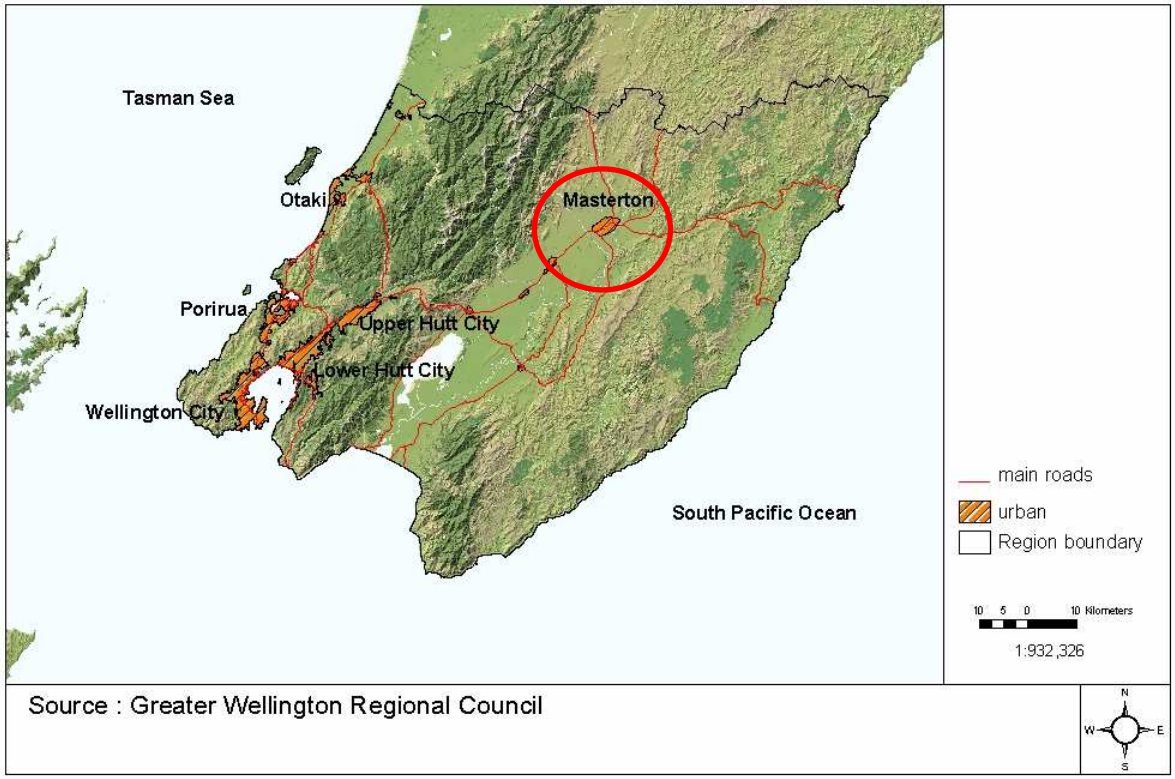
Particles under a clear sky:

Air pollution meteorology in a valley

The Introduction:

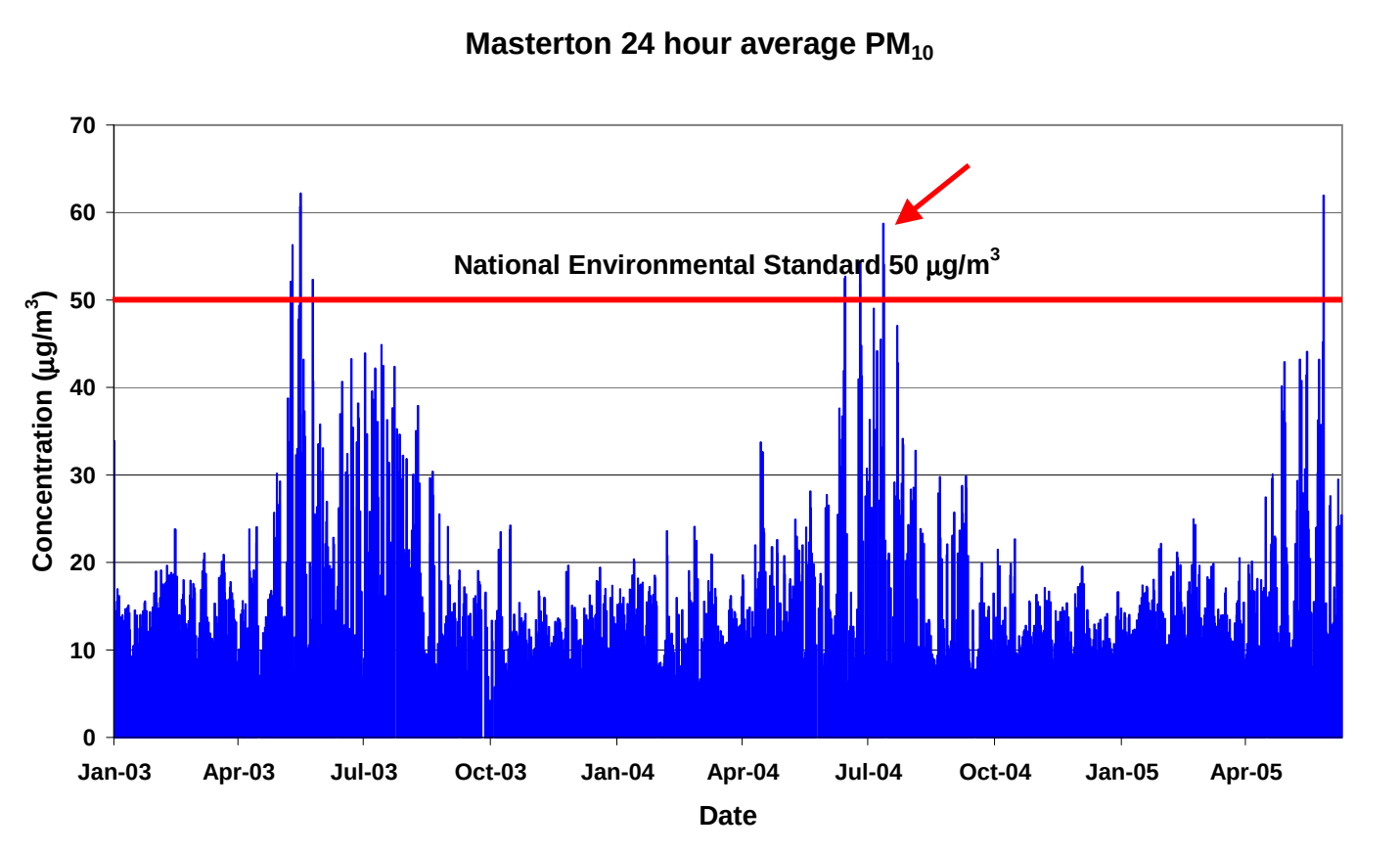
- The location;
- The picture;
- The issue;
- The elements;
- The sources;
- The meteorology;
- The theory;
- The particles;
- The end.

