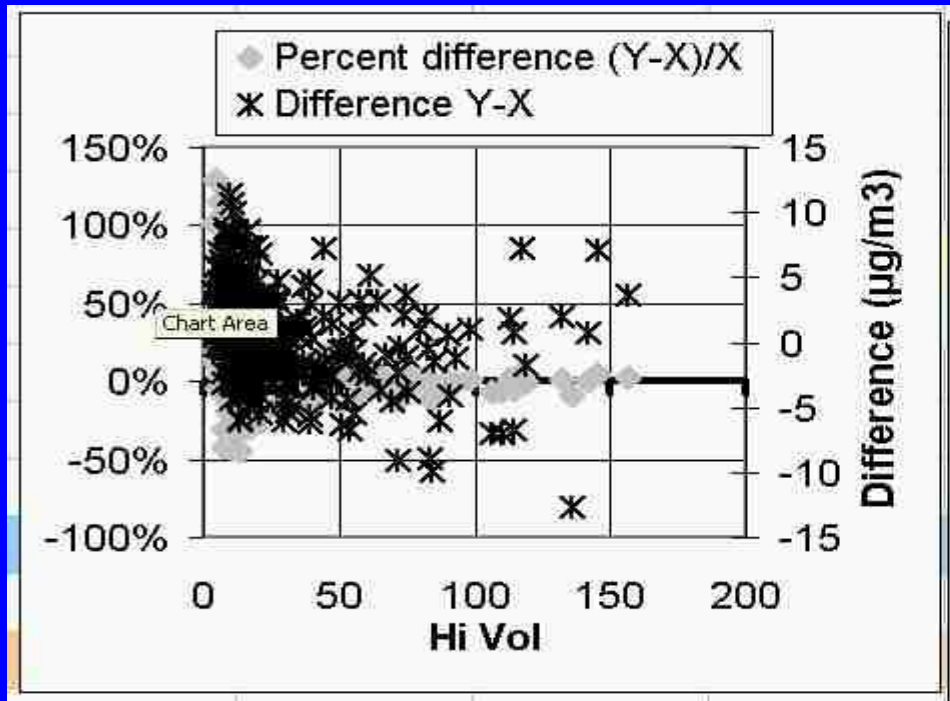
- Method to use, rather than adjustment factor
- Adjustments seem to differ from year to year and town to town
- Testing equivalence
- http://europa.eu.int/comm/environment/air/ambient.htm

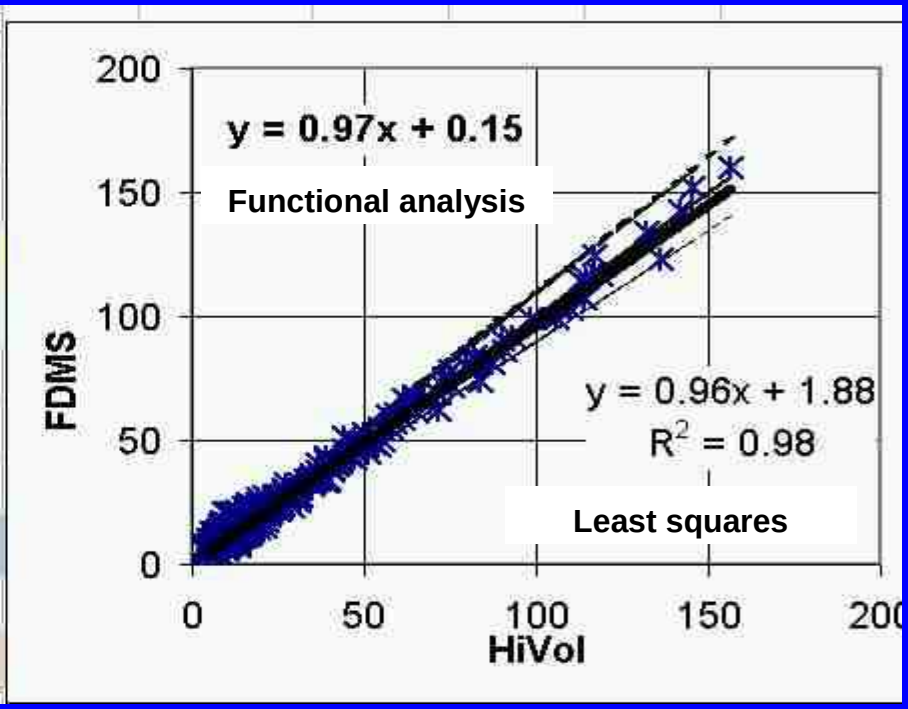
The final version of this Guidance for the Demonstration of Equivalence of Ambient Air Monitoring Methods (pdf ~540Kb) from May 2005 is available right here. In order to facilitate the use of the guidance in particular for checking the equivalence of non-reference methods for PM-monitoring, additionally 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.

