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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Decadal trends in aerosol chemical composition at Barrow, AK: 1976–2008" *by* P. K. Quinn et al.

Anonymous Referee #2

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This paper presents an interesting analysis of measurement data from Barrow, Alaska. Long-term trends in the mass concentrations and chemical composition of aerosols are assessed to investigate changes in long range transport and sources of Arctic Haze, a well-known winter/spring phenomenon. Additional analysis of summertime concentrations, which are less influenced by long range transport, provides better insight into biogenic sources in the Arctic, which are potentially sensitive to climate change and can in turn impact climate through enhanced particle formation. The paper also suggests changes in near-surface halogen (and thus ozone and methane) chemistry as a result of the measured increase in the Cl^- deficit associated with sea salt aerosol.

The study has a clear focus, the results are relevant and well presented, and the methods are well explained. The paper should be published in ACP after minor revision.

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1) The first data set is based on one year only. Inter-annual variability is not large, but will add to the uncertainty in the trend. Has this been taken into account in the significance levels? A sentence or two should be added about this, e.g. at the end of section 2 or middle of section 3.1.

2) In fig captions write Sen's slope instead of SENS slope.

3) The conclusion section is concise and contains all major findings. However, I suggest moving some recommendations of future work from section 3 into the conclusion section, or just repeat the most important ones, e.g. a) from 3.1: Weakening of the Siberian High / relative importance of transport frequency and removal processes: this will require further studies combining models, measurements, emission work. b) from 3.3: Assessing concentration decreases at Barrow will require more accurate emission data for NH3 and SOx, and better quantification of reaction rates to model chemical conversions enroute to Barrow. c) from 3.3: Further work is required to link observed trends at Barrow to changing environmental factors / climatic importance of biogenically produced particles at Barrow, their ability to act as cloud condensation nuclei - yet to be determined.

4) Many but not everyone on Earth knows what AK stands for, I'd suggest Alaska be written out once, either in the title or first sentence of abstract.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 18727, 2009.

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