PM$_{2.5}$ in Urban NZ: Section 3.2
Particle Aerodynamic Diameter (µm) vs. Relative Mass Concentration

- PM$_{10}$
- PM$_{2.5}$
- PM$_{0.1}$
- PM$_{0.01}$


Aitken Condensation Mode Droplet Mode Nucleation Fresh High Temperature Emissions, Organic Carbon, Sulfuric Acid, Metal Vapors

Ultrafine (PM$_{0.1}$) Nanoparticles (PM$_{0.01}$) Coarse Fine Ultra-Fine Nano-part.
Sources PM$_{10-2.5}$

- Mechanical sources such as dusty roads, soil tiling, bulk handling and quarries.

Roadside PM$_{10}$, polycarbonate filter, Christchurch, February 2003

David Shooter, AU
Sources PM$_{2.5}$

- **Primary**
  - Burning fuel, transportation, industrial processes and some natural sources.

- **Secondary**
  - Chemical reactions in the atmosphere.
Soot, road side sample 40,000x magnification

David Shooter, SEMS, Auckland University
Human Health and PM

- Correlation between exposure to particles and adverse health effects
- Generally association stronger between PM$_{2.5}$ than PM$_{10}$
  - PM$_{2.5}$ penetrates deeper into the lungs
  - Active component of particulate matter resides mostly in PM$_{2.5}$
International Context

PM$_{2.5}$ Standard

USA: 65 µg/m$^3$

EU: Recommended 35 µg/m$^3$

Canada: 30 µg/m$^3$

UK: “Highly Desirable” - Expert Panel

Australia: Monitor and Report
New Zealand, No Standard. But Ambient Air Quality Guidelines (MfE 2002) note that:

- $PM_{2.5}$ may be responsible for specific health effects caused by fine particulates
- Need to increase our understanding of $PM_{2.5}$
- “Monitoring Value” of 25 $\mu g m^{-3}$ (24-hr)
- To promote $PM_{2.5}$ monitoring and assessment.
PM$_{2.5}$ Data in NZ

60% PM$_{10}$ is PM$_{2.5}$. Win~sum. 8 days > 25, 2003

80% PM$_{10}$ is PM$_{2.5}$ in Winter. 62% days >25.

90% PM$_{10}$ is PM$_{2.5}$ in Winter. 17 days > 25, 2003

Results not published yet.
The Way Forward?

- Invest time and/or resources into a nationwide study that:
  - Quantifies PM$_{10}$/PM$_{2.5}$ relationship
  - Explores regional differences
  - Explores seasonal differences
  - Reviews methods used to monitor PM$_{2.5}$
  - Reviews the PM$_{2.5}$ monitoring network
  - Attempts to identify sources
Options to consider

- Review Outcomes of RC Programmes
  - Desktop and passive
- Collaborative Study
  - Aim to analyse all NZ data in usefully and in a nationally consistent manner
  - Working Group with Stakeholders
  - Access to the data – an issue
  - Report findings and make recommendations
- FRST Standalone Study
  - Field campaigns to provide data desired outcomes to be achieved.