

This is the response of H.E. Rieder and L. Frossard on behalf of all authors (AC written in italic) to the comments of Referee 2 (R2).

First of all we thank the referee for his/her positive judgment and valuable suggestions leading to an improved version of the manuscript.

We thank the referee in particular for taking the effort to go through part 1, even if not commented on, and for acknowledging its contribution to the research field.

The individual points raised by the referee are addressed in the point to point reply below.

### **General Question:**

**R2:** Why is the analysis not applied to the tropics? Immediately the paper pre-selects two regions (60S-30S and 30N-60N) without providing a rationale for it. ....

*AC: Our analysis focuses (as already stated in the title) particularly on northern and southern mid-latitudes. There are two main reasons: (i) a different (reduced) set of explanatory variables would be needed for the tropics, entailing the use of a different statistical model, which is unsuitable because the joint plotting of coefficients from different models in one figure does not allow for direct comparison of the results; and (ii) our analysis extends earlier work based on long-term ground-based stations (Rieder et al., 2010a,b; 2011) and thus allows for direct comparison of the results. However, we agree with the referee that an additional analysis for tropical latitudes would be an interesting topic for future work.*

### **General Comments:**

**R2:** Nearly all figures contain an information overload, because always all three results (two for the extreme values and one for the mean) are shown. Is this necessary? In many plots the differences between the methods are not large and are not addressed in the text.

*AC: According to the referee's suggestion we modified the graphical work in the paper. We removed the panels showing the standard errors of the coefficient estimates from the figures in the paper and provide the full versions as supplementary material (in both part 1 and part 2). Further we modified the text to better highlight differences and similarities between the results achieved for mean and extreme values, e.g. on p.13213 L11-14, p.13216 L7-10 and 20, p.13217 L26-27 and p.13218 L4-6 of the original manuscript. We prefer to show ELOs, EHOs and mean values next to each other as, e.g., for the volcanic eruptions there is a striking difference in significance (p-values) between the extremes and mean values.*

**R2:** Figure style (e.g. figure 1) ....

*AC: According to the referee's suggestion we modified the graphical work in the paper, see comment above.*

**R2:** Figure style (e.g. figure 9): This figure style is totally overloaded and the message that the authors might wish to communicate about regional and methodological differences is getting lost. I would suggest to focus on one region (year round or particular season) first, where the estimates differ between the different statistical models and to focus on the differences. Based on this figure select your favorite model and look at the regional differences.

*AC: We agree with the referee on the difficulty to access Figures 9 and 10 in the discussion paper. However, we believe it is of interest to show various regions of the northern (and southern) mid-latitudes in one figure to highlight the regional differences. In addition part of the difficulty in accessing these figures comes from the ACPD page style. In the final manuscript the figures will be plotted over a full page which will improve readability. The same will hold for all other multi-panel figures comparing ELOs, EHOs and mean values as they will be printed over a full page width.*