

## ***Interactive comment on “Physical and optical aerosol properties at the Dutch North Sea coast” by J. Kusmierczyk-Michulec et al.***

### **Anonymous Referee #3**

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This manuscript presents data of vertical column-integrated physical and optical aerosol properties for a site at the Dutch North Sea coast and relates them with boundary layer aerosol characteristics (i.e., PM<sub>10</sub> mass and black carbon data) and meteorological conditions and air mass trajectories. The results and their discussion are of interest. However, the manuscript should be better organized. The introduction fails to indicate what the objectives of the study are and it contains information on sampling sites and measurements, which belongs in the Experimental section. The titles of the sections are not always appropriate (e.g., for sections 2 and 3). It is strange to see that the theoretical section 4 on the EOF method is given after experimental results were presented in section 3. I suggest to have after the Introduction first an Experimental section (which includes information on the measurement sites and mea-

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surement methods used), then a Theoretical section (which could include, in addition to the description of the EOF method, also information on the analysis methods for the AERONET data and on the calculation of the air mass trajectories) and then have a presentation of the Experimental data, followed by Discussion sections. Another shortcoming of the manuscript is that it is insufficiently emphasized that the physical and optical aerosol properties are vertical column-integrated properties whereas the PM10 mass and black carbon data are for the atmospheric boundary layer, so that the relationship between both is not that simple. The authors make no mention at all of the mixing height of the boundary layer at their site(s) and of the possible variation therein with season and how this variation may influence some of the relationships that are presented in the manuscript (e.g., that between AOD and PM10 mass concentration in Fig. 8).

Specific comments:

1. “Angstroem coefficient” should be replaced by “Angstroem exponent” (AE) throughout the manuscript.
2. Pages 1558 and 1559: On page 1558 coordinates are given for TNO and later, on lines 13-15 of page 1559, it is stated that the sun photometer measurements were made at the North Sea coast at the outskirts of The Hague. It is unclear whether the latter site is on the premises of the TNO and whether the coordinates given for the TNO apply to the location of the sun photometer measurements. On line 18 of page 1559, it is then stated that the chemical aerosol information comes from a nearby station and on lines 8-9 of page 1561 it is said that this nearby station is rural station 444 in De Zilk. The latter information is of little help. It should be indicated what the distance between the two locations is and possibly also in which direction the rural station 444 is from the station where the sun photometer measurements were made. Furthermore, the specific (detailed) information on the measurement sites and types of measurements belongs in the Experimental section and not in the Introduction.

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3. Page 1561, lines 9-12: Some information on the instrumentation used for obtaining the PM10 mass and black carbon data would be welcome. It definitely should be specified to which aerosol size range the black carbon data apply (PM10, TSP, PM2.5 or still something else?).
4. Page 1562, lines 8, 16, and 17: It is unclear what the “most probable values” and “frequency of occurrence” actually mean. Instead of using such obscure terminology, well-defined data, such as (full) ranges or interquartile ranges, should be given.
5. Page 1563, lines 5-7: Instead of deriving relationships of the BC/PM10 ratio on the AE, it would be more logical to derive relationships of the AE on the BC/PM10 ratio.
6. Page 1563, lines 11-14: The explanation given in this sentence is unclear. In any case, it is farfetched to invoke an article which deals with savanna fires in South Africa to explain aerosol properties in The Netherlands.
7. Page 1563, line 23: Instead of enhanced deposition of fine particles, changes in air mass origin (and thus also in aerosol sources) are expected to have a much greater impact on the change in proportion between fine and coarse particles.
8. Page 1569, lines 24-25, and Page 1570, lines 1-3 (section 6.1): These sentences and the relationship between Fig 10 and Fig. 9 are unclear. The authors relate here the air masses from the NE-SSW sector with the size distributions (Fig. 9), but the latter Figure has also size distributions for the SSW-NE sector.
9. Page 1571, lines 10-15 (section 6.2): These sentences are equally confusing. It says that the fine mode radius is the same for all seasons except the winter, but Figs. 9c-d are only for the summer and winter seasons. The size distributions in Figs. 9a-b for the spring and autumn seasons do not apply to the SSW-NE sector, but instead to the NE-SSW sector.
10. Page 1575, lines 12-14: The title of the article is missing for this reference.
11. Page 1576, lines 6-7: The text in this reference is mixed up.

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