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LETTER TO THE EDITOR

Reply to R. Jaenicke and L. Schütz

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The comments by Jaenicke and Schütz on our paper concerning transport, conversion and deposition of sulphur oxides over the Atlantic (Prahm et al., 1976) are well taken, and cover points which perhaps were not sufficiently stressed in our discussions. The main purpose in presenting the electron microscopic data was to demonstrate the verification of the prediction, implicit in the "air trajectory box model", that the aerosol morphology must be dependent on, and a unique characteristic of the air mass trajectories. Our finding that the two carefully chosen and distinctly different trajectories examined were each characterized by distinct morphologies, encourages us to continue a series of experiments designed for scanning electron microscopy of aerosol morphology as a function of trajectory. If the universal correctness of the model could be demonstrated through the careful use of well-defined trajectories, then one can use the morphologies as a diagnostic tool in identifying unknown trajectories. The experiments we analyzed and described were not planned for scanning electron microscopy, and we certainly would discourage anyone from using millipore filters for quantitative determination of particle size or shape distribution without considerable development of the technique. We particularly point out that the measurement of particle concentration in the ranges 0.02–0.04, and 8–16 microns were not considered significant (although measurements of the former were made on enlargements of the original 10,000 magnification images (i.e. 40,000×)). A preliminary scan of transverse cross sections of the filters indicates that the volume of the filter contains the same order of magnitude of particles as does the surface, with no particles in the volume exceeding 0.3 micron. The physics of aerosol collection on filters is complex, as discussed, e.g. by Spurny & Pich (1964) and Spurny & Lodge (1968), and the problem of specifying the surface collection characteristics as distinct from that of the volume, difficult, especially on coarse Millipore filters. It is reasonable to assume, however, that provided the collection characteristics are the same, two aerosols can be compared directly by SEM observation of the filter surface. We also speculate, contrary to Jaenicke and Schutz' unjustified implication, that the filter surface samples only a fraction of the total volume of air passing through the filter, but it may do this sampling efficiently. If the large fraction of particles in the range 0.08–0.4 are deposited by diffusion out of the laminar flow, this process should be even more efficient for smaller particles, which are in fact absent from the distribution, and hence not present in the aerosol (this would also explain the second maximum in the mass distribution above 4 microns, since these particles are collected with almost unit efficiency for the entire air volume). Heating of the filter samples occurs simultaneously with the coating process. It remains to be shown how large is the fraction of the volatile particles which are not replicated during this procedure. Only the relative mass distribution can, of course, be studied by the discussed procedure, and it is used as such in our paper. However, we do not consider the problem concerning quantitative size distribution measurements solved, and emphasize that we described our size distribution study as both "preliminary and exploratory" (Prahm et al.,

1976). Although we appreciate the comments by Jaenicke and Schütz, we consider them to have no impact on the statements and conclusions in the paper questioned, and would like to re-emphasize the benefit to be gained by combining a detailed meteorological analysis including air trajectories with electron microscopy of sampled aerosols.

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[1] In this publication the following reference was missing in the reference list: Junge C. & Jaenicke, R. 1971. New results in background aerosol studies from the Atlantic Expedition of the *R. V. Meteor*, spring 1969, *Aerosol Sci. 2*, 305–314.