

Interactive comment on “Integration between X-Band Radar and Buoy Sea State Monitoring” by

Giovanni Ludeno et al.

Anonymous Referee #2

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The authors did simultaneous measurements of waves during storm events with landbased X-band radars and wave buoy. Final target of this work seems to give some insight to Small Scale Storm Variation (SSSV) from the results of the measurements.

Radar and buoy measurements described in this work are both established methods (and tools), and there is no novelty and merit from this part.

Reply

The wave radar system and buoy are indeed established methods, but we believe that having applied two devices simultaneously to the same phenomenon has added something to the knowledge.

In order to clarify this, the following sentences have been add at the end of the Introduction:

*“This area of the Mediterranean Sea has a significant biodiversity and is affected by several complex oceanographic processes. Therefore, the information about the sea state parameters as well as surface currents is important in order to safeguard the biodiversity, to forecast the coastal erosion, to support decisions for the crisis events related to pollution. The novelty of the work lies also in the possibility monitor these complex oceanographic processes simultaneously and to verify their evolution in the space and time on a small scale with various devices.”*

The description of the two events is not shown in details. Are they induced by a similar weather system, or by a quite different situation? This must be an important information to discuss SSSV.

Reply

The two storms are both caused by weather perturbations typical of the Mediterranean Sea. In the revised manuscript, we have added the evolution of the wind during the events from ECMWF data.

Figure 3a and Figure 7a in the revised manuscript

The reviewer was expected to learn about SSSV, but the description on this is very few. The authors should explain processes in a SSSV, and whether they are detectable from their deployment: two radars and a buoy. The authors claim that Eq. (5) can be used as an index to discuss SSSV, but the background of this idea is not shown.

(Overall) The authors should describe more on SSSV:

- what are the variations in a small scale storm
- are the variations detectable from the deployment: two radars and a buoy
- how to detect variations from the measured data

Reply

In the revised manuscript a brief discussion has been added with some references.

*“This dispersion (CV) is partly due to measurement errors, but it also provides some evidence of the presence of random oscillations of the storm intensity. This is an indicator of short term storm intensity variations (SSSV) also i.e. variation of wind intensity (“gustiness”) on a much smaller scale than the evolution of the storm, and therefore inherently random in nature. Abdalla and Cavaleri (2002) actually simulated SSSV by feeding synthetic gusty wind series to a WAM model and provided some evidence of SSSV not unlike those found in the present work; later, Cavaleri and Burgers (1992) used the gustiness concept to improve the friction velocity estimates; Accadia et al (2007) made use of the concept in the context of Scatterometer wind observations while Pleskachevsky et al (2012) considered the influences of gustiness on ocean waves - in space rather than in time. Carratelli et al, 2014 gained some insight on the spatial aspect phenomenon by analysing the along-track altimeter values. So far little or no experimental work has been carried out on the time behaviour of wave data from either buoy or x-band radar*

*The similar values for MSE and CV of the very same storm with two entirely different measuring systems opens new possibilities for the analysis of SSSV.*

*Unfortunately, very little can be said about the remaining part of the storm, since the wave meter buoy was not operating at the time; the only useful information are the MSE, M and CV values, as above which are shown in Figure 6, and appear to be consistent with the previous ones.”*

One of the advantages of radar measurement is to collect spatial distribution of backscatter from the wave field. The authors should try to assess spatial variability from their data to discuss SSSV.

Reply

In this work, we did not use the radar to derive the spatial distribution but only temporal variation. The area covered by the radar is however (2 km<sup>2</sup>) too small to provide any understanding of gustiness