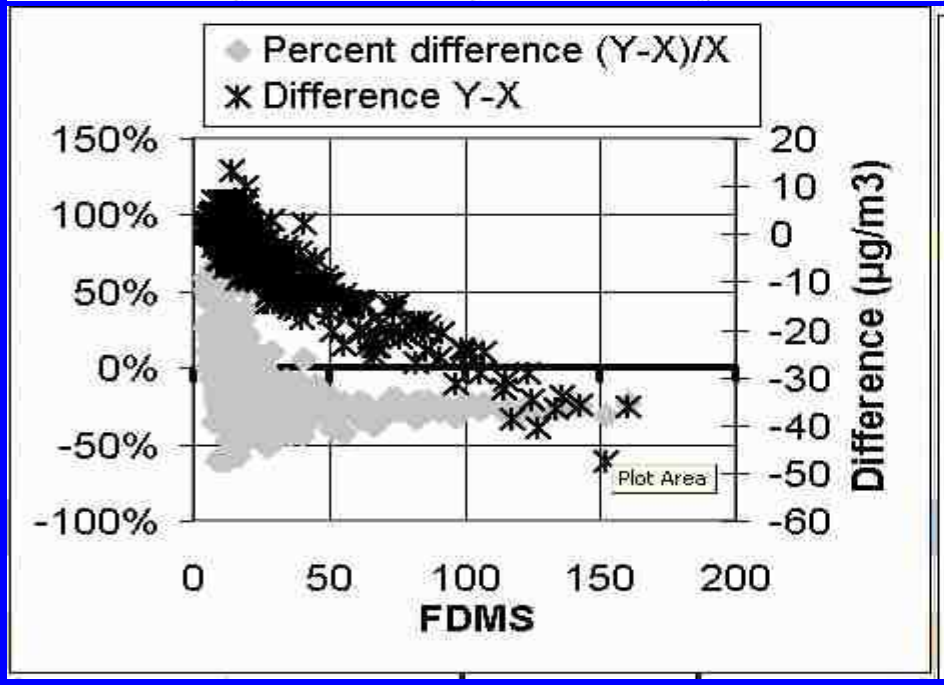
Adjusting historic data to current method - Regressions

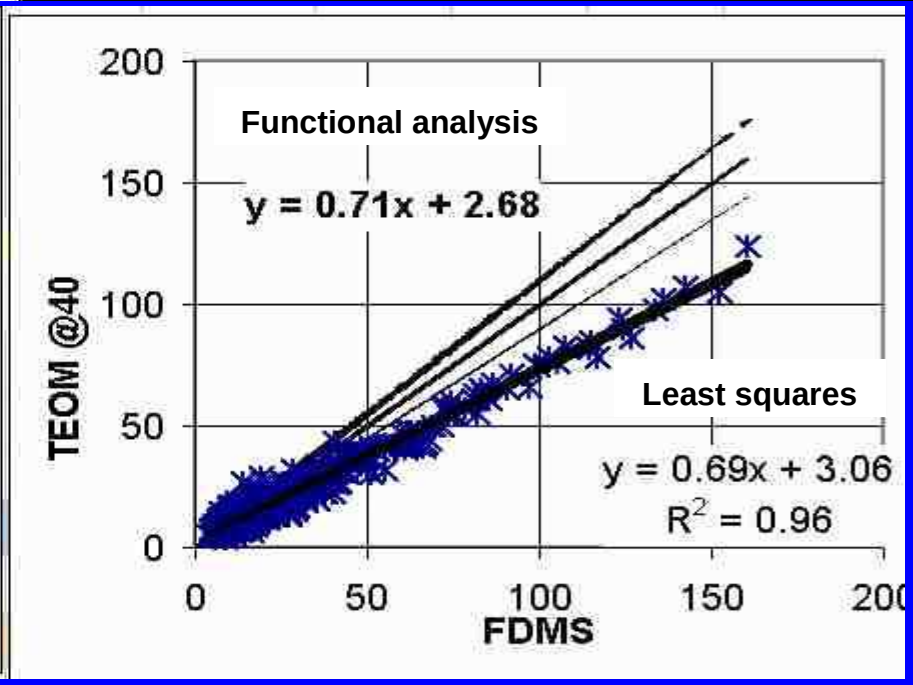
- *Foster, E. 1998: An investigation into the measurement of PM_{10} in Christchurch. ECan Report U98(69)*
- Least squares vs Functional analysis (RMA / Orthogonal)
  "these coincide if, and only if, the independent variable is in error"
- *Lindley, D.V., 1947. Regression lines and the linear functional relationship. Jour. Royal Stat. Soc, Suppl., v. 9, p 218-244*
- *Ayers, G.P. 2000. Comment on regression analysis of air quality data. Atmospheric Environment 35 (2001) 2423-2425*
- *Mark, D.M. and M. Church (1977) "On the misuse of regression in earth science," Math. Geol., 9(1), 63-75.*

