Natural source contributions to PM_{10} in Awatoto

Emily Wilton – November 2010

Objectives

- Trial method for suitability for estimating natural sources contributions in New Zealand.
- Evaluate the contribution of sea spray and soil/ dust to PM_{10} in Awatoto during the summer.

Method

- First approximation method using Na and Si
- About 30 filters analysed with PIXE
  - Normally source apportionment – costs in excess of $30K
  - This approach costs likely to be around $18K


More...
Map
Satellite
Waitangi Rd
Waitangi Rd
Waitangi Rd
SH 2
2
2
2
50 m


PORTER HIRE

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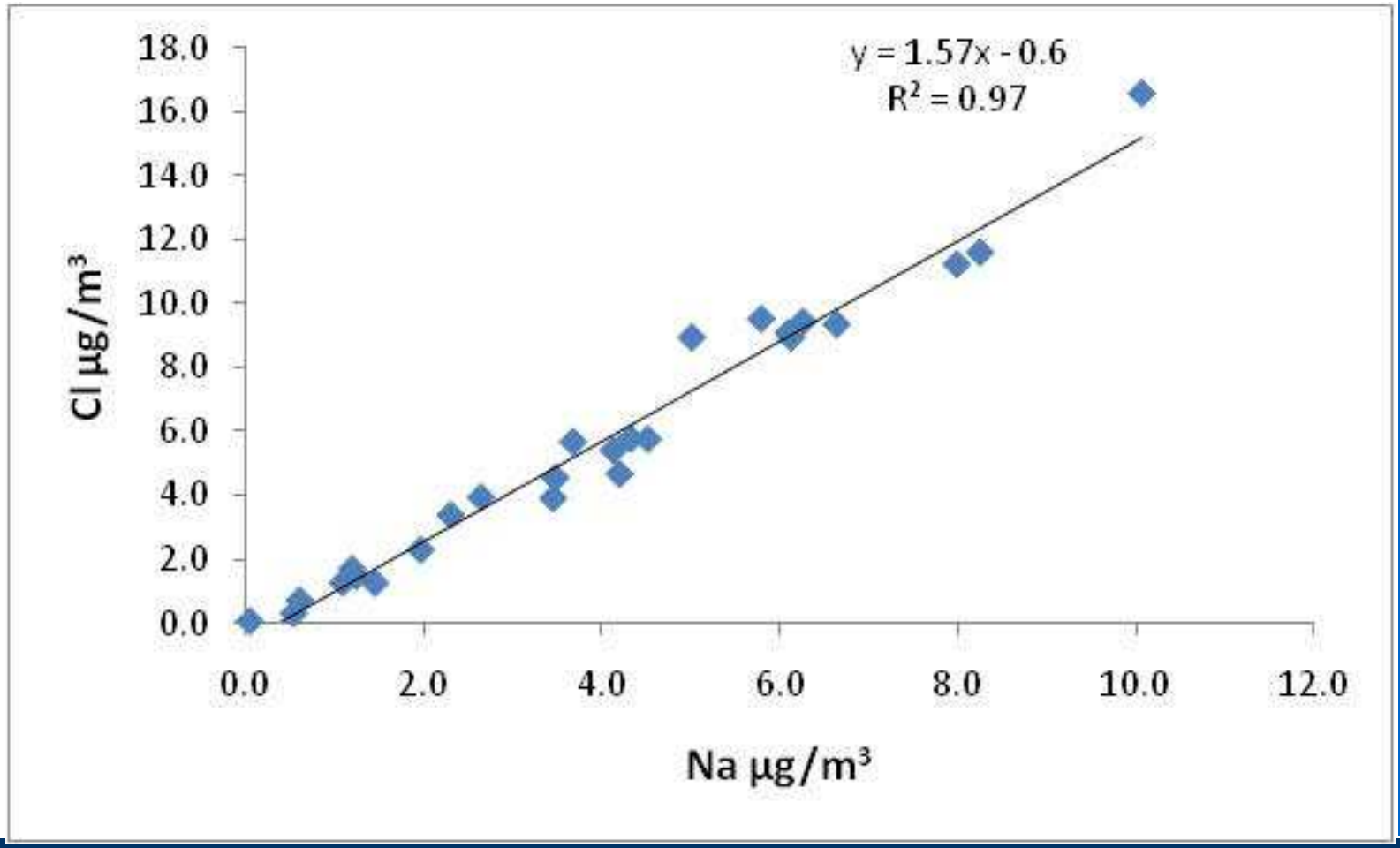
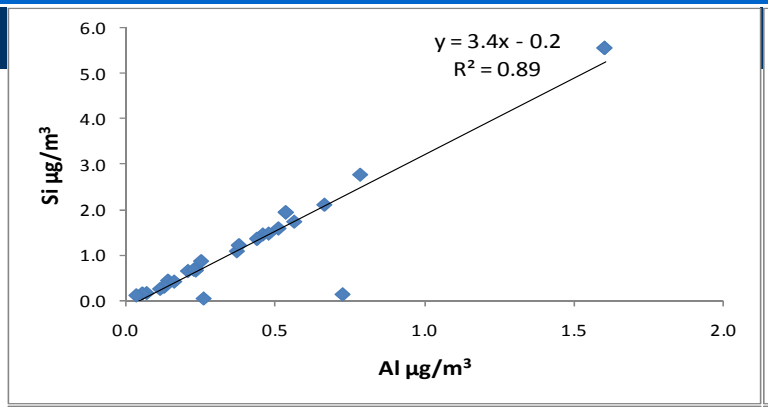
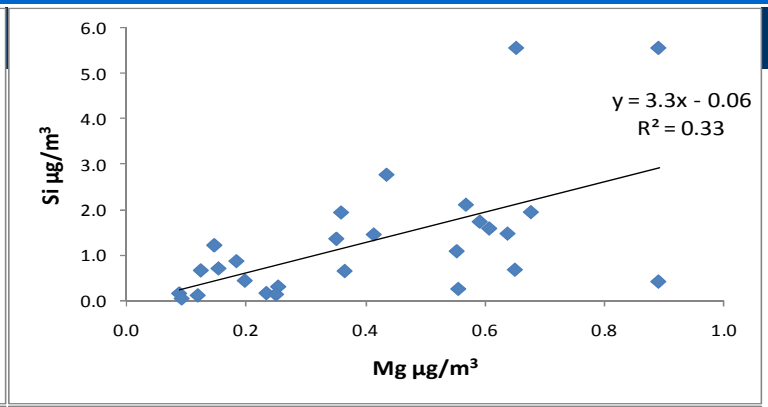
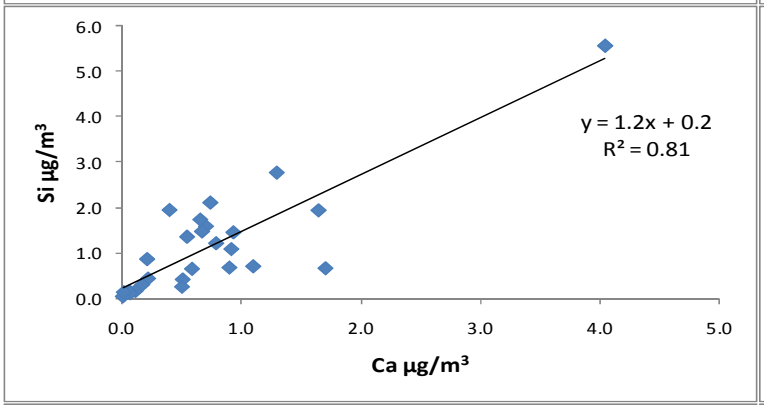
Analysis Na:Cl

