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Supplement of

Aerosol optical properties in the southeastern United States in summer – Part 1: Hygroscopic growth

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S.1 Demonstration of broader applicability of the κ_{ext} parameterization for *f(RH)*

The data presented in this manuscript are limited to the southeastern U.S. in summer. In this section we show fits of the κ_{ext} parameterization (Eq. 6) to *f(RH)* measurements reported in Zieger et al. (2014). These measurements were taken in Ny Ålesund, Spitsbergen (remote Arctic site), the Jungfraujoch, Switzerland alpine research station (high-altitude background/free troposphere site), Cabauw, The Netherlands (rural polluted continental site), Mace Head, Ireland (rural coastal site), and Melpitz, Germany (rural polluted continental site). Data were digitized from Zieger et al.'s Figs. 8 and 9 using the online graph digitizer tool WebDigitizer (http://arohatgi.info/WebPlotDigitizer/, accessed December 5th 2015). Cases described as "sea-salt" or "dust" or that showed a distinct deliquescence step were not digitized because the κ_{ext} parameterization is not applicable in these circumstances (Sect. 3.4). The digitized cases and their descriptions from Zieger et al. (2013) are: Fig. 8b (Cabauw: continental south), Fig. 8c (Cabauw: maritime heavily polluted), Fig. 8e (Cabauw, continental east), Fig. 8f (Ny Ålesund, non sea-salt), Fig. 9h (Jungfraujoch, background), Fig. 9k (Mace Head, polluted sector), Fig. 9l (Melpitz, continental west), Fig. 9n (Melpitz, polluted), and Fig. 9o (Melpitz, continental southwest). Figure S1 shows the fits to the κ_{ext} and γ parameterizations for these cases. By inspection the κ_{ext} parameterization describes the observed *f(RH)* curve as well or better than the γ parameterization in 8 of 9 cases, and especially captures the rapid increase in *f(RH)* for RH>80% in the polluted continental cases, which are presumably organic-dominated.

S2. Relative humidity within the CRDS during SENEX and SEAC4RS

The efficacy of the RH control of the humidified and dry channels in the CRDS varied during SENEX and SEAC^{4}RS. A histogram of RH is not well described by a Gaussian distribution for the high-RH (~90%) channel (Fig. S2). Flight-to-flight changes in the RH were associated with changes in the control software, air in the water circulation lines, and temperature control issues in the aircraft cabin.

References

Zieger, P., Fierz-Schmidhauser, R., Weingartner, E. and Baltensperger, U.: Effects of relative humidity on aerosol light scattering: results from different European sites, Atmos. Chem. Phys., 13, 10609–10631, doi:10.5194/acp-13-10609-2013, 2013.

