

***Interactive comment on* “Total aerosol effect: radiative forcing or radiative flux perturbation?” by U. Lohmann et al.**

Anonymous Referee #3

Received and published: 8 February 2010

General:

This is an important paper, because it provides a possible solution to a long-standing problem in assessments of the climate effects of anthropogenic aerosols, namely, how to quantify the non-Twomey indirect aerosol effects. Until now, e.g., in the IPCC AR4, only the Twomey effect was quantified as a radiative forcing, enabling a direct comparison to e.g., greenhouse gas forcings. Unfortunately, the paper, in its present form, is not as convincing as the Abstract would indicate. The clarity of the presentation needs to be improved in several places, to improve the readability. For instance, the authors several times use the concept "fast feedbacks", but they never clearly explain what they mean: How fast is "fast"?

Recommendation: Accept only after minor revisions

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Specific comments:

Page 25634, line 5: "rain formation" should be changed to "precipitation formation".

Page 25635, line 27: Please define "fast".

Page 25636, lines 12-14: "For ... CO₂, this adjustment cools However, for stratospheric ozone depletion, omission of the adjustment" Better: Do not use opposite logic in the two cases.

Page 25636, line 29: What is "delta T"?

Page 25637, line 21: "longer time scales (those on which T changes)".

Exactly how are these time scales determined? And, approximately how long are they?

Page 25637, line 28: What do you mean by "intermediate GCM"?

Page 25639, line 15: There is no "solid black line in Fig. 1".

Page 25641, lines 13-14: What do you mean by "aerosol concentrations were put to zero for the integration of the model"? No time evolution of the aerosols?

Page 25642, lines 19-20: "The deviation ... may be indicative of a semi-direct cloud response ..." Agreed, but couldn't it also be due to other effects, i.e., feedbacks between the climate system and clouds?

Page 25643, lines 6-7: This sentence is poorly worded. Apart from typos (see below), it is not clear what "because of the inclusion of fast interactions and feedbacks in the latter" means. Shouldn't it be "the former", i.e., the RFP estimates, rather than "the latter", i.e., the forcing distributions?

Typos, etc:

Page 25641, line 14: "set to zero" would be better than "put to zero".

Page 25641, line 14: "forward integration in time of the model" is poorly phrased. Of

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course the integration is forward in time. Suggestion: "time integration of the model".

Page 25641, line 26: Please insert comma between "CO₂" and "as an increase".

Page 25642, line 3: Please insert comma between "CO₂" and "RFP".

Page 25643, line 6: "pattern" should be "patterns".

Page 25643, line 6: "are a noisy version" should be "are noisy versions".

Page 25643, lines 12-15: This sentence is too long, and poorly structured, with the essence of it, "to be compared", appearing almost at the end.

Page 25643, line 17: Suggest to replace "but do not differ systematically" by ", while they do not systematically differ".

Page 25656, Fig.1 caption: Replace "Per method" by "For each method".

Page 25656, Fig.1 caption: Replace "effects considered" by "effect considered".

Page 25656, Fig.1 caption: Replace "satellite only" by "satellite estimates only".

Page 25656, Fig.1 caption: Replace "yellow circle represents an estimate of" by "yellow dots represent estimates of the combined".

Page 25656, Fig.1 caption: Replace "Black circles" by "Black dots".

Page 25656, Fig.1 caption: Replace "green circles" by "green dots".

Page 25657, Fig.2 caption: The acronyms need to be explained. E.g., does "IAE" refer to the cloud albedo effect only?

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 25633, 2009.

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