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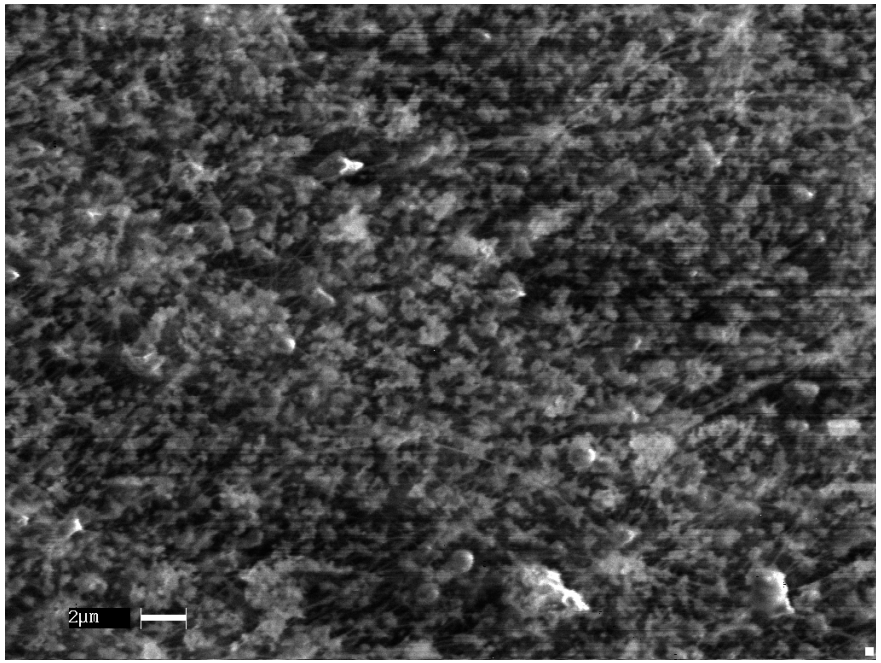
Particulate matter composition and source apportionment



