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Interactive comment on "Trends in new particle formation in Eastern Lapland, Finland: effect of decreasing sulphur emissions from Kola Peninsula" *by* E.-M. Kyrö et al.

Anonymous Referee #3

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The manuscript describes in a very detailed way and utilizing sophisticated instrumentation the temporal trends in new particle formation in NE Finland, and suggests a causal relationship with decreased SO2 emissions from Kola peninsula. The presented data is exceptional, since it is one of the longest time series of its kind, and the analysis is carefully done. Results are important and shed new light to our understanding of the potential factors behind NPF events in Arctic areas. Although the ms is rather long and includes quite many figures, I feel that this is necessary to take full advantage from the provided evidence, clearly showing that the dynamics of NPF events in this remote measurement station has changed considerably over the last two decades that

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measurements have been conducted.

I'm happy to recommend the acceptance of the ms with minor revisions, and below I list only some small remarks which would improve the readability and make the content more standardized.

- One of your aims is to compare the results from Eastern Lapland to those from Western Lapland. However, in order to understand what is similar and what is different in those locations, you should characterize first a bit more the local conditions in both places (also in relation to elsewhere in the Arctic / boreal region (and also to outside Finland if possible)). So please, add some more details for the basis of this comparison (e.g. latitude, altitude, ecosystem type, distance from major SO2 sources) when you first make this comparison (p. 30729)

- p. 30732: 'Contrary to our findings, Hamed et al. (2010). . . . ' Why do you think this finding is contrary to your findings in Värriö? Please elaborate a bit more.

- p 30737: 'We calculated the percentage of time that the air masses had arrived to Värriö over Kola for each month. . . .' please move the explanation how the trajectory calculations were done to Methods -section.

- what do you mean by filtering (p. 30737 last line and the discussion that follows)? Please first introduce the emission policy in a more general way and then go into details in how it was implemented.

- the Conclusion needs rewriting:

- p 30739: 'higher concentrations of SO2 and H2SO4. . . .' please clarify the comparison (higher than what?)

- I would prefer you discussing the actual measure instead of a loose 'data' (lines 22-25). For example, 'These data are entirely associated with the Kola sector' – I presume you mean the high SO2 concentrations? In the next sentence, 'clean data' – I presume you mean days with low SO2 concentrations?

- p 30739 line 28 and p 30740 line 2: 'The relative difference' – please specify which measure you speak about?

- p 30740: 'Until now, there has been no clear evidence on the cleaning of emissions in the Murmansk Oblast region.' What do you mean by this? evidence regarding what? To me the official published statistics are clear and form an evidence on cleaning of emissions. Please clarify!

- Table 1: give the time range for the mean.

- Table 2: temperature – please specify which temperature value this is (annual mean/min/max, summer/winter/spring/fall...)?

General remark on figs: In all figures that have more than one panel, the panels should be named (A, B, C...) There are quite many figures. Consider if some of them could be left out?

- fig 3: add: The black curves in A) denote the ....

- fig 4: give time range also here (average of years....)

- fig 5 (B): the legend panel is covering some black bars. Please give this information in the figure legend (remove the legend panel from fig 5B) or position so that the information is visible. The %-change can be given in figure legend.

- Fig 8: orange line is poorly visible. Can you change the colour to make it more visible?

- Fig 10: please give A and B also in legend. In A the orange line is also very poorly distinguishable.

- fig 12 legend has the A and B but figure panels are missing these.

- fig 12: How can the explained % be >100? please explain in figure legend this confusing issue.

- Is the fig 13 needed – it is rather simple and Table 2 already has the same information

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(or does it?)

- Fig 15: 'faction' revise to 'fraction'. What does Fig 15B mean? relative difference to what? Please clarify.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 30721, 2013.