

## ***Interactive comment on “Identifying the sources driving observed PM<sub>2.5</sub> variability over Halifax, Nova Scotia, during BORTAS-B” by M. D. Gibson et al.***

### **Anonymous Referee #2**

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#### General comments.

This paper reports the results of a PMF-based source attribution for a set of PM<sub>2.5</sub> daily compositional data collected in Halifax, Nova Scotia for the period 11 July – 26 August 2011, coincident with the BORTAS-B field campaign. The suite of particle composition data is comprehensive, including major ions, major and trace metals, BC, and OM as determined by an accelerator mass spectrometer. By examination of the statistical loadings of individual components in the factors output by the PMF the authors have identified, and quantified average mass and % contributions for, the following 6 sources - long-range transport pollution, long-range transport marine mixture, vehi-

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cles, fugitive dust, ship emissions and refinery - with the first two sources comprising three-quarters of the PM<sub>2.5</sub> mass on average. Given this latter statistic, the source attribution has perhaps not been particularly discriminatory, but as the authors note the PM<sub>2.5</sub> total concentrations during their field measurements were particularly low with little in the way of ‘episodes’ of varying origin to analyse. The authors indicate that it was hoped their measurements might have contributed insight into biomass burning events in the region – the focus of the main BORTAS-B campaign – but given the authors here were not measuring specific OC markers this was perhaps always optimistic. Nevertheless, together with the wind direction and air-mass back-trajectory data, the authors have undertaken a considered, quantitative and appropriate source apportionment analysis, which demonstrates the utility of such techniques for PM<sub>2.5</sub> source apportionment. The paper is generally well written, and data and results neatly presented, and is suitable for consideration by Atmospheric Chemistry and Physics.

#### Technical/scientific comments.

P4494, l8: insert comma after Edinburgh.

P4495 & 4497: In at least a couple of places, the element phosphorus is listed as a metal which it is not.

P4495, l18 and many other instances in the paper: On many occasions, the chemical symbols for sulphate, nitrate, ammonium and chloride are presented without their anion or cation charges. The charges need to be included. When measured by IC, it is the ions that are measured. (If the halogens are measured by another technique then the neutral chemical symbol can be used.)

P4496,l8: Is the sentence beginning “The Partisol stopped sampling if...” required? It is not if this QC procedure was never actually activated.

P4496, l13: Correct the grammar to “manufacturer’s”

P4497,l3: Rephrase start of sentence to “Due to low PM<sub>2.5</sub> mass, the following 14

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elements were not detected in . . .”

P4497, I13 & I 18: There are two citations to a “Gibson et al. (2013)” reference which is not presented in the reference list.

P4498, I2: What is meant by the precision of 1-min averages? How is the stated precision value of 18% derived?

P4498, I3: Is it better to say the 1-min data were averaged rather than integrated to match the 24 h samples?

P4499, I2: As above, use the phrasing averaged rather than integrated?

P4499, I6: Delete the sentence beginning “The daily wind vectors. . .” This sentence does not need to be in the methods section.

P4499, I22: At first reading the statement that (5 min) wind speed was 8.0 m/s on 7 days is not consistent with the summary data presented in Table 1 which indicates that the maximum wind speed during the campaign was 5.4 m/s. I think the data in Table 1 summarise the range of daily averages in the meteorological variables, i.e. 5.4 m/s is the highest daily average wind speed. Therefore, (1) start the sentence on p4499 with “Maximum 5-min average wind speed was significant. . .”, and (2) modify the caption of Table 1 to read: “Descriptive statistics for the daily averages of the meteorological variables. . .”

P4499, I28: Phrase as either “This data was accessed. . .” or “These data were accessed. . .”

P4500, I4: There is a sudden introduction of first person “we”. Decide whether a passive or first-person approach is being used and review the whole text for consistency.

P4500, I7: It is stated here that back-trajectories were calculated twice per 24 h period at 07:00 UTC and 19:00 UTC, but the caption on Figure 2 states that trajectory initialisation was at 08:00 UTC, and makes no mention of a second back trajectory per 24 h

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period. Please correct text and/or Figure 2 caption as required.

P4500, I24: Insert “The” before “PMF method”

P4500, I27: It is sufficient to list only a sub-set of all these references as examples of previous PMF application.

P4501, I23: Insert “is the” before “residual matrix”

P4501, I23: The “i” and “j” should be subscripts to “S” not superscripts.

P4502, I1 and I2: In two places insert “number of” before “degrees”

P4502, I4: Single word for “dataset”

P4502, I12: Plural “components”

P4503, I6: Lower case for “levoglucosan”

P4505, I18: Lower case for “sea salt” when referring to sea salt generally (could use upper case if referring specifically to a source identified from the PMF that is given the label Sea Salt).

P4506, I27: Delete the comma after “Figure 7”

P4509, I23: Start new sentence at “Both are. . .”

Reference list: The doi address is given for a subset of the references but not others. Delete the doi for all those references (most, perhaps all, of them) that are uniquely cited by volume and page numbers.

Table 1: Why does this table summarise 42 days of meteorological data, yet there were 45 days of PM2.5 sample collection?

Table 2: In the footnote, is the text “Data Meteorological Data Summary” erroneously present?

Table 3: Group the data for the ions determined by IC separately from the data for the

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elements determined by ICP (i.e. do not intersperse the lines of data) and add the correct anion and cation charges to all those species quantified by IC.

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Interactive comment on Atmos. Chem. Phys. Discuss., 13, 4491, 2013.

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