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Atmospheric Chemistry and Physics Discussions

Interactive comment on "In situ measurements of aerosols optical properties and number size distributions in a subarctic coastal region of Norway" *by* S. Mogo et al.

Anonymous Referee #1

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The paper presents a very thorough and well-written analysis of aerosol optical and microphysical properties measured at the ALOMAR station during the summer of 2008. A trajectory analysis has been added to the paper to relate measured aerosol properties to general source regions. This is a good start for placing the measurements into a broader context but the analysis could go further. Mentions are made of MODIS images and CIMEL sunphotometer data that support particular transport events. These data could be included in the paper to provide further evidence of the impact of transport from different regions on the aerosol properties. In addition, actual trajectories could be shown in a figure for each air mass origin classification to indicate source regions more explicitly. In particular, it would be helpful to know the distance the air

mass traveled in the 120 h prior to measurement. Once these issues and the more minor concerns listed below are addressed, the paper should be publishable in ACP.

Title: Why is "subarctic" used in the title when the measurement location is north of the Arctic circle? Is it because the climate of this region is more typical of subarctic regions than regions further north? This may be confusing to some readers who, based on the title, will think the site is located further south than it actually is.

p. 32924, lines 22 – 24: What concentration of light absorbing particles does the albedo reduction of "1 to 3 %" and a "factor of 3" correspond to?

p. 32924, lines 25 – 27: What is meant by "remote background aerosols"? In particular, how do they differ from "natural particles"?

p. 32927, line 12: change to ". . .can occur in the summer. . .."

p. 32928, lines 6 – 7: The flow was controlled once a day or measured once a day?

p. 32932, lines 27 – 28: Show the back trajectories for the periods of high scattering Angstrom exponents to verify that the source of the aerosol was long range transport from Southern Europe.

p. 32933, lines 10 – 13: How were the dust events confirmed by CIMEL data – observations of high optical depths values? It would be helpful to show back trajectories and a MODIS image from these events.

p. 32934, first paragraph: It would be helpful to put the other stations that the ALOMAR data are compared to in the map shown in Figure 1.

Figure 5: In the figure, indicate the periods of each of the three types of aerosol conditions described in the text on p. 32934.

p. 32935, first paragraph: Can anything be said about the source or composition of the newly formed particles based on measurements or the trajectory analysis? What air mass sector did they correspond to? Were they associated with frontal activity and

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subsidence from the upper troposphere? This type of discussion should be included here or in Section 3.4.

p. 32936, first paragraph: Describe the composition of the aerosol measured at the ALOMAR station and the criteria for inclusion in the "Northern European Aerosol" group.

p. 32936, lines 8 – 21: The discussion of the Angstrom Exponent for scattering indicates that "two lines appear to represent different aerosol types" is not consistent with the statement in the previous section that the particulate composition at the ALOMAR station fits into the group "Northern European Aerosol", i.e., that there is only one aerosol type. Explain.

p. 32936, lines 15 – 16: Can't the line with the smaller slope also correspond to dust particles since they are also relatively large in size?

p. 32936, last sentence: Describe the physical significance of the observation that ". . ..decreases quickly in the 450nm/550 nm range and decreases less abruptly in the 550 nm/700 nm range. . ."

p. 32938, first paragraph: Why aren't MODIS images and CIMEL data included in the manuscript? A comparison of the surface in situ measurements with the column CIMEL data would indicate how representative the surface measurements are of the atmospheric column.

Figure 12: It would be most convenient for the reader if the map shown in Figure 1 with the classification of air mass origins were shown here.

Section 3.4: Typical trajectories for each air mass origin classification should be shown in a figure. Without seeing the actual trajectory, the reader does not have a sense of the distance the air masses travelled over the course of 120 h, and hence, has no idea of the actual source region. Do any of these calculated back trajectories support transport of dust to the site as hypothesized earlier in the paper? What regions of

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Southern Europe were responsible for the high scattering Angstrom Exponents shown in Figure 12 for air mass sectors 1, 2, and 3?

p. 32942, line 20: change to "...during the summer of 2008 at the ALOMAR station..."

p. 32942, lines 26 – 27: change to "...leading to high single scattering albedos..."

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 32921, 2011.