The location: Masterton

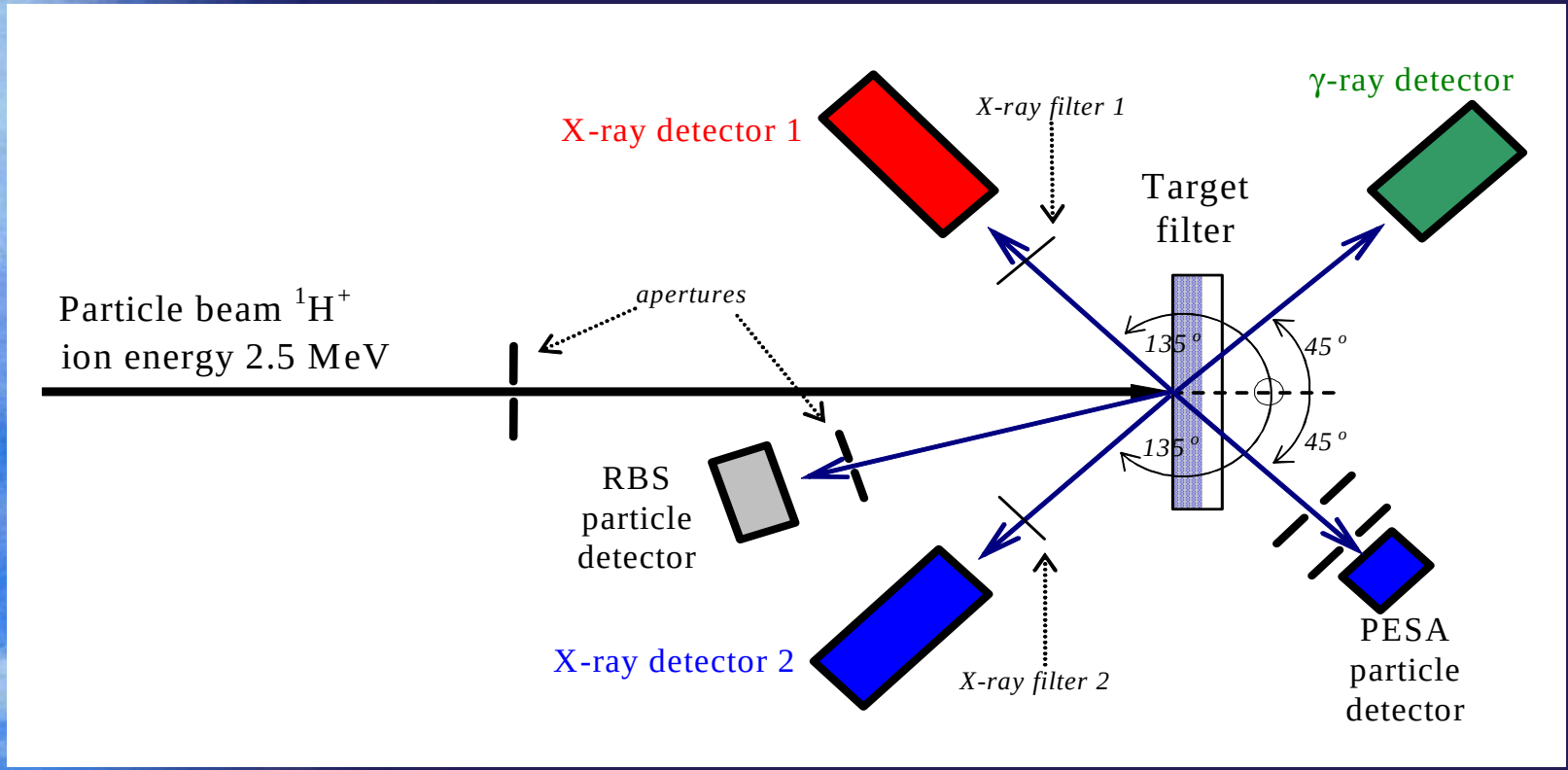


The picture (winter 2004):

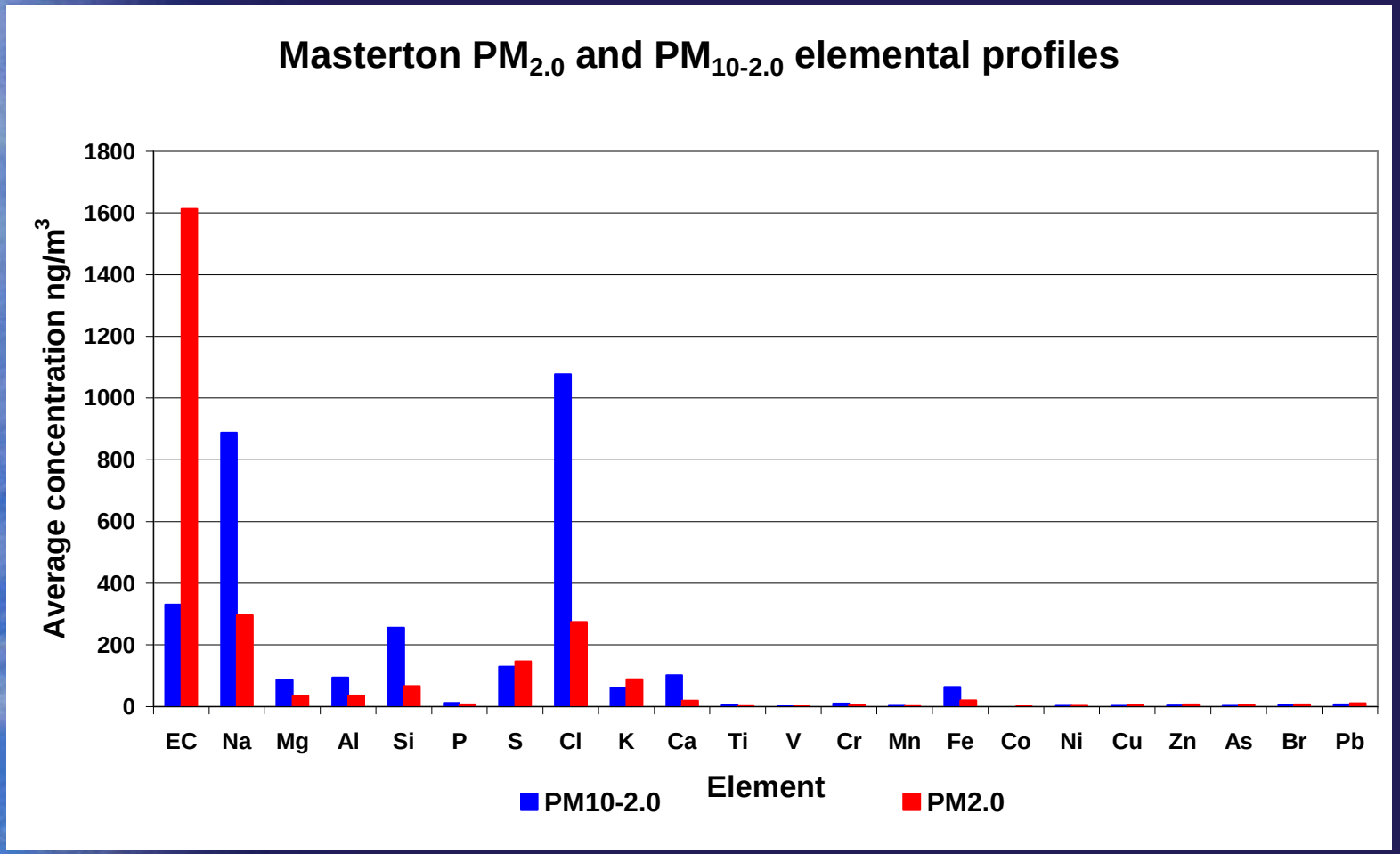
The issue:


Masterton 24 hour average PM10
National Environmental Standard 50 µg/m3
Concentration (µg/m3)
70
60
50
40
30
20
10
0
Jan-03
Apr-03
Jul-03
Oct-03
Jan-04
Apr-04
Jul-04
Oct-04
Jan-05
Apr-05
Date

The analysis:
proton induced x-ray emission

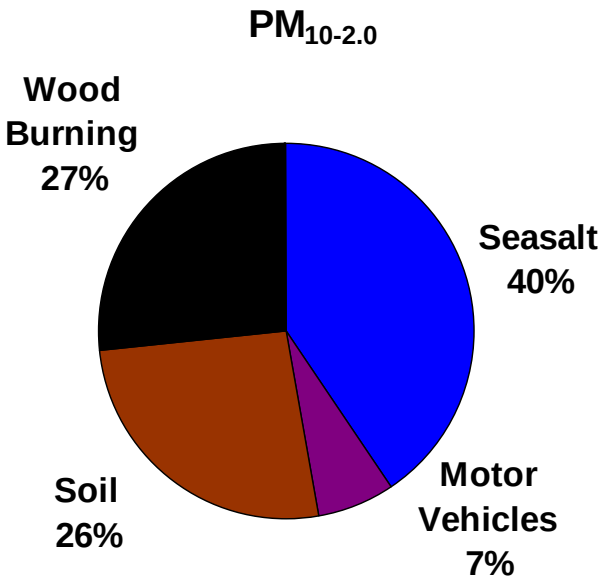


The elements:

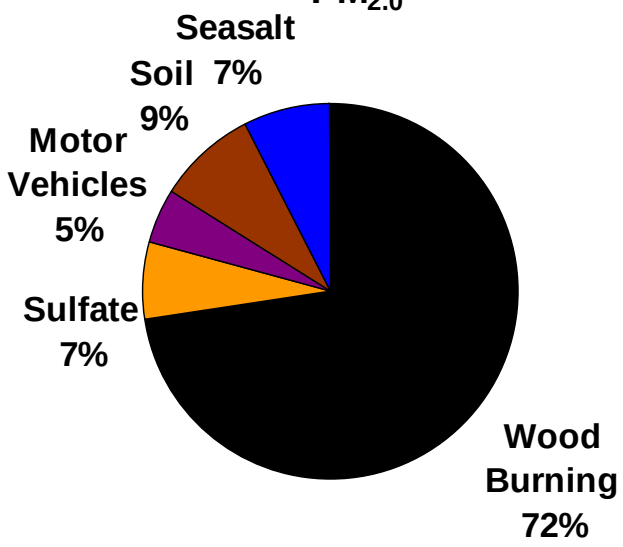


The sources of PM_{10}:

