

Interactive comment on “The value of remote marine aerosol measurements for constraining radiative forcing uncertainty” by Leighton A. Regayre et al.

Anonymous Referee #1

Received and published: 17 January 2020

The paper is an interesting attempt at constraining radiative uncertainty with a not too common approach. The paper is generally well written and the method generally adequately described. I do think however that the some of the conclusions drawn by the authors goes beyond what is supported by the data and references, in particular with respect to sea-salt parameterisation.

It may be that this is just a matter of making the assumptions more clear.

Introduction section 2. No variations in pre-industrial aerosols → The author has included a reference in SI (Korhonen et al (2010) that shows this is still a possibility. This may be possibly be given as an example but I agree that it is likely not important.

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Line 79. Is this RF or is it ERF?

Line 93 N700: Is it wet or dry size. Radius or diameter?

Line 109-1111 + Figure 1d. While the constraintment of the model parameterisation narrows the range of CCN concentrations and reduces the original model bias, the constrained values has a very low variability compared to the observations. While it is understandable that the combined product should may have lower deviation than both the model and measurements alone. Is it realistic that the constrained variability is so much lower compared to observations?

Figure 2. The N700 number is much lower than than CCN_0.2 Do you have any estimates for N(total sea-salt) to show that the constrained sea-salt emissions increase is indeed the cause of CCN_0.2 and not e.g. the increase in Nss-sulphate. Or the constraining of accumulation mode dry deposition. Figure 2: Does both model and measurements use the same definition of aerosol size, i.e. the same relative humidity? If the measurements is done at e.g. 80 % relative humidity and the model results use dry radius, the N700 from the model should be lower than the measurements

Line 216: Adding the NH experiment is reducing the number of constrained model versions to 0.7 % of the total. As this likely give an even more narrow range for the constrained estimate e.g. as in figure 1d. Any comments on the validity of this heavy constraintment given that it is based on a very limited amount measurements?

SI Line 106. Any estimates for the uncertainty caused by the sampling procedure?

SI: Wind speed discrepancies. I can not see that the assumption about wind speed discrepancy being unimportant is supported at all by Korhonen et al. On the contrary the main point of Korhonen et al is that even a quite modest increase in wind-speed creates a higher CCN concentration. As the wind speed in the ensembles is said to be lower than the values in ACE-SPACE and even much lower than the climatological values the unconstrained values, the unconstrained sea-salt emissions is expected

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to be lower than during the campaign and even lower compared with climatological values (potentially relevant if the "NH" added constraint use retrieved values for AOD). Any deviations for the high wind speeds would be even more deleterious for the constraint of sea-salt emissions.

Interactive comment on *Atmos. Chem. Phys. Discuss.*, <https://doi.org/10.5194/acp-2019-1085>, 2019.

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