Correction to "Energy dissipation of wind-generated waves and whitecap coverage"

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The equation of the total energy given by *Hwang and Sletten* [2008, equation 5] is for a sinusoidal wave field. In the translation to random wave field, a factor-of-two error has been introduced inadvertently. So the parameterization equation as presented underestimates the wave energy dissipation by a factor of two when the wave energy is expressed correctly. A few possible interpretations of the underestimation in the process of developing the parameterization function include: (a) the frequency bandwidth of integration for calculating the energy dissipation over the wave spectrum is too narrow, probably by a factor of about two, (b) the assumption of power law spectral function for short and intermediate scale waves (SISW) may be insufficient to capture the complicated spectral composition of the SISW, which are the primary contributor of the ocean surface roughness that influences the surface wind stress and energy transfer, (c) the dimensionless dissipation coefficient derived from simultaneous measurements of surface elevation and near surface pressure fluctuation may underestimate the total wind input into the wave field, and (d) a combination of all factors mentioned above. Given the present state of available data on wind wave generation and the SISW spectral information, it is not possible to pin down the exact source of discrepancy and better empirical data are needed on SISW and wind generation measurements in the ocean environment. In the interim, the factor-of-two overestimate of wave energy in the parameterization equation can be compensated by expanding the integration bandwidth by a factor of two, from N=5 to N=10 (all notations in this note are the same as those in *Hwang and Sletten* [2008]). As shown in Figure 1 here, the

calculation result base on $a_s \approx 4$ and $N=10$ would yield

$$\langle \gamma \rangle = 0.20 \left(\frac{U_{10}}{c_p} \right)^{2.3} = 0.20 \omega_*^{2.3} . \quad (1)$$

With the corrected total energy per unit area of the ocean surface, E (in J m^{-2}), of a random wave field given by [e.g., *Komen et al,*. 1994; *Drazen et al.*, 2008)

$$E = \rho_w g \eta_{rms}^2 , \quad (2)$$

the parameterization function for the total wave energy dissipation remains

$$\varepsilon = \alpha \rho_a U_{10}^3 , \text{ with } \alpha = 0.20 \omega_*^{3.3} \eta_* , \quad (3)$$

same as equation (15) of *Hwang and Sletten* [2008].

References

Drazen, D. A., W. K. Melville, and L. Lenain (2008), Inertial scaling of dissipation in unsteady breaking waves, *J. Fluid Mech.*, *611*, 307-332.

Hwang, P. A., and M. A. Sletten (2008), Energy dissipation of wind-generated waves and whitecap coverage, *J. Geophys. Res.*, *113*, C02012, doi:10.1029/2007JC004277.

Komen, G. J., L. Cavaleri, M. Donelan, K. Hasselmann, S. Hasselmann, P. A. E M. Janssen (1994), *Dynamics and modelling of ocean waves*, Cambridge Univ. Press, Cambridge, UK, 532 pp.

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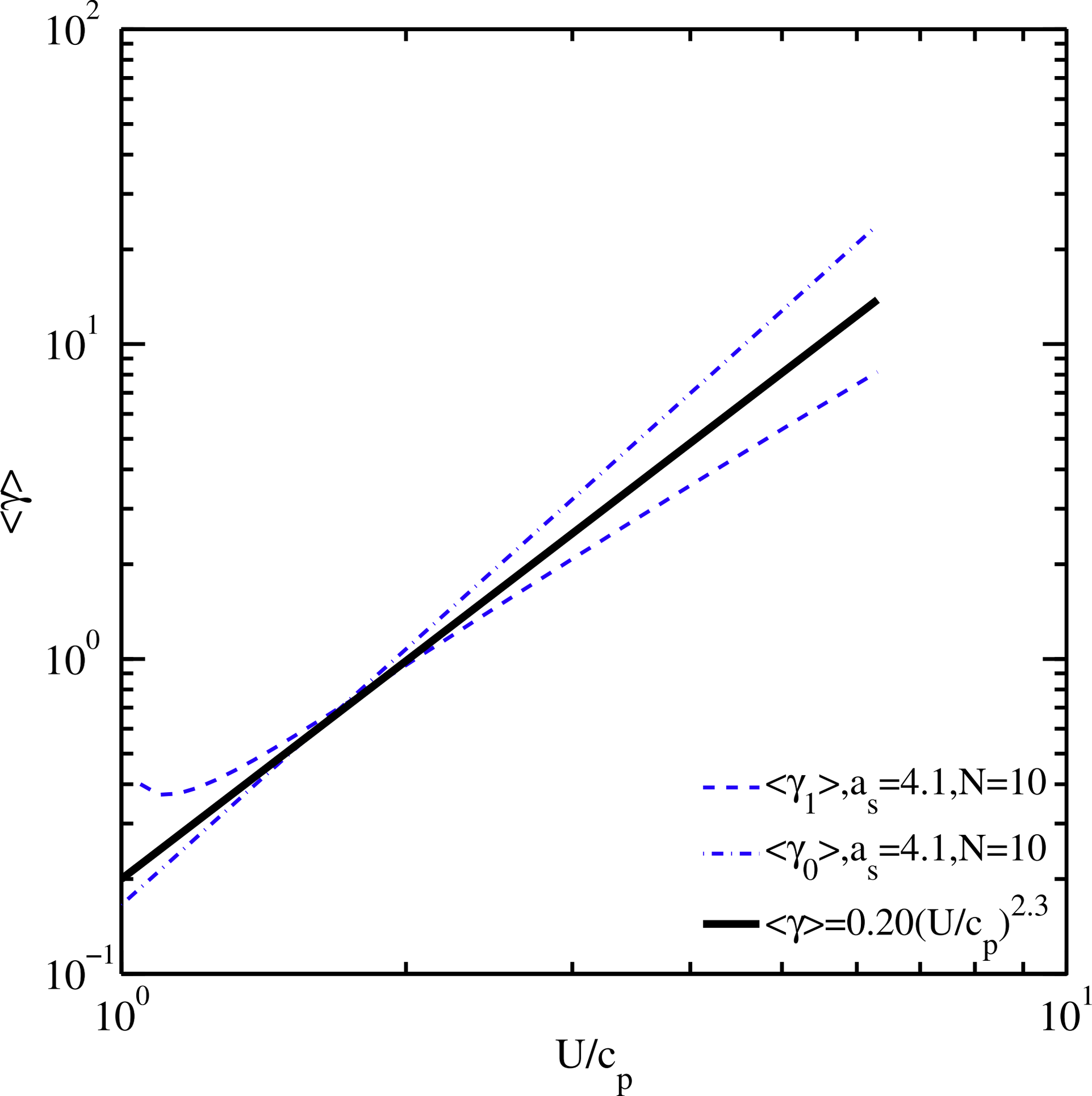
Fig. 1. Integrated dimensionless wind input coefficient matched to the average of computation with assumed spectral function of short and intermediate waves and empirically fitted spectral function of dimensionless wind input coefficient.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