Correction to the effective radius expression in O'Neill et al. (2005)

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Equation (5) in O'Neill et al. (2005) relates the fine-mode effective radius to the spectral derivatives α_f and α'_f in a simple analytical fashion. The coefficients of the 3rd order ($\rho_{eff,f}$) polynomial contained errors introduced in the transcription from our documentation to the paper. There was, in addition, a problem at the small particle end of its applicable range due to higher order polynomial effects. This brief note was accordingly written to corrrect the transcription error while at the same time improving and simplifying the polynomial fit.

The expression which replaces the $\rho_{eff,f}$ polynomial of equation (5) in O'Neill et al. (2005) is;

$$\rho_{eff,f} = a_0 + a_1\psi + a_2\psi^2 \qquad (1)$$

where, as before;

$$\rho_{eff,f} = 2\frac{2\pi r_{eff,f}}{\lambda}|m - 1|,$$

$$\tan\psi = \frac{\alpha'_f - \alpha'_{f,0}}{\alpha_f - \alpha_{f,0}},$$

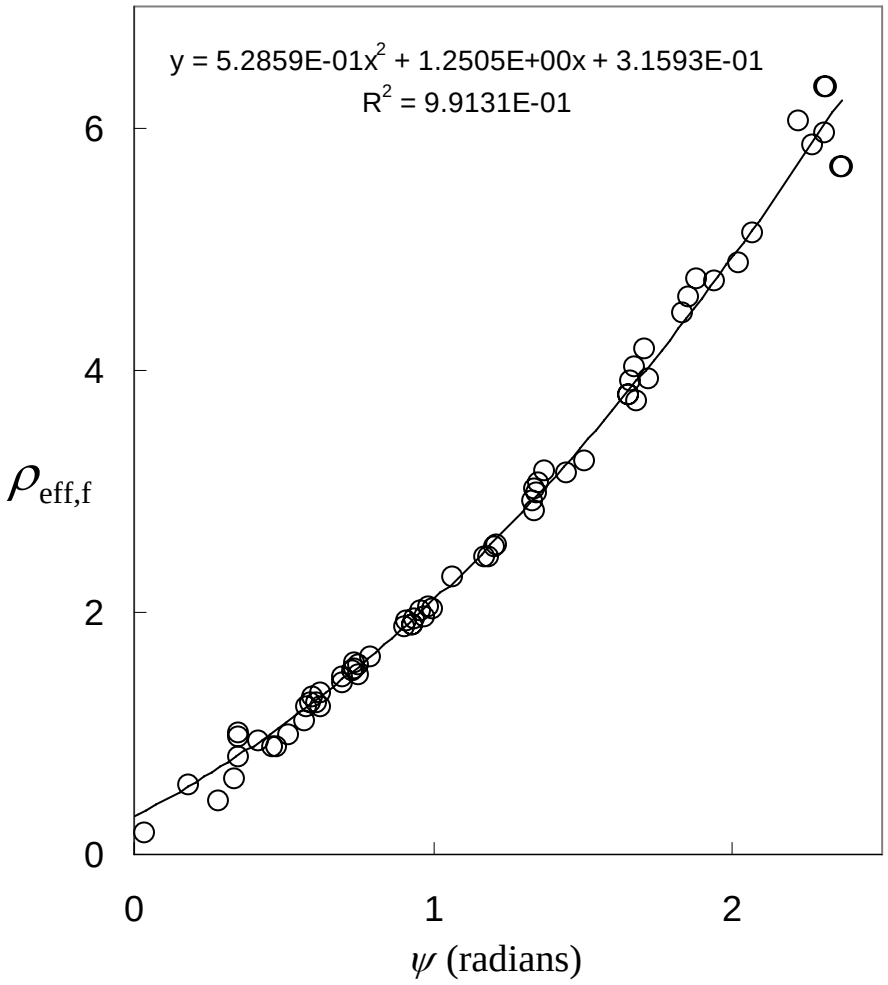
but where ψ is in radians. The curvature parameters ($\alpha_{f,0}$, $\alpha'_{f,0}$) = (0.5, 0.2) and the polynomial coefficients (a_0, a_1, a_2) = (0.31593, 1.25050, 0.52859). Figure 1 illustrates the quality of the fit to a variety of simulated fine-mode aerosol cases.

References

O'Neill, N. T., S. Thulasiraman, T. F. Eck, J. S. Reid, Robust optical features of fine mode size distributions; application to the Québec smoke event of 2002, *J. Geophys. Res.*, Vol. 110, No. D11, D11207, doi:10.1029/2004JD005414, 2005.

Figure captions

Variation of $\rho_{eff,f}$ as a function of the curvature angle ψ. The circles represent 69 simulated Mie calculations for a variety of (log-normal) fine-mode, pollution and smoke cases whose parametric ranges are described in O'Neill et al. (2005). The solid line is the 2nd order polynomial fit of equation (1).


y = 5.2859E-01x2 + 1.2505E+00x + 3.1593E-01
R2 = 9.9131E-01
6
4
2
0
0
1
2
ρeff,f
ψ (radians)