Average mass contributions by PMF

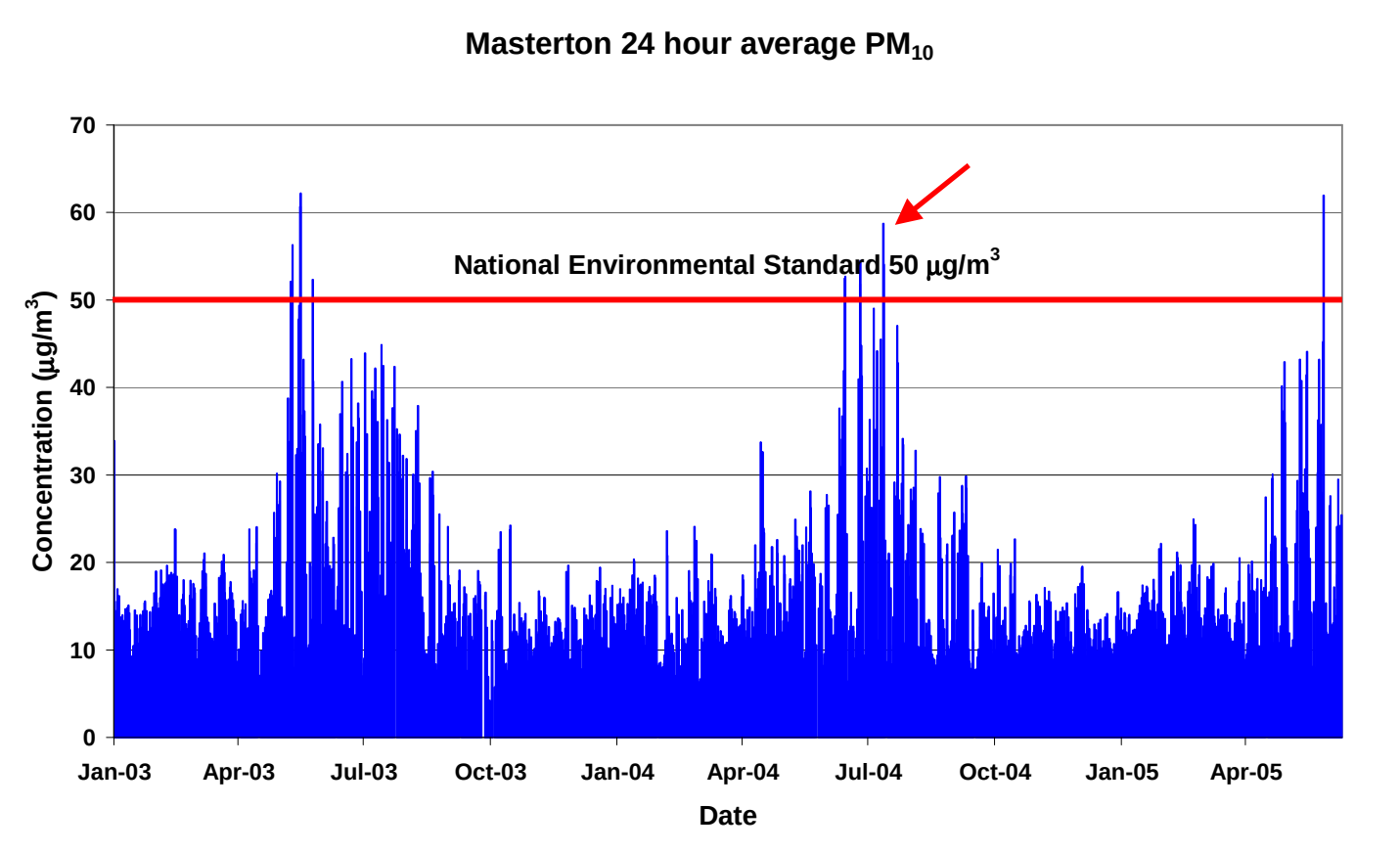


$PM_{10-2.0}$



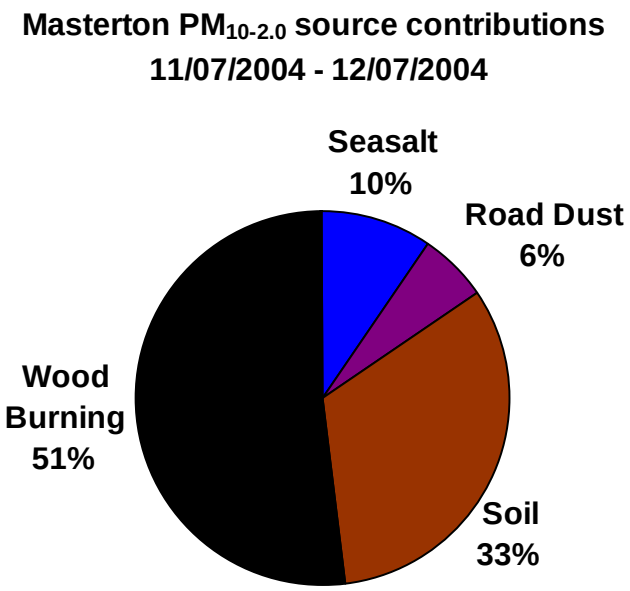
$PM_{2.0}$

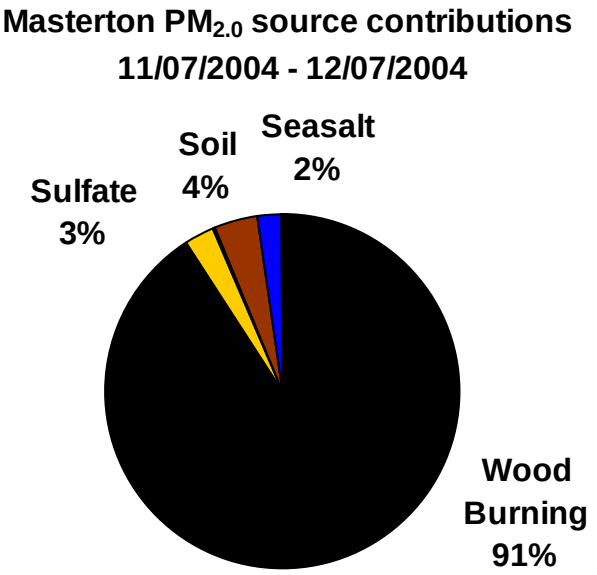
The issue:


Masterton 24 hour average PM10
National Environmental Standard 50 µg/m3
Concentration (µg/m3)
70
60
50
40
30
20
10
0
Jan-03
Apr-03
Jul-03
Oct-03
Jan-04
Apr-04
Jul-04
Oct-04
Jan-05
Apr-05
Date

