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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Sea Spray Fluxes from the Southwest Coast of the United Kingdom – Dependence on Wind Speed and Wave Height" *by* Mingxi Yang et al.

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This contribution describes total and size resolved Eddy Covariance measurements of aerosol number flux at a coastal research station. The total number flux measured with a CPC integrates particles larger than 1.5 nm. While size resolved fluxes between 0.1 and 6 um are derived from a CLASP. The authors combine the measured net fluxes with size resolved dry deposition velocities derived from the model of Slinn and Slinn (1980), in order to obtain the source flux over the footprint area. The dependence of the size resolved and size-integrated source flux on wind speed, wave height, and wave Reynolds number is studied in detail and compared with previous parametrizations

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Discussion paper

that where derived over the open ocean and in coastal waters. The authors conclude that their measurements and findings are representative for coastal waters (excluding the surf zone) where sea spray emissions are largely enhanced due to costal wave breaking. Eddy Covariance measurements of aerosol fluxes in the marine environment provide an almost direct way to measure sea spray emission fluxes, however due to the complexity of making these measurements only few data sets exist today. Quantification of coastal sea spray emissions are relevant to the aerosol concentration and composition in the densely populated coastal regions and may thus bear relevance for heath related studies. Comparing the relation of coastal and open ocean sea spray emissions to forcing parameters may help to further improve the understanding of sea spray emission in general. I therefore consider this paper to be a valuable contribution and recommend publication with minor revisions as outlined below.

*As stated by referee Christopher Fairall the source flux can be derived from the measured turbulent flux (FEC) via Source = FEC+Vd*C-Vg*C, where C is the particle concentration, and Vd and Vg are the dry deposition and the settling velocity respectively. Vg depends on the particle size, shape and density, and hence on the relative humidity and the hygroscopy of the particles. The deposition velocity Vd may in additional be affected by turbulent and diffusive processes. Various dry deposition parametrizations can be found in the literature. The authors settle for the model of Slinn and Slinn (1980), which assumes that the particles assume their dry diameter in the constant flux layer and grow to a diameter defined by the growth rate and the assumed equilibrium relative humidity above seawater. Depending on the ambient relative humidity, the assumption of dry sea salt particles in the constant flux layer may introduce some errors. I therefore recommend the authors to explicitly state how they apply Slinn and Slinn (1980), i.e. which diameter conversions are performed, what particle densities are assumed.

*I further suggest that the ambient relative humidity time series should be presented in Fig 3., since it should play an important role in determining the correction term (Vd*C-Vg*C).

Line 103 to 105: Please consider splitting this sentence into two. Maybe the time series of the correction factors could be provided in the appendix to illustrate the variability of the relative importance of the correction term.

Line 109: Please specify which of the formulations, provided in Gerber (1985), you are using and with which set of coefficients?

Line 115: please correct “off of”

Line 138: R (=radius) has not been defined previously. Theres is some chance of confusion with the coefficient of determination. At this note, please unify the use of italic and noraml font for variables like Hs and RHw.

Line 134 to 142: How much does Vd predicted by Slinn and Slinn (1980) vary over the range of conditions encountered during the observations? Would accounting for these variations reduce the scatter in Figures 4, 6, and 7? However, these variations may be small compared to the uncertainties introduced by the unknown size distribution below 0.1 um.

Line 189 to 190: Replace “likely” with “obviously”. What other difference is there between the source and net fluxes than the deposition correction scheme?

Line 222: Please state the parameters used in the parametrization of Resio et al (2002).

Line 247 “. . . dependence of the sea spray flux . . .”

Line 265: May this be because above 2 um the deposition and settling velocities become so large that the correction term plays an too important role, thereby increasing the uncertainty of the source flux estimation?

Line 272 to 275: please specify to which size range the lognormal mode is fitted to? From the data there is no evidence that the peak of dF/dR80 is at R80=0.1um. I suggest that you also assume a lower mode center e.g. 50 nm or 70 nm, in order to estimate

the uncertainty of the correction for the missing film drop flux.

Line 276: What is the reason for integrating from 10 nm rather than from 1.5 nm?

Line 275 to 278: What is the reason for comparing the median of the correction to the mean of the number flux difference? Considering the large variability of the total number fluxes (Fig 3. B), the median of the number flux difference may be the more robust estimate.

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