Emily Wilton – Environet Ltd

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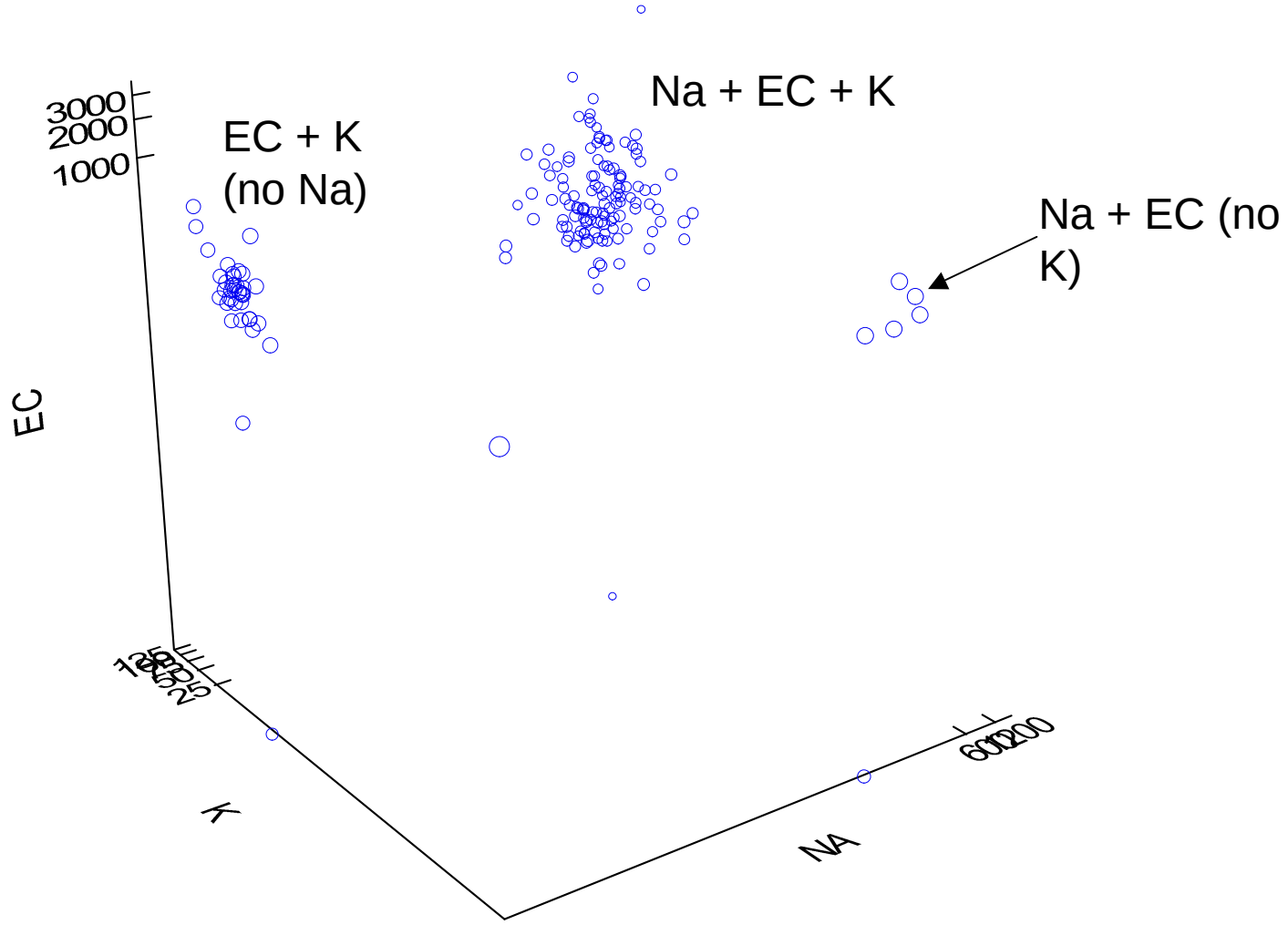
Overview

- Filter based method
  - techniques such as PIXE to determine concentrations of elements on each filter
  - inorganic ions – nitrates and sulphates
  - elemental and organic carbon
- Statistics
  - clusterings of different elements together
  - identification of profiles
- Source apportionment
  - how much is each source contributing


Na + EC + K
EC + K
(no Na)
Na + EC (no
K)
3000
2000
1000
EC
K
NA

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Advantages

- Compelling – chemistry based
- Natural sources – sea spray, dusts
- Secondary particulate contributions
- Daily variations in contributions
- Site specific

