We thank referee #2 for their review, questions and suggestions to improve the manuscript. In the following we will respond in to the different comments and explain the general changes we intend to make to the manuscript based on them. The reviewer's comments are in black italics, our responses are shown in blue. All line numbers and references refer to the originally submitted manuscript.

This paper looks at the impact that storms have on ensemble spread of S2S forecasts, focussing on Northern Europe/the North Atlantic region. The results show that the occurrence of strong storms contributes around 20% of the Z1000 spread. The study then moves on to look at the impacts of strong and weak SPV states on storms and ensemble spread. Overall the paper is well written, with clear and useful figures, and a logical structure. I have only a couple of minor comments.

Thanks for highlighting the strengths of our paper and the positive feedback.

Minor comments:

Fig 1: it is interesting to see that on some days the spread without storms is (albeit slightly) higher than the spread with storms: do you have any ideas why this would happen? I can see that it happens when the Z1000 spread of the active storm members is within the range of other members, but in a dynamical sense how would you interpret this?

This is indeed an interesting question. Situations where the presence of a storm does not lead to a significant increase in spread, or even a decrease, is indeed, as you explained, if the Z1000 index of the corresponding ensemble member is close to the ensemble mean. One practical scenario that could lead to such a situation if the centre of a relatively weak storm is detected inside the detection area, while most of the Z1000 anomaly of that storm lies outside of the area. Such a situation is for example happening at leadtime day 15 in the case study discussed in Section 3 of the manuscript (hindcast initialised 31 December 2007). In this case, we identify a storm within the detection area for only for 1 of 10 members (see Fig. 1 in the manuscript). Removing this member associated with a storm from the dataset very slightly increases the ensemble spread.
The synoptic situation of selected members for this case are shown in Figure R2.1. Member 4 of this hindcast shows a storm at the very edge of the detection area (green box), but of the Z1000 anomaly lies outside of the area used to compute the Z1000 spread (purple box). In addition, members 1 and 2 show storms with centres just outside of the green box, but with Z1000 anomalies reaching inside the purple box, hence these members will likely show more negative Z1000 extremes than member 4, while not being associated with a storm. However, these situations are rather rare. The motivation for choosing a slightly larger detection area than area used for Z1000 spread analysis is based on the synoptic size of storms and to reduce the impact of situations like shown in Fig. R2.1b, where a storm centre lies outside of the target area, but the storm extends inside.

We will add a short note to the discussion of Fig. 1 to address this issue.

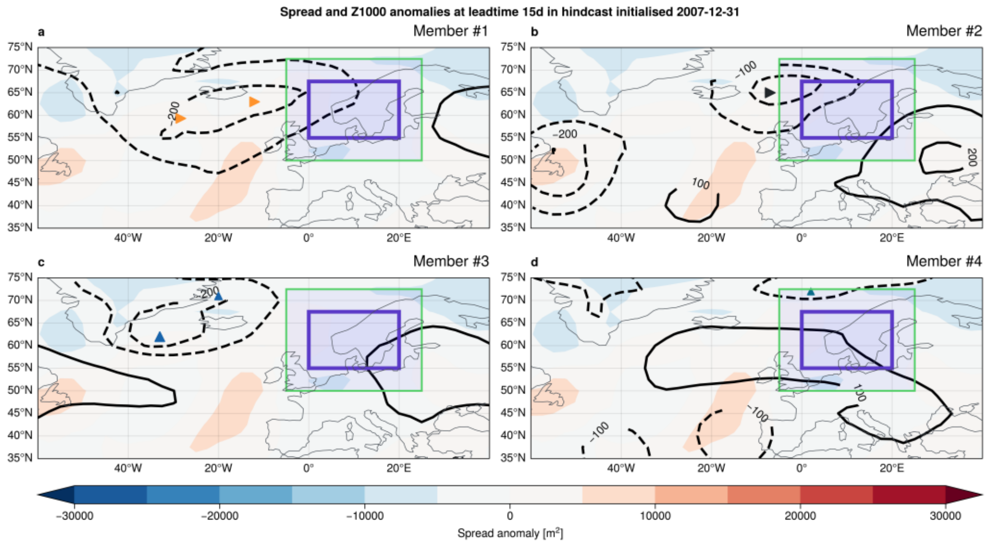

Figure R2.1: Z1000 anomalies (contours) and associated spread anomalies (shading) for selected member at lead-time day 15 of the hindcast with initial conditions from 31st December 2007. Markers indicate the centre location of strong storms in the respective member. Marker sizes scaled with storm strength. Purple thick box indicates the Northern European region used for averages in the manuscript, green thin box shows the region used to identify members with active storm.

Fig 4 a and b: I didn't entirely understand what is plotted here or follow the interpretation about this - Please could you try to clarify more in the text.

Figure 4 shows a composite over 'spread peaks', which are identified as time steps in a hindcast where the ensemble spread anomaly is extremely high. The red curve in Fig. 4a shows the composite mean of the spread anomaly indeed exceeding the 95th percentile for these events. The panel further shows the distribution of Z1000 anomaly over Northern Europe around these events. While the Z1000 distribution is symmetric around 0 long before or after the events, it is highly skewed during the event (lag=0). The reason is that strong storms (which are a main driver of these extreme spread events) are associated with extremely negative Z1000 anomaly.

To further substantiate the hypothesis that strong storms drive such spread events, Figure 4b shows the storm density and strength in the area. At the time of the event (lag=0), both metrics are significantly increased, suggesting that both physical characteristics contribute to the extreme spread (more storms and stronger storms).

We will revise the paragraph discussing this figure and clarify our interpretation of the associated results.

Typos:

Fig 4 caption: anomay – should be anomaly
Will be corrected.

Fig 5 caption: Evolution of …
Will be corrected.