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# *Interactive comment on* "Wave boundary layer model in SWAN revisited" *by* Jianting Du et al.

**Jianting Du et al.**

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We are grateful for the valuable comments and suggestions. We give our response to the editor's comments in the following.

General comments

Comments: Page 3, equation 5: the possible effect of directional dispersion

Replay: Equation (5) c=u(zc)cos($\theta$-$\theta$w) is to define the "critical height" according to Miles (1957). Considering the misalignment between wind and wave direction, the "critical height" is the height where the phase velocity equals to the wind velocity component in the same direction as the phase velocity. The same method is also used by Janssen (1991), which is equation (3) in this paper. This equation applies to all the directions (36 directions in this study) in SWAN. We changed the expression in Section



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2.1 (page 4, lines 3-5) in case of misleading the readers.

Comments: Page 4, equation 11: introduction of the wave age tuning parameter

Replay: It is the same method (equation 3 in Bidlot, 2012) as that used in WAM. A positive wave age tuning parameter shifts the wave growth towards lower frequency. This paper is mainly about introducing the WBLM source terms for real applications, it is proved to be an effective way of tuning for both idealized cases and real storm cases, therefore we still keep using this parameter. We added some explanations in Section 2.1 (page 4, lines 13-14).

Comments: Page 4, equation 13: the possible effect of over/under dissipation at high frequencies

Replay: As discussed by Bidlot (2007), the introduction of the mean frequency and wave number with emphasis more on the high frequencies, is to reduce the impact of swell waves on the white-capping dissipation. Our present study is focus on the wind sea part as well, so it is reasonable to follow this method. More discussion is added in Section 2.2 (page 5, lines 1-2).

Comments: Page 5, lines 17-18: Â£this applies to cases like modal waves?

Replay: Firstly, fp is a discretized variable in the wave model. That will make discontinuity when it is being use for parameterizing dissipation coefficient. Second, it will be difficult to determine which fp should be used in case of bimodal waves. The integrated variable <f> changes more gentle than fp and it always have one value in any given wave spectrum. Therefore, we prefer to use <f> instead of fp for generality and numerical stability. The uncertainty of using <f> in the bimodal wave case is not investigated in this study. Considering the model performs quite well in the two real storm simulations, we assume that the uncertainty is relatively small. We discussed this uncertainty in Section 2.2 (page 6, lines 3-6).

Comments: Page 10, equation 22: the role of to scale U' with 10 m/s





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Replay: We choose 10m/s because in this wind speed condition, the fetch-limited wave growth curves follows the reference quite well without needing to tun the dissipation coefficient. We appreciate your suggestion, and it will be subject of future testing, this stage we still keep using this parameter. We added some explanation in Section 4.1 (page 11, lines 11-13). Detailed Comments

Comments: Page 6, lines 17-18: Include some table comparing calculation times in the same examples for the WBLM (new and previous version), KOM and JANS formulations

Replay: Suggestion taken. A table of calculation times during the idealized fetch-limited study using the new and old WBLM, KOM, and JANS source terms is added in Section 2.3. Comments: Page.10, line 25: Change Tp for fp

Replay: Correction made. Now it is in page 11, line 29.

Comments: Figure 2: (title) Change Tp for fp

Replay: Correction made.

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