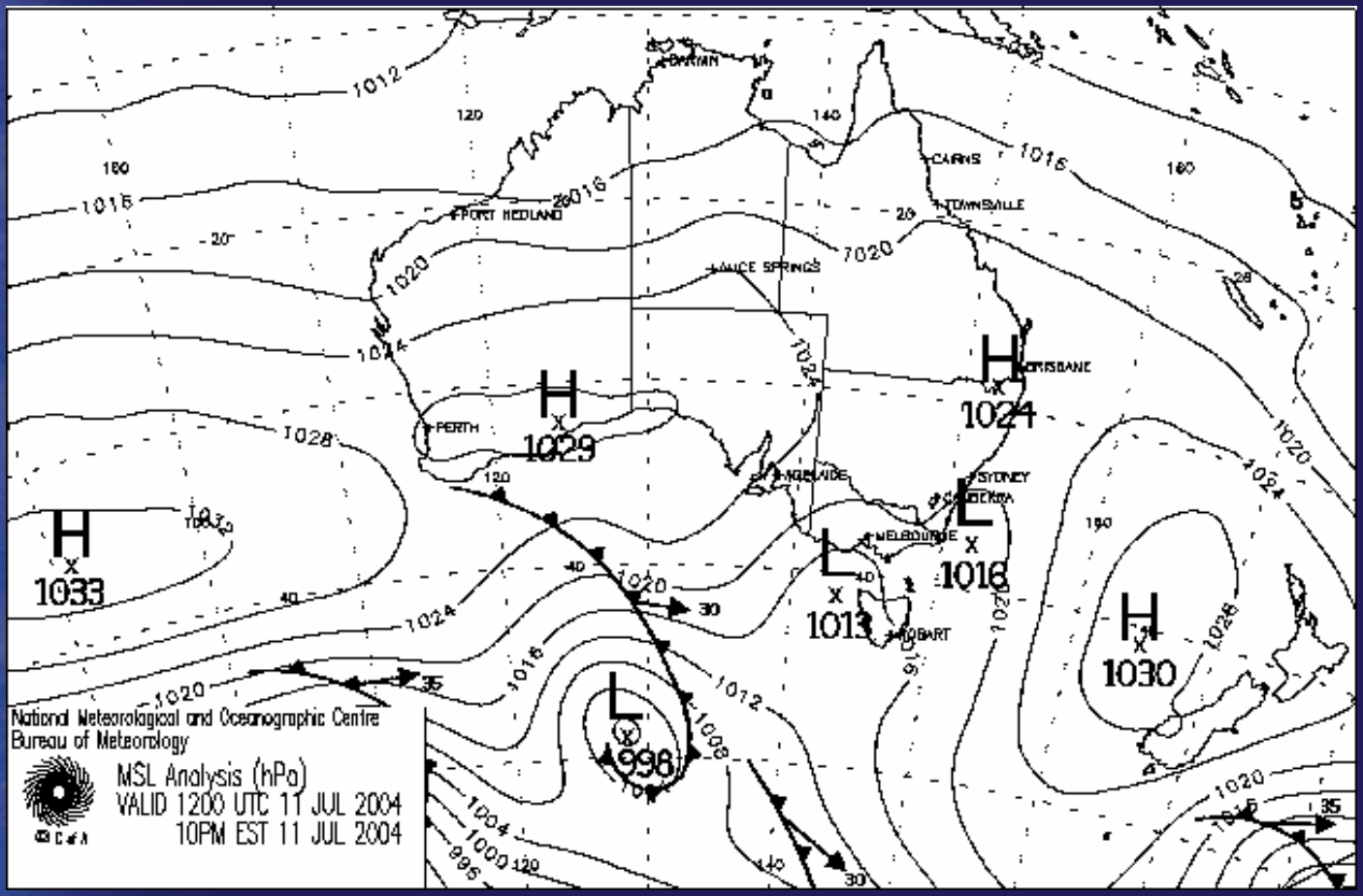
Sources of PM_{10}: 11 – 12 July 2004

PM_{10} = 59 μg/m³ (TEOM)

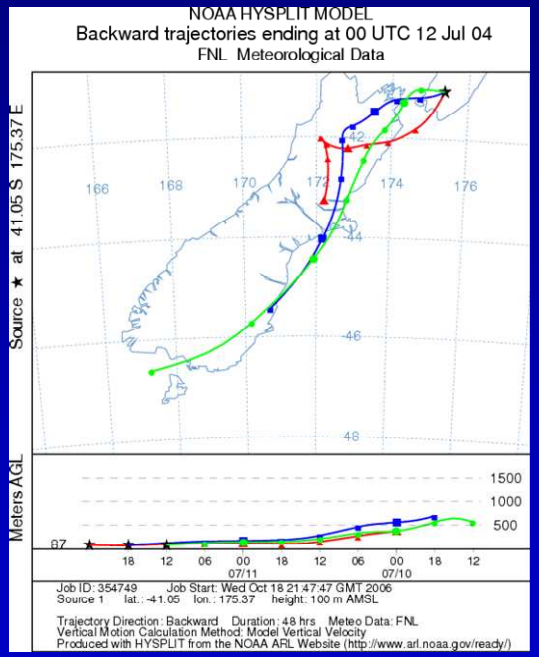


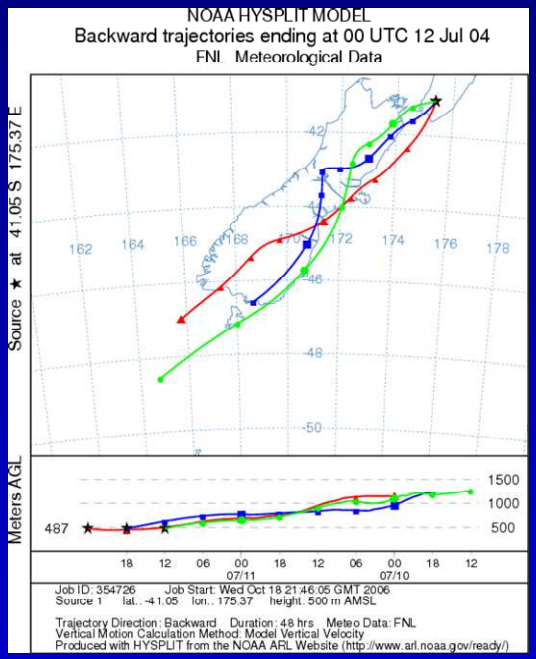


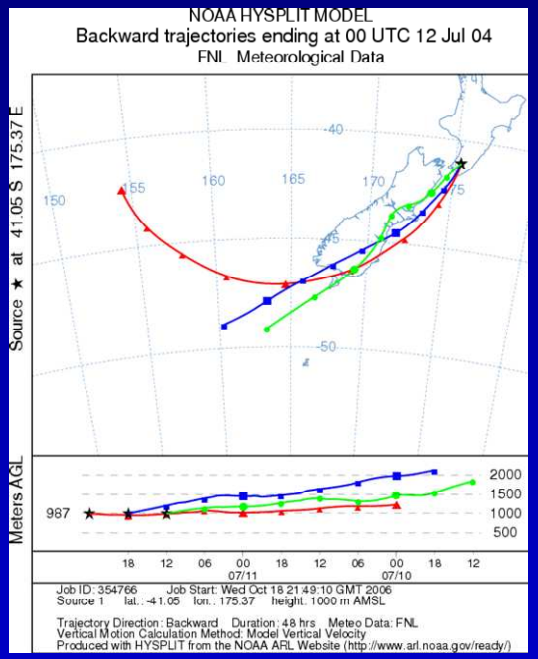
The Meteorology: MSLP 00:00 12/07/2004 NZST