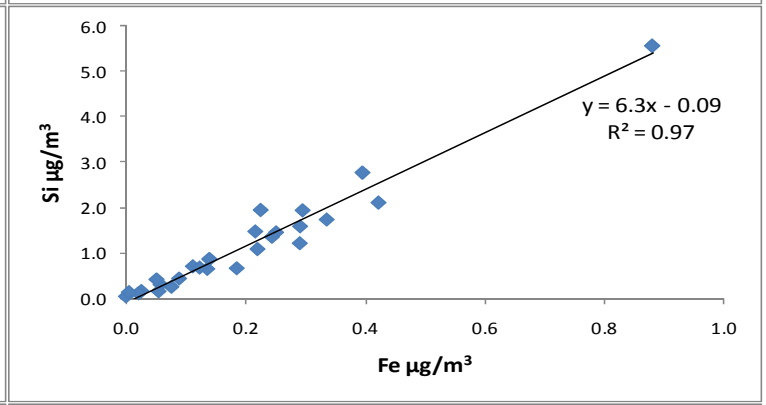


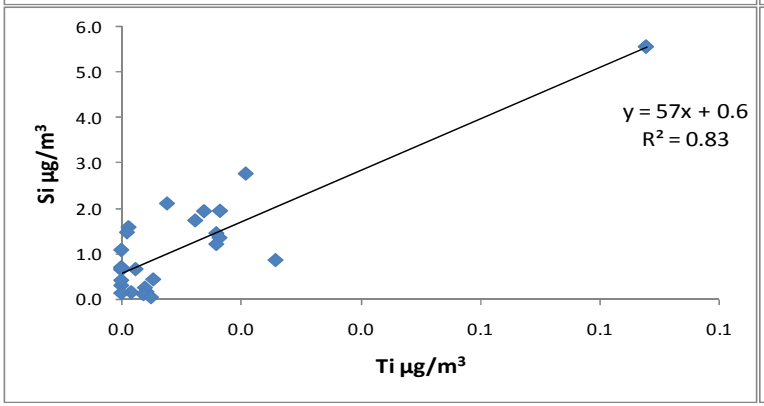
Soil/ dust

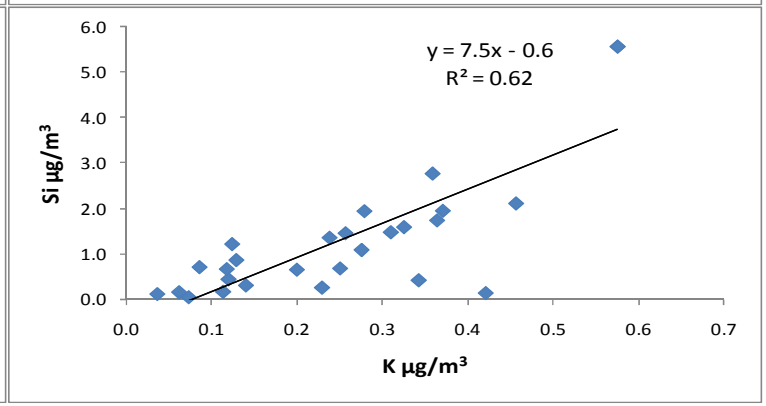












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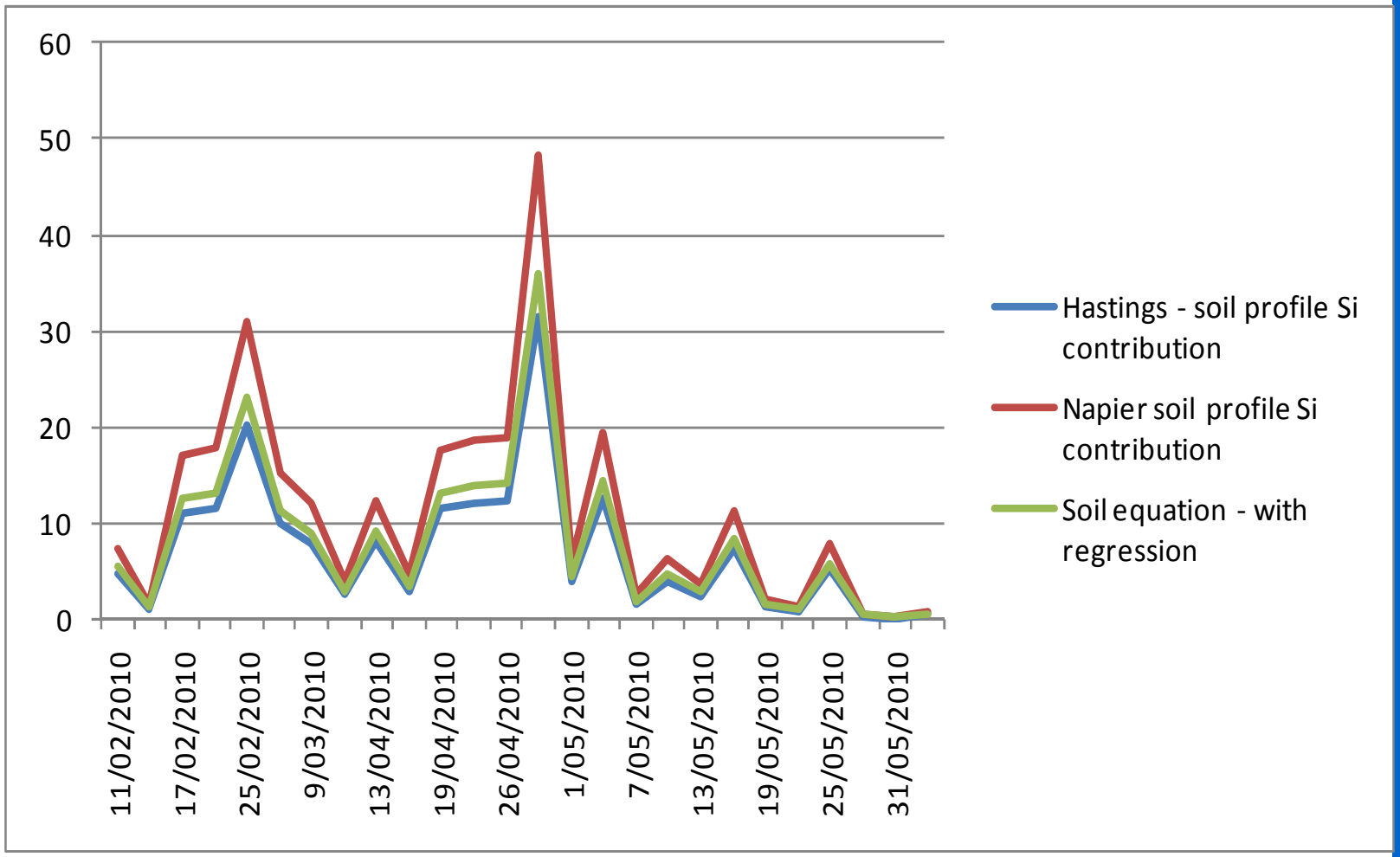
Soil method comparison

- Reconstructed soil mass = 2.2[Al] + 2.49[Si] + 1.63*[Ca] + 2.42*[Fe] + 1.94[Ti]
- Soil profile for Napier
- Soil profile for Hastings


60
50
40
30
20
10
0
11/02/2010
17/02/2010
25/02/2010
9/03/2010
13/04/2010
19/04/2010
26/04/2010
1/05/2010
7/05/2010
13/05/2010
19/05/2010
25/05/2010
31/05/2010
Hastings - soil profile Si contribution
Napier soil profile Si contribution
Soil equation - with regression

	Fraction	SD - plus or minus	Crustal Material	Soil - Awatoto
	Cohen et al 2004		Mason and Moore 1982	This study
AL	0.069	0.01	0.086	0.069
Si	0.215	0.039	0.294	0.234
K	0.041	0.006	0.027	0.031
Ca	0.046	0.014	0.039	0.19
Ti	0.0074	0.002	0.0047	0.004
Mn	0.003	0.002	0.001	n/a*
Fe	0.068	0.01	0.053	0.037
O	0.55	0.027	0.495	0.57

