Ocean Sci. Discuss., 9, C1263–C1264, 2012
www.ocean-sci-discuss.net/9/C1263/2012/

Ocean Science Discussions

Interactive comment on "Imbalance of energy and momentum source terms of the sea wave transfer equation for fully developed seas" *by* G. V. Caudal

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Received and published: 13 November 2012

Dear reviewer,

As you mention, the downward flux introduced in the paper, while permitting to bring consistency between energy and momentum equations, does not however allow a decrease of the cost function, as could be seen in former Figure 2. I have now included two modifications to the paper : Firstly, I now use the exact calculation of the non-linear transfer term (instead of the discrete interaction approximation). Secondly, I now use the wind and wave breaking model functions that led to the smallest energy-momentum imbalance in Tables 1 and 2 (i. e., βbr by Komen et al. (1984) and βw from WAMDI (1988)). With this new approach, not only the cost function is strongly reduced, but also the model of this paper yields cost functions which are systematically significantly

lower than cost functions obtained with the classical approach (see in attached file the proposed new figure replacing former figure 2). In that figure it can be seen for example that for U=10m/s and using the Elfouhaily HF spectrum the cost function K*10**7 is reduced from 8.2 to 6.7 when the model of this paper is used instead of the classical approach.

In your third paragraph you recommend that possible improvements of the source terms or empirical spectra should be investigated. I have therefore tested different modifications of the empirical spectrum and source functions. A rather efficient way to reduce further the cost function was obtained by smoothing out the transition between the azimuthal spreading function by Resio et al. (2011) (used at the lower wavenumbers) and the one by Elfouhaily et al. (1997). Moreover, in the standard version of the model, the position of this transition had been chosen rather arbitrarily at k=ko=25kp, on the basis that it corresponded to the wavenumber domain where Resio et al.'s model was validated against data. It is however possible to make ko an adjustable quantity. For example, for U=10m/s using Elfouhaily et al.'s (1997) HF spectrum and including the aforementioned smoothing, an optimum is found by taking ko≈90kp (instead of ko=25kp). In that optimal case, the cost function K*10**7 is reduced from 6.7 to 6.25. Other trials were also done modifying the source functions, but they did not lead to very significant improvements

I propose to insert the above discussion within the paper, at the end of section IV.3 .

Please also note the supplement to this comment:
http://www.ocean-sci-discuss.net/9/C1263/2012/osd-9-C1263-2012-supplement.pdf

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Interactive comment on Ocean Sci. Discuss., 9, 2581, 2012.