

Interactive comment on “Comparison of ambient aerosol extinction coefficients obtained from in-situ, MAX-DOAS and LIDAR measurements at Cabauw” by P. Zieger et al.

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Review of : Comparison of ambient aerosol extinction coefficients obtained from in-situ, MAX-DOAS and Lidar measurements Authors: Ziegar et al.

This paper describes results from a field campaign that compares in-situ and remote measurements of the aerosol extinction as well as a closure study between HTDMA $g(RH)$ and humidified nephelometer $f(RH)$ measurements. The extinction comparison identifies specific air mass source regions and aerosol types that account for differences in the remote and in-situ measurements.

Experimental Section:

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Was the nafion tubing a bundle of many tubes or a single tube? What was the tube ID?

Is it possible to apply the same O₄ correction factor to the MAX-DOAS retrievals so that this difference can be eliminated when comparing the measured extinctions to the surface in-situ measurements?

4.1 Wet neph analysis

How much does the fitted value of fRH differ if RH values down to the lower limit of the dehydration branch are used? There are so few data points above 70% RH that doing the fits over a larger RH range will decrease the fit uncertainty. What is the variability in the scattering coefficient over the 3 hour time frame of the humidity scans? My concern is that the air mass and aerosol can change significantly over such a long time period. Is it possible to average the humidity scans over an hour or less?

4.2 Factors influencing $f(RH)$

How does the 165 nm diameter size of the HTDMA compare to the median volume or surface area aerosol diameter during the measurement period?

Trish Quinn has a paper where she shows a nice correlation between fRH and the ratio of $OC/(OC + SO_4)$. (Geophys. Res. Lett., 32, L22809, doi:10.1029/2005GL024322) Can you compare fRH to this fraction or to the mass fraction of OC or total carbon rather than just BC ? I don't know if there was any aerosol chemistry measured or if there are past measurements from this region to which you can refer. BC may have a minor influence on fRH or its influence is coincidental with its co-emission with OC as OC will comprise a much larger fraction of the aerosol mass than BC . Keep in mind that BC usually comprises a larger portion of the aerosol mass in fine mode aerosol than in accumulation mode aerosol, so its influence will be more apparent for gRH than fRH .

4.3 Closure Study

In your calculation of g from Equation 2 what values did you use for a_w and κ ? How did you determine κ ?

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Place the empirical equation for $g(\text{RH}=85\%) = b_1 + \dots$ on a separate line with a number. The following sentence would be clearer if written "The result of the $f(\text{RH})$ calculation using Equation 9 for $g(\text{RH})$ compared to the measurements is presented in Fig. 5d." Otherwise it's unclear as to how $f(\text{RH})$ was calculated, whether from the measured $g(\text{RH})$ or from the empirical equation.

4.4.1 MAX-DOAS

The error bars for the in-situ data are for the dry neph measurements. Depending on the ambient RH, the single largest source of uncertainty is likely from the derived scattering enhancement factor or $f(\text{RH})$. An uncertainty of 1-2% in the measured RH can propagate to a very large uncertainty in $f(\text{RH})$ and the calculated ambient scattering coefficient. In the Experimental Section can you give information about the type of RH sensor used in the $f(\text{RH})$ measurement and how this sensor was calibrated? Can you give an approximate range to the uncertainty in the $g(\text{RH})$ and $f(\text{RH})$ measurements?

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