

Interactive comment on “Source identification of short-lived air pollutants in the Arctic using statistical analysis of measurement data and particle dispersion model output” by D. Hirdman et al.

Anonymous Referee #1

Received and published: 3 December 2009

This is the second time I've reviewed this paper. The first time, when it was submitted as a discussion paper, I made the following comments:

This is an excellent paper. The methods, presentation and analysis are all top quality and the authors are to be congratulated. I found the paper wanting in only two minor ways. The authors used a time frame of 20 days for the particle model, and considered a time frame of 8 years, 2000 - 2007. Why 20 days and 8 years? These are certainly arbitrary values. I suppose that 20 days can be justified using arguments related to the lifetime of the pollutants considered, as well as the time scale of precipitation systems

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responsible for scavenging these pollutants. I would suggest that this strong paper can be made a bit stronger if the authors present these arguments. Similarly, why 8 years? Thirty years is more typical for climatological analyses. I'm sure that logistical considerations figured strongly here, as the authors clearly need both good meteorological data and good pollutant data for the same years. But is an 8-year period sufficient to support the important conclusions regarding source-receptor relationships? And what about the particular 8 year period used (2000 - 2007)? I would feel a bit more comfortable if the authors could justify the selection of these particular years, i.e. show that atmospheric transport patterns and related meteorological processes (precipitation scavenging, stratospheric intrusions, etc.) during these years were representative of a longer time period.

line 55: "can" should be deleted lines 430-433: This discussion of the effect of screening winds outside Summit's clean air sector (and also that on lines 193-197) might benefit from the trajectory climatology results for Summit of Kahl and Davidson (JGR-Atmospheres, 1997) which also showed little transport outside the clean air sector.

In its present form, the authors have satisfied my comments about a time frame of 20 days and screening winds outside Summit's clean air sector. They haven't, however, addressed some of the questions I raised concerning the selection of an 8-year period: I'm still not convinced that an 8-year period is sufficient to support the important conclusions regarding source-receptor relationships. Similarly, the authors haven't demonstrated that the particular 8 year period used, (2000 - 2007), is representative of a longer period.

These critical comments notwithstanding, I continue to consider this to be an excellent paper. The authors state that a decadal analysis will be forthcoming. I look forward to the next paper.