New text that I propose to insert at the end of section 4.3 :

- - - - - - -

It may be interesting to illustrate in wavenumber space where the imbalance is occurring. The net variation rate of sea wave momentum may be written :

$$\left(\frac{\partial M}{\partial t}\right)_T = \int g(k)\,d(\ln k) \qquad \text{(Za)}$$

$$\text{with } g(k) = \rho\omega k^2 \int_{-\pi}^{\pi} \left(\frac{\partial F}{\partial t}\right)_T \cos\varphi\, d\varphi \qquad \text{(Zb)}$$

In equation (Zb), $(\partial F / \partial t)_T$ includes all the terms of equation (28). In a stationary situation the spectrum does not evolve any more and g(k) should be zero everywhere. Unfortunately due to the inaccuracies of the models this cannot be achieved perfectly. Figure Z displays an example of the variation of function g as a function of $\log_{10}$(k). Due to the definition of function g(k) in equation (Za), momentum balance implies that the areas above and below the line g(k)=0 should be equal in Figure Z. By construction this is achieved when the model of this paper is used (full line). When the classical approach is used (dashed line), the fact that we have taken $\gamma=\gamma_1$ ensures that the overall energy balance requirement is fulfilled. As concerns the momentum balance, however, it can be seen in Figure Z that the area over the line g(k)=0 is significantly larger than the area below the line. This indicates that the integrated momentum variation rate is positive, leading to irrealistic accumulation of momentum within the wave system, as discussed in section 2.

- - - - - -

(see proposed figure Z on next page)

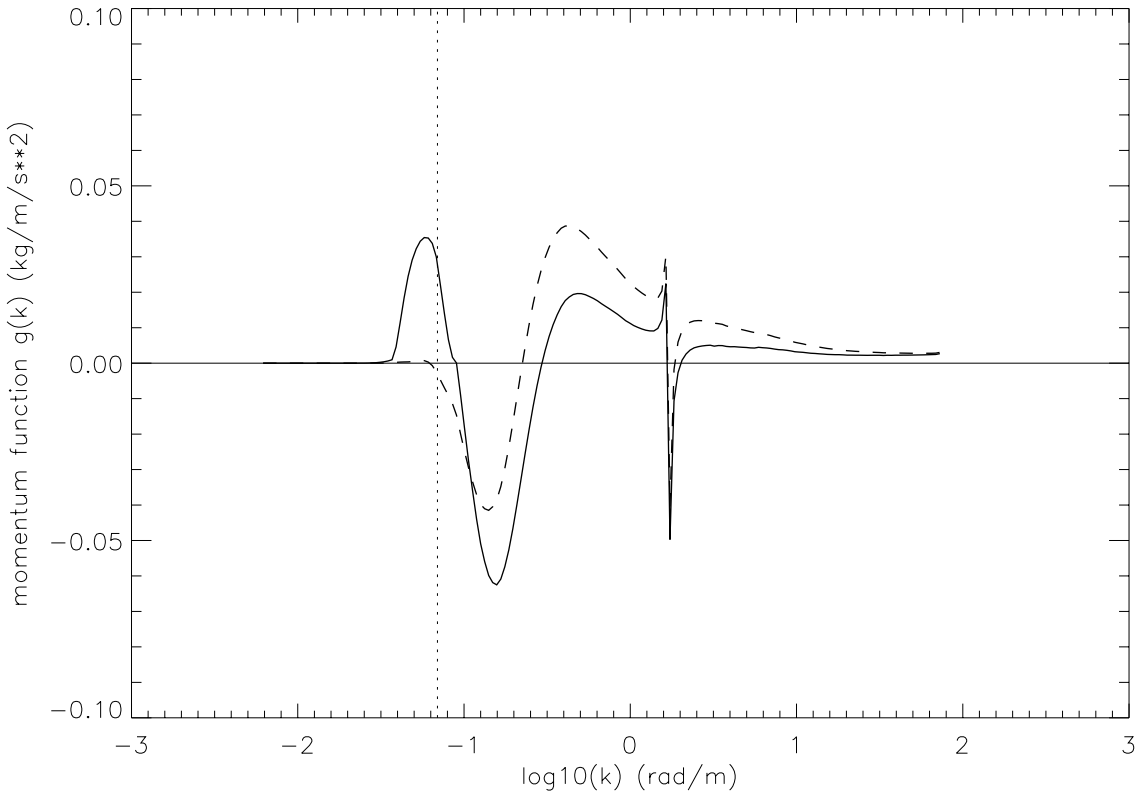

Figure Z. Momentum function g(k) (equation Za) as a function of $\log_{10}(k)$. Wind speed is taken as 10m/s. The sea wave spectral model is the same as in Figure 1, with high wavenumber spectrum from Elfouhaily et al. (1997). The dotted vertical line indicates the position of the spectral peak k_p. The wave breaking term β_{br} is from Komen et al. (1984), and the wind input term β_w is from WAMDI (1988). Solid line : results from the model of this paper. Dashed line : results from the classical approach taking $\gamma=\gamma_1$. The discontinuity near $\log_{10}k=0.2$ rad/m is an artefact produced by the change of directional spreading function of the model spectrum taken at $k=25k_p$.