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LETTERS TO THE EDITOR

Comment on an article by J. Wu

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In a recent publication, Wu (1989) has argued that the majority of the marine aerosol consists of jet drops as opposed to film drops. I would suggest that this conclusion is incorrect, being based on poor estimates of the oceanic flux of large bubbles. In addition, Wu relies entirely on a single study of film drop production which, whilst of great value, was restricted to the measurement of film drops of greater than 8 μm (Resch et al., 1986). Other studies have revealed that a far greater number of smaller film drops are produced (Blanchard and Syzdek, 1988).

Wu is apparently aware of the work of Blanchard and Woodcock (1957) and Cipriano and Blanchard (1981), but has failed to correctly grasp the crucial issue. Blanchard and Woodcock did indeed conclude that jet drops probably formed the most important part of the marine aerosol. However, Blanchard realized that a definite conclusion was premature because of the limitations of their bubble measurements. The principal limitation of their measurements was their inability to measure near-surface bubble concentrations or fluxes close to and immediately following a breaking wave. It was obvious to Blanchard and Woodcock (as it should be to anyone) that the majority of large (>1 mm) bubbles were surfacing in this region. Ever since, the answer to the problem of the relative importance of film drops and jet drops has rested upon evaluating the flux of large bubbles surfacing immediately following a breaking wave.

The experiments reported by Cipriano and Blanchard (1981) were an ingenious response to the difficulties of measuring bubbles near an ordinary breaking wave. They used a simple simulation in which it was possible to measure the total flux of bubbles, and concluded that film drops were the main component of small drops. There is a good deal of supplementary evidence that this conclusion is correct (Woolf et al., 1987). It should be emphasized that this evidence is from laboratory simulation experiments and field verification is necessary. However, the irresponsible use of oceanic data by Wu is very far from the upgrade he boasts.

The measurements of Kolavayev (1976) and Johnson and Cooke (1979) are among the most important measurements of oceanic bubbles. These measurements were of small bubbles, 0.5 m and more beneath the sea surface. Hence, the summary description of the distribution of bubbles by Wu (1988) is valid for small bubbles at a depth of 0.5 m or more. However, it is entirely inappropriate to extrapolate this distribution to the surface and to very large bubbles. It is very unlikely that the distribution of highly buoyant large bubbles can be described by Wu's formulae.

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