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Interactive Comment

# *Interactive comment on* "A fully coupled Atmosphere–Ocean Wave modeling system (WEW) for the Mediterranean Sea: interactions and sensitivity to the resolved scales and mechanisms" *by* P. Katsafados et al.

**P. Katsafados et al.**

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Dear Dr. Yool,

The revised manuscript gmd-2015-38 has been submitted for review. Following your recommendation and the comments from the reviewers, the paper in its present form has been revised accordingly. The revisions can be summarized as follows: 1. Addition of an extensive paragraph describing the previous work done by ECMWF in the coupling of the atmosphere-ocean wave system (in page 4). The manuscript references

are also updated. 2. A reference of the recent paper from Breivik et al. (2015) is added in the revised manuscript. 3. An English language editing has been applied in the entire manuscript. The manuscript revised by a proficient in the English language. 4. The minor comments of the 2nd reviewer have been entirely addressed. Detailed replies on your comments follow.

A) The work described in the manuscript overlaps that previously published.

Reply: The work described in this manuscript is the approach adopted to develop a fully coupled atmosphere-ocean wave model for supporting regional research and operational activities on a very high horizontal resolution. Obviously there are many other similar works published during last decades at global scale (ECMWF, NOAA/GFDL, CNRM-CM5) or at regional scale (COSMO, HIRLAM, WRF, BOLAM). In particular, ECMWF has developed an advanced, state-of-the-art system based on a two-way coupling of the IFS spectral atmospheric model and the ECMWF version of WAM ocean wave model (ECWAM). Its superiority has been proved through a number of publications for a decade or even more. On the other hand, we developed a regional two-way coupled system based on a non-hydrostatic limited area atmospheric model and the WAM in order to resolve synoptic to mesoscale atmospheric and ocean wave features (eg. etesian winds, sea-land breezes etc.) over areas with complex physiographic characteristics (eg. Mediterranean Sea, Aegean Sea etc.). The native horizontal resolution of WEW is 0.05x0.05 deg and we are currently testing its performance on even finer resolutions (eg. 0.02x0.02 deg) where the non-hydrostaticity comes into play. Therefore a substantial difference between the coupled system of ECMWF and WEW is that each resolves different scales of atmospheric motions. From the technical point of view, the integration of the coupling environment, the exchange fields, the surface layer parameterization schemes are entirely different between the two systems. So the only partially common component between the two systems is the WAM (ECWAM for the slightly different version of ECMWF), which is a state-of-the-art and very well documented ocean wave model, developed by a great team of scientists including Pe-



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ter Janssen (The WAMDI Group, 1988. The WAM Model - A Third Generation Ocean Wave Prediction Model. Journal of Physical Oceanography, 18, 1775-1810), which made a tremendous work through numerous research projects almost three and a half decades ago. The Hellenic Centre for Marine Research (HCMR) is using various versions of WAM for operational and research activities and Dr. G. Korres has the appropriate and in depth knowledge of the model to support the WEW coupling group. This is the main reason that we opted to add WAM as the ocean wave component of WEW. Moreover this work is done in the framework of MyWave project, in which members of the WAMDI group (Peter Janssen was among others) were also involved, supporting us with constructive comments and suggestions. In regional scale, there are also groups coupling WAM with various limited area atmospheric models, such as the COSMO model (Cavalieri et al., 2012), the HIRLAM model (Saetra, 2007), the WRF model (Tolosana-Delgado et al., 2012 and Jenkins et al., 2012) and many other models. In line with this trend, we fully coupled the Eta atmospheric model with WAM and we present the methodology and a sensitivity test in this manuscript.

B) The manuscript does not properly acknowledge this work.

Reply: The work related to the development and applications of ECWAM is acknowledged in the revised version of the manuscript.

The corresponding author,

Petros Katsafados

List of the works cited in our reply

Cavaleri, L., Roland, A., Dutour, M., Bertotti, L., and Torrisi, L.: On the coupling of COSMO to WAM, In Proceedings of the ECMWF Workshop on Ocean-Waves, 2012. Jenkins, A. D., Paskyabi, M. B., Fer, I., Gupta, A., and Adakudlu, M.: Modelling the effect of ocean waves on the atmospheric and ocean boundary layers. Energy Procedia, 24, 166-175, 2012. Tolosana-Delgado, R., Soret, A., Jorba, O., Baldasano,



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J. M., and Sánchez-Arcilla, A.: Coupling of WRF meteorological model to WAM spectral wave model through sea surface roughness at the Balearic Sea: impact on wind and wave forecasts, European Geoscience Union (EGU) General Assembly Conference Abstracts, Vienna, Austria, 22-27 April 2012, Vol. 14, p. 7744, 2012. Sætra Ø.: A Coupled Atmosphere-Wave system to simulate Polar Lows, Polar Dynamics. Monitoring, Understanding, and Prediction. Open science conference, August 29-31, 2007, Bergen, Norway.

Please also note the supplement to this comment:
http://www.geosci-model-dev-discuss.net/8/C1903/2015/gmdd-8-C1903-2015-supplement.pdf

Interactive comment on Geosci. Model Dev. Discuss., 8, 4075, 2015.



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