

Interactive comment on “Aerosol exposure versus aerosol cooling of climate: what is the total health outcome?” by J. Löndahl et al.

Anonymous Referee #3

Received and published: 3 August 2010

This paper addresses the adverse health effects of aerosols as compared to the cooling effect that aerosols have on climate. The health effect is estimated in terms of the number of deaths from direct aerosol exposure. It is compared to the lives saved by the cooling effect of aerosols. Especially, the latter effect is highly uncertain. Comparing these two effects in principle is worthwhile, but the approach taken is not convincing. The methods that were used to estimate the number of death per degree warming or number of death due to exposure to ship exhaust are not described. Instead only a literature reference is given. Thus, the reader has no clue how these estimates were calculated and what uncertainties went into these calculations. In addition, the paper has scientific flaws in the climate aspects. Thus, in summary, I need to reject this paper.

Some detailed comments:

1. What do you mean by "In addition, low conc. of PM have impacts on mortality"? Do you mean that already low conc. of PM can have adverse health effects? Please specify.
2. Please explain how the relative risk of premature death per increase in PM_{2.5} is estimated and which uncertainties go into these calculations.
3. You are talking about climate and health effects of aerosols but you include SO_x and NO_x. Either change to "gaseous pollutants and aerosols" or subtract the contribution of SO_x and NO_x from your study.
4. p. 15060, lines 2/3: It is not true that the main indirect aerosol effect is the conversion of cloud droplets to rain drops. The main mechanism is the brightening of clouds due to the more but smaller cloud droplets for the same water content. In fact the Twomey effect that you quote is only about this effect but does not talk about the conversion of cloud droplets to rain drops. If you look in the paper you quote (Lohmann and Feichter, 2005) or into the IPCC AR4 report (chapter 7 vs. chapter 2), you will find that the Twomey effect dominates. There are other additional effects, among them the cloud lifetime effect, but that one is much more uncertain.
5. p. 15060, line 11: There is a specific aerosol property that is most essential for the interaction with climate and that is the size of the aerosol. Accumulation mode aerosols are those that reflect most sunlight back to space and are the preferred aerosols for activation into cloud droplets.
6. p. 15061, lines 22-24: This statement is wrong as well. Aerosols act as CCN, such that an increase in aerosols can increase cloud reflectivity for the same cloud water content, but there is no solid evidence that an increase in aerosols leads to an increase in cloud cover.
7. How did Corbett et al. estimate the number of death from shipping and which uncertainties are associated with this approach?

9., p. 15066, line 26: The sentence: "Other aerosols, especially sulphates and CCN..." is wrong. CCN are no aerosols.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 15055, 2010.

ACPD

10, C6037–C6039, 2010

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C6039