- Midnight vs 9am
- Daily vs hourly
- Comparing regressions year to year, seasonally
- Comparing same methods i.e. 2 FDMS, 2 Hi Vols etc


Percent difference (Y-X)/X
Difference Y-X
150%
100%
50%
0%
-50%
-100%
15
10
5
0
-5
-10
-15
Difference (µg/m3)
Chart Area
0
50
100
150
200
Hi Vol

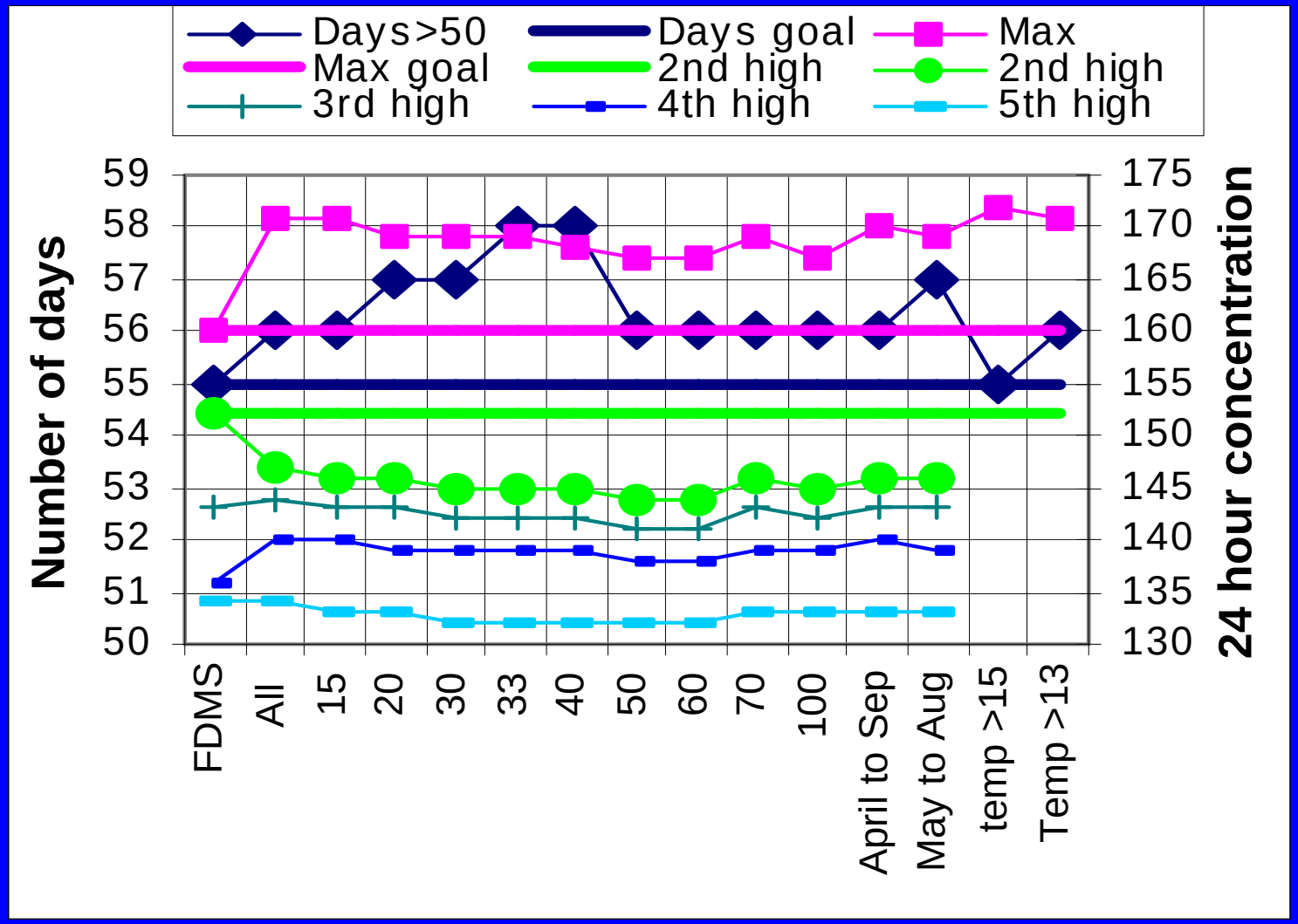

y = 0.97x + 0.15
Functional analysis
y = 0.96x + 1.88
R2 = 0.98
Least squares
200
150
100
50
0
FDMS
0
50
100
150
200
HiVol


Percent difference (Y-X)/X
Difference Y-X
150%
100%
50%
0%
-50%
-100%
20
10
0
-10
-20
-30
-40
-50
-60
Difference (µg/m3)
Plot Area
0
50
100
150
200
FDMS


Functional analysis
y = 0.71x + 2.68
Least squares
y = 0.69x + 3.06
R2 = 0.96
200
150
100
50
0
TEOM @40
0
50
100
150
200
FDMS

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**