

## *Interactive comment on “*

# **Development of an online radiative module for the computation of aerosol optical properties in 3-D atmospheric models: validation during the EUCAARI campaign” by B. Aouizerats et al.**

### **Anonymous Referee #1**

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This manuscript describes development and validation of a radiative module designed for computation of aerosol optical properties in 3D online atmospheric models. The radiative module aims to reduce computational cost in modeling of aerosol optical properties. The presented validation relies on a series of measurements conducted in the framework of a field campaign in the Netherlands, May 2008. Overall, the manuscript gives an impression of a completed study and is well structured. However, my main

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comments and suggestions are directed to the clarity of the presentation. Also, I am very surprised by the reported in this study single scattering albedo reaching the values of 0.6 and even 0.5 at the wavelength of 550 nm. These values are obtained by measurements and reproduced by the radiative module for the Cabauw site in the Netherlands. I hardly believe that such low values can be observed for the ambient aerosols, even in an industrial region. The authors certainly have to check it carefully before possible publication. Coming back to the clarity of the presentation, I found that some statements are limited in justifications and some parts of the manuscript can be better formulated. In particular, the validation part of the paper (section 4) has to be improved. The authors go too fast into the detailed explanation of the measurements and comparison of the number. It has to be clearly stated in which conditions the validation is conducted and what are the restrictions. In addition, I would suggest providing a schematic diagram in the first part of the manuscript illustrating logistics of the developed radiative module. Second schematic diagram can illustrate logistics of the validation part. I leave to the authors to decide how to improve the presentation clarity, but I believe that this improvement will be appreciated by the readers. Nevertheless, I think that this is a useful study which worth of publication and certainly appropriate to Geoscientific Model Development. Below please find my specific comments.

Regarding the limitations of the presented validation: As far as I understand this module is not validated for dust particles. The measured chemical composition does not include mineral dust and the effect of non-sphericity is not accounted for. By the way, how it was found that 29 May represents dust? Is a constant value of density ( $2.5 \text{ g cm}^{-3}$ ) used for all type of particles? Could references or a discussion be provided for this value? What are the expected uncertainties? Are only dry conditions considered in the validation procedure? All above has to be clarified.

The absorption Angstrom exponent is used for the assessment of the absorption coefficient at 550 nm. The absorption Angstrom exponent is derived from the aethalometer measurements and I think that presentation of these values could be interesting. Also

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how they agree with the literature?

The section 4.1.2 is not very clear to me. Could you please provide a justification for 60-40% split of POM? How do you explain the factor used for multiplication of composition concentration? Are these non measurable remaining chemical elements? If yes, what are the assumptions regarding optical properties of these elements?

I think that the word "assumption" appropriates better than "hypothesis" in sections 4.1.1 and 4.1.2.

Section 4.1.3: The next sentence is not clear to me "The median diameter evolves as the geometric standard deviation." Also, there is a typo in second after this sentence: "size description" replace by "size distribution".

Section 4.2: The correlation coefficients for the modeled and the measured mass extinction efficiency and single scattering albedo are reported. The authors can present also the biases.

Explanation of EUCAARI abbreviation is missing. Please provide it already in the abstract and in the introduction.

Introduction, row 14: What do the authors mean by "and so"? Please avoid. Introduction, row 29: There is a typo "elvolving".

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