Natural Hazards
and Earth System
Sciences

Discussions

Interactive comment on "Assimilation of decomposed in-situ directional wave spectra into a numerical wave model on typhoon wave" *by* Y. M. Fan et al.

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The authors would like to thank you for very valuable comments and suggestions, which will undoubtedly improve our submitted manuscript and the related figures and thus will be taken into consideration in our revised manuscript.

In the following parts you may find our reply to your comments and the contents will be revised in the manuscript:

1.Optimal interpolation is a statistical method, which determines the minimum error variance solution for the model state, by combining a model first-guess field and ob-

servations, with pre-specified forecast and observation error covariances. Previous experience has been obtained with the optimal interpolation method applied to wave height and wave period measurements (Janssen et al, 1989; Lionello and Janssen, 1990; Burgers et al, 1992; Mastenbroek et al, 1994). Optimal Interpolation of Partitions (OI-P) method, which used in the present study is also an optimal interpolation method, but an extended version which assimilates observations of full wave spectra.

Although we did a comparison of OI-P scheme with OI-I scheme (Fan, 2008), but the present study focuses on the impact of data assimilation of OI-P on typhoon wave forecasts. Therefore, the comparison of OI-P scheme with OI-I scheme is the other research issue and will be published in the next paper.

2.The difference of wave spectra obtained from SAR and pitch-and-roll buoys has been discussed in previous research (Violante-Carvalho et al., 2005 and Ren et al., 2011). Although the spatial coverage of buoys is limited, but the pitch-and-roll buoys supply more data than the synthetic aperture radar (SAR) in the region because they continuously record data at fixed positions. Therefore, this is why we chose the wave spectra obtained from pitch-and-roll buoys for data assimilation.

Reference: Violante-Carvalho, N., Robinson, I. S., Schulz-Stellenfleth J., Assessment of ERS synthetic aperture radar wave spectra retrieved from the Max-Planck-Institut (MPI) scheme through intercomparisons of 1 year of directional buoy measurements, Journal of Geophysical Research, VOL. 110, C07019, 2005

Ren Q., Zhang J., Meng J., Song P., Comparison and analysis of Envisat ASAR ocean wave spectra with buoy data in the northern Pacific Ocean, Chinese Journal of Oceanology and Limnology, Vol. 29 No. 1, P. 10-17, 2011.

3.The main wave systems mean wind sea system and swell system.

4.As the prediction error correlation matrix Pmk and the observation error correlation matrix Omk are not available, hence the assumption from Lionello et al. (1992) was

adopted in this study. δmk is Kronecker delta.

5.Although we could get higher spectral resolution from the buoy's observation, but due to the limitation of transmission technology, 32 wave directions and 41 wave frequencies are real-time data transmission only. Therefore, the analysis of the results improved with increasing spectral resolution can't be achieved at this stage.

6.Assimilation runs means the model-simulated with data assimilation; reference runs means the model-simulated without data assimilation.