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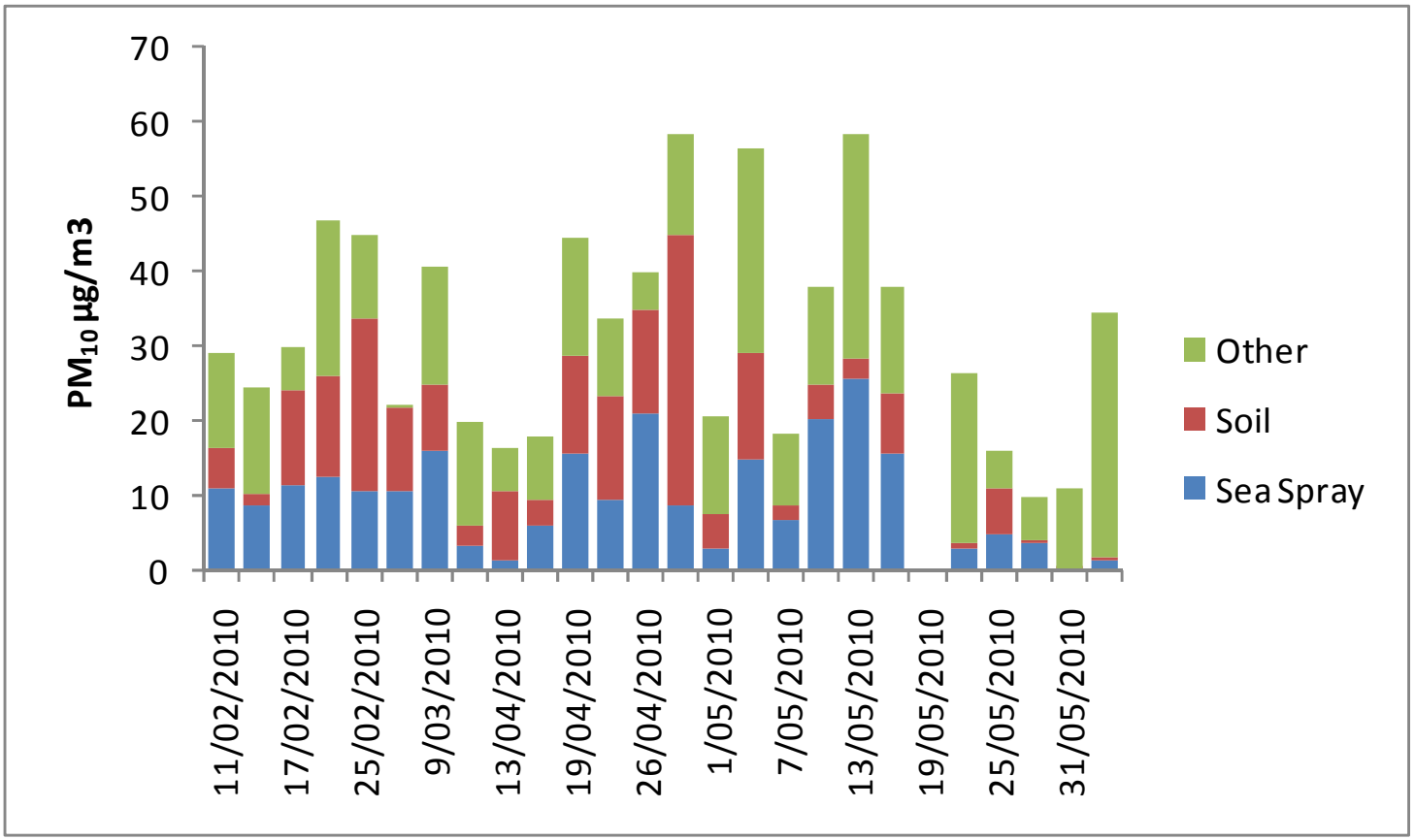
Source contributions



