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## ***Interactive comment on “An approach to build an event set of European wind storms based on ECMWF EPS” by R. Osinski et al.***

### **Anonymous Referee #1**

Received and published: 6 May 2015

This paper describes the use of the ECMWF ensemble forecasts to generate an enhanced ensemble of European windstorm events on which to perform statistical analysis. This ensemble dataset has many more storms than the ERA-Interim dataset, against which it is constrained and validated, leading to smoother statistics. The ensemble forecast and ERA-Interim datasets are presented in the paper followed by the definition of 'storm severity' and the scaling performed on the ensemble dataset. The ensemble dataset is then validated against ERA-Interim (with the specific example of windstorm Emma) before the statistical spatial and temporal properties of the ensemble dataset are presented. The paper concludes that this ensemble dataset is suitable for climatological analysis of extreme events.

The paper presents an interesting and potentially very useful approach to generating

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the long datasets needed for climatological analysis. It is generally well-written and structured although it contains many instances of slightly odd phasing and grammar. More clarity is needed on the configuration of the ensemble storms dataset and interpretation of statistics resulting from it (given that the storms within it are not independent).

Major corrections:

Several different configurations of the EPS were operational during the period chosen for analysis with resolutions varying from T63 to T\_L 399. Some of the plots/tables exclude data from the T63 configuration without explanation (Table 2, Fig 3). Why is this?

The ratio between the size of the ensemble database and ERA-Interim database is mentioned (in passing) for the first time on p1244 (300 times as the EPS has 50 members and runs for 6 days). Does this mean that at any given time, forecasts with lead times out to 6 days are taken that verify at that time and the analysis time is ignored. But if so this wouldn't work with tracked storms - don't you just have the 50 ensemble forecasts starting at any given time to compare to the ERA-Interim analysis/forecast sequence starting at the same time? Also, given that the ensemble is initialised twice daily since Nov 2000 shouldn't the ratio be greater than this or is only one of the initialisation times considered? The generation of the ensemble storms dataset needs to be more clearly specified in section 2.2 (or an additional section added such that section 2.2 contains the specification of the ECMWF EPS and the new section the use of this EPS dataset to create the storms dataset).

The question of the independence of the storms in the ensemble dataset needs also to be discussed. Obviously for short lead time forecasts the storms will be very similar to the storms in the reanalysis whereas for longer lead times they can be very different (as indicated by the increase in the number of 'pure' storms with lead time in Fig 11). Hence the statistics of the ensemble derived dataset will not be the same as those of a

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reanalysis dataset with the equivalent number of days. I think this (and the implications) should be discussed in the paper. Introduction: I would find it helpful at the end of the introduction if a 'road map' to the rest of the paper was included. This guides the reader as to what to expect. It would also be helpful to include in the introduction a clear statement of purpose for the presented research i.e. the aim of the research or questions to be answered.

ERA-Interim data: section 2.1 states that 6 hourly reanalysis data is used. I think the reanalysis dataset contains analyses at 0 and 12 UTC, and 6 hourly forecasts out to 36 hours. So, are the analyses and 6 hour forecasts used to comprise the ERA-Interim storms dataset?

Minor corrections:

p1235, L27: I don't understand the sentence 'As ERA-Interim data is only available with 6 hourly resolution, the EPS data with 3 h resolution were used in subsets of 6 hourly resolution again'. What does the 'again' mean?

p1237, L16. What is the evidence (e.g. a reference) that difference resolutions of the EPS system produce difference wind speed biases?

p1238, L9: It would be helpful to add a sentence explaining what a quantile-quantile mapping is.

p1240, L8: Here a 'notable feature' of storm Emma is described. What interpretation and importance do you attach to this notable feature? Is it 'meaningful' or just a result of random chance.

p1240, L13: You argue that the increased range of the SSI in the EPS compared to ERA-I is 'partly due to the definition of the SSI, using cubic exceedences'. I don't think this directly follows. Surely the range in the EPS is larger than that in ERA-I simply because the severity of the storms in the EPS can exceed those in ERA-I. The definition of the SSI using cubic exceedences leads to the range in SSI in the EPS

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being very much larger than that for ERA-I as a result of relatively small increases in windspeed and/or area in the EPS.

p1241, L20: You say that the SSI values are expected to be lower for data with 12-hourly compared to 6-hourly temporal resolution. Is this simply because the time of maximum severity is more likely to be further away from one of the data times for the 12-hourly data?

p1241, L28: Add a reference for the 'Anderson-Darling test'.

Table 1: Why are there 2 temporal resolutions available for 2 of the EPS configurations?

Fig 11: given that ERA-Interim does not include a 192+ h forecast, what does the line for ERA-Interim mean on this plot?

Fig 13 caption: please define 'relative grid cell affection (%)'. Is this the % of time a 'pure' storm relative to 'all storms' is seen at this grid point in the EPS? Is this for a specific lead time? In the associated text, p1244 L16, it says that this figure shows that 'Over the Atlantic the number for the "pure" EPS storms is lower than over North Africa and Eastern Europe'. The % pure storms is less over the Atlantic but is the absolute number also less? This section needs some clarifying.

Fig 14 & 15 caption: The x-axes here are labelled duration but I think this is actually forecast time with the different coloured lines relating to different storm durations (if I've interpreted the text correctly).

Grammatical corrections/ typographical errors:

Lots of minor English language and syntax errors. Although all the text is understandable and for the most part the English is very good there are many instances of slightly odd phrasing and grammar. I have indicated some of these below. It would help though to ask a native English speaker to read through the paper and suggest further corrections if possible.

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p1233, L7: 'station-data' should not be hyphenated.

p1233, L 11: 'quintessence' is a seldom used English word and does not seem to be used in context here - perhaps 'implication' would be more appropriate.

P1233, L16: too many commas and sentence doesn't make sense - rewrite.

p1233, L23: 'been become' - remove 'been'

p1234, L2: 'was already used' -> 'was used'

p1235: L16-18: Sentences describing the evolution of the resolution of the model and the singular vectors need re-writing for clarity. e.g. 'The horizontal resolution was increased from T63 as follows: T\_L 159 (12.1996), T\_L 255 (11.2000) ....'

p1236, eq 1: Please define all terms in the equation ( $V_{perc,k}$  and  $A_k$  are not defined).

p1237, L8: Sentence beginning 'As the excess...' doesn't quite make sense. What 'can also be affected by the inhomogeneities'?

p1238, L24: 'steps then' -> 'steps than'

p1239, L4: 'valid noon' -> 'valid at noon'

p1239, L9: 'well visible' -> 'clearly visible'

p1239, L12: 'without figure' -> 'figure not shown'

p1240, L27: 'forecasted' -> 'forecast'

p1240, L28: 'for a maximum' -> 'as the maximum'?

p1240, L7: 'mentioned earlier' -> please be specific i.e. 'described in section 4.1'.

p1240, L8: Here an un-numbered bold heading is given that is virtually identical to the previous heading numbered 4.3. Either this should be a different numbered heading or be removed.

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p1240, L16: 'to ERA-Interim' -> 'with ERA-Interim'

p1240, L18: change to '...that there is a reasonable number of events in each of the classes to permit...'

p1242, L7: please write out 'SD' as 'standard deviation' for clarity.

p1242, L9: Change to 'Storm representations in the EPS and ERA-Interim with comparable SSI values show, on average, comparable storm duration as well as storm size (not shown).'

p1242, L13: 'imagination' is an odd choice of word here. Do you mean 'assumption'?

p1242, L23: 'synoptical' -> 'synoptic'

p1243, L3: remove comma after 'assumed'

p1243, L7: 'grey lines' -> 'dark grey lines without symbols'? There are 3 different grey lines in this figure and so the description needs to be more precise.

p1243, L16: 'its values' -> 'their values'

p1243, L23: the term 'affection' is not used in this sense in modern English. Replace phrase beginning 'affection' by 'effect of all detected storms on each grid cell'. See also p1243 L27, p1244 L5 & L14 and fig 12 and 13 captions.

section 5.3: Fig 12 needs to be referenced here as the text relates to this figure.

p1243, L7: '50 member' -> '50 members'

p1244, L12: 'is originated in' -> 'originates from', 'which are independent to' -> 'that are independent of'

p1245, L3: 'The Fig. 14 shows...' -> 'Figure 14 shows...'

p1245, L8: By 'growth' I think you mean 'growth rate' and similarly 'intensification rate' in L12.

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p1245, L9: 'extension' -> 'size of the wind field'?

p1245, L18 & 19: 'extension' -> 'area' (extension more usually refers to a length in 1 dimension rather than 2 dimensions).

p1245, L20: sentence beginning 'The fact...' needs rewriting. I think you mean 'The fact that the operational EPS changed its characteristics during the data period led to changes in the value of the 98th percentile of windspeed. Hence a homogenization ....'

p1246, L9: 'did have' -> 'had'

p1246, L17: change to '...occurrence that is different...'; 'storm' -> 'storms'

p1246. L27: 'statistical' -> 'statistically'

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