The Meteorology:
Air mass back-trajectories





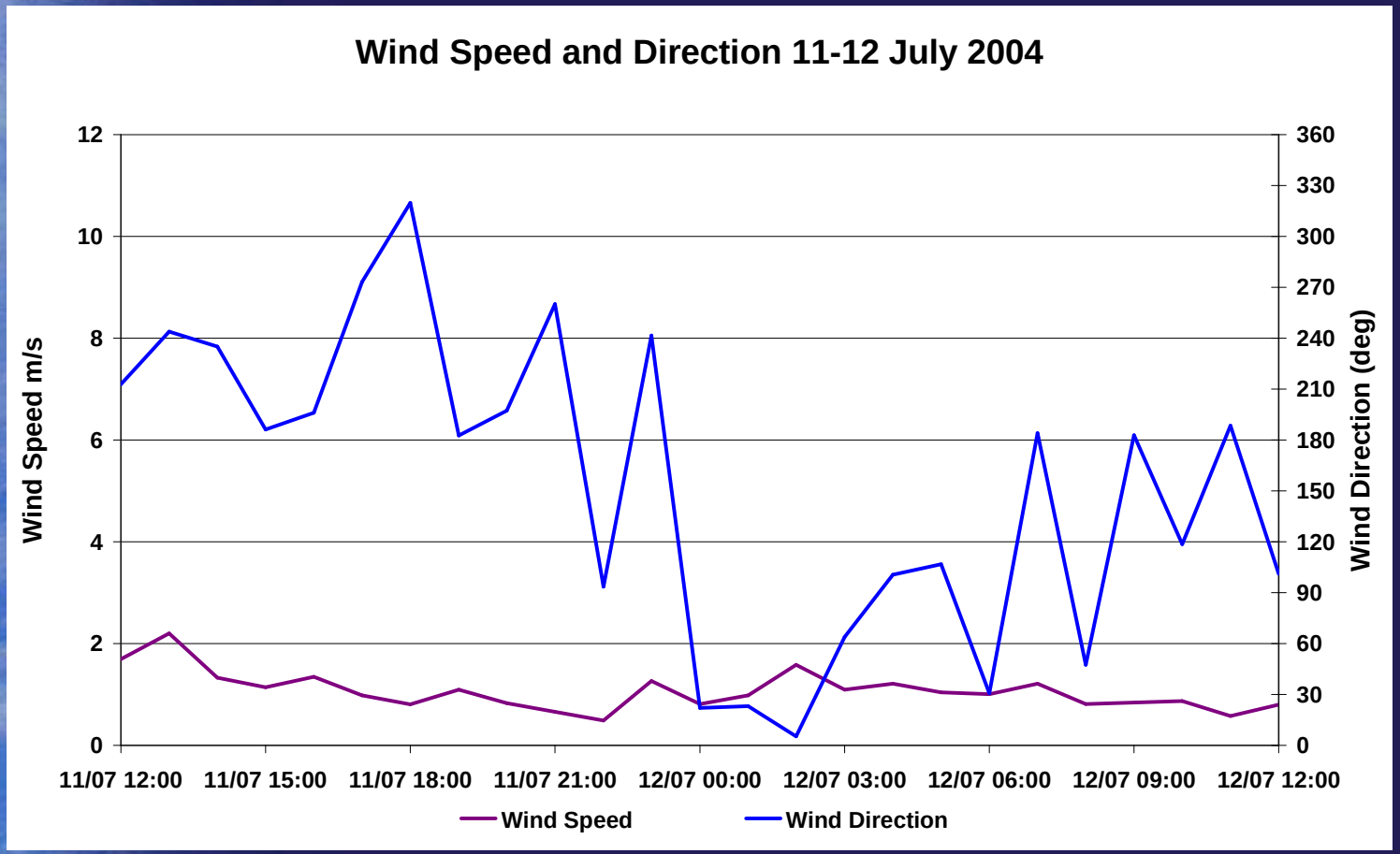


100m **500m** **1000m**

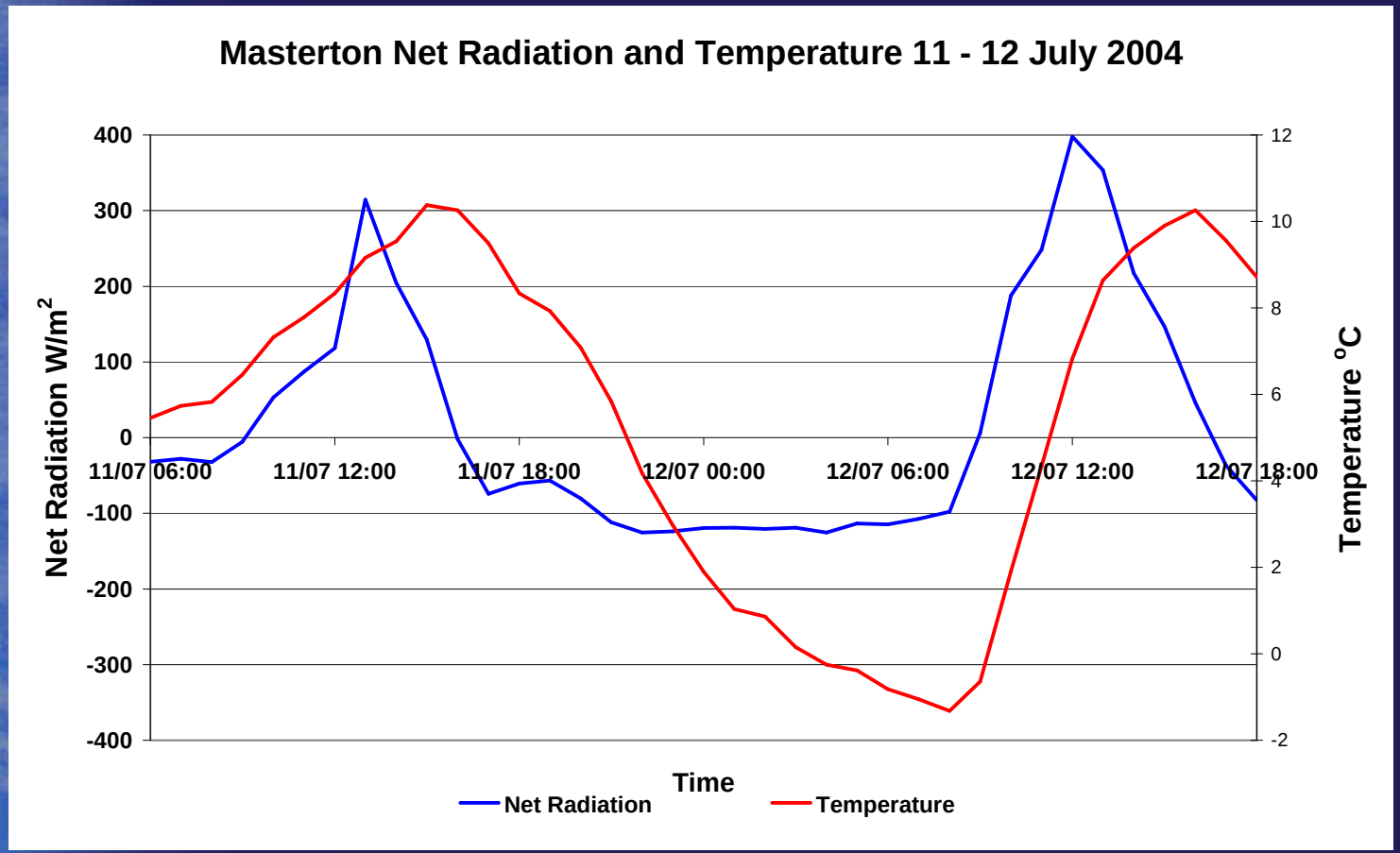
Are Christchurch and Nelson to blame?

Yeah right

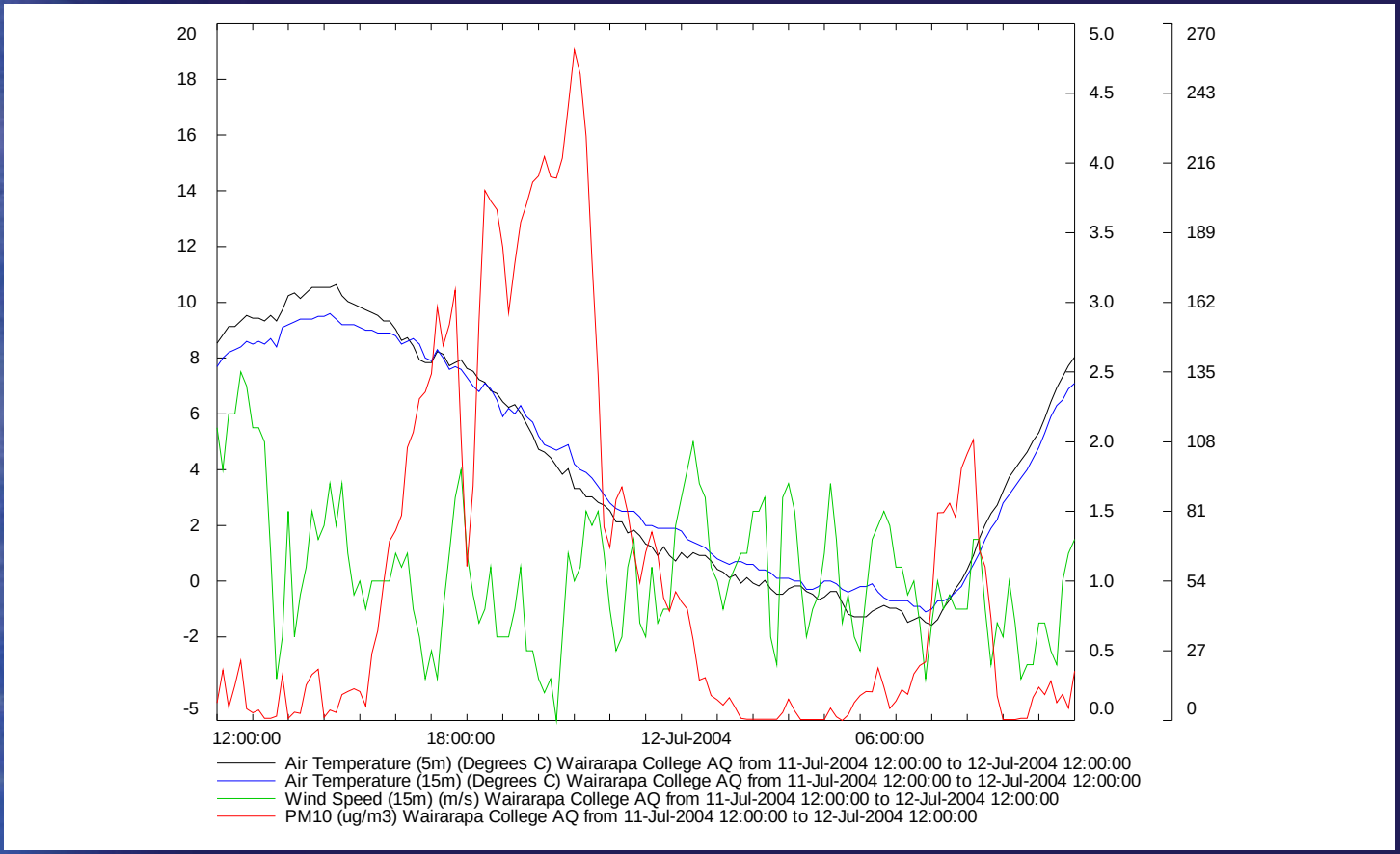
The Meteorology:
Down on the ground at Masterton



Net Radiation – clear skies:



Wind and PM_{10}:



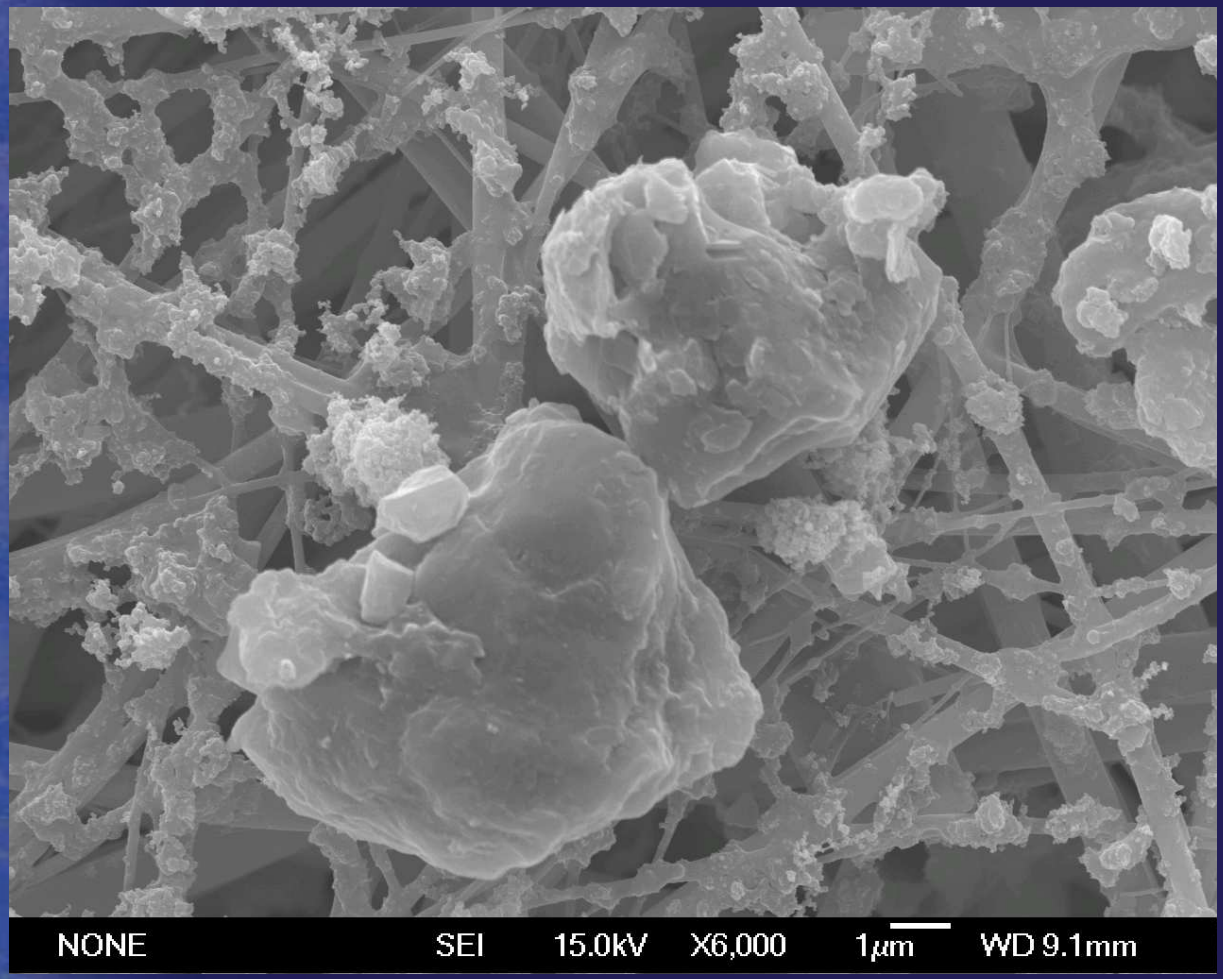
The theory:

The nocturnal katabatic effect

- Characterised by radiational cooling and temperature inversions with down-valley winds decoupled from synoptic flows;
- Observed on the majority of nights with high PM_{10};
- Has a limiting effect on peak PM_{10} values and therefore on 24-average;
- Similar pattern observed for Upper Hutt.

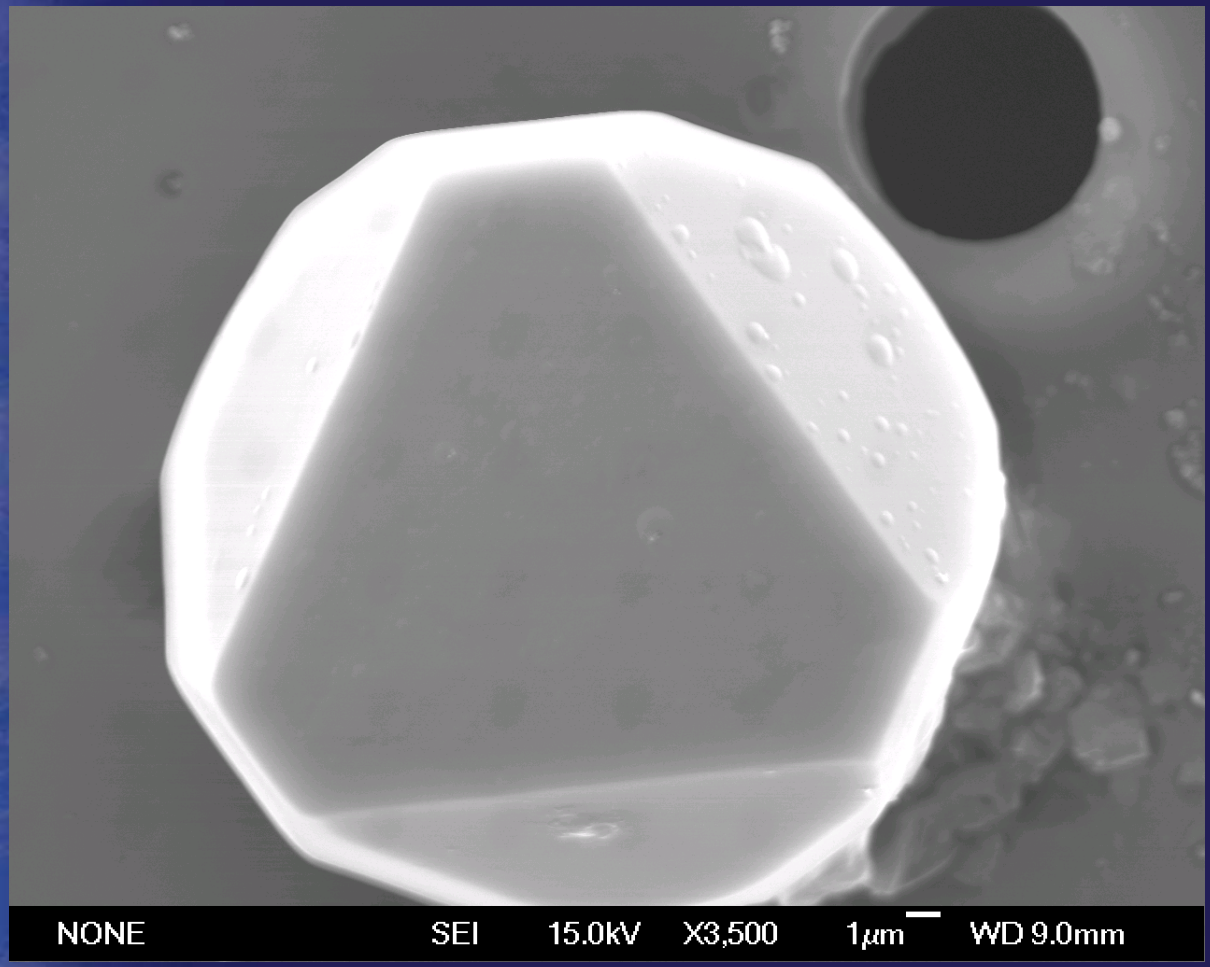
The particles:

Soil



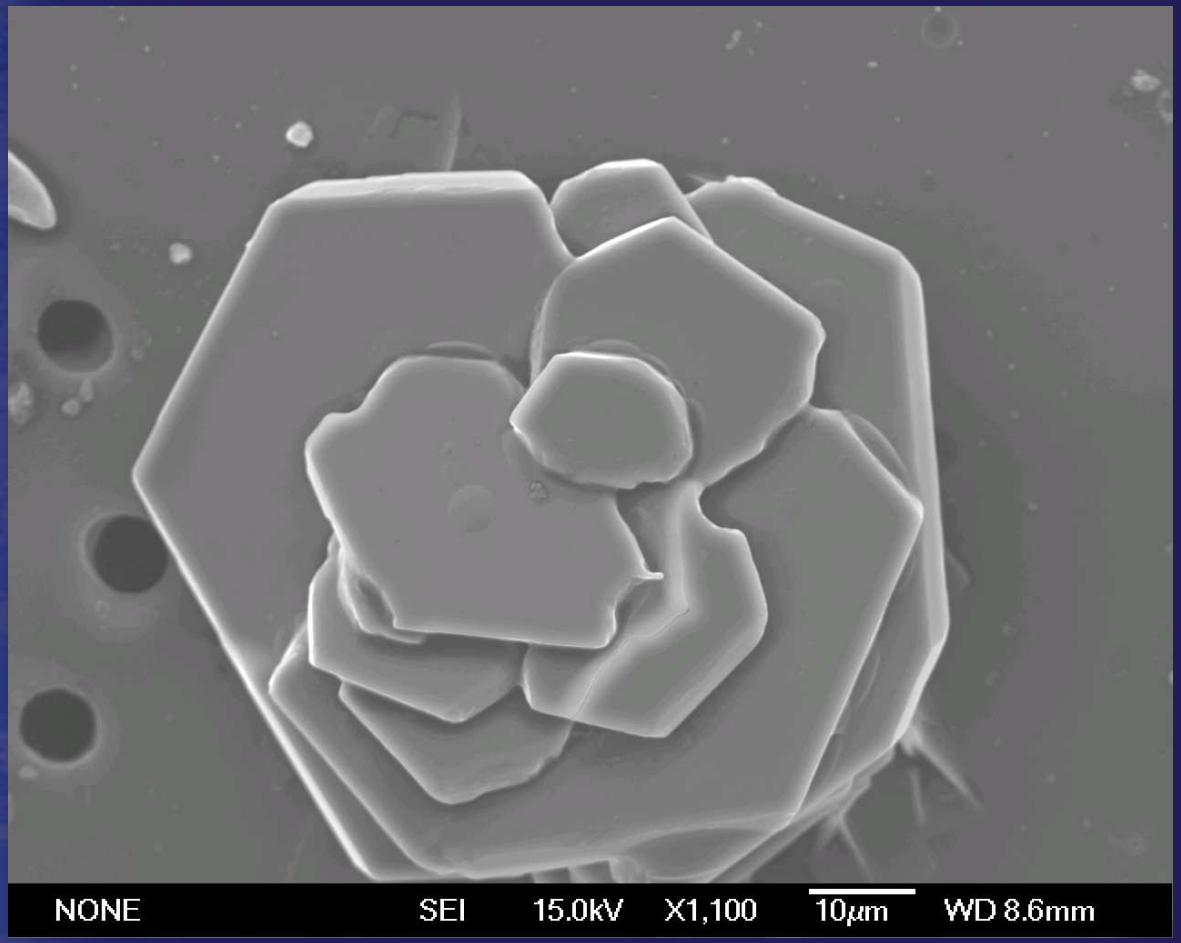
The particles:

Seasalt



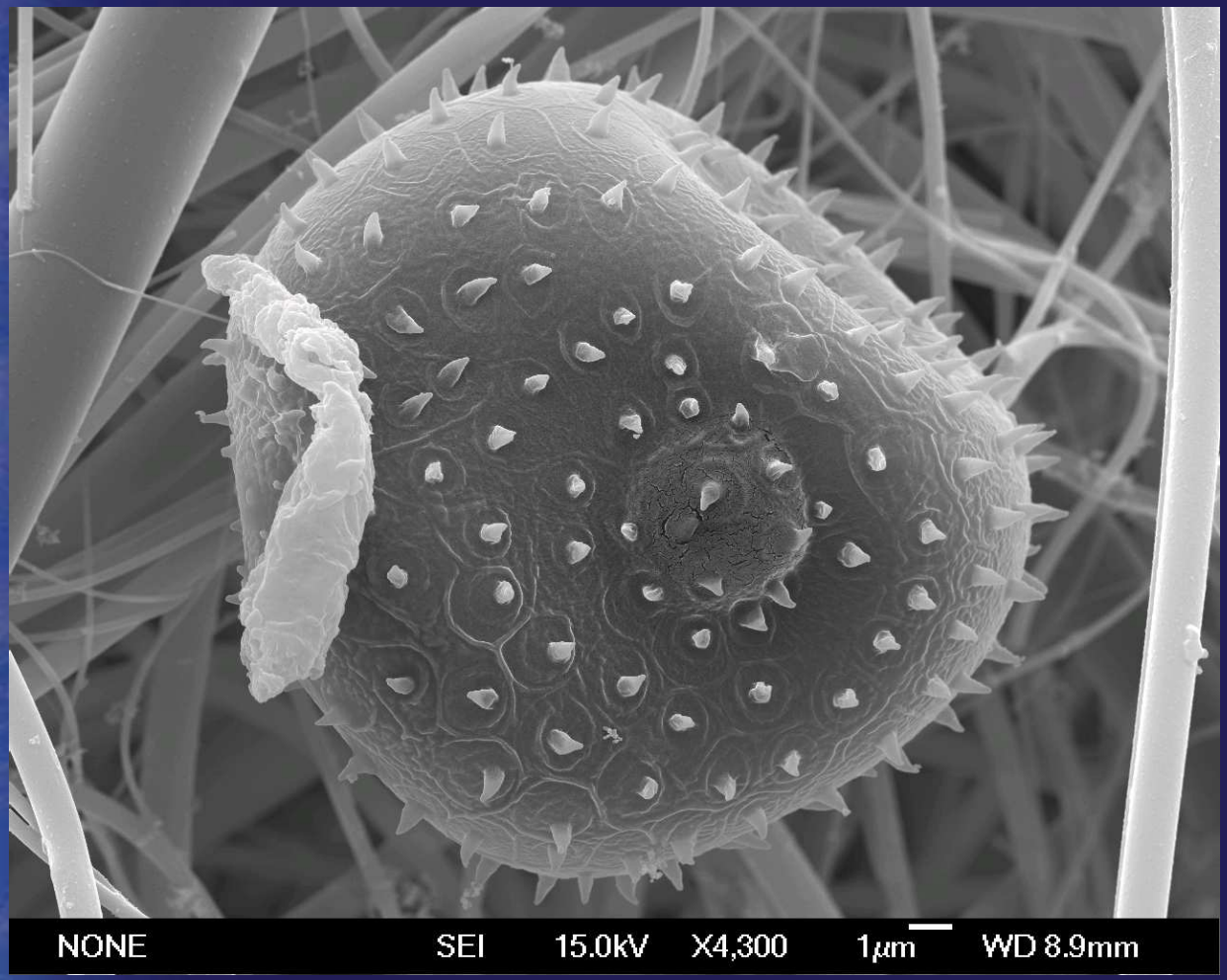
The particles:

Sulfate



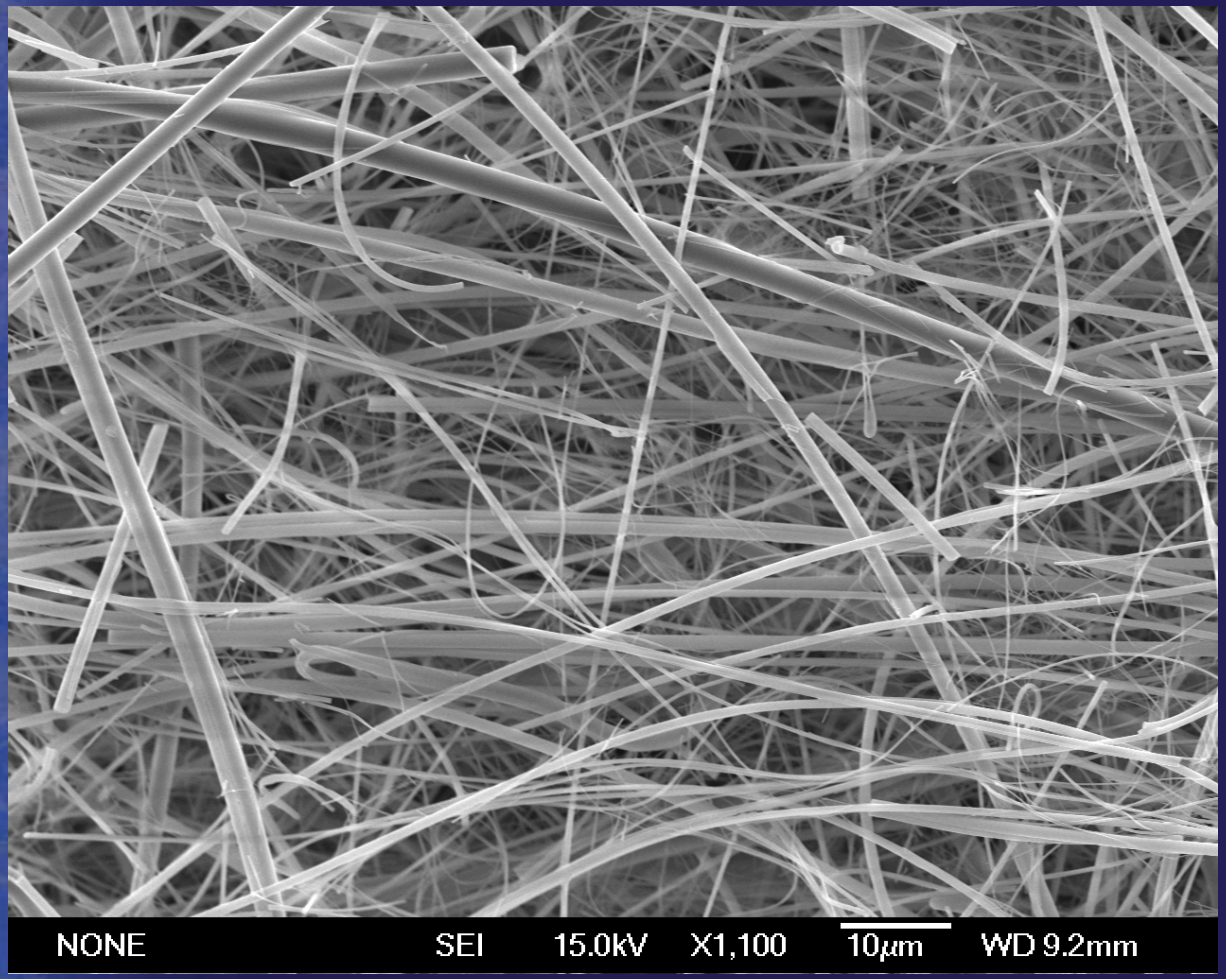
The particles:

Pollen



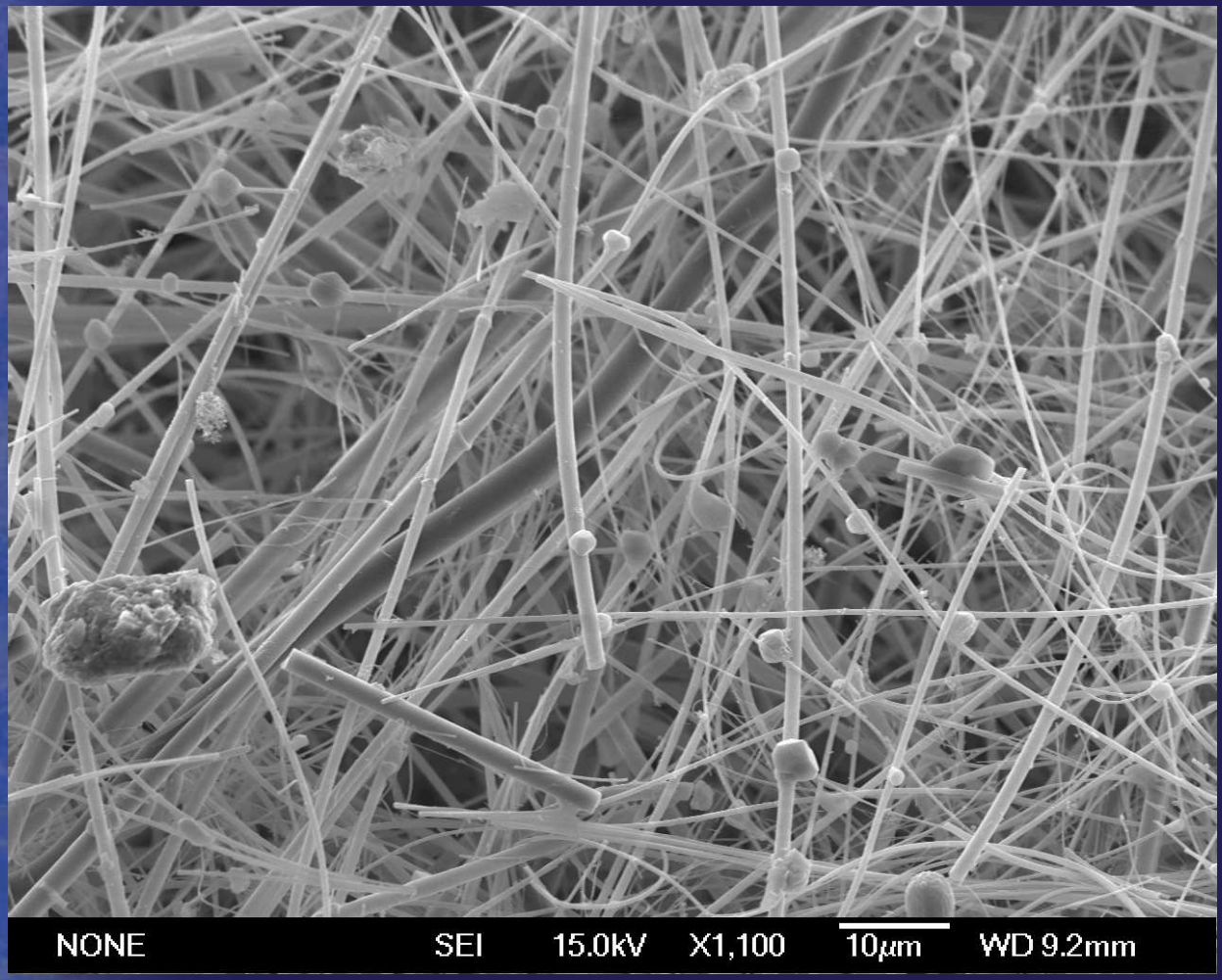
The particles:

Blank



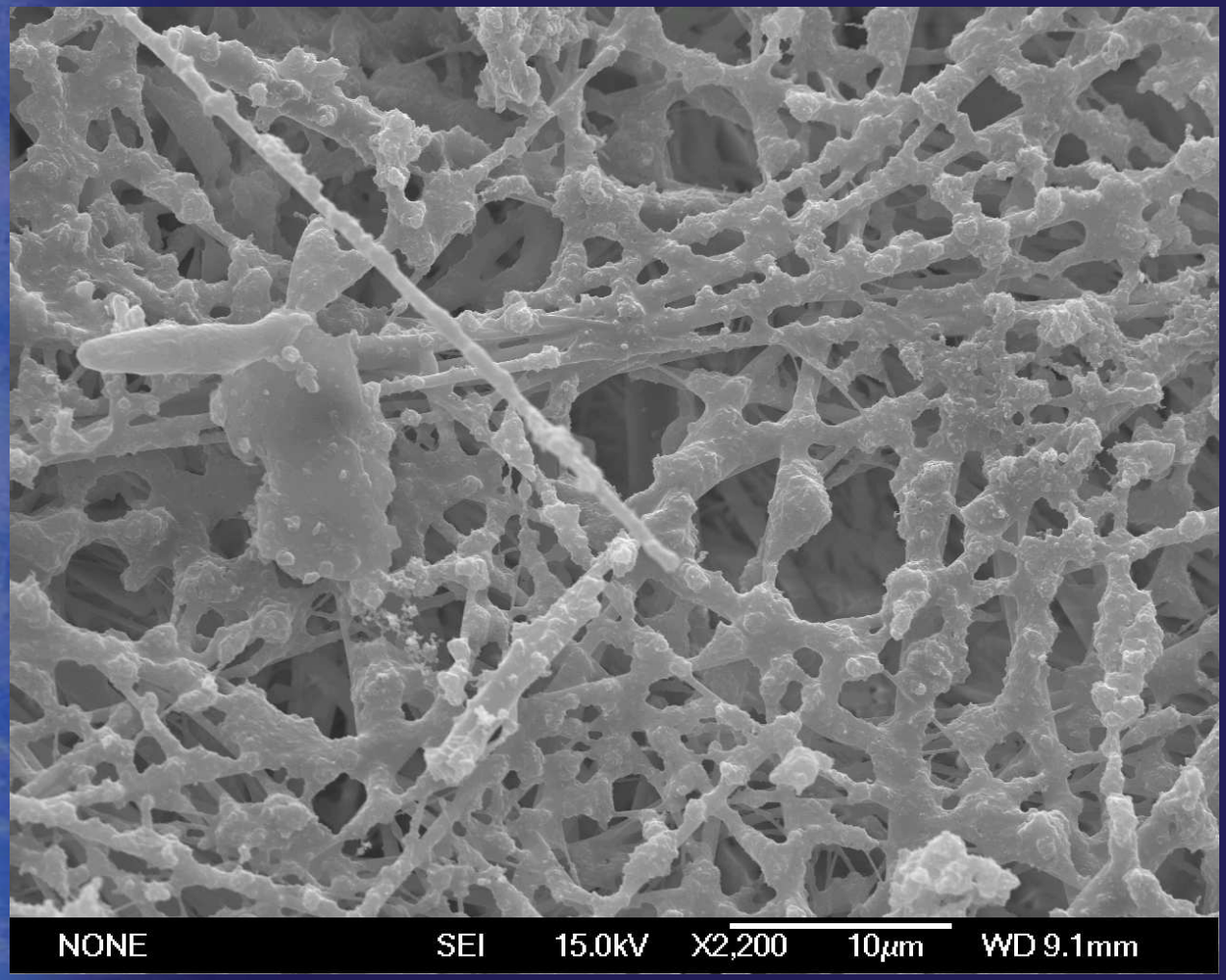
The particles:

Summer PM_{10} = 9 μg/m^3



The particles:

Winter – 11 - 12 July 2004 PM_{10} = 59 $\mu g/m^3$



The morning after:

Thanks to Greater Wellington for the use of images and material.

www.niwa.co.nz