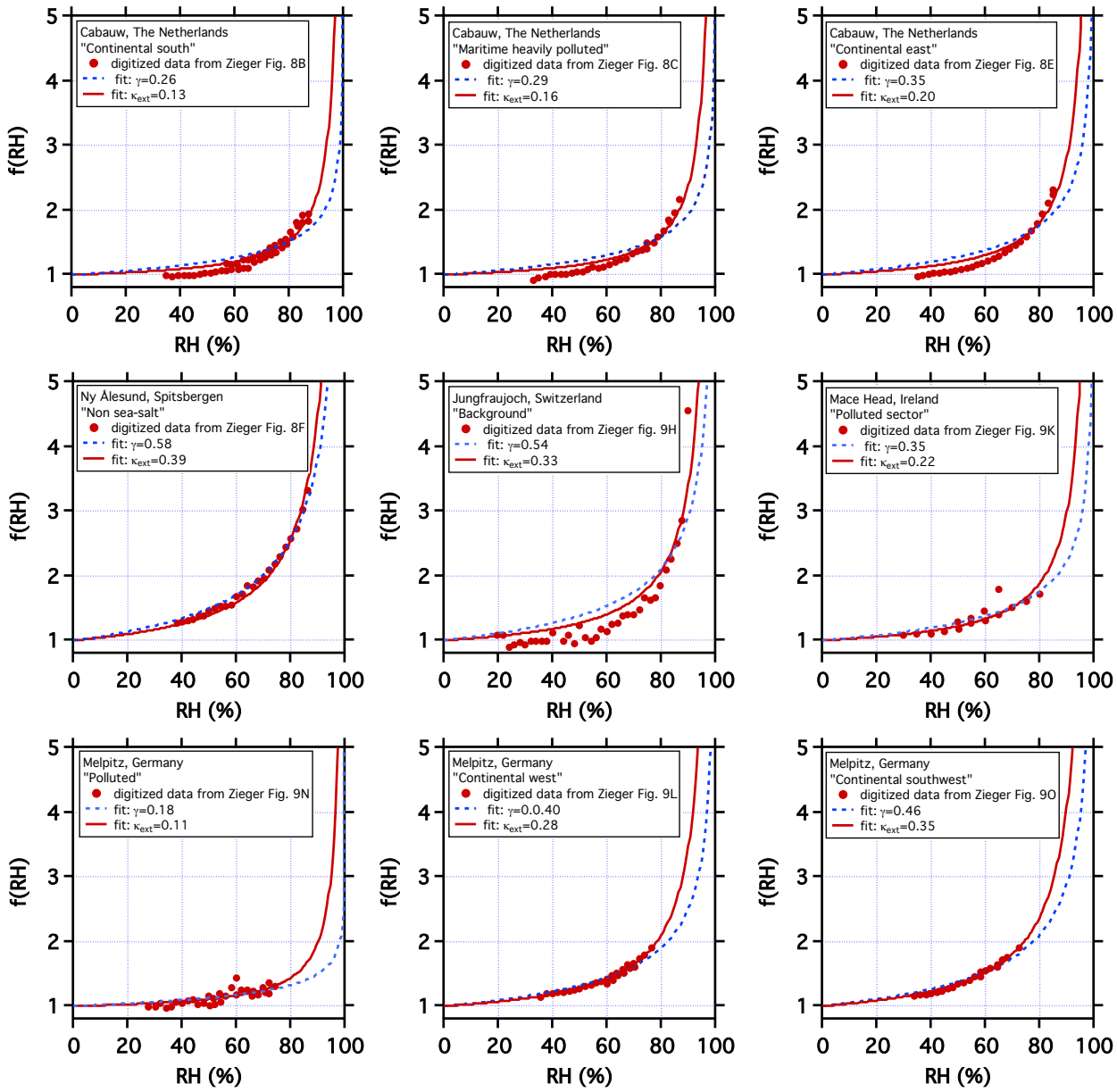

Figure S1. Data digitized from Zieger et al. (2013) of f(RH) at European sites under polluted or background conditions and fit with the κ_{ext} and γ (RH_0=0) parameterizations.

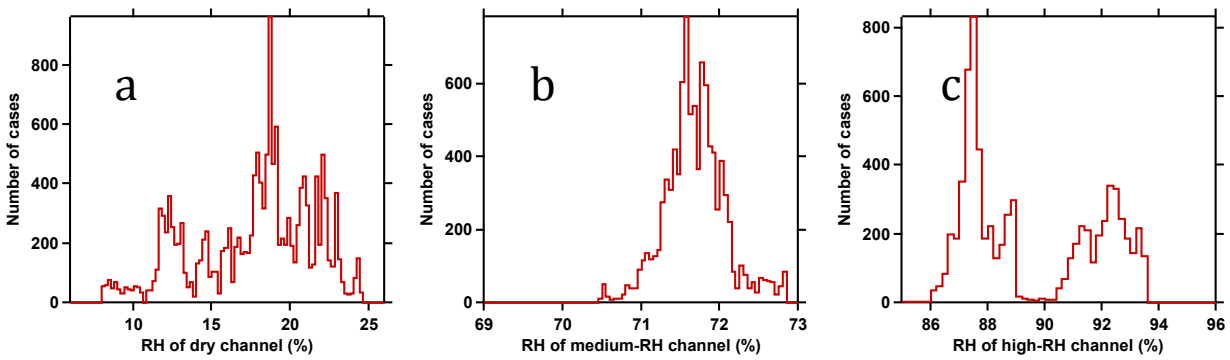

Figure S2. Histograms of RH values measured in the dry, medium, and high-RH channels of the CRDS for the selected data from SENEX and SEAC^{4}RS.