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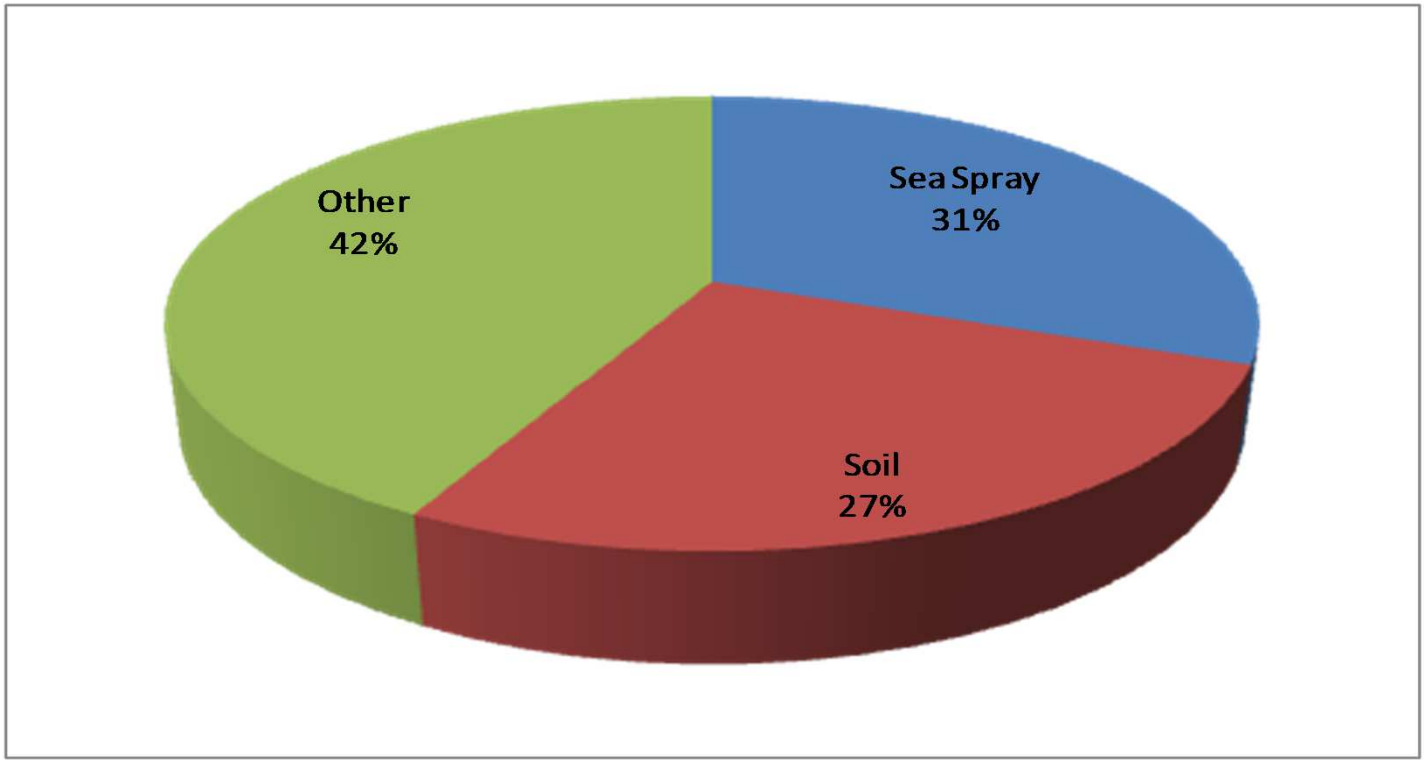
Average contributions



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Conclusions

- Method seems to work well in this scenario
- May be issues if other sources of Si or Na
- Sea spray contributed 31% of PM_{10}
- Soil/ dust contributed 27% of PM_{10}