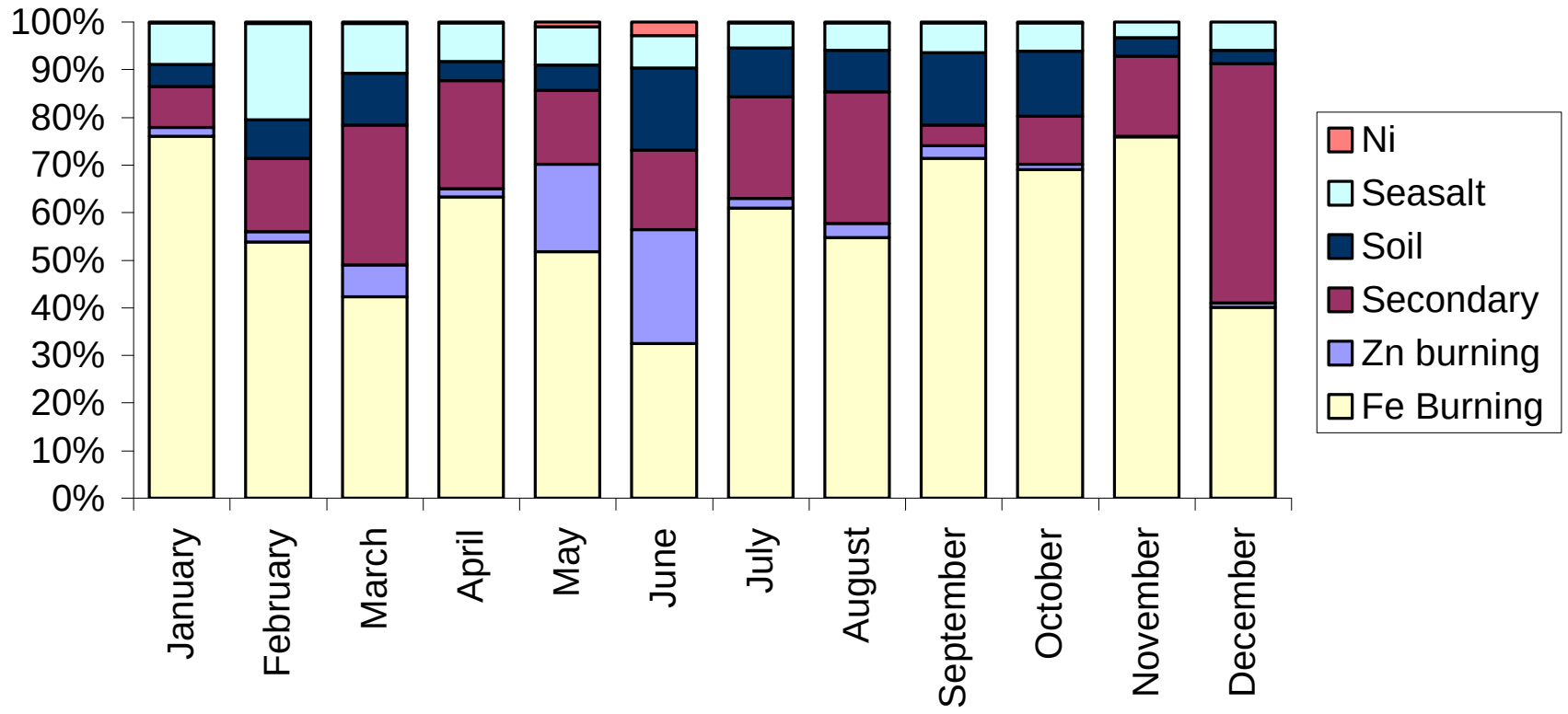
Disadvantages

- Bad design = bad results
- Profiles not always resolved
- Resource intensive

What has been done in NZ:

- Christchurch –visibility study
- Christchurch - mass study
- Masterton – mass study
- Auckland – preliminary and ongoing

Specific applications - Christchurch daytime visibility



Note: Sample size for April are insufficient to provide adequate representation

What existing studies show:

- Domestic heating main source in Chch, Masterton
- Secondary daytime PM in Christchurch dominated by sulphate
- Sea spray/ marine around 8% in Chch
- Sea spray around 6% and soil 2% on high pollution days in Masterton

Improvements in NZ

- More locations – determining background and secondary particle contributions
- Better source profiles for NZ (domestic combustion, motor vehicle tailpipe, road dust profiles)

GAP Recommendations

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FRST research focus on…

- the potential contributions of natural sources and road dust in urban areas
- source profiles for New Zealand, in particular differences between different types of combustion processes
- examine relationships between external variables that may allow for some proxy indications of sources

FRST proposals for 2005/06

- Collaborative studies
  - Napier road side and natural sources study (GENT – PM_{10} and $PM_{2.5}$)
    - PIXE and elemental carbon
  - Auckland complex chemistry study
    - PIXE
    - Inorganic ions – nitrates and sulphates
    - Organic and elemental carbon

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Where to from here….

- More site specific studies to determine background contributions
- Determining industrial contributions in problem cases
- Seasonal issues – e.g., high summer concentrations, domestic and outdoor burning in summer