Authors' response to comments by referee #1

Manuscript title: The selection of directional sectors for the analysis of extreme wind speed.

We would like to thank the reviewer for the positive and constructive comments that will help us to improve the quality of the paper. Comments from the reviewer are written in italics followed by our response.

Reviewer #1

This paper describes a method for finding the optimum set of directional sectors for a directional extreme value analysis. The goal is interesting and the proposed method seems plausible, but it failed to convince me that the results are optimal. In the example, the sections for analysis are separated from each other. Why are the proposed sectors superior to sectors that match the sections? The sections are far enough separated that independence should not be an issue. The intuitive choice would be to pick sectors centered on the sections and as wide as the data appears to be homogeneous. Why is that not better?

> The reviewer says he is not convinced that the proposed method is optimal. However, the authors do not pretend to be presenting an "optimal" method, but an objective method of directional classification for directional extreme value analysis. The current state of the art on selection of sectors for directional analysis is subjective. In this work, the objective is to propose an objective method "considering the main sources of uncertainty stemming from sector selection: (1) the validity of the model used to characterize the extreme behavior of the sector samples; (2) the goodness of parameter estimation; (3) the capacity of each model to represent extreme behavior in the total amplitude of the corresponding sector; (4) the validity of the working hypothesis of the independence between extreme values in different sectors" (quoted from first paragraph of section 5).

> Whether or not the sectors division is optimal will depend on its application and on the objective function and the constraints of the optimization. This analysis is out of the scope of this manuscript.

> What the authors do intend is the proposed method to be general and not conditioned by the subsequent use made of the directional sectors, e.g. in the case of the example presented in the manuscript, that the method is not conditioned by the structure that is being designed. In this sense, it is possible that, as the reviewer points out, other specific directional partitioning methodologies can be defined for the analysis of the structure in question, and that these can be considered "optimal" for that particular case. It is important to note that the methodological approach and the tools proposed in this paper would also be useful when objectively determining the sectors if the approach proposed by the reviewer is followed (i.e. conditioned to the structure being designed).

According to Table 2 and Figure 7, all of the extreme value fits are good and do not affect the sector choices. But some of the fits in Figure 6 do not appear to be all that good. (Incidentally, I applaud the selection of Figures that give details of the process). The fit for Sector 1 in C45 is considerably higher than the empirical data. Is that related to why the extreme wind speed for Section 1 and T45 is so high? By comparison with results in Figure 4, 26 m/sec does not seem reasonable.

The QQ graph for sector 1 with criterion T45 has values between 14 m/s and approx. 17 m/s. It shows that the model slightly underestimates the observations (in less than 0.5 m/s), as opposed to what was indicated by the reviewer.

The large values obtained for section 1 in the case of criterion T45 (we assume that the reviewer refers to table 4) are likely to come from sector 2, where the fit of the GPD results in a positive shape parameter (approx. 0.1), unlike all others fits, where the shape parameter is always negative (see table 3). This, if you will, highlights once again the drawbacks of using arbitrary sectors for the analysis of directional extremes.

There are a few places where the text is not clear and I had to read farther on through the examples to understand the process.

In heading 3.1, what does "agent" at the site mean?

Given that the proposed methodology is applicable not only to wind, but also to other directional climatic agents, such as waves or currents, it was decided to use "agents" instead of "wind" in many paragraphs throughout the text to highlight this generality.

On line 7, page 8, what are "two moments"? Are they six hours apart or do they include the whole storm?

The whole storm is included. It refers to the absolute maximum difference of the wind direction that can be found between any two points in time within a given storm, taking into account the direction of rotation (clockwise or counterclockwise).

On lines 12-14, page 8, are the peak events just the peak Hs in each storm or the peak Hs in each sector in each storm?

For every storm, we obtain the peak of the wind speed for each one of the sectors that the storm passes through.

The caption for Table 1 would be much clearer if it read "Directional sectors resulting from applying the different selection criteria."

We appreciate review suggestion and we will include it in the new version of the manuscript.

In equation (8), I don't see where the width of the sector appears.

The width of the subsector is considered in the calculation of each Poisson parameter nu_s. This parameter indicates the annual rate of peaks within the subsector, therefore it is influenced by subsector's width (please see page 16 line 13).