

Interactive comment on “Suitability of high-volume aerosol samplers for ultra-trace aerosol iron measurements in pristine air masses: blanks, recoveries and bugs” by Holly Winton et al.

Anonymous Referee #1

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This work examines the contamination of high-volume aerosol samples during non-baseline conditions at a site well known for Southern Ocean air sampling (Cape Grim Baseline Air Pollution Station, Tasmania, Australia). Trace metal concentrations, specifically total and soluble iron, were measured and microscopy was used to show good laboratory practices for trace level iron measurements as well as contamination on a one month exposure filter. Atmospheric iron measurements in the Southern Ocean are difficult to make due to low aerosol (and iron) mass loadings and scarcity of adequate sampling locations. This paper addresses the important issue of reducing contamination when making trace metal aerosol measurements, especially in this region.

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Although the implications of this work are important and it falls within the scope of AMT, the lack of data to prove the source and significance of filter contamination is problematic.

My main concerns with this paper are the number of samples analyzed (i.e. one of each kind ($n=3$ in tables are punches from the same filter)) and conclusions regarding the source and magnitude of contamination drawn from one month long exposure filter. One TSP and one PM10 high volume aerosol sample, collected during baseline conditions, showed suspect contamination (bugs, large mineral dust particles, etc.). The authors attributed this contamination to passive deposition during non-baseline conditions over the month long sampling periods and collected an exposure filter (filter in a sampler with the pump off) to show this (Figure 2). However, the exposure filter was collected during baseline and non-baseline conditions (as shown by HYSPLIT trajectories; Figure 7), so it is not conclusive when the contamination occurs. To accurately determine if sealing a sampler during non-baseline conditions would reduce (likely) or eliminate (not necessarily) contamination then an exposure filter should be collected during only baseline conditions or during only non-baseline conditions.

Specific Comments/Technical Corrections

Page 2 Line 5: “60 ng m⁻²”, I think the author means “60 ng m⁻³”

Page 2 Line 25: “of soluble iron” should be inserted between “estimates” and “exist”

Page 4 Line 1-2: “. . . a series of filter blanks and baseline aerosol samples.” I find this to be a strange claim as only one of each kind of sample is reported, not a series.

Methods Section 2.2. Analytical methods for trace level iron measurements were expertly followed. The quality of the data presented in this work is not a problem; it is the lack of data that is the major issue with this work.

Page 6 Line 23: Manganese should not be capitalized.

Page 9-10 Paragraphs 1 and 2: Need citations as this is not the first study that has

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shown that acid washing filters is important.

Page 10 Line 18: Change of wording for “contamination-free” as there does not appear to be any proof of zero contamination. Just calling them “archived filters” might be sufficient.

Page 10 Line 26: Insects could also fly or crawl into the sampler during baseline conditions.

Page 11 Line 5-7: ‘This type of blank gives an indication of the relative magnitudes of the in-sector active sampling (i.e., pump turned on and controlled by the baseline switch for a month) versus passive deposition’ There is no data to support this claim. This blank shows what can be passively deposited by in and out of sector baseline sampling. It is possible that during baseline conditions, especially at this height (6m), that there might be local contamination as well.

Page 12 Section 4.3: What would the EF be if iron was derived from long range transport? I am not sure if EF is a good way to prove this is a locally derived contamination as there are not many anthropogenic inputs in this region. Maybe some sort of principal component analysis with a larger data set would be more appropriate?

Page 13 Line 29-30: “The contamination was primarily due to the lack of an air-tight closure at the sampler intake.” This was not shown in this study. To show this you would need to compare a sealed and not sealed sampler at the same elevation. A direct comparison of sealing cannot be made between the 6m platform and 70m tower.

Page 14 Line 13: “US EAP